LAKE BERRYESSA WATERSHED SANITARY SURVEY UPDATE

FINAL REPORT

JUNE 2013

PREPARED BY
ARCHIBALD CONSULTING

FOR

NAPA COUNTY DEPARTMENT OF PUBLIC WORKS
AND
SOLANO COUNTY WATER AGENCY

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1.0 INTRODUCTION

Watershed Sanitary Surveys were prepared on the Lake Berryessa watershed in 1993 and 2001. The 1993 Watershed Sanitary Survey was conducted for Solano County Water Agency (SCWA) and was focused on the Solano Project. Information was provided on contaminant sources in the Lake Berryessa watershed and the significance of the contaminant sources was assessed for the SCWA facilities downstream of Lake Berryessa. The significance of these contaminant sources for the small water systems that take water from Lake Berryessa was not addressed. The 2001 Watershed Sanitary Survey Update contains a limited amount of information on the lake water systems.

The California Department of Public Health agreed that the 2012 Update could be a simplified report that focuses on the Lake Berryessa Resort Improvement District and the Napa Berryessa Resort Improvement District water systems and describes the changes in the watershed since the 2001 Update was prepared. The Napa County Department of Public Works and SCWA responses to the recommendations in the 2001 Watershed Sanitary Survey Update are also discussed.

2.0 WATER TREATMENT PLANTS

There are a number of small water systems that rely on Lake Berryessa as a water source; however, this watershed sanitary survey only covers the two systems that are operated by the Napa County Department of Public Works. These two systems, the Lake Berryessa Resort Improvement District (LBRID) and the Napa Berryessa Resort Improvement District (NBRID), are shown in **Figure 2-1**. The water treatment plants (WTPs), the systems served, and information on planned improvements are described in this section.

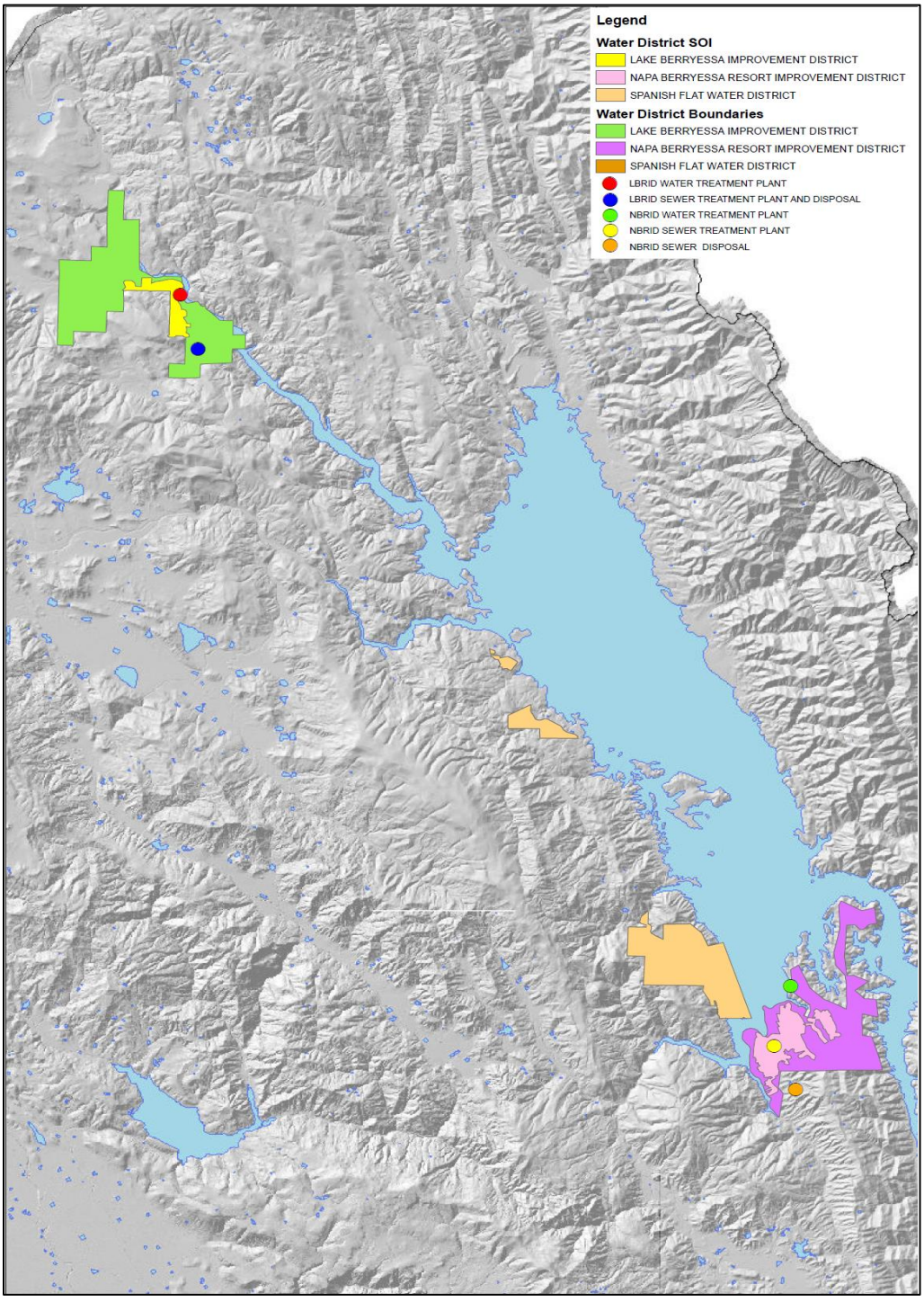
Lake Berryessa also provides water to the Solano County Water Agency (SCWA) and Solano Irrigation District (SID). The WTPs that receive water from SCWA and SID are described in the Watershed Sanitary Survey Update 2012 for Solano Project Below Monticello Dam (Archibald Consulting, 2013).

2.1 Lake Berryessa Resort Improvement District

LBRID was established in 1965 to provide potable water and sewer services to the Lake Berryessa Estates Unit 2 subdivision, an unincorporated community located along Putah Creek. Currently, LBRID provides water and sewer services to 167 single-family residences. At full build-out, LBRID will provide water to 339 lots. LBRID's water supply is drawn from Putah Creek, near where Putah Creek flows into Lake Berryessa. LBRID's right to draw water from the lake is secured through a 1999 agreement with the Napa County Flood Control and Water Conservation District. LBRID is entitled to 200 acre-feet per year through 2024 (Napa County, 2007).

The water system was constructed in the 1960s and consists of a raw water pumping station, a WTP, three potable water storage tanks, and a distribution system. LBRID replaced the 40-year old WTP with a new plant in 2011, using funding from the Federal American Recovery and Reinvestment Act of 2009. The new WTP is a 0.3 million gallons per day (mgd) dual train immersed membrane filtration plant called the Ultrafiltration Z-Box-S12 (Z-Box), which is manufactured by Zenon and General Electric. The Z-Box contains 12 membranes per train and is capable of providing 4-log removal of *Giardia* and *Cryptosporidium* and 3.5-log removal of viruses. Membrane filtration is preceded by coagulation and flocculation in a 1,000 gallon tank. Sodium hypochlorite is used for disinfection. Potassium permanganate is used seasonally for iron and manganese removal. LBRID is currently in the process of replacing its three redwood storage tanks with bolted steel storage tanks.

Figure 2-1. LBRID and NBRID Water Service Areas



Source: Napa County Department of Public Works

2.2 Napa Berryessa Resort Improvement District

NBRID was established in 1965 to provide potable water and sewer services to existing residences, the Steele Park Resort, and a planned recreational and residential development along the southern shoreline of Lake Berryessa. Currently, NBRID currently provides water and sewer services to 329 service connections primarily in the Berryessa Highlands subdivision. At full build-out, NBRID will provide water to 560 lots. The Steele Park Resort is no longer served by the system. NBRID's water supply is drawn from Lake Berryessa. NBRID's right to draw water from the lake is secured through a 1999 agreement with the Napa County Flood Control and Water Conservation District. NBRID is entitled to 200 acre-feet per year through 2024 (Napa County, 2007).

The water system was constructed in the 1960s and consists of a raw water pumping station, a WTP, one 500,000 gallon potable water storage tank, and a distribution system. The conventional WTP has a capacity of 425 gallons per minute or 0.6 mgd. The WTP includes chemical treatment, rapid mix chamber, flocculation basins, sedimentation basin, and a sand filter. Chlorine is used for disinfection. The U.S. Bureau of Reclamation (Reclamation) issued an Environmental Assessment (EA) for upgrades to the water and wastewater systems owned by NBRID in January 2013 (Reclamation, 2013). The EA states that the new WTP will be a Roberts Filter style package treatment plant system. The system will be sized to handle average and peak potable demand conditions, which will reduce backwash from the existing system that is currently discharged to the wastewater treatment plant. Use of the existing backwash pond system will be discontinued and the existing sedimentation basins, which will not be used with the new plant, will be used in its place. The EA states work will be completed by December 2013.

3.0 POTENTIAL CONTAMINANT SOURCES

The 1993 and 2001 Watershed Sanitary Surveys provide a comprehensive description of the watershed and potential contaminant sources in the Lake Berryessa watershed. Agreement was reached with the California Department of Public Health that the 2012 Update would focus on recreational use of Lake Berryessa, wastewater treatment facilities, agricultural practices in the watershed, and hazardous materials spills. **Figure 3-1** shows the key features of the Lake Berryessa watershed.

3.1 Recreational Use of Lake Berryessa

Lake Berryessa has been an outdoor recreation destination for over 50 years and has offered both water-based and land-based recreation options. Recreational uses of Lake Berryessa include boating and personal watercraft activities and swimming on the water, along with land-based activities, such as shore fishing, birding, wildlife observation, picnicking, camping, bicycling, and hiking.

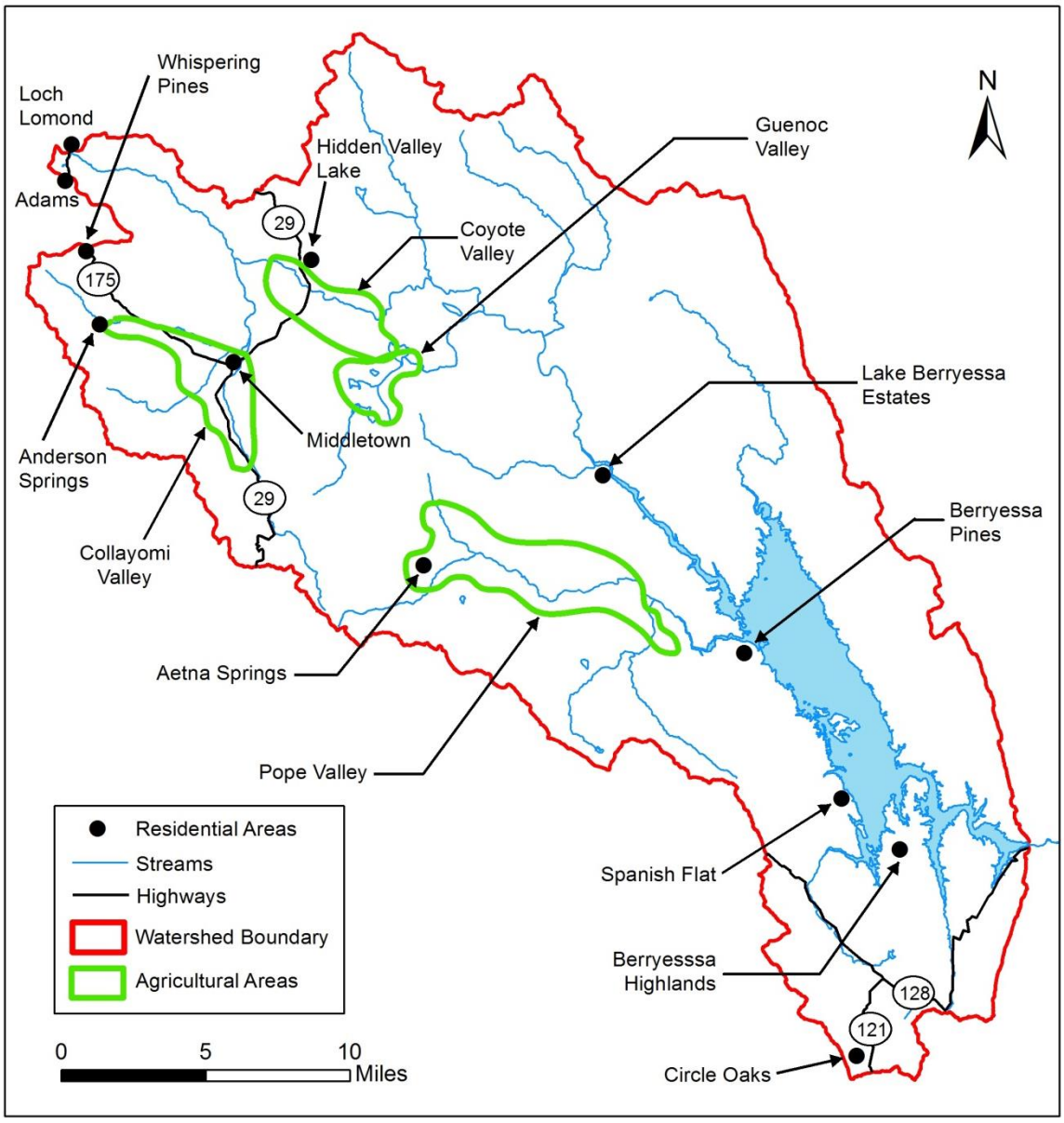
While the lake has averaged 1.5 million visitors in recent years, recreation facilities and options are currently undergoing major changes under the Visitor Services Plan (VSP) adopted by the U.S. Bureau of Reclamation (Reclamation) in 2006, including the removal of over 1,300 permanent and semi-permanent residential structures from concession areas along the shoreline, the closure of several of these areas, severe reductions in the number of overnight stay sites along the lake, and a continuing process for developing long-term contracted management and operation of the lake's concession areas. As a result, visitation is down from its normal annual level.

3.1.1 Background

Recreation was not originally a federally-authorized use of Lake Berryessa. Project engineers believed that flood control and water supply activities would result in wide swings in the lake's water level, rendering shoreline and water-related recreation undesirable. Nevertheless, soon after construction of the Monticello Dam was completed in 1957 and the reservoir started to fill, public visitors began to use the lake for recreation.

In 1958, Reclamation entered into an agreement with Napa County Department of Public Works (Napa County) to manage recreation at the lake. Over the next year, Napa County awarded seven concession contracts, each with a term of 30 years, to develop and manage designated areas along the lake shore for short-term recreation of the visiting public. These seven areas covered a total of 1,700 acres of land and water. During this same period, Reclamation commissioned the National Park Service to develop a Public Use Plan (PUP) to guide management of resources and recreation at Lake Berryessa. Once the PUP was adopted, Lake Berryessa was officially available for public recreational use.

Figure 3-1. Lake Berryessa Watershed



All seven concession contractors, once their respective areas had opened for business and with the approval of Napa County, began to allow private owners to install their trailers and mobile homes on an indefinite basis, actions that conflicted with both the PUP and the provisions of their contracts. Concessionaires contended that revenue generated by these arrangements was necessary to provide a year-round revenue flow to keep their businesses solvent. Over the next several years, over 1,300 trailers and mobile homes were installed at the seven concession areas, along with significant owner-added amenities like private decks, docks, and driveways. These facilities occupied space along and near the shoreline to the exclusion of campsites, picnic areas, and other short-term or overnight facilities. Over time, these permanent dwellings began to challenge or overwhelm the measures taken by

concessionaires to control and capture the volume of wastewater generated. This is discussed in more detail in Section 3.2.

In 1971, a General Accounting Office audit, along with later audits performed in 1995 and 2000 by the U.S. Department of Interior's Office of Inspector General, found that the concessionaires were essentially operating mobile home parks at the lake's shoreline and required Reclamation to address health, safety, and exclusionary issues associated with these facilities. In 1972, the PUP was formally updated and imposed new conditions on long-term exclusive use at concession areas. Hundreds of trailers and mobile homes, however, were already installed at the seven concession areas, many of them serving as permanent, primary residences.

In October 1974, Congress authorized Reclamation to manage all recreation activities and facilities at the lake and to develop and build, with a $3 million budget authorization, new government-operated facilities. The next year, the agreement with Napa County was terminated and all seven long-term concession contracts were transferred to Reclamation oversight.

Despite the serious problems associated with the over 1,300 trailers and mobile homes at the seven concession areas and despite these 30-year contracts expiring during 1988 and 1989, all seven contracts were renewed until 1998 and 1999. Then, all seven contracts were renewed again for another ten years. The Secretary of Interior was not authorized by Congress to renew any of these contracts when they were set to expire during 2008 and 2009.

On June 26, 2000, Reclamation initiated a formal VSP effort through the National Environmental Policy Act process and, in February 2001, Reclamation partnered with the State of California to begin addressing pollution problems at Lake Berryessa. Reclamation stated one of its intents in initiating the VSP effort at that time was to provide ample time and opportunity for then-current concession area contractors to prepare for the expiration of their contracts in 2008 and 2009.

The VSP Draft Environmental Impact Statement (EIS) was published in October 2003 and included four broad alternatives for managing future recreation use and operations at Lake Berryessa. The Final EIS was released in November 2005 and the Record of Decision (ROD) for the VSP was approved in June 2006. The ROD included the following elements:

- Develop a public agency forum to promote communication and collaboration in implementing the VSP ROD.

- Limit future development of concession areas to facilities that support short-term, traditional, non-exclusive, and diverse recreation opportunities.

- Provide prospective concession area contractors the flexibility to meet new requirements, subject to environmental analysis.

- Require all facilities at concession areas to be built/installed, operated, and maintained by the concessionaires.

- Specify the type of facilities that may be developed at each concession area.

- Classify facilities as Day Use, Short-Term and Annual. Annual occupancy is allowed under certain circumstances in units that are constructed/installed, operated and maintained by concession area contractors.

- Identify mitigation measures to reduce the VSP ROD's impact on existing contractors and their employees, then-current trailer and mobile home owners, and others.

- Reserve certain areas of the lake for non-motorized watercraft and electric trolling engines; the lake's watercraft carrying capacity is limited to 3,000 vessels, 75 commercial houseboats or other overnight vessels, and 75 privately-owned houseboats.

- Require Reclamation to work with partner agencies and new contractors to expand and maintain a trail system for non-motorized recreation.

In June 2007, Reclamation released a Concession Prospectus, inviting potential concession contractors to manage the concession areas at Lake Berryessa, once the contracts expired in 2008 and 2009. In April 2008, Reclamation announced the selection of three proposals for new concession contracts, as follows:

FX10 LLC, the new name of the operator of the Markley Cove concession area, submitted a successful offer to operate Markley Cove Resort.

Pleasure Cove Marina LLC, a Forever Resorts property, the operator of the Pleasure Cove concession area since 2005, submitted a successful offer to operate Pleasure Cove Marina.

Pensus Group LLC, headquartered in Paradise Valley, Arizona, submitted a successful offer to operate Steele Park, Spanish Flat, Lake Berryessa Marina, Rancho Monticello, and Putah Creek concession areas under one contract.

In December 2008, Reclamation signed a 30-year contract with Pleasure Cove Marina LLC to manage the Pleasure Cove Resort but was still negotiating with FX10 LLC and Pensus on the six other concession areas. In March 2009, these negotiations were canceled and, two months later, a request for proposals (or prospectus) was once again released. In April 2010, Reclamation signed a 30-year contract with Pensus Lake Berryessa Properties, LLC to manage all concession areas, other than Pleasure Cove Marina and Markley Cove. Less than two years later, in December 2012, Reclamation, citing noncompliance with contract terms and timelines, terminated the concession contract with Pensus and, currently,

Reclamation is directly managing the five concession areas, with Markley Cove continuing to be privately managed. Pensus formally appealed the contract termination, but on February 13, 2013, the U.S. Department of Interior's Office of Hearings and Appeals denied the appeal.

Since the VSP was finalized in 2006 and all then-existing concession contracts had expired by 2009, Reclamation has undertaken the task of removing hundreds of abandoned trailers, mobile homes, and related personal property from the concession areas. In March 2010, Reclamation awarded a $191,000 contract to to remove the remaining abandoned trailers and mobile homes. These funds were part of a $3 billion appropriation made to the Department of the Interior under the American Recovery and Reinvestment Act of 2010.

In January 2013, Reclamation announced that it was attempting to find interim concessionaires to operate the resorts for two to four years. As an incentive to attract interim contractors, Reclamation intends to commit funds and other resources to make basic infrastructure improvements for water, power, and facilities at some of the resorts this year. As of May 2013, Reclamation has not identified funding for this purpose and has not released a timeline for these actions.

Reclamation announced in January 2013 that it would establish the Lake Berryessa Community Forum Coordinating Team, as required by the 2006 VSP ROD. The purpose of the forum is to better communicate and coordinate with parties interested in and affected by the management and operation of Lake Berryessa. Reclamation identified the following eleven groups to be represented on the forum:

- Local Landowners and Residents
- Local Ranchers
- Local Businesses
- Land-Based Recreation
- Water-Based Recreation
- Conservation Groups
- Gateway Communities
- Water Quality and Water Supply
- Public Services and Public Safety
- Broad Based Interests
- Fish and Wildlife Management

After a brief nomination process, Reclamation selected ten individuals to represent ten of these groups (no nominations were received for the Fish and Wildlife Management position). The Lake Berryessa Community Forum Coordinating Team held its first public meeting on February 27, 2013. Reclamation intends to initially conduct these meetings on a monthly basis in an effort to keep interested parties informed about upcoming Reclamation decisions on interim and long-term concession contracts and on other matters related to implementation of the VSP ROD and to receive community feedback and recommendations on the best ways to achieve the goals of the VSP ROD.

During the two years Pensus held the contracts for five of the seven resorts the company renamed each resort and placed signage at each entrance indicating both the new and former name. These new names were not popular with much of the Lake Berryessa community and, after the Pensus contract was terminated, Reclamation considered requests from the community to return to the traditional names that applied until 2010. Due to legal restraints, Reclamation announced in March 2013 that reinstating the traditional names was not possible. On April 5, 2013, Reclamation issued a press release that concession areas were renamed. **Table 3-1** contains the original names of the resorts, the Pensus names, and the new names announced by Reclamation.

Table 3-1. Resort Names

Original Name	Pensus Name	2013 Reclamation Name
Putah Creek Resort	Chaparral Cove	Putah Canyon Recreation Area
Rancho Monticello Resort	Manzanita Canyon	Monticello Shores Recreation Area
Lake Berryessa Marina Resort	Blue Oaks	Berryessa Point Recreation Area
Spanish Flat Resort	Foothill Pines	Spanish Flat Recreation Area
Steele Park Resort	Lupine Shores	Steele Canyon Recreation Area

3.1.2 Current Recreational Facilities at Lake Berryessa

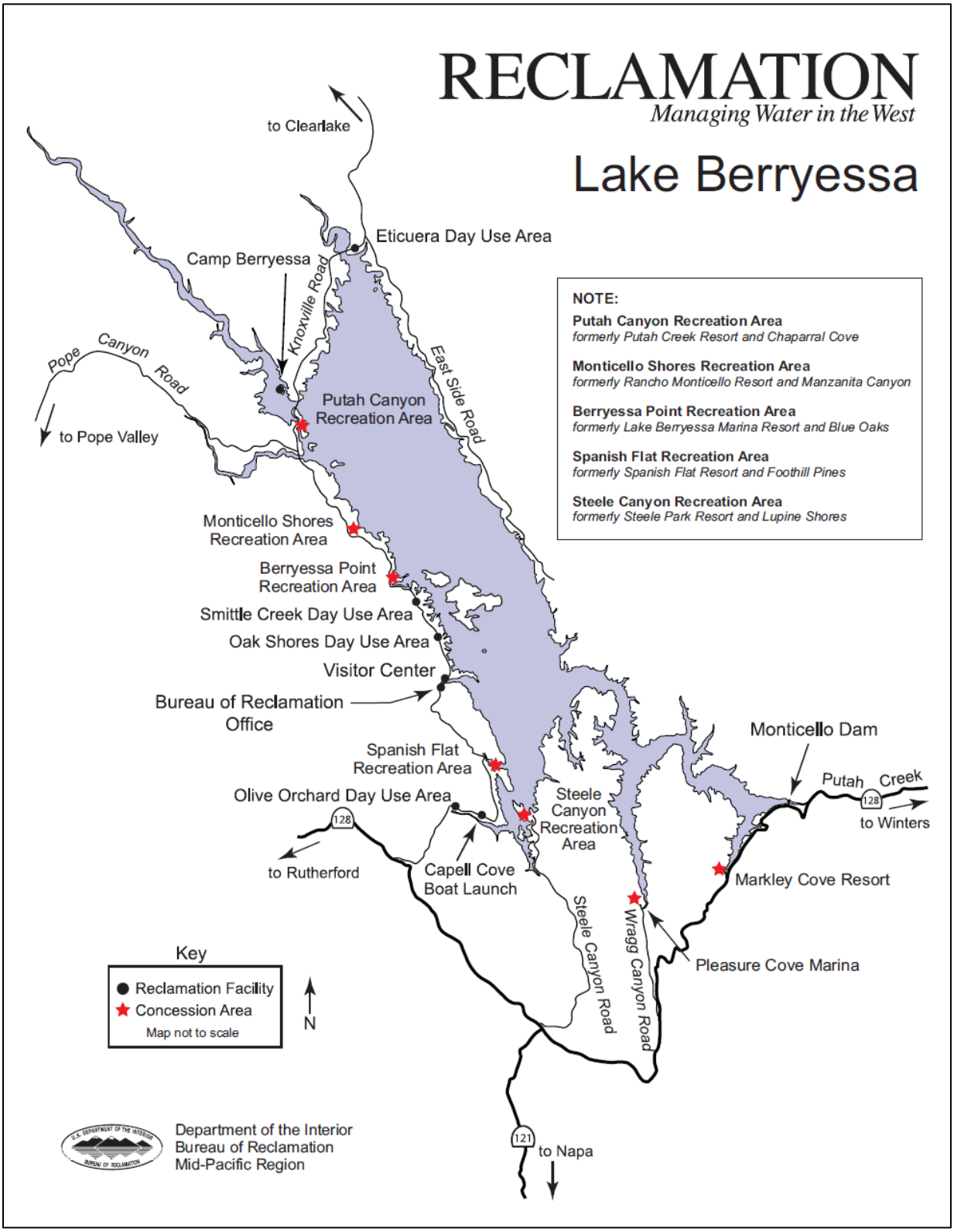
Due to the current unstable nature of concession contracts at Lake Berryessa, most resort facilities are either closed or their recreation opportunities significantly curtailed. Reclamation has committed to reopening as many resorts as possible in 2013, contingent upon entering into short-term agreements with interim concession contractors. The current recreational facilities at Lake Berryessa are shown in **Figure 3-2** and described in this section. Table 3-2 provides a summary of the amenities available at each of the recreational facilities.

Recreation Areas

Putah Canyon Recreation Area

The Putah Canyon Recreation Area is located 29 road miles from Monticello Dam. Currently, Putah Canyon is being operated by Reclamation as a free day use and boat launching area and is open from 7:00 am to 8:00 pm. Reclamation is in search of an interim concessionaire for Putah Canyon

Figure 3-2. Recreational Facilities at Lake Berryessa



Source: U.S. Bureau of Reclamation

Table 3-2. Amenities at Recreational Facilities

Facility	Boat Launch (Motorized Boats)	Day Use	Camping or Lodging
Putah Canyon Recreation Area	✓	✓	
Monticello Shores Recreation Area			
Berryessa Point Recreation Area			
Spanish Flat Recreation Area		✓	✓
Steele Canyon Recreation Area	✓	✓	✓
Pleasure Cove Marina	✓	✓	✓
Markley Cove Resort	✓	✓	✓
Eticuera Day Use Area		✓	
Smittle Creek Day Use Area		✓	
Oak Shores Day Use Area		✓	
Dufer Point Visitor Center		✓	
Capell Cove Boat Launch	✓	✓	
Olive Orchard Day Use Area		✓	

Monticello Shores Recreation Area

The Monticello Shores Recreation Area is 27 road miles from Monticello Dam. Currently, Monticello Shores is closed to the public. Its reopening is contingent upon Reclamation securing interim and long-term concession contracts for its management and operation and upon significant improvements being made to infrastructure at the site.

Berryessa Point Recreation Area

The Berryessa Point Reclamation Area is 26 road miles from Monticello Dam. Currently, the recreation area is closed to the public. Its reopening is contingent upon Reclamation securing interim and long-term concession contracts for its management and operation and upon significant improvements being made to infrastructure at the site.

Spanish Flat Recreation Area

The Spanish Flat Recreation Area is located 19 road miles from Monticello Dam. Currently, Spanish Flat is being operated by Reclamation as a day use area, open from 7:00 am to 8:00 pm daily. On May 20, 2013, Reclamation announced that they had entered into a contract with Pleasure Cove Marina to operate Spanish Flat. The contract is for the 2013 recreation season with two optional years. Day use, RV and tent camping will be available.

Steele Canyon Recreation Area

The Steele Canyon Recreation Area is located 17 road miles from Monticello Dam. Currently, Steele Canyon is being operated by Reclamation as a day use area open from 7:00 am to 8:00 pm daily for free boat launching. Reclamation is currently negotiating with the current owner of the boat launch and access road to keep that infrastructure open and operating. A site cleanup contract between the former owner and Reclamation signed in 2010 stipulates that both the road and the launch must be removed by February 5, 2013. On May 20, 2013 Reclamation announce that they had entered into a contract with Pleasure Cove Marina to operate Steele Canyon. The contract is for the 2013 recreation season with two optional years. Day use, RV and tent camping, and boat launching will be available.

Pleasure Cove Marina

Pleasure Cove Marina, located at the lake shore at the end of Wragg Canyon, 9 road miles from Monticello Dam, is currently being operated under a long-term contract with Reclamation. Forever Resorts operates the marina facilities, which includes houseboat rentals and other marina services, rental cabins, overnight campsites, and recreational vehicle (RV) sites.

Markley Cove Resort

Markley Cove Resort is located 3 road miles from Monticello Dam. On May 1, Reclamation signed a contract with John and Linda Frazier for continued management of Markley Cove through December 2014, with two one year option periods. The resort has a general store, boat launching facilities, a boat storage area, rental cabins, boat and jet-ski rentals, boat slips, and fueling services.

Day Use Areas

In October 1974, Congress authorized Reclamation to develop and build, with a $3 million budget authorization, new government-operated facilities at Lake Berryessa. Between the mid-1970s and mid-1980s, Reclamation planned and constructed the Oak Shores Day Use Area, the Smittle Creek Day Use Area, the Capell Cove Boat Launch and parking area, and the Federal Administrative Office Complex which included the Reclamation Field Office Headquarters and a Visitors Center. Oak Shores opened to the public in 1977, with Reclamation collecting a day use fee for the first few years. Since the mid-1980s, public access to all Reclamation-operated recreational facilities has been free of charge. More recently, Reclamation has added two small day use areas: Eticuera and Olive Orchard.

The facilities are operated by Reclamation with the exception of Camp Berryessa operated by the Napa County Regional Park and Open Space District. These facilities, all located along Berryessa Knoxville Road on the western shoreline of Lake Berryessa are described in this section.

Eticuera Day Use Area

Located on the far north shoreline of Lake Berryessa at Eticuera Creek and 33 road miles from Monticello Dam, Eticuera Day Use Area consists of a parking lot, a comfort station with pit toilets located in the lot, a trash bin, and a short walkway down to the lake shore. While picnicking and shoreline fishing can take place at Eticuera Day Use Area, there are no tables or other facilities to support these activities. While East Side Road extends further south along the lake's eastern shoreline, Eticuera Day Use Area is the recreation facility most distant from Monticello Dam developed and operated for visitors to Lake Berryessa.

Smittle Creek Day Use Area

Smittle Creek Day Use Area, located on the lake's western shore, 25 road miles from Monticello Dam is open to visitors from sunrise to sunset. The day use area consists of a parking lot, picnic tables, barbeque grills, a water fountain, a comfort station with flush toilets and a 5.2-mile out and back nature trail.

Oak Shores Day Use Area

By far the largest and most-visited recreation facility operated by Reclamation at Lake Berryessa, Oak Shores Day Use Area, located on the lake's western shoreline, 23 road miles from Monticello Dam, offers day visitors a variety of recreational opportunities, including fishing, wildlife viewing, beach activities, swimming, hiking, and picnicking. Open from 7:00 am to 8:00 pm daily and spread out over eight distinct areas (from north to south: Coyote Knolls, Coyote Beach, Patwin Grove, Twin Oaks, McKenzie Ridge, Shale Point, Foxtail Flat, and Acorn Beach), Oak Shores is equipped with over 100 individual and group picnic sites equipped with barbeque grills, two hand launches for kayaks and canoes (at Foxtail Flat and Coyote Knolls), shoreline fishing areas, and protected swimming areas at Coyote Beach and Acorn Beach. A short trail leads from the southern end of Oak Shores just beyond the Acorn Beach area to the Reclamation Field Office and the Dufer Point Visitor Center.

The areas just offshore of the two beaches are off-limits to motorized boating and what areas do allow motorized boating between Oak Shores and Big Island limit boaters to a 5 mile per hour speed limit. Oak Shores provides several comfort stations with flush and pit toilets, supplemented by portable toilets, along with trash and recycling receptacles.

After closure of several concession areas, Reclamation operated the northern portion of Oak Shores Day Use Area as an 85-site campground in 2009 and 2010. Currently, Reclamation is seeking an interim concession contractor to operate the campground in the northern portion of Oak Shores.

Dufer Point Visitor Center

Located 22 road miles from Monticello Dam, the Dufer Point Visitor Center offers visitors exhibits on the lake's natural resources and provides printed information and literature. The center is open to the public on Saturdays and Sundays only but several brochures are available when the center is closed at a display just outside the entry door. The center's restrooms are equipped with flush toilets.

Capell Cove Boat Launch

Located 18 road miles from Monticello Dam, the Capell Cove Boat Launch is a day use facility consisting of a boat launch ramp, an adjacent dock, a parking lot with a comfort station connected to a septic tank system, an oil absorbent bilge pad dispensing and receiving station and an access gate that is closed during non-operating hours.

Olive Orchard Day Use Area

Located 17 road miles from Monticello Dam, the Olive Orchard Day Use Area is a small facility with a few parking spaces, a comfort station equipped with a pit toilet and a single picnic table.

Camp Berryessa

Located on 15 acres on the northern shore of Putah Cove on the lake's western shoreline and 29 road miles from Monticello Dam, Camp Berryessa is a former Boy Scout camp that closed in 2004. Reclamation, in partnership with the Napa County Regional Park and Open Space District, plans to develop the area into a public environmental education facility. The land is owned by Reclamation and the proposed facility will be managed by the district. Phase 1 of the project, construction of camp infrastructure and approximately 30 tent cabins, is scheduled to commence late in 2013 or early 2014. The camp will eventually accommodate 128 campers and include a common dining and assembly area, education spaces, showers and laundry, a non-motorized boat launch and a buoy line to separate boaters from swimmers. The camp is scheduled to open to the public on a reservation basis in late 2014.

Boating at Lake Berryessa

While boating occurs year-round at the lake, most boating takes place during the warmer and dryer period between April 1st and October 15th. The peak season occurs between the start of the Memorial Day holiday weekend in late May through the end of the Labor Day holiday weekend in early September. The most common watercraft used on the lake are runabouts and ski boats. Other common vessels include personal watercraft, houseboats, fishing boats, pontoon/patio boats, sail boats, rubber rafts, canoes, kayaks, paddle boats, and rowboats. While boating takes place throughout the lake, most activity occurs along the western half. The use of houseboats, first introduced to the lake in 1981, is gaining in popularity. Sometimes, especially during the peak season, there are crowded conditions on the lake, increased boat traffic and use conflicts resulting from incompatible boat types and activities.

On summer holiday weekends, the number of watercraft on the lake has been as high as 3,700, far exceeding the operational limit of 3,000.

The Final EIS for the VSP adopted a criterion of an established water recreation management program known as the "Water Recreation Opportunity Spectrum" or WROS. The WROS doesn't impose specific numeric restrictions on any particular type of motorized or non-motorized watercraft. Instead, the WROS is a zoning classification system designed to adapt to various lake conditions and to better protect the lake's natural resources, ensure public safety, expand opportunities for diverse boating experiences by the visiting public, and more accurately forecast future visitor needs. Use of the WROS, however, was not included in the VSP ROD. Instead, existing requirements were carried forward and certain areas of the lake are reserved for non-motorized vessels and electric trolling engines. In recent years, Reclamation has announced that a few very high vessel occupancy areas of the lake are closed during the summer holiday weekends due to public safety concerns.

The Lake Berryessa Trail System

Existing formal hiking and walking trails are located on the eastern shore of Markley Cove, in Steele Canyon, between Smittle Creek and the Reclamation Field Office/Visitor Center, at the Visitor Center, and between Eticuera Day Use Area and Camp Berryessa (the North End Trail). Primarily through the efforts of nonprofit organizations, an uninterrupted 7.25 mile trail to Berryessa Peak has recently been added, beginning 2 miles north east of the Eticuera Day Use Area on the Berryessa-Knoxville Road. The trail traverses California Department of Fish and Wildlife and Bureau of Land Management property, along with an easement through private property.

The VSP ROD calls for the expansion and upgrading of the trails system at Lake Berryessa to include a shoreline trail, several connector trails, more trails at concession areas, and an inventory and upgrading of existing trails. Toward this end, Reclamation completed a Trail Management Plan in 2012. During fall and winter 2012-13, Reclamation began implementing the plan by performing maintenance on portions of the Smittle Creek Trail.

3.1.3 Boater Education Efforts

As noted earlier, boating is a major recreational activity on Lake Berryessa. Outreach efforts directed at operators of inboard motor boats and other motorized vessels focus both on safety and on minimizing the impacts boating activity has on the lake's water quality. While boating accidents can have some impact on lake water quality, this section concentrates on how boaters on Lake Berryessa are informed of their responsibility to minimize the impact their activity has on water quality and water operations.

The Lake Berryessa Watershed Partnership was formed in 1999 to educate boaters, campers, day visitors, and other users of Lake Berryessa about the importance of water quality and good personal stewardship practices. In addition to organizing and carrying out annual cleanup days at the lake, the

Lake Berryessa Watershed Partnership operates a boater and visitor education program during the summer months.

The Solano Resource Conservation District manages the Lake Berryessa Watershed Partnership's Summer Boater Outreach Program. Staffed by a team of interns from local colleges, the program provides person-to-person clean water boating information to visitors who explore Lake Berryessa in boats and to visitors picnicking and/or camping along the shore. These interns explain good water quality practices to both groups. Interns also work with Reclamation to educate boaters about the threat of aquatic invasive species, most recently zebra mussels and quagga mussels. Starting in 2012 and 2013, the Solano County Water Agency (SCWA) in cooperation with the Lake Berryessa Watershed Partnership, began funding several Lake Berryessa Outreach interns due to the high risk of zebra and Quagga mussels in Lake Berryessa, and the need for additional public outreach to protect Lake Berryessa water quality. In 2013 the Water Agency hired six summer interns to support the Berryessa Outreach Program.

The Partnership administers a Bilge Pad Exchange Program. Boaters simply place their used bilge pads in the red canisters and take new pads from blue dispensers located at Markley Cove Resort, Pleasure Cove Resort, and Capell Boat Ramp. The Partnership also publishes the "Lake Berryessa User's Guide" which, among other topics, explains the importance of using bilge pads to reduce discharges of petroleum-based contaminants overboard when bilge chambers are pumped out. This guide also provides helpful information on how to reduce accidental spills when fueling a motorized vessel.

3.1.4 Summary

When the scope of work was developed for this sanitary survey in early 2012, Napa County and SCWA expressed concern that recreational use of the area around Lake Berryessa and the lake itself would increase tremendously under the plans that Pensus had developed for major new facilities at the resorts. As described previously, those plans did not come to fruition and recreational use of the lake and surrounding area has declined in recent years.

Impacts on Lake Berryessa Resort Improvement District Water Treatment Plant

The recreational facilities at Lake Berryessa are all downstream of the Lake Berryessa Resort Improvement District (LBRID) water treatment plant (WTP) intake. While boaters congregate in the Putah Creek arm of the lake, they do not go as far upstream as the intake. Local swimmers may impact water quality in Putah Creek during the summer months. As discussed in Section 4, total coliform levels are often quite high at the intake with some of the high values occurring during the summer months.

Impacts on Napa Berryessa Resort Improvement District Water Treatment Plant

Activities at Steele Canyon Recreational Area and boating in the vicinity of the Napa Berryessa Resort Improvement District (NBRID) WTP intake could impact water quality at the NBRID WTP. As discussed in

Section 4, total coliform levels are occasionally high during the summer months at the intake. The annual WTP raw water quality monitoring, which is conducted during the summer months, has not detected any petroleum hydrocarbons. This is not surprising since petroleum hydrocarbons would likely be found in surface waters rather than at the depth of the intake.

Impacts on Water Treatment Plants along Putah South Canal

The current recreational activities at Lake Berryessa are unlikely to impact the WTPs that take water from the Solano Project downstream of the lake due to the large amount of dilution capacity of the lake, the deep withdrawal from the lake, and travel time to the Putah South Canal. Recreational activities at Lake Solano are much more likely to impact water quality than activities at Lake Berryessa.

3.2 Wastewater Treatment Facilities

There are no direct discharges of wastewater to surface waters in the Lake Berryessa watershed. The direct discharge of municipal and industrial wastes to Lake Berryessa is prohibited by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) Water Quality Control Plan for the Central Valley Region. The upper portions of the watershed are served primarily by onsite wastewater treatment systems and several small wastewater treatment facilities that discharge to ponds or to the Southeast Geysers Effluent Pipeline (SEGEP). The small communities and resorts around Lake Berryessa are served primarily by systems that discharge to evaporation and percolation ponds. Individual home owners and businesses near the lake have onsite wastewater treatment systems. Onsite wastewater treatment systems are governed by the State Water Resources Control Board (State Water Board) Onsite Wastewater Treatment Systems Policy (Order 2012-0032) and by local agencies. In Napa County, the Environmental Health Division of the Planning, Building & Environmental Services Department oversees the permitting and inspection of onsite wastewater treatment systems. In Lake County, these services are overseen by the Environmental Health Division of the Health Services Department. The community and resort wastewater systems are governed by the Central Valley Water Board through waste discharge requirements (WDRs) issued to each facility.

The 2001 Update expressed concern over the wastewater spills and the aging wastewater infrastructure in the Lake Berryessa watershed. The wastewater facilities in the watershed are described in this section. The history of untreated and partially treated wastewater spills and violations of WDRs are also discussed. Spills from sanitary sewer collection systems are governed by the State Water Board under Order No. 2006-0003-DWQ, Statewide General Waste Discharge Requirements for Sanitary Sewer Systems. The State Water Board defines Category 1 spills as discharges of sewage that equal or exceed 1,000 gallons, or result in a discharge to a drainage channel and/or surface water, or discharge to a storm drain that was not fully captured and returned to the sanitary sewer system. Category 2 spills are defined as other discharges of sewage and are generally small discharges that do not reach surface waters. Discharges from wastewater treatment facilities are governed by the individual WDRs issued to the facilities. Spill information was obtained from the State Water Board's California Integrated Water Quality System (CIWQS) database and from Central Valley Water Board records. Operators of sanitary

sewers in the Lake Berryessa watershed were required to start reporting spills to CIWQS in November 2007.

3.2.1 Wastewater Treatment Facilities in the Upper Putah Creek Watershed

Rural Areas and Small Communities

The rural areas of the Putah Creek watershed and the small communities of Loch Lomond, Adams, Whispering Pines, and Anderson Springs are served by onsite waste treatment systems. Installation of new systems is subject to review and approval by the Lake County Environmental Health Division. Onsite systems must be designed to meet the optimal carrying capacity of the individual site's soils, slopes, and water table conditions. While lots with site conditions that are inadequate to support septic systems previously were undevelopable, relatively new technology and regulations permit installation of engineered systems that are self-contained and not reliant on site conditions. Many previously undevelopable lots can now be developed using these systems (Lake County Community Development Department, 2010).

The Anderson Springs subdivision has had numerous septic system failures in recent years, largely due to inadequate and/or aging systems (Lake County Community Development Department, 2010). The Lake County Sanitation District (LACOSAN) is preparing an environmental impact report (EIR) on a project to provide a collection system for Anderson Springs and capacity expansion of the Middletown Wastewater Treatment Facility (WWTF) to treat wastewater from Anderson Springs. The recommended alternative is to use a Septic Tank Effluent Pump (STEP) system (Lake County Local Agency Formation Commission, 2010). STEP systems use onsite septic tanks to remove grit and solids and provide initial biological treatment of the wastewater. Rather than use onsite disposal of the septic tank effluent, each septic tank is fitted with an effluent pump. The effluent would then be pumped to the Middletown WWTF.

Middletown

LACOSAN provides wastewater collection and treatment to 733 connections in the community of Middletown and the Harbin Springs Resort. The Middletown WWTF operates under WDR Order 97-249, issued by the Central Valley Water Board. The WWTF was constructed in 1992 and has an average dry weather flow of 0.15 million gallons per day (mgd) and a peak wet weather flow of 0.5 mgd. The WWTF consists of a facultative pond system consisting of a primary pond, three secondary ponds, a sodium hypochlorite feed system and contact basin, an effluent storage reservoir, an effluent pump station, and a spray irrigation system that may be used as a back-up disposal. The ponds are all lined. The facility discharges to SEGEP, where it is injected into the Geysers steamfield for power production. The back-up disposal system consists of a 240 acre-foot storage pond. Water from the storage pond is used to spray irrigate fodder crops. **Figure 3-3** shows the location of the facility.

Figure 3-3. Location of Middletown WWTF

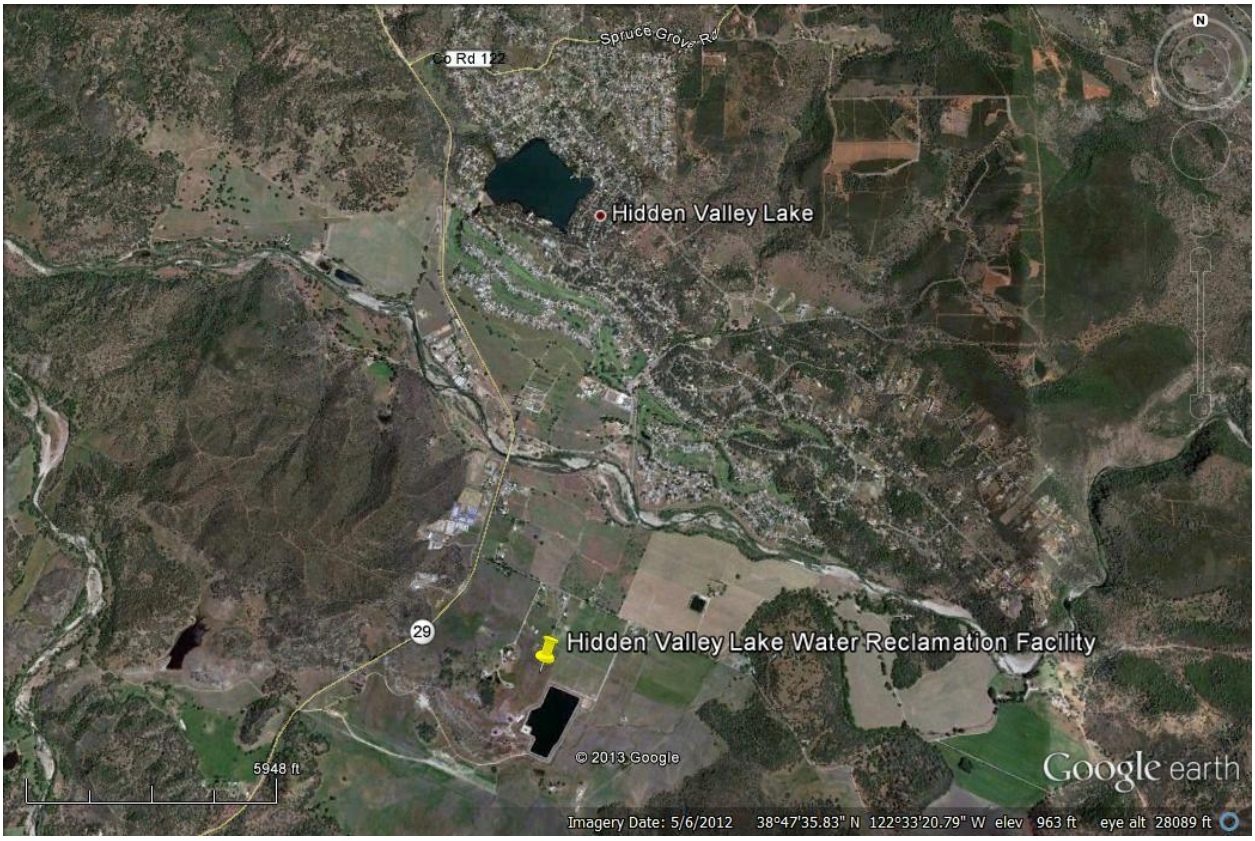
Based on existing and anticipated population growth, the WWTF is undergoing modification and phased capacity improvements. As discussed previously, LACOSAN is preparing an EIR on a capacity expansion of the Middletown WWTF to treat wastewater from Anderson Springs.

Although discharge to surface waters is not allowed, any spills from the collection system or WWTF would flow into Putah Creek. There are no reports of Category 1 spills from the sanitary sewer system in CIWQS. There were two minor spills that did not reach surface waters. CIWQS contains two violations under Waste Discharge Order 97-249 for failure to submit quarterly monitoring reports.

Hidden Valley Lake Community Services District

The Hidden Valley Lake Community Services District provides wastewater collection and wastewater treatment services to 1,400 connections in the community of Hidden Valley Lake and some commercial parcels in the Coyote Valley. **Figure 3-4** shows the location of the treatment facility. A number of residences in the Hidden Valley Lake community are on engineered onsite wastewater treatment facilities.

Figure 3-4. Location of Hidden Valley Lake Water Reclamation Facility



The wastewater collection system consists of seven sewage booster pump stations. The Hidden Valley Lake Water Reclamation Facility operates under Waste Discharge Order R5-00-019, issued by the Central Valley Water Board. The facility became operational in 1996 and includes an activated sludge-extended aeration plant with an average dry weather flow of 0.350 mgd and a peak wet weather flow of 0.894 mgd. The facility processes include primary screening, secondary treatment through an activated sludge and clarification process, direct tertiary filtration, chlorination, six sludge drying beds, a concrete-lined equalization basin and an effluent storage basin. Treated effluent is stored in the 412 acre-feet, clay-lined, effluent storage basin during periods when irrigation is prohibited. Treated effluent is used to spray irrigate the Hidden Valley Lake golf course. Biosolids are disposed on a field located near the treatment plant.

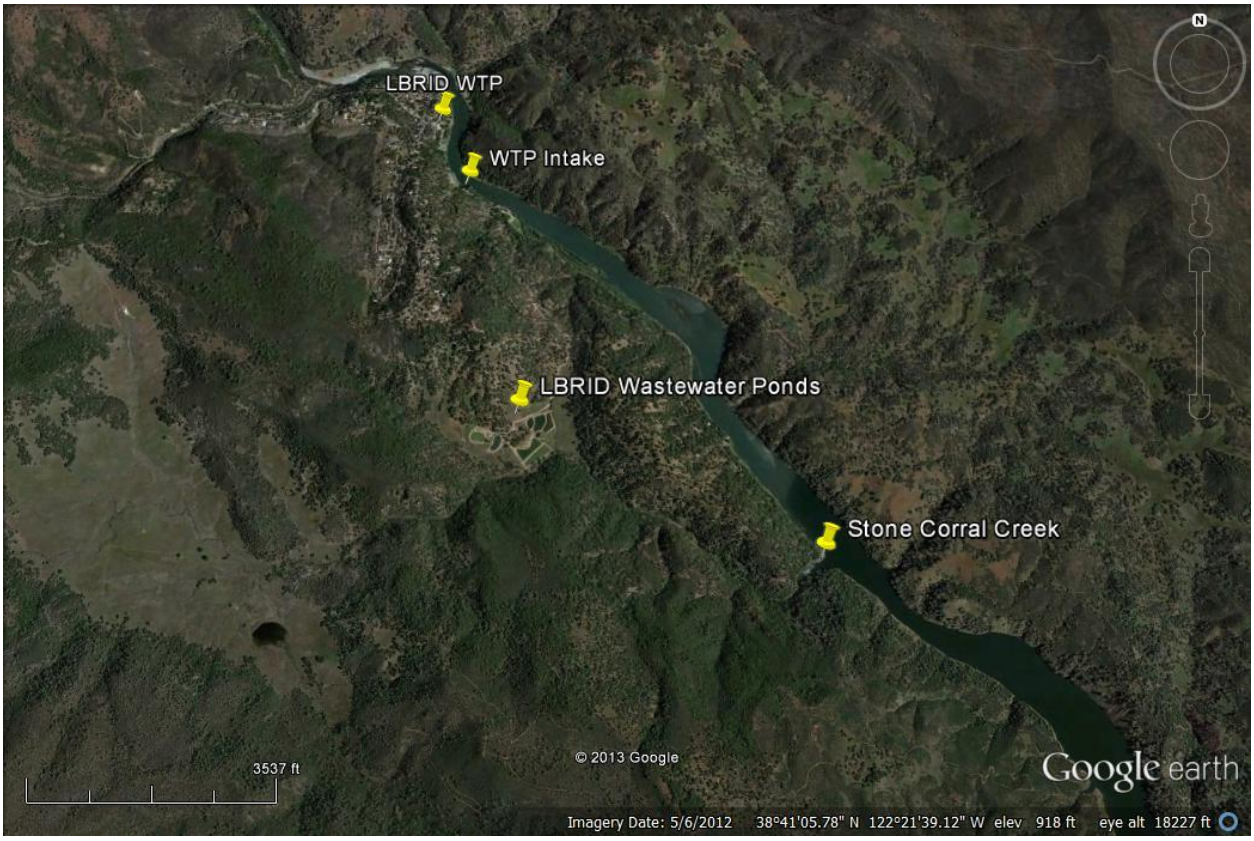
Although discharge to surface waters is not allowed, any spills from the collection system or plant would flow into Crazy Creek and then into Putah Creek. There are no reports of Category 1 spills from the sanitary sewer system in CIWQS. There were five minor spills that did not reach surface waters. CIWQS contains one violation under Waste Discharge Order R5-00-019 for failure to submit a monthly monitoring report.

3.2.2 Wastewater Treatment Facilities Serving Communities near Lake Berryessa

Lake Berryessa Resort Improvement District, Lake Berryessa Estates

LBRID was established in 1965 to provide potable water and sewer services to the Lake Berryessa Estates Unit 2 subdivision, an unincorporated community located along Putah Creek. The LBRID WWTF currently serves 180 single-family residences. At full build-out, LBRID will provide water and wastewater services to 339 lots. **Figure 3-5** shows the location of the WWTF.

Figure 3-5. Location of LBRID WWTF



Wastewater from the community flows via gravity to three lift stations where it is pumped to a 91,000 gallon aboveground holding tank and a 21,000 gallon overflow tank. From the tanks, wastewater is pumped approximately 1.2 miles into a manhole. From the manhole, wastewater gravity flows to the treatment ponds. LBRID completed repairs to the sewage collection system in the fall of 2011 to reduce infiltration and inflow to the system.

The disposal of wastewater is allowed under WDR Order R5-2008-0068, issued by the Central Valley Water Board. The Central Valley Water Board has issued revised tentative WDRs that will be considered

at the July 25/26, 2013 Board meeting. The tentative order allows LBRID to treat and dispose of an average dry weather flow of 42,000 gallons of treated water per day with a peak flow of 123,000 gallons per day. The LBRID pond system contains seven ponds. Three are considered treatment ponds, one is considered a "polishing pond, and the final three are storage ponds. Wastewater flows via gravity through the three treatment ponds that are connected in series. From the third pond, wastewater gravity flows into the fourth and fifth ponds. A portable pump is used to transfer wastewater from pond four or five into the two remaining ponds. The wastewater in the last pond is disinfected with sodium hypochlorite. Wastewater from this pond is then pumped through a chlorine contact basin and then applied via spray irrigation to two separate land application areas totaling approximately six acres. Runoff from the sprayfield is collected by a tailwater collection ditch which either flows via gravity, or is pumped back into the seventh pond depending on the spray field in use.

LBRID is currently designing improvements to the WWTF, which must be completed by January 2014. The facilities improvements include construction of a new 18 million gallon storage pond and enlargement of the existing seven ponds to provide a total pond capacity of 27.1 million gallons. The land application area would be expanded by 9.4 acres to provide a total area of 15.2 acres. Construction of the improvements is contingent on LBRID obtaining grant funding.

CIWQS does not contain any reports of sanitary sewer overflows from the collection system. The Central Valley Water Board has issued numerous Notices of Violation (NOV), Administrative Civil Liabilities (ACL) and one Cease and Desist Order (CDO) for failing to comply with WDRs. The major actions taken by the Central Valley Water Board are shown in **Table 3-3**. There have also been many other violations including failure to submit monthly monitoring reports, incomplete reports, late reports, effluent violations, and insufficient freeboard in the ponds.

Table 3-3. Major Regulatory Actions against LBRID

Date	Order No.	Type of Order	Amount, $	Comments
12/28/95	95-516	ACL	25,000	50,000 gallon raw sewage spill to Putah Cr. Required plan to complete system improvements.
9/20/96	96-233	CDO		Required various plans and construction of upgraded system by 9/15/01. Discharger did not comply.
4/29/05	R5-2005-0072	ACL	$400,000	Violations of CDO and unauthorized discharges, including 4.1 million gallons of wastewater into Stone Corral Creek.
1/24/07		NOV		Unauthorized discharge of 5.5 million gallons of partially treated wastewater to unpermitted sprayfields. An unknown volume reached Lake Berryessa.
5/16/07		NOV		Unauthorized discharge of 7,500 gallons of wastewater. None of the wastewater entered surface waters.
9/7/07		Stipulated Judgment		Required payment of the $400,000 fine from R5-2005-0072, replacement of sewer lines, lift station upgrades, submittal of Report of Waste Discharge, replacement of water treatment plant, monitoring, and prevention of future discharges. LBRID complied with all requirements except prevention of discharges.
3/24/11	R5-2010-0516	ACL	$375,000	Unauthorized discharge of 3.8 million gallons of partially treated wastewater to Stone Corral Creek in 2009-2010. LBRID required to pay $8,300, received credit of $6,700 for improvements made in 2010 and $375,000 suspended contingent upon upgrades to the system by 1/1/14.
3/5/12	R5-2011-0538	ACL		Revised deadlines from R5-2010-0516. Improvements must still be completed by 1/1/14.

Spanish Flat Water District, Berryessa Pines

The Spanish Flat Water District provides water and sewer services to the Berryessa Pines subdivision. The WWTF serves approximately 73 homes. **Figure 3-6** shows the location of the WWTF.

Figure 3-6. Location of Berryessa Pines WWTF

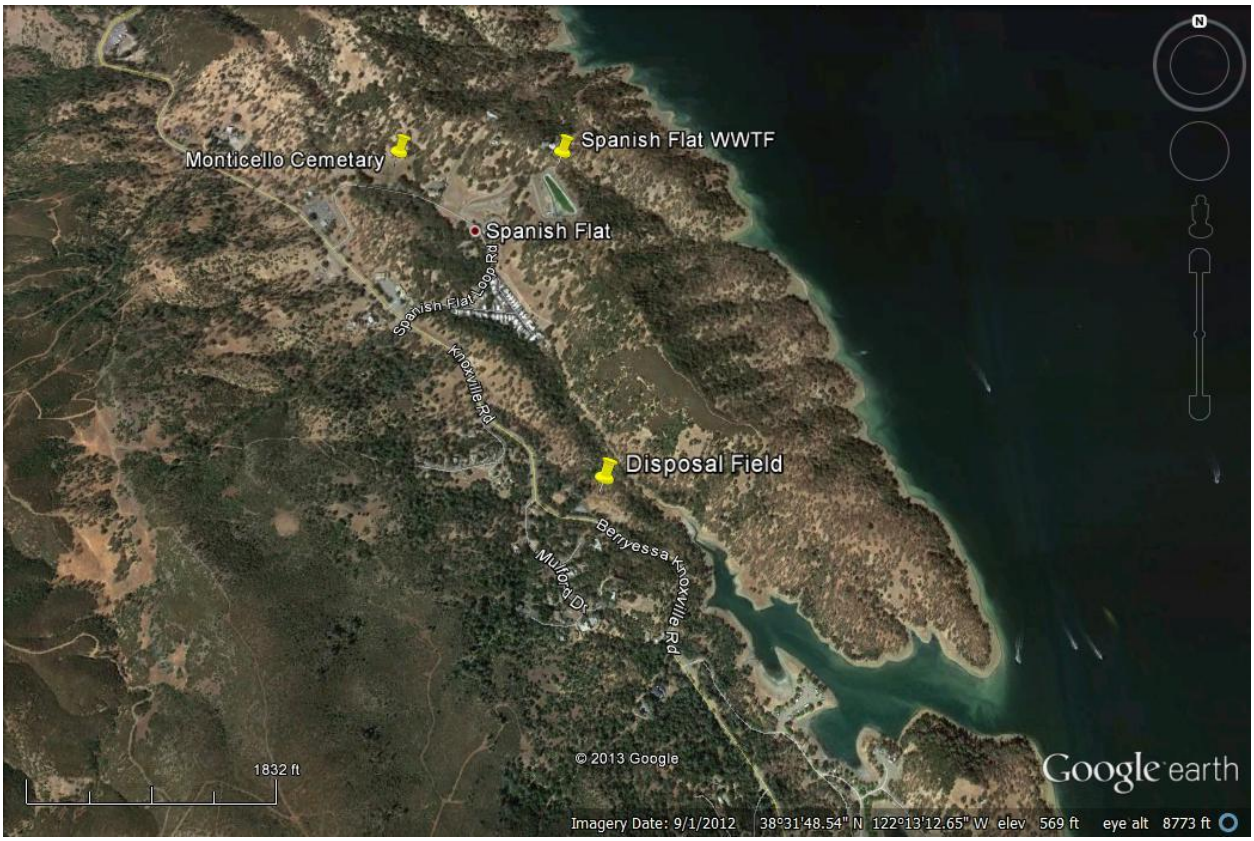
Sewage from most of the subdivision flows to a pump station at the east end of the site. Sewage from a small portion of the subdivision flows by gravity to the WWTF. The disposal of wastewater is allowed under WDR Order R5-2000-0068, issued by the Central Valley Water Board. The wastewater is treated at a 14,000 gallons per day extended aeration package plant. Effluent from the plant is discharged to an evaporation and percolation pond. There is a second pond that is used in emergencies.

CIWQS does not contain any information on sanitary sewer overflows in the Berryessa Pines subdivision. CIWQS contains a number of violations under WDR Order R5-2000-0068 for failure to submit monthly monitoring reports.

Spanish Flat Water District

The Spanish Flat Water District provides water and sewer services to Spanish Flat Mobile Villa, Spanish Flat Woodlands, and Spanish Flat Center. The Spanish Flat Water District owns the Spanish Flat WWTF and Napa County owns the land on which the treatment plant and main storage/disposal ponds have been constructed. The location of the WWTF is shown in **Figure 3-7**.

Figure 3-7. Location of Spanish Flat WWTF



The disposal of wastewater is allowed under WDR Order 93-326, issued by the Central Valley Water Board. The WDRs allow the discharge of a monthly average dry weather flow of 25,000 gallons per day, with peak daily flows up to 53,000 gallons per day. The WWTF was constructed in 1993 and consists of an extended aeration package treatment plant with an aeration tank, a clarifier, and a chlorine contact chamber. Wastewater is stored and disposed of in an unlined 4.2 million gallon percolation/evaporation pond. During the summer, wastewater is also spray-irrigated on a 2.5 acre disposal field and at the 3.7

acre Monticello Cemetery. In 2006, the Central Valley Water Board adopted a new Monitoring and Reporting Program (Order No. R5-2006-0095) requiring the installation of groundwater monitoring wells. The Central Valley Water Board will review the data from the groundwater monitoring program and issue new WDRs in the next several years.

CIWQS does not contain any reports of sanitary sewer overflows from the collection system. A cleanup and abatement order was issued in 1989 and an ACL was issued in 1991 that required the discharger to construct the current WWTF. The Central Valley Water Board Executive Officer's Report for June 2006 states that a spill of 1.05 million gallons of wastewater entered Lake Berryessa in April 2006 when the pond levee failed. CIWQS contains a number of violations between 2010 and 2012 for failure to submit monthly reports or submitting the reports late.

Napa Berryessa Resort Improvement District, Berryessa Highlands

NBRID was created in 1965 for the purpose of providing water and wastewater service to residential customers and the Steele Park Resort. The WWTF is located on land owned by Reclamation under a permanent easement to NBRID. The WWTF and disposal areas are shown in **Figure 3-8**. The WWTF currently serves the Berryessa Highlands subdivision, supporting 343 dwelling units with the potential to support up to approximately 560 lots pending upgrades to the existing infrastructure. Prior to 2007, Steele Park Resort was served by NBRID. It is expected that NBRID will provide potable water and treat wastewater from the newly named Steele Canyon Recreation Area when it is updated and reopened.

Wastewater is conveyed to the WWTF by gravity sewers, lift stations, and force mains. The disposal of wastewater from the NBRID WWTF is currently allowed under WDR Order R5-2013-0065, adopted by the Central Valley Water Board on May 31, 2013. The current order allows NBRID to treat and dispose of a monthly average flow of 50,000 gallons of treated water per day to four sprayfields. The existing plant has been in operation since 1967. It is sized to treat an average dry weather flow of up to 175,000 gallons per day. The WWTP is an extended aeration activated sludge plant consisting of a single inlet structure, two aeration basins, two rectangular clarifiers, and three effluent holding ponds. One of the effluent ponds serves as a chlorine contact basin. Chlorinated effluent is pumped to a 50,000 gallon storage tank located on a hillside at the remote effluent disposal site. The tank is used to gravity feed a spray irrigation system, which consists of four adjacent areas totaling approximately 60 acres. Some of the tailwater from the sprayfields drains to a tailwater pond. A pump station recycles tailwater from the pond back up to the storage tank. Sludge is dewatered and disposed of in a landfill. Due to insufficient wastewater storage, treated wastewater has repeatedly been discharged to Lake Berryessa.

Figure 3-8. Location of NBRID WWTF

NBRID is currently constructing upgrades to the WWTF. The new WWTF will be a membrane bioreactor package treatment system, which will produce a higher quality effluent. The new system will be sized to handle average and peak stormwater conditions. Two existing wastewater ponds will be used for flow equalization during storm flow conditions. One of the existing ponds will be removed. Three new high density polyethylene geomembrane lined ponds will be constructed and the existing tailwater pond will be expanded and lined. This will increase treated wastewater effluent storage from 1.3 million gallons to 20.1 million gallons. Wastewater will be stored in the ponds during the wet weather months and will be discharged to the sprayfield during the dry weather months.

There are no reports of Category 1 spills from the sanitary sewer system in CIWQS. There have been three minor spills of raw sewage from the collection system in the last five years, totaling 530 gallons. The Central Valley Water Board has issued numerous NOVs and three CDOs in 1996, 2006, and 2010, for violations of WDRs, as shown in **Table 3-4**. The last two CDOs restricted any additional hookups to the NBRID system until necessary system improvements have been completed, resulting in a moratorium on development in Berryessa Highlands. Because all connections from Steele Park Resort were removed in 2009, the 2010 CDO restricts any new development at the resort. The Central Valley Water Board issued an ACL to NBRID for $330,000 for wastewater discharges to Lake Berryessa totaling almost 11 million

gallons in 2010 and 2011. This was later reduced to $190,000 with $95,000 of that amount allocated to system improvements as part of the settlement with the Central Valley Water Board. NBRID agreed to an accelerated schedule for completion of the wastewater system improvements. The new plant must be fully operational by Nov 30, 2013. There have also been other violations primarily due to lack of insufficient freeboard in the ponds.

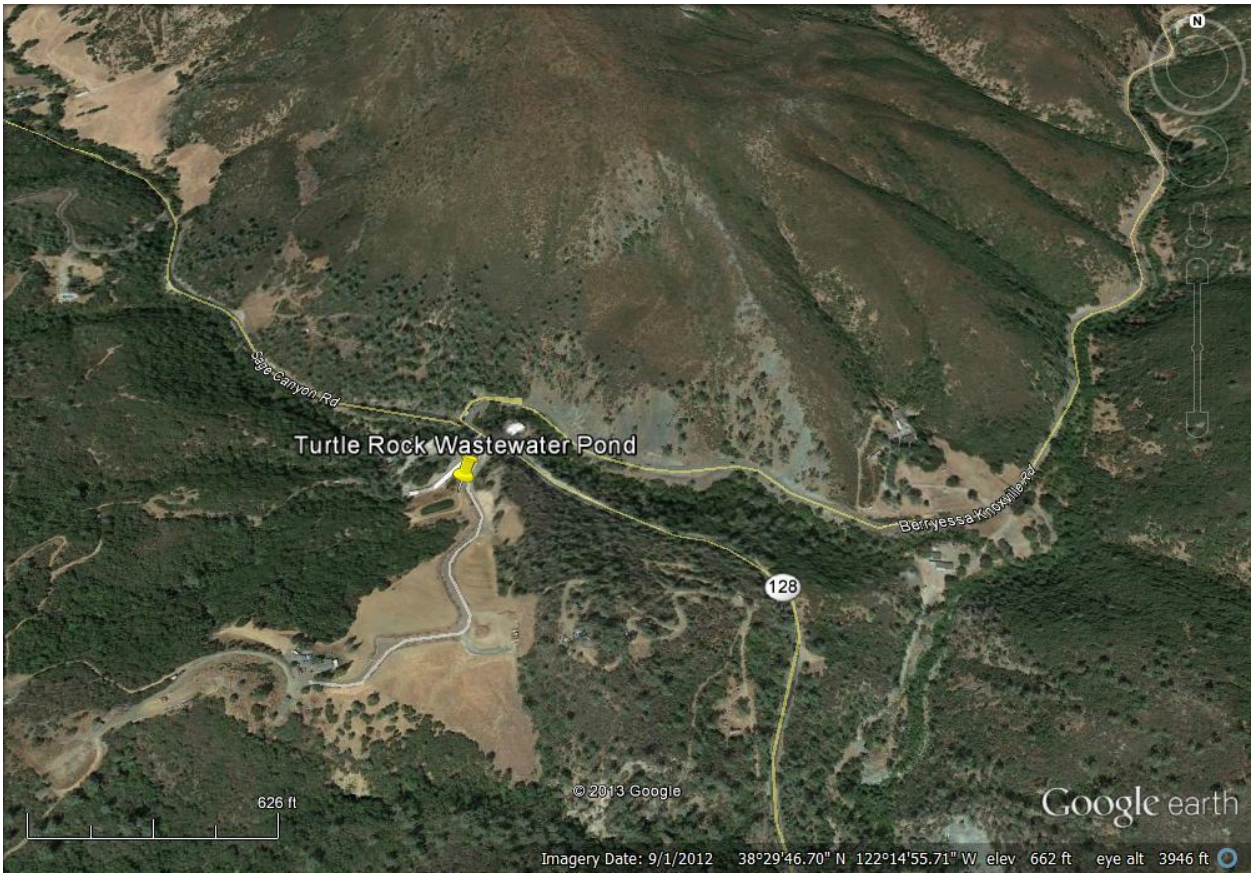
Table 3-4. Major Regulatory Actions against NBRID

Date	Order No.	Type of Order	Amount, $	Comments
9/20/96	96-232	CDO		Response to numerous wastewater spills to Lake Berryessa. Required NBRID to improve storage and disposal capacity by 9/15/00.
10/26/06	R5-2006-0113	CDO		Violations of 1996 CDO and unauthorized discharges. Included a sewer connection restriction, required technical reports, and improvements to the facility.
3/5/07		NOV		Inadequate response to CDO for inspection of sprayfields.
4/28/08		NOV		Unauthorized discharge of 500 gallons of raw wastewater in Feb 2008.
5/10/10		NOV		Unauthorized discharge of 1,418,400 gallons of treated wastewater between January and June 2010.
9/23/10	R5-2010-0101	CDO		Violations of 1996 and 2006 CDOs and unauthorized discharges. Expanded sewer connection restriction to Lupine Shores Resort, required technical reports, and improvements to the facility.
12/31/10		NOV		Unauthorized discharge of 385,824 gallons of wastewater in December 2010.
9/6/11	R5-2011-0590	ACL	$330,000	Unauthorized discharges of 10.5 million gallons of treated wastewater in 2010 and 2011
7/3/12	R5-2012-0556	Stipulated Order		Reduced ACL to $190,000 with $95,000 allocated to system improvements.
8/20/12	R5-2012-0900	TSO		Established accelerated schedule for completion of improvements by 10/1/13.

Turtle Rock

The Turtle Rock WWTF is a privately owned facility that serves a small motel, a few mobile homes, and a few commercial facilities located near the intersection of Highway 28 and Berryessa Knoxville Road. **Figure 3-9** shows the location of the WWTF.

Figure 3-9. Location of Turtle Rock WWTF



The disposal of wastewater from the facility is allowed under Water Quality Order 97-010-DWQ, General Waste Discharge Requirements for Discharges to Land by Small Domestic Wastewater Treatment Systems. The facilities consist of two septic tanks and an oxidation pond with a monthly average dry weather flow of 2,500 gallons.

Although discharge of wastewater is not allowed, any spills from the WWTF would flow into Soda Creek, a tributary of Capell Creek and Lake Berryessa. CIWQS does not contain any information on this facility. A review of Central Valley Water Board files indicates that a NOV was issued for failure to submit monitoring reports.

Capell Valley Mobile Home Park

The Capell Valley Mobile Home Park WWTF is privately owned and serves approximately 59 sewer connections, which include the Capell Valley Mobile Home Park, a few commercial establishments, and domestic wastewater from Moss Creek Winery. The mobile home park is located near the intersection of Highways 128 and 121. **Figure 3-10** shows the location of the WWTF.

Figure 3-10. Location of Capell Valley Mobile Home Park WWTF

In 1994, the Central Valley Water Board adopted WDRs Order 94-099 to regulate discharges from the Capell Valley Mobile Home Park WWTF. Approximately 9,600 gallons per day of septic tank effluent is discharged to three evaporation/percolation ponds and one emergency overflow pond. In 2006, the Central Valley Water Board adopted a new Monitoring and Reporting Program, requiring the installation of groundwater monitoring wells. The Central Valley Water Board will review the data from the groundwater monitoring program and issue new WDRs in the next several years.

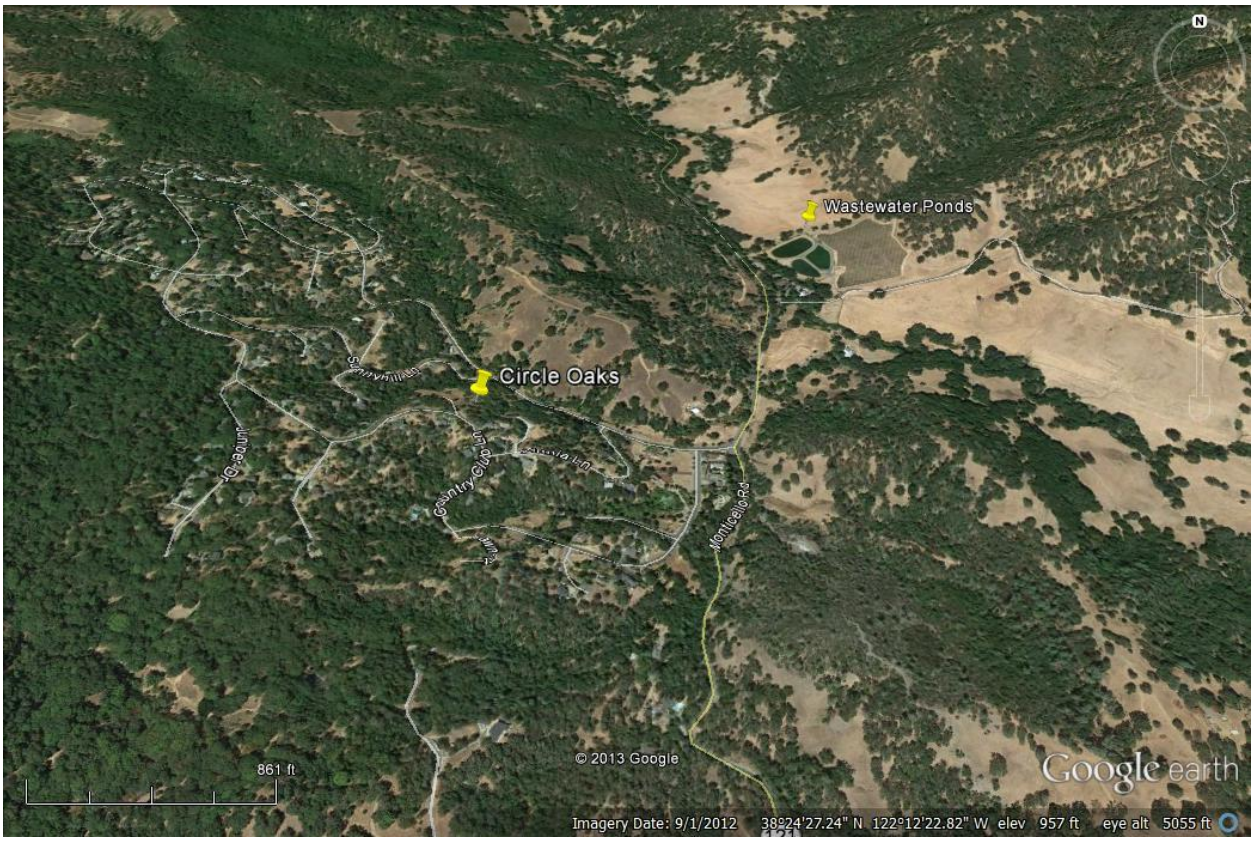
Although discharge to surface waters is not allowed, any spills from the collection system or wastewater ponds would flow into Oak Moss Creek, a tributary of Capell Creek and Lake Berryessa. CIWQS does not contain any information on sanitary sewer overflows from the collection system. In May 2011 the

Central Valley Water Board issued a NOV citing problems with not maintaining adequate freeboard in the ponds and requiring the discharger to submit a short-term contingency plan and a water balance plan. The plans were submitted and Central Valley Water Board staff concurred with the recommendations and required the work to be completed by October 2012. The discharger was unable to complete the work by October 2012 and failed to submit a work plan and schedule. In July 2012, the Central Valley Water Board issued Cleanup and Abatement Order R5-2012-0711. The Cleanup and Abatement Order requires the discharger to submit plans for improvements to correct the pond capacity problem and requires a number of plans and improvements to the monitoring program. In addition, CIWQS contains over 50 waste discharge violations for late and deficient reporting and freeboard violations in the last five years.

Circle Oaks County Water District

The Circle Oaks County Water District serves the Circle Oaks subdivision, located three miles south of the junction of Highways 128 and 121. The WWTF currently serves approximately 189 homes. The location of the WWTF is shown in **Figure 3-11**.

Figure 3-11. Location of Circle Oaks WWTF



In 1994, the Central Valley Water Board adopted WDRs Order 94-097 to regulate discharges from the Circle Oaks County WWTF. The WWTF consists of three ponds with the capacity to treat a monthly average dry weather flow of 72,000 gallons per day with disposal by evaporation and percolation.

Although discharge to surface waters is not allowed, any spills from the collection system or WWTF would flow into Capell Creek. In February 2003 the Central Valley Water Board issued a NOV for a spill of 660 gallons of untreated wastewater from the collection system. CIWQS does not contain any information on recent sanitary sewer overflows from the collection system. In September 2003 a NOV was issued citing problems with inadequate freeboard and pond maintenance. The Central Valley Water Board also required the installation of groundwater monitoring wells in 2003. In December 2005 the Central Valley Water Board issued Cleanup and Abatement Order R5-2005-0720 requiring the installation of groundwater monitoring wells and the submittal of various plans, including one for controlling infiltration and inflow to the system. CIWQS contains several violations in the last five years for late reports, inadequate freeboard in the ponds, and violations of other order conditions, including the detection of total coliform organisms in groundwater monitoring wells.

3.2.3 Wastewater Treatment Facilities Serving Resorts and Recreation Areas near Lake Berryessa

Camp Berryessa

As discussed in the Recreation section, Camp Berryessa will be a public environmental education camp on the site of the former Boy Scout camp that closed in 2004. Camp Berryessa will be operated by Napa County Regional Park and Open Space District on land that is owned by Reclamation. The first phase of the camp is scheduled to open late in 2014. Wastewater from the Phase 1 facilities will be treated in composting toilets. Approximately once a month the remaining waste will be hauled offsite. The camp will also have a graywater system. The second phase of the project will include an onsite wastewater disposal system. The schedule for the second phase is unknown because there is currently no funding for the second phase (Personal Communication, Chris Kahill, Napa County Parks).

Putah Canyon Recreation Area (Formerly Putah Creek Resort)

There has been no discharge to the wastewater facilities at Putah Creek Resort since July 2008. The wastewater collection and disposal facilities at the Putah Creek Resort were closed and demolished by Reclamation in the spring of 2011. The Central Valley Water Board rescinded WDRs Order No. 5-00-020 in October 2011. Reclamation is currently operating the site for RV and tent camping and boat launching. Currently there are portable toilets at several locations in the recreation area. If a new long-term concessionaire is found to operate the recreation area, new facilities will be constructed.

The wastewater facilities at the resort were previously operated by Lake Berryessa Enterprises, Inc. and consisted of a septic tank system and three evaporation/percolation ponds with a capacity of 1.7 million gallons. The WDRs allowed an average dry weather flow of 30,000 gallons per day until 2005. This was reduced to 14,000 gallons per day in 2005 because the discharger had failed to construct a fourth

evaporation/percolation pond. The wastewater was not disinfected. The wastewater system served approximately 150 mobile homes, a 27-unit motel, 150 campsites, a store, and a restaurant.

CIWQS does not contain any information on sanitary sewer overflows from the former collection system. The Central Valley Water Board has issued numerous NOVs, two ACLs, and one CDO. The major actions taken by the Central Valley Water Board are shown in **Table 3-5**. Lake Berryessa Enterprises, Inc., had a long history of other violations including submitting incomplete or late monthly reports and not maintaining sufficient freeboard in the ponds.

Table 3-5. Major Regulatory Actions against Lake Berryessa Enterprises, Inc.

Date	Order No.	Type of Order	Amount, $	Comments
7/13/98	R5-1998-0505	ACL	10,500	Unauthorized discharge to surface waters between Jan and June 1998 and failure to submit technical and monitoring reports.
12/24/98	R5-98-736	CAO		Discharges, integrity of pond berms, pump house and septic tanks, and exposed pipeline.
6/6/02	R5-2002-0087	ACL	23,500	Unauthorized discharges to surface waters.
1/27/05	R5-2005-0001	ACL	29,600	Failure to submit technical reports.
1/27/05	R5-2005-0002	CDO		Reduced average dry weather flow from 30,000 gallons per day to 14,000 gallons per day because discharger had not constructed fourth pond. Required contingency plan for not encroaching on pond freeboard.

Monticello Shores Recreation Area (Formerly Rancho Monticello Resort)

This resort is currently closed. The wastewater facilities at the Rancho Monticello Resort were closed and demolished by Reclamation prior to August 2011. The Central Valley Water Board rescinded WDRs Order No 98-085 in October 2011. If a new long-term concessionaire is found to operate the resort, new facilities will be constructed.

The wastewater facilities at the resort were previously operated by Laguna Hermosa Corporation and consisted of a septic system and ten evaporation/percolation ponds, located in four separate areas. Two of the sites had small sprayfields uphill from the ponds. The WDRs allowed an average dry weather flow of 70,500 gallons per day. The wastewater was not disinfected. The wastewater system served approximately 570 mobile homes, 130 campsites, a store, and a restaurant.

There are no records in CIWQS for the former wastewater collection system. The Central Valley Water Board issued a NOV in 2004, requiring the discharger to make modifications to the sprinkler system and

install a tailwater interceptor ditch after wastewater was found running off of the sprayfield. The discharger made the improvements.

Berryessa Point Recreation Area (Formerly Lake Berryessa Marina Resort)

This resort is currently closed. The Lake Berryessa Marina Resort WWTF was closed and demolished by Reclamation prior to February 2011. The Central Valley Water Board rescinded WDRs Order No. 90-150 in October 2011.

The wastewater facilities at the resort were previously operated by Chuck Vaughn, a private concessionaire, and consisted of an Imhoff tank, two septic tanks, and five evaporation/percolation ponds and spray disposal fields. The WDRs permitted an average dry weather flow of 15,000 gallons per day. The wastewater was not disinfected. The wastewater system served approximately 176 mobile homes, 71 camping sites, a restaurant, and a store.

CIWQS does not contain any records of sanitary sewer overflows in the last five years. The Central Valley Water Board issued a Water Code 13267 Order to the discharger in 2004 requiring the discharger to divert stormwater around the ponds. The discharger complied with the Order. The Central Valley Water Board issued a NOV in January 2007 for a raw sewage spill of 200 to 1,000 gallons in December 2006. The sewage spilled from a pipeline that crossed a cove of Lake Berryessa at the resort.

Reclamation Administrative Center and Day Use Areas

The Eticuera and Olive Orchard Day Use Areas have pit toilets and the Capell Cove Boat Launch has restrooms connected to a septic tank. The Reclamation Administrative Center, Dufer Point Visitor Center, Oak Shores Day Use Area, and Smittle Creek Day Use Area are located on the west shore of Lake Berryessa near the community of Spanish Flat. Reclamation operates its own wastewater collection, treatment, and disposal system. The location of the Reclamation facilities and the wastewater ponds are shown in **Figure 3-12**.

Figure 3-12. Location of Reclamation WWTF

The discharge of wastewater is authorized by WDR 5-00-202. Wastewater is collected from the Administration Center and eight public restrooms in nine septic tanks located near the facilities at each site. Nine lift stations pump the wastewater to two concrete lined oxidation-evaporation ponds. The ponds receive up to 3,000 gallons per day (average dry weather flow) of wastewater. Backwash from a water treatment plant is discharged to a third unlined evaporation/percolation pond. Graywater from the administrative center (except the dormitory) and sinks in the recreation area is discharged to subsurface leachfields.

CIWQS does not contain any information on sanitary sewer overflows or spills of treated wastewater from the system. The Central Valley Water Board Executive Officer reports on sewage spills were reviewed for 2007 to 2012 and none were found for this facility. CIWQS shows that Reclamation failed to submit monitoring reports in 2008 and 2010.

Spanish Flat Recreation Area (Formerly Spanish Flat Resort)

The Spanish Flat Resort WWTF was closed and demolished by Reclamation prior to May 2011. The Central Valley Water Board rescinded WDRs Order No. 5-00-204 in August 2011. If a new long-term concessionaire is found to operate the resort, new facilities will be constructed.

The WWTF at the resort was previously operated by Spanish Flat Enterprises, and consisted of two septic tanks, two pump stations, and an evaporation and percolation pond. The WDRs allowed for the discharge of up to 15,000 gallons per day. There were also approximately 40 portable toilets at the resort that were pumped out twice a week through contracted services and disposed of at an off-site location. The wastewater facilities previously served approximately 75 mobile homes, a general store, one residence, and a RV dump station.

CIWQS does not contain any information on sanitary sewer overflows or spills of treated wastewater from the system. The Central Valley Water Board Executive Officer reports on sewage spills were reviewed for 2007 to 2012 and none were found for this facility. CIWQS shows that Spanish Flat Enterprises failed to submit monitoring reports in 2008.

Steele Canyon Recreation Area (Formerly Steele Park Resort)

Prior to 2007, Steele Park Resort was served by NBRID. The Steele Canyon Recreation Area is currently managed by Reclamation but the wastewater collection system is not currently in operation. There are portable toilets at the resort in several locations. It is expected that NBRID will treat wastewater from the Steele Canyon Recreation Area when it is updated by a new long-term concessionaire.

Pleasure Cove Marina

Pleasure Cove Marina, located on Wragg Canyon, is one of the few resorts that stayed open. The resort is operated by a private corporation, Forever Resorts, on land owned by Reclamation. **Figure 3-13** shows the location of the resort and the WWTF.

The Central Valley Water Board adopted WDRs Order 98-086 to permit wastewater treatment and disposal at the resort. The campgrounds are served by portable chemical toilets. The other facilities are served by septic tanks. The marina also has a wastewater pump-out dock that discharges to one of the septic tanks. Effluent from the septic tanks is discharged to four stabilization ponds at three separate sites. Waste from the portable chemical toilets is discharged to Pond 1, which is near the entrance gate. This pond has a capacity of 105,000 gallons. Ponds 2 and 3, near the mid-point of the resort, have a combined capacity of 70,000 gallons. Pond 4, near the north end of the resort, has a capacity of 25,000 gallons. Up to 25,000 gallons per day of wastewater is collected in the ponds, and disposed of by sprayfield irrigation.

Figure 3-13. Location of Pleasure Cove WWTF

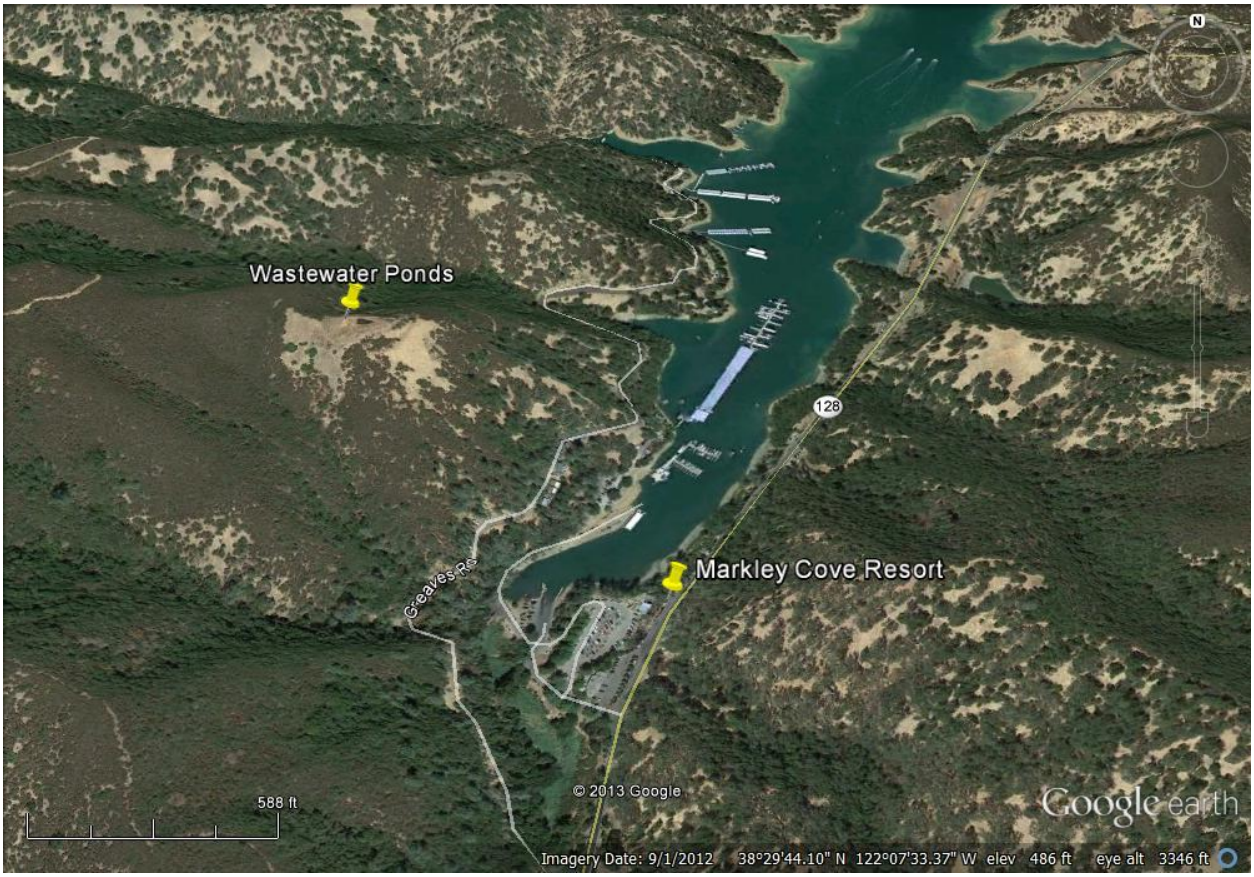
CIWQS contains information on one spill of an unknown quantity in June 2008 that did not reach surface waters. The discharger has submitted monitoring reports late and in 2012 was issued a NOV for excessive vegetation in the ponds.

Markley Cove Resort

Markley Cove Resort, on Highway 28 about 3 miles west of Monticello Dam, is one of the few resorts that stayed open. The resort is operated by a private concessionaire on land owned by Reclamation. The location of the resort and wastewater facilities are shown in **Figure 3-14**.

The Central Valley Water Board adopted WDRs Order No. 98-084 in 1998 authorizing the collection and treatment of up to 11,500 gallons per day (average dry weather flow). Wastewater is discharged to septic tanks and then to two evaporation/percolation ponds.

Figure 3-14. Location of Markley Cove WWTF



CIWQS does not contain any information on spills from the collection system. The Central Valley Water Board issued a NOV in October 2005 because wastewater was surfacing in a spring down gradient of the ponds. The estimated quantity was 14,197 gallons. In December 2005 the Central Valley Water Board issued a cleanup and abatement order requiring the discharger to reconstruct the ponds, conduct a pipeline inspection, and complete a number of reports. The cleanup and abatement order was rescinded in August 2007 after the discharger completed all of the work and submitted the reports required by the cleanup and abatement order. The discharger violated the WDRs several times in 2008 by failing to conduct required monitoring.

3.2.4 Wastewater Facilities on Lake Berryessa

Houseboats

Discharge of sewage from houseboats is prohibited by the U.S. Environmental Protection Agency and by Napa County. The houseboats at Lake Berryessa contain holding tanks for both sewage and greywater.

Floating Restrooms

There are five floating restrooms on Lake Berryessa that are managed by Reclamation. The restrooms are located at Putah Creek, Inner Island, Big Island, Hanes Cove, and Little Portagee Canyon. There have not been any sewage spills from the floating restrooms (Personal Communication, Jeff Laird).

3.2.5 Summary

Impacts on Lake Berryessa Resort Improvement District Water Treatment Plant

The Upper Putah Creek watershed, upstream of the LBRID WTP contains numerous onsite wastewater treatment systems and the Middletown and Hidden Valley WWTFs. These facilities do not discharge to surface waters so the only potential impact on water quality in Upper Putah Creek is due to spills from the facilities. As discussed previously, there have been no Category 1 spills from either of these facilities in the last several years. The LBRID WWTF has a history of spills to Putah Creek; however, the spills enter Putah Creek downstream from the intake to the WTP. Expansion of the LBRID WWTF is currently being designed that would prevent spills in the future.

Impacts on Napa Berryessa Resort Improvement District Water Treatment Plant

The NBRID WTP is located on Capell Cove, downstream from the NBRID and Circle Oaks WWTFs. In the past, spills from the Spanish Flat Resort WWTF could potentially have impacted water quality at the NBRID WTP intake. These WWTFs do not discharge to surface waters. The Circle Oaks WWTF has had one small spill in the last ten years and the Spanish Flat Recreation Area is currently closed. The greatest threat to the NBRID WTP is spills from the NBRID WWTF. The WWTF is currently being upgraded and pond storage is being substantially increased to prevent spills in the future.

Impacts on Water Treatment Plants along Putah South Canal

Wastewater spills to Lake Berryessa are unlikely to impact the WTPs that take water from the Solano Project downstream of the lake due to the large amount of dilution capacity of the lake, the deep withdrawal from the lake, and travel time to the Putah South Canal.

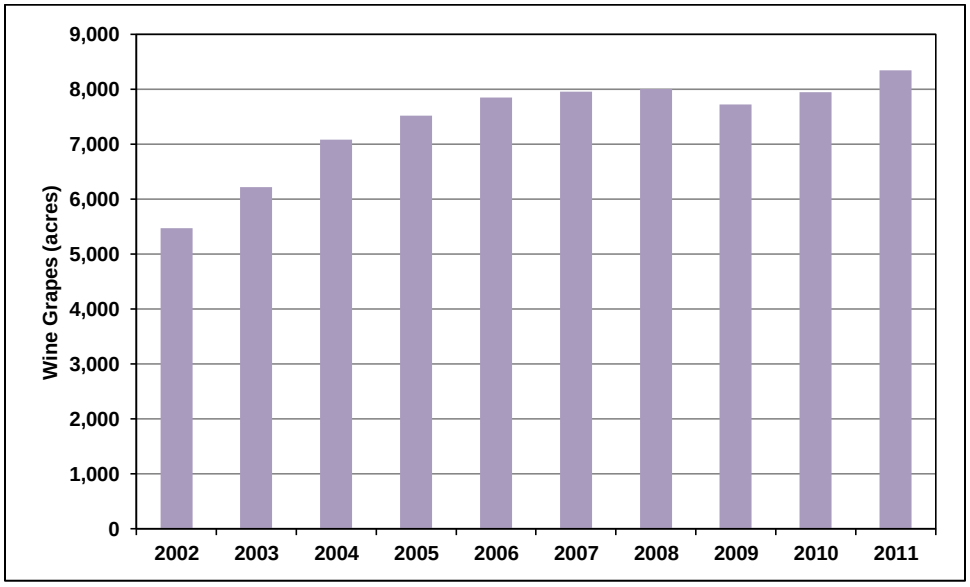
3.3 Agriculture/Pesticide Use

There are four primary areas of the Lake Berryessa watershed devoted to agricultural use; the Coyote, Collayomi, and Guenoc valleys of Lake County and the Pope Valley of Napa County. The 2001 Update states that vineyard acreage was rapidly increasing in the Lake Berryessa watershed and there was concern over the impacts on water quality.

3.3.1 Lake County

The primary crops in Lake County are wine grapes, pears, and walnuts (Lake County Agricultural Commissioner, 2011). Most of the pear and walnut orchards are located in the upper portion of Lake County that is outside of the Lake Berryessa watershed. Wine grapes are the primary crop in the Coyote, Collayomi, and Guenoc valleys. The annual Crop Reports contain information on the total acreage of wine grapes in Lake County but they do not contain information that is specific to these three valleys. The Lake County Agricultural Commissioner was contacted and he reported that they only have acreage for the entire County and he could not break it down into specific areas (Personal Communication, Steven Hajik). Historical Google Earth maps were viewed but it is difficult to determine from these maps if wine grape acreage has increased in these valleys. The total acreage in the county is presented in **Figure 3-15** as a potential indicator of the growth in wine grapes in the Lake County portion of the watershed. This figure shows that wine grape acreage increased from 5,465 acres in 2002 to 8,338 acres in 2011. Most of this growth occurred between 2002 and 2007. There has been little change in the last five years.

Figure 3-15. Acreage Devoted to Wine Grapes in Lake County

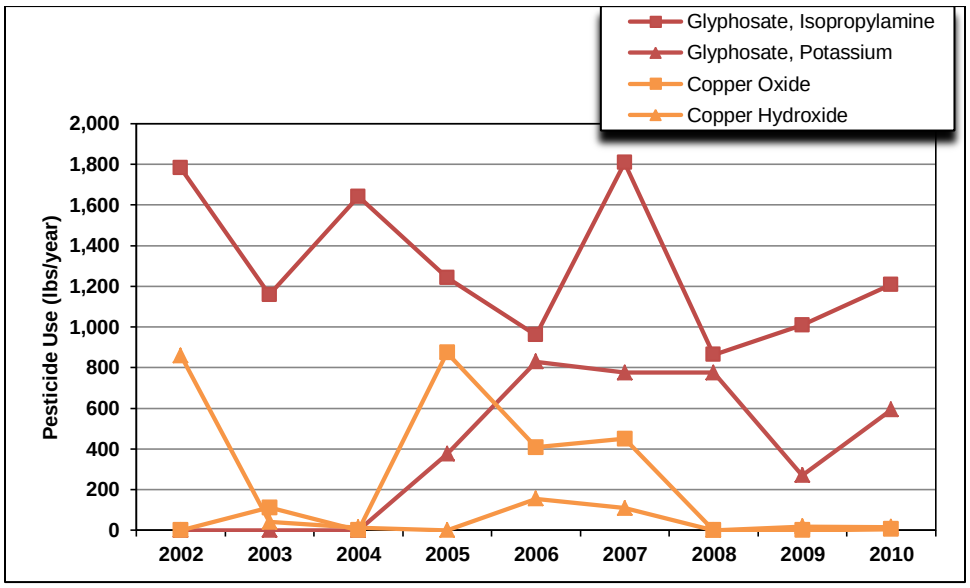


The California Department of Pesticide Regulation database on pesticide usage was searched for pesticides used in the 95461 zip code, which generally encompasses the Coyote, Collayomi, and Guenoc valleys. The primary pesticides used in these valleys of Lake County are sulfur, petroleum distillates, and glyphosate. **Table 3-6** shows the ten pesticides that were used in the largest average quantities between 2002 and 2010 (the latest date for which information is available). Glyphosate and copper are the only pesticides used in average quantities of over 100 pounds per year for which drinking water maximum contaminant levels (MCLs) have been promulgated. **Figure 3-16** shows the usage of copper and glyphosate pesticides between 2002 and 2010. This figure shows that the use of copper has declined and the use of glyphosate has fluctuated; however, total glyphosate usage has remained at about 1,800 pounds per year.

Table 3-6. Pesticides Used in Coyote, Collayomi, and Guenoc Valleys in Lake County

Pesticide	Average Use (lbs/year)
Sulfur	38,420
Petroleum Distillates	3,310
Glyphosate, Isopropylamine	1,167
Petroleum Oil	768
Potassium, N-methyldithiocarb	477
Glyphosate, Potassium	362
Copper Oxide	185
Oxyfluorfen	158
Potassium Bicarbonate	148
Copper Hydroxide	121

Figure 3-16. Usage of Glyphosate and Copper Pesticides in Lake County



3.3.2 Napa County

Wine grapes are by far the largest crop in Napa County (Napa County Agricultural Commissioner, 2012). The Napa County Crop Reports show that wine grape acreage in the county increased from 43,073 acres in 2002 to 45,301 acres in 2012; however most of this acreage is in the Napa Valley. The Crop Reports do not contain specific data on the Pope Valley region. The data are not available through the Agricultural Commissioner's Office (Personal Communication, Jose Chang). Historical Google Earth maps were viewed but it is difficult to determine if wine grape acreage has increased in the Pope Valley region.

The California Department of Pesticide Regulation database on pesticide usage was searched for pesticides used in Pope Valley. The primary pesticides used are sulfur, petroleum distillates, 1,3-Dichloropropene and glyphosate. **Table 3-7** shows the pesticides that were used in the largest average quantities between 2002 and 2010 (the latest date for which information is available). Glyphosate, 1,3-Dichloropropene, copper, methyl bromide (bromomethane) and simazine are the pesticides used in average quantities of over 100 pounds per year for which drinking water MCLs have been promulgated. Methyl bromide was used in 2002 (4,978 lbs) but has not been used since that time. Similarly, 1-3-Dichloropropene was used between 2002 and 2005 (1,498 to 26,137 lbs/year) but has not been used since then. **Figure 3-17** shows the usage of glyphosate pesticides between 2002 and 2010. This figure shows that the use of glyphosate has fluctuated; however, total glyphosate usage appears to be decreasing. The use of copper and simazine has decreased in recent years, as shown in **Figure 3-18**.

Table 3-7. Pesticides Used in Pope Valley in Napa County

Pesticide	Average Use (lbs/year)
Sulfur	85,538
Petroleum Distillates	4,366
1,3-Dichloropropene	3,852
Glyphosate, Isopropylamine	2,457
Lime Sulfur	1,531
Potassium Bicarbonate	1,437
Oryzalin	748
Oxyfluorfen	608
Copper Oxide	556
Methyl Bromide	553
Mineral Oil	510
Simazine	429
Copper Hydroxide	418
Petroleum Oil	293
Tebuconazole	166
Boscalid	131
Mancozeb	128
Myclobutanil	124
2,4-Dimethylamine Salt	117

Figure 3-17. Usage of Glyphosate Pesticides in Napa County

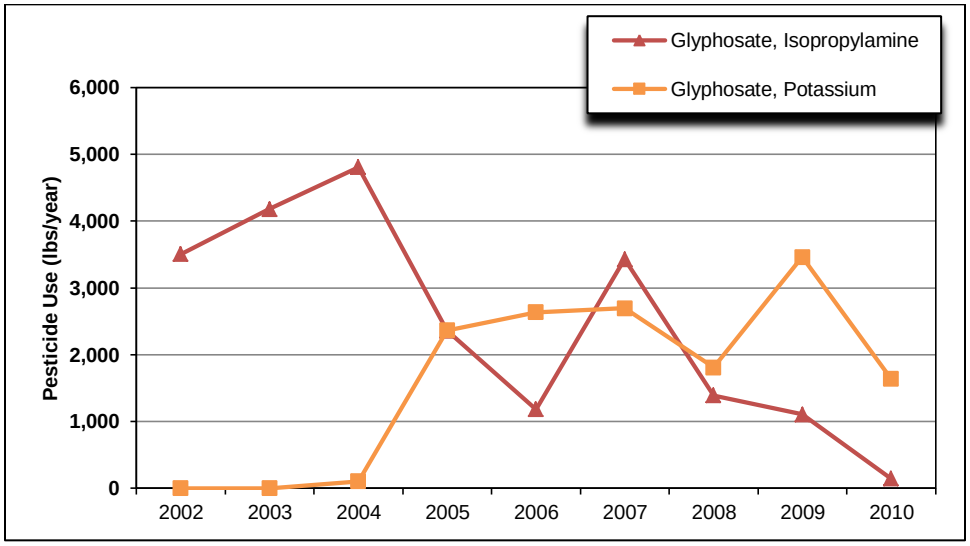
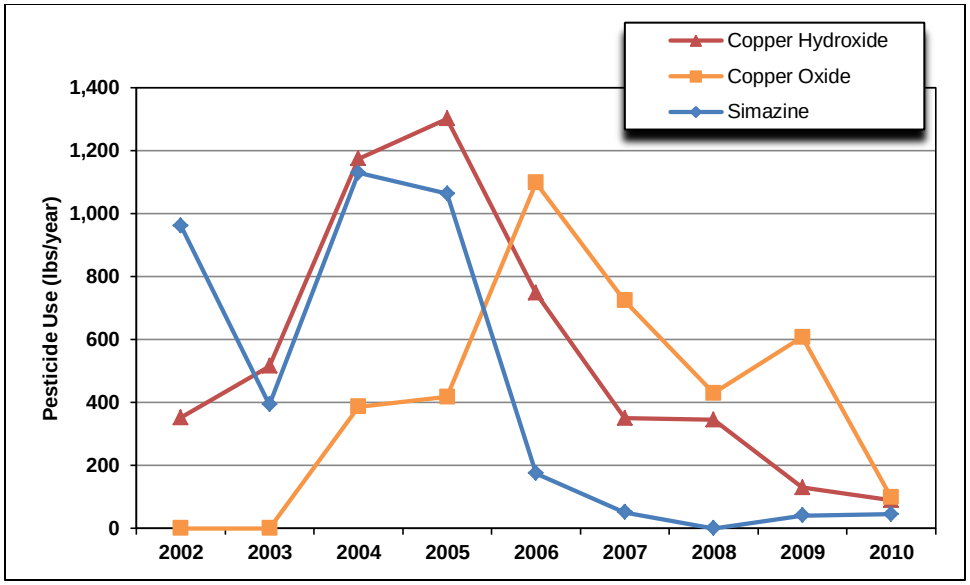


Figure 3-18. Usage of Copper Pesticides and Simazine in Napa County



3.3.3 Summary

The 2001 Update states that vineyard acreage was rapidly increasing in the Lake Berryessa watershed and there was concern over the impacts on water quality. It is difficult to tell from the available information if wine grape acreage has increased in the Coyote, Collayomi, and Guenoc valleys of Lake County or the Pope Valley of Napa County. The Napa County and Lake County Agricultural

Commissioners only have information for the entire county. Historical Google Earth maps were viewed but it is difficult to determine from these maps if wine grape acreage has increased in these valleys. Sulfur is the pesticide used in the greatest quantities by far in both counties. Smaller amounts of other pesticides are used; some of which have MCLS. Most wine grapes are irrigated with drip irrigation, which limits runoff from the vineyards and lessens the potential for pesticides to enter water bodies.

Impacts on Lake Berryessa Resort Improvement District Water Treatment Plant

The Coyote and Collayomi valleys are upstream of the LBRID WTP intake on Putah Creek. Glyphosate and copper are the only pesticides used in average quantities of over 100 pounds per year for which MCLs have been promulgated. Neither glyphosate nor copper was detected in monitoring conducted between 2007 and 2012 in the raw water.

Impacts on Napa Berryessa Resort Improvement District Water Treatment Plant

The Coyote and Collayomi valleys drain to Lake Berryessa via Putah Creek and the Pope Valley drains to Lake Berryessa via Pope Creek. Both drainages enter the northern part of the lake and are quite distant from the intake of the NBRID WTP. Glyphosate, 1,3-Dichloropropene, copper, methyl bromide (bromomethane) and simazine are the pesticides used in average quantities of over 100 pounds per year for which drinking water MCLs have been promulgated. None of these was detected in monitoring conducted between 2005 and 2011 in the raw water.

Impacts on Solano Project Water Treatment Plants

The substantial amount of dilution available in Lake Berryessa and the fact that the pesticides have not been detected at the LBRID and NBRID WTP intakes, which are substantially closer to the areas of usage, indicate that pesticides used in the Lake Berryessa watershed are not likely to have any adverse impact on WTPs taking water from the Solano Project.

3.4 Hazardous Materials Spills

A review of the Response Information Management System (RIMS) database indicated that during the 2006 to 2012 period there have been very few reported hazardous materials spills. Most of the spills reported were spills from wastewater collection systems that are discussed in Section 3.2. There was a spill of an unknown amount of petroleum on October 29, 2007 when a plane crashed into the lake and on August 14, 2011, 16 gallons of petroleum spilled to Lake Berryessa when there was a fire on board a watercraft. Napa County Department of Environmental Management is listed in the spill reports as the administrative agency for these two spills. The spill report for the downed plane indicates that SCWA and Solano Irrigation District were notified. The spill report for the boating accident doesn't list any agencies as having been notified of the spill, likely due to the small volume of the spill.

Caltrans no longer allows public access to its database on vehicle accidents on California highways; however, RIMS has no records of accidents resulting in spills in the watershed.

3.5 Wildfires

The CAL FIRE website (http://cdfdata.fire.ca.gov/incidents/incidents_archived?) was searched for fires in the Lake Berryessa watershed. The database contains information on fires between 2003 and 2013. There was one fire in the watershed during this period. The Knoxville Fire started on August 13, 2011 and burned 508 acres over a three day period. The fire burned part of the watershed along Berryessa-Knoxville Road, about 2 miles north of the lake.

Erosion after fires is the primary water quality concern. Due to the relatively small size of this fire and the large hydraulic capacity of Lake Berryessa, it would be difficult to detect any impacts on water quality in the lake.

4.0 WATER QUALITY

The Napa County Department of Public Works (Napa County) provided the water quality data collected at the Lake Berryessa Resort Improvement District (LBRID) and the Napa Berryessa Resort Improvement District (NBRID) water treatment plant (WTP) intakes in the last several years. The U.S. Bureau of Reclamation was contacted to determine if they conducted monitoring of Putah Creek below Monticello Dam that would represent the quality of water leaving Lake Berryessa. Monitoring was conducted between December 1997 and May 2006 but no data have been collected in recent years.

4.1 Microbiological Contaminants

Under the Surface Water Treatment Rule (SWTR), the general requirements are to provide treatment to ensure at least 3-log reduction of *Giardia lamblia* cysts and at least 4-log reduction of viruses. The Interim Enhanced Surface Water Treatment Rule requires 2-log reduction of *Cryptosporidium*. Source water monitoring for *Escherichia coli* (*E. coli)*, conducted to comply with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), is used to determine if additional inactivation of *Cryptosporidum* is required

The California SWTR Staff Guidance Manual provides a description of source waters that require additional treatment above the minimum 3-log *Giardia* and 4-log virus reduction (California Department of Health Services, 1991). The Guidance Manual states "...in a few situations, source waters are subjected to significant sewage and recreational hazards, where it may be necessary to require higher levels of virus and cyst removals...". Due to the expense and uncertainties associated with pathogen monitoring, California Department of Public Health (CDPH) staff historically relied on monthly median total coliform levels as a guide for increased treatment. When monthly medians exceeded 1,000 most probable number per 100 milliliters (MPN/100 ml), CDPH staff considered requiring additional log reduction. More recently, CDPH staff has started to rely upon fecal coliform and *E. coli* as more specific indicators of mammalian fecal contamination. When the monthly median *E. coli* or fecal coliform density exceeds 200 MPN/100 ml, CDPH staff considers requiring additional log reduction.

4.1.1 Lake Berryessa Resort Improvement District Coliform Data and Treatment Requirements

Napa County provided total coliform and *E. coli* data for the LBRID intake for 2009 to 2012. Samples were generally collected every two weeks during this time. Total coliform densities ranged from 43.5 to >2,419 MPN/100 ml with an overall median of 1,300 MPN/100 ml. The *E. coli* densities ranged from <1 to 980.4 MPN/100 ml with an overall median of 5.1 MPN/100 ml. **Figure 4-1** presents the monthly median total coliform densities and **Figure 4-2** presents the monthly median *E. coli* densities. The monthly median total coliform densities frequently exceed 1000 MPN/100 ml. Most of the monthly *E. coli* medians were below 200 MPN/100 ml. LBRID conducted *E. coli* monitoring to comply with the LT2ESWTR between January and December 2009. The annual mean during this period was 57 MPN/100 ml, which is below the trigger level of 100 MPN/100 ml for requiring *Cryptosporidium* monitoring. There

were no coliform violations in the treated water reported in the Consumer Confidence Reports for 2008 through 2011. These data indicate that 2-log *Cryptosporidium*, 3-log *Giardia*, and 4-log virus removal and inactivation is the appropriate level of treatment.

Figure 4-1. Monthly Median Total Coliforms at the LBRID WTP Intake

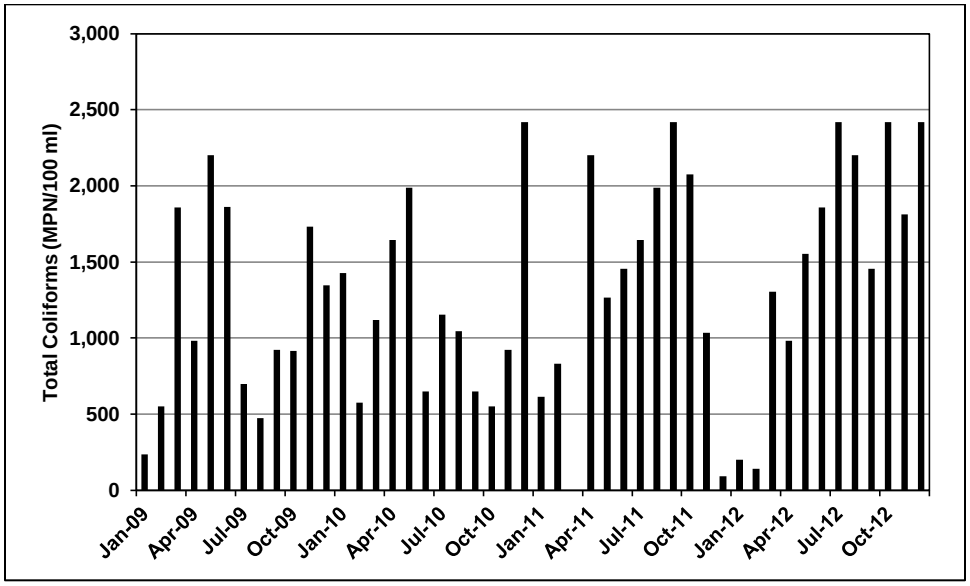
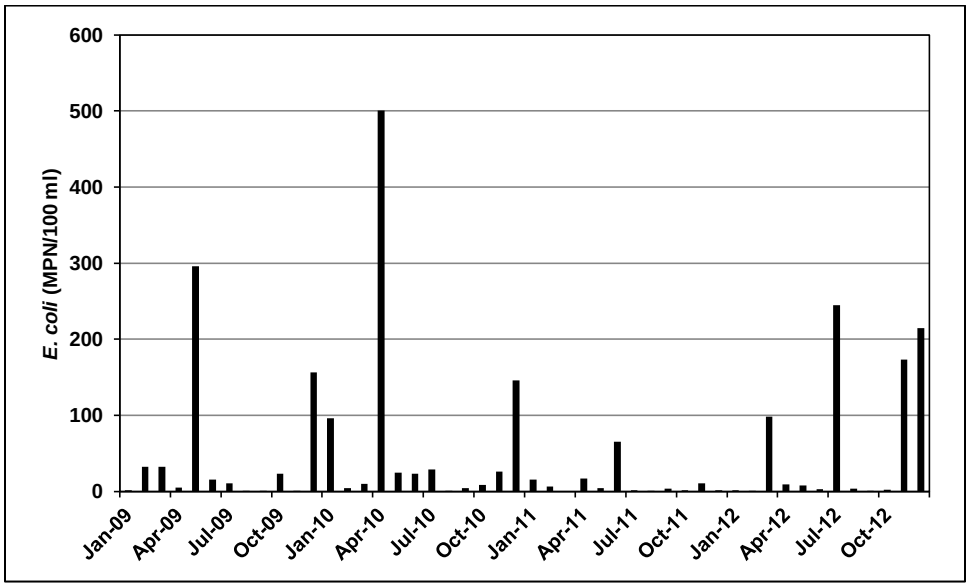


Figure 4-2. Monthly Median *E. coli* at the LBRID WTP Intake



4.1.2 Napa Berryessa Resort Improvement District Coliform Data and Treatment Requirements

Napa County provided total coliform data for the NBRID intake from 2010 to 2012 and *E. coli* data for October 2008 to 2012. Samples were generally collected every two weeks during this time. Total coliform densities ranged from <1 to >2,419 MPN/100 ml with an overall median of 121 MPN/100 ml. The *E. coli* densities ranged from <1 to 33.6 MPN/100 ml with an overall median of <1 MPN/100 ml. **Figure 4.3** presents the monthly median total coliform densities and **Figure 4.4** presents the monthly median *E. coli* densities. The monthly median total coliform densities exceeded 1,000 MPN/100 ml in six months during this period. The monthly *E. coli* medians were consistently substantially below 200 MPN/100 ml. NBRID conducted *E. coli* monitoring to comply with the LT2ESWTR between October 2008 and September 2009. The annual mean during this period was 2.1 MPN/100 ml, which is well below the trigger level of 100 MPN/100 ml for requiring *Cryptosporidium* monitoring. There were no coliform violations in the treated water reported in the Consumer Confidence Reports for 2006 through 2011. These data indicate that 2-log *Cryptosporidium*, 3-log *Giardia*, and 4-log virus removal and inactivation is the appropriate level of treatment.

4.2 Turbidity

High levels of turbidity can create water treatment challenges by reducing filter run times and shielding microorganisms. **Figure 4.5** presents the raw water turbidity data for LBRID and **Figure 4-6** presents the raw water turbidity data for NBRID. The LBRID data indicate that there are turbidity peaks during the winter months, most likely during storm events. The peak turbidity recorded was >100 nephelometric turbidity units (NTU) for several days in March 2011. The NBRID data indicate that turbidity is often >100 NTU. Most of the turbidity peaks occur during the winter months but there are occasional peaks during the dry season. The LBRID treated water complied with the turbidity performance standards between 2008 and 2011. The highest treated water turbidity recorded was 0.50 NTU in 2008 and 2011. The NBRID treated water also complied with the turbidity performance standards between 2006 and 2011. The highest treated water turbidity recorded was 0.31 NTU in 2006.

4.3 Organic Carbon

Total organic carbon (TOC) is a disinfection byproduct precursor that reacts with chlorine to form trihalomethanes and haloacetic acids in treated drinking water. **Figure 4-7** presents the available TOC data for the LBRID WTP intake and **Figure 4-8** presents the data for the NBRID WTP intake. While there are a couple of peak values in the LBRID data, TOC is generally between 1.0 and 3.0 mg/L. The NBRID TOC concentrations are generally between about 1.5 and 2.5 mg/L. These concentrations are relatively low for surface water sources in California. The 2008 and 2009 Consumer Confidence Reports for LBRID show that the running annual average for total trihalomethanes was below the maximum contaminant level (MCL) of 80 µg/L and haloacetic acids were below the MCL of 60 µg/L. The 2006 through 2009 Consumer Confidence Reports for NBRID show that the trihalomethanes and haloacetic acids were below the MCLs.

Figure 4.3. Monthly Median Total Coliforms at the NBRID WTP Intake

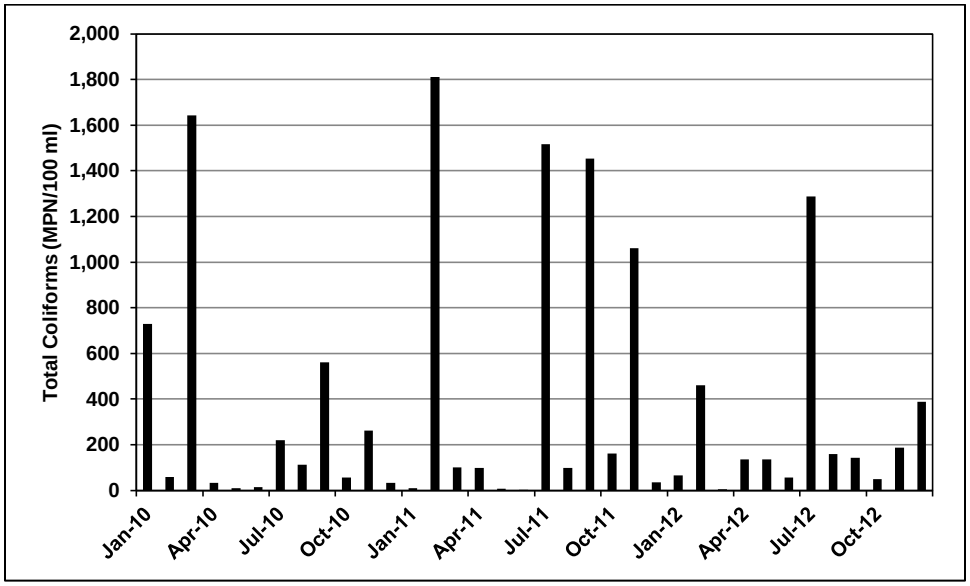


Figure 4.4. Monthly Median *E. coli* at the NBRID WTP Intake

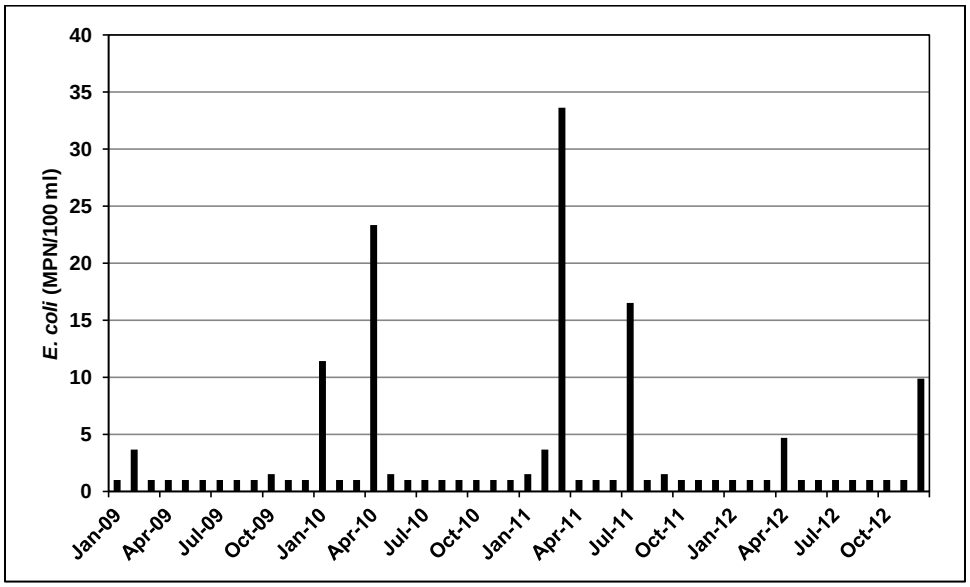


Figure 4.5. Turbidity at the LBRID WTP Intake

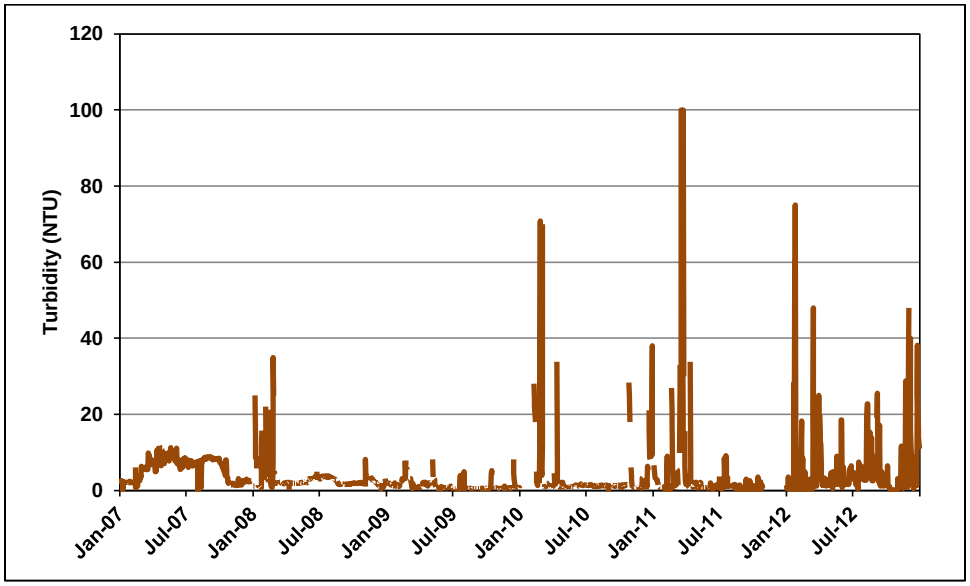


Figure 4.6. Turbidity at the NBRID WTP Intake

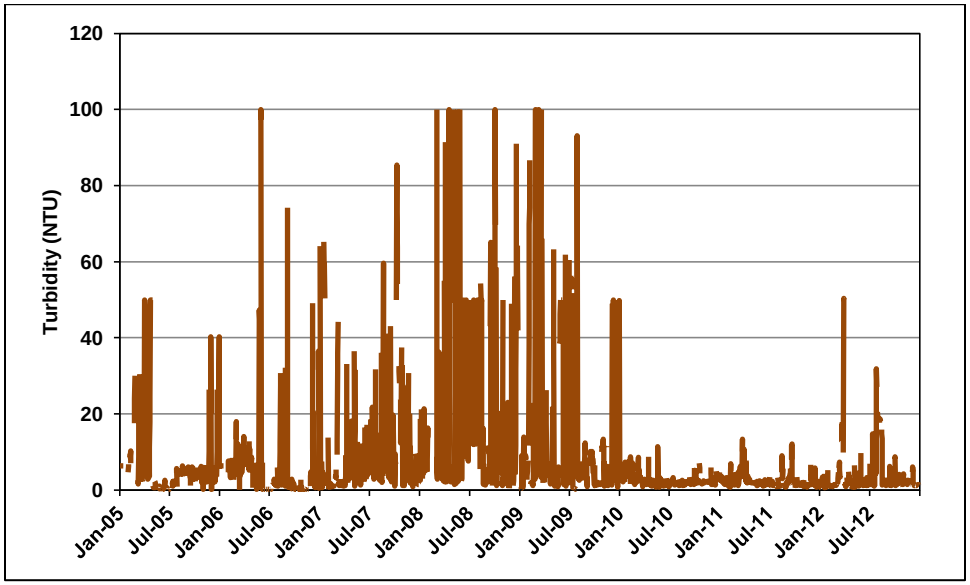


Figure 4.7. TOC Concentrations at the LBRID WTP Intake

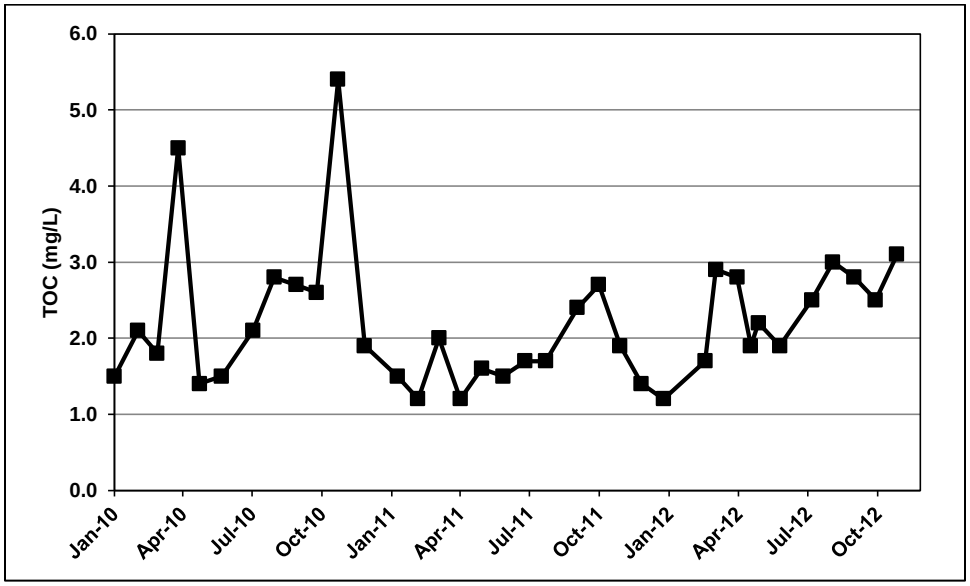
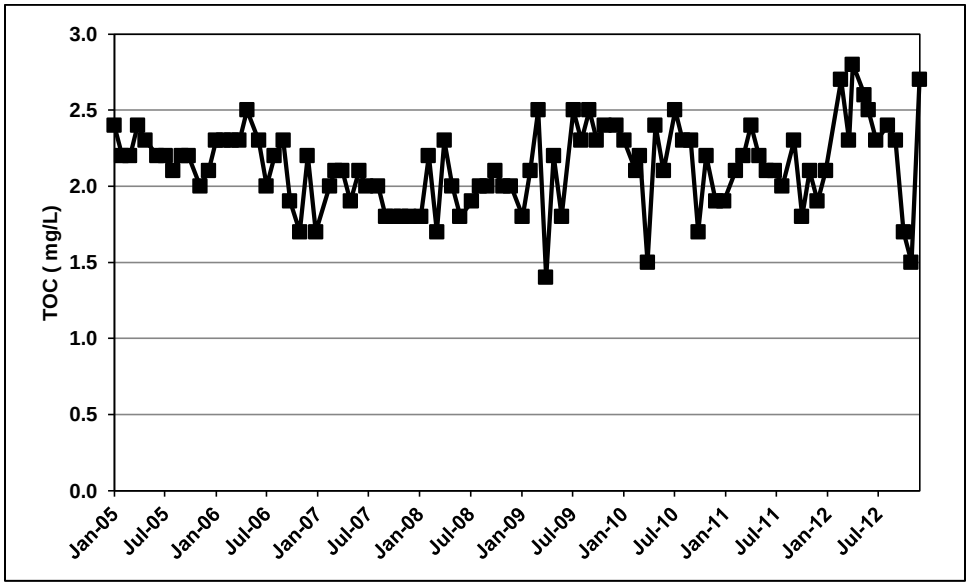


Figure 4.8. TOC Concentrations at the NBRID WTP Intake



4.4. Comparison to Maximum Contaminant Levels

Table 4-1 compares the LBRID data to primary MCLs and **Table 4-2** compares the data to secondary MCLs. **Tables 4-3 and 4-4** compare the NBRID data to primary and secondary MCLS, respectively. Most primary and secondary MCLs were met in both systems. A brief discussion of the constituents for which the MCLS were exceeded follows for each system.

Table 4.1. Comparison of LBRID Monitoring Data (2007 to 2012)
To Primary Maximum Contaminant Levels

Constituent	Primary MCL	Monitoring Data		
		Number of Samples	Median Concentration	Maximum Concentration
Inorganic Chemicals				
Aluminum, mg/L	1	6	0.085	0.110
Antimony, mg/L	0.006	5	<0.006	<0.006
Arsenic, mg/L	0.01	6	<0.002	0.0023
Asbestos, MFL	7	18	ND	12
Barium, mg/L	1	6	<0.10	<0.10
Beryllium, mg/L	0.004	6	<0.001	<0.001
Cadmium, mg/L	0.005	6	<0.001	<0.001
Chromium, mg/L	0.05	6	<0.001	0.002
Copper, mg/L	1.3	6	<0.050	<0.050
Cyanide, mg/L	0.15	0		
Fluoride, mg/L	2.0	6	<0.10	0.14
Lead, mg/L	0.015	1	<0.005	<0.005
Mercury, mg/L	0.002	6	<0.001	<0.010[a]
Nickel, mg/L	0.1	6	<0.010	<0.010
Nitrate, mg/L as N	10	6	<0.44	<0.44
Nitrate + Nitrite, mg/L as N	10	0		
Nitrite, mg/L as N	1	4	<0.4	<0.4
Perchlorate, mg/L	0.006	11	<0.004	<0.004
Selenium, mg/L	0.05	6	<0.005	<0.005
Thallium, mg/L	0.002	6	<0.001	<0.001
Radioactivity				
Gross alpha particle, pCi/L	15	8	0.06	6.25
Gross beta particle, pCi/L Gross beta particle, millirem/yr	50 4	0 0		
Radium 226 & 228, pCi/L	5	0		
Radium 226, pCi/L		0		
Radium 228, pCi/L		9	0.038	0.177
Strontium-90, pCi/L	8	0		
Tritium, pCi/L	20,000	0		
Uranium, pCi/L	20	0		
Organic Chemicals[b]				

[a] One sample had a detection limit of 0.01 mg/L so it is not possible to determine if this sample exceeded the MCL of 0.002 mg/L.

[b]No organic chemicals were detected.

Table 4.2. Comparison of LBRID Monitoring Data (2007 to 2012) to Secondary Maximum Contaminant Levels

Constituent	Secondary MCL	Monitoring Data		
		Number of Samples	Median Concentration	Maximum Concentration
Aluminum, mg/L	0.2	6	0.085	0.110
Color, units	15	6	13	20
Copper, mg/L	1.0	6	<0.050	<0.050
MBAS, mg/L	0.5	6	<0.050	<0.050
Iron, mg/L	0.3	8	<0.10	0.33
Manganese, mg/L	0.05	8	<0.020	0.098
MTBE, mg/L	0.005	3	ND	ND
Threshold Odor Number, units	3	6	7	17
Silver, mg/L	0.1	6	<0.010	<0.010
Thiobencarb, mg/L	0.001	1	ND	ND
Turbidity[a], units	5	6	2.9	5.7
Zinc, mg/L	5.0	6	<0.050	<0.050
Total dissolved solids, mg/L	500-1,500	6	275	310
Specific conductance, µS/cm	900-2,200	6	485	550
Chloride, mg/L	250-600	6	7.8	11
Sulfate, mg/L	250-600	6	18	24

[a] Turbidity measured in annual samples.

Table 4.3. Comparison of NBRID Monitoring Data (2005 to 2012)
To Primary Maximum Contaminant Levels

Constituent	Primary MCL	Monitoring Data		
		Number of Samples	Median Concentration	Maximum Concentration
Inorganic Chemicals				
Aluminum, mg/L	1	29	0.29	68
Antimony, mg/L	0.006	28	<0.006	0.036
Arsenic, mg/L	0.01	10	<0.002	0.053
Asbestos, MFL	7	1		ND
Barium, mg/L	1	8	<0.10	0.26
Beryllium, mg/L	0.004	8	<0.001	<0.001
Cadmium, mg/L	0.005	8	<0.001	<0.001
Chromium, mg/L	0.05	8	<0.001	0.0043
Copper, mg/L	1.3	8	<0.050	<0.050
Cyanide, mg/L	0.15	0		
Fluoride, mg/L	2.0	8	0.115	0.26
Lead, mg/L	0.015	3	<0.005	<0.005
Mercury, mg/L	0.002	8	<0.001	<0.001
Nickel, mg/L	0.1	8	<0.010	0.015
Nitrate, mg/L as N	10	8	0.99	1.2
Nitrate + Nitrite, mg/L as N	10	0		
Nitrite, mg/L as N	1	6	<0.4	<0.4
Perchlorate, mg/L	0.006	15	<0.004	<0.004
Selenium, mg/L	0.05	8	<0.005	<0.005
Thallium, mg/L	0.002	8	<0.001	<0.001
Radioactivity				
Gross alpha particle, pCi/L	15	8	0.31	1.65
Gross beta particle, pCi/L Gross beta particle, millirem/yr	50 4	0 0		
Radium 226 & 228, pCi/L	5	0		
Radium 226, pCi/L		0		
Radium 228, pCi/L		8	0	0.12
Strontium-90, pCi/L	8	0		
Tritium, pCi/L	20,000	0		
Uranium, pCi/L	20	0		
Organic Chemicals[a]				

[a] No organic chemicals were detected.

Table 4.4. Comparison of NBRID Monitoring Data (2005 to 2012) to Secondary Maximum Contaminant Levels

Constituent	Secondary MCL	Monitoring Data		
		Number of Samples	Median Concentration	Maximum Concentration
Aluminum, mg/L	0.2	29	0.29	68
Color, units	15	8	10	15
Copper, mg/L	1.0	8	<0.050	<0.050
MBAS, mg/L	0.5	8	<0.050	<0.050
Iron, mg/L	0.3	15	<0.10	1.1
Manganese, mg/L	0.05	9	<0.020	0.11
MTBE, mg/L	0.005	4	ND	ND
Threshold Odor Number, units	3	8	1.1	3
Silver, mg/L	0.1	8	<0.010	<0.010
Thiobencarb, mg/L	0.001	1	ND	ND
Turbidity[a], units	5	8	1.5	39
Zinc, mg/L	5.0	8	<0.050	0.088
Total dissolved solids, mg/L	500-1,500	8	195	220
Specific conductance, µS/cm	900-2,200	8	360	410
Chloride, mg/L	250-600	8	6.1	55
Sulfate, mg/L	250-600	8	21.5	40

[a] Turbidity measured in annual samples.

4.4.1 Lake Berryessa Resort Improvement District Constituents Exceeding Maximum Contaminant Levels

Asbestos

LBRID collected 18 samples for asbestos between June 2007 and October 2012. Asbestos was detected in 8 of the samples at levels ranging from 1 to 12 million fibers/L (MFL). The MCL of 7 MFL was exceeded in one sample that had 12 MFL collected in April 2010. LBRID conducted quarterly sampling for asbestos between April 2010 and October 2012. Asbestos was detected in many of the samples but it did not exceed the MCL after the initial exceedence in April 2010. The asbestos is likely derived from the serpentine soils in the Upper Putah Creek watershed.

Color

LBRID collected annual samples between June 2007 and August 2012 for color. Color ranged from 5 to 20 color units, with two samples exceeding the secondary MCL of 15 color units. The high color in the source water is likely due to naturally occurring organic materials.

Iron

LBRID collected eight samples for iron between June 2007 and August 2012. Iron was not detected in six of the samples and was detected at 0.12 mg/L and 0.33 mg/L in two samples. The 0.33 mg/L sample, collected in June 2007, exceeded the secondary MCL of 0.3 mg/L. The iron is likely due to leaching of natural deposits.

Manganese

LBRID collected eight samples for manganese between June 2007 and August 2012. Manganese was detected in only one sample at 0.098 mg/L. This sample, collected in June 2007, exceeded the secondary MCL of 0.05 mg/L. The manganese is likely due to leaching of natural deposits.

Threshold Odor Number

LBRID collected six samples for threshold odor number (TON) between June 2007 and August 2012. TON ranged from 3 to 17 odor units, with four of the samples exceeding the secondary MCL of 3 odor units. The high odor levels are likely due to naturally occurring organic materials.

Turbidity

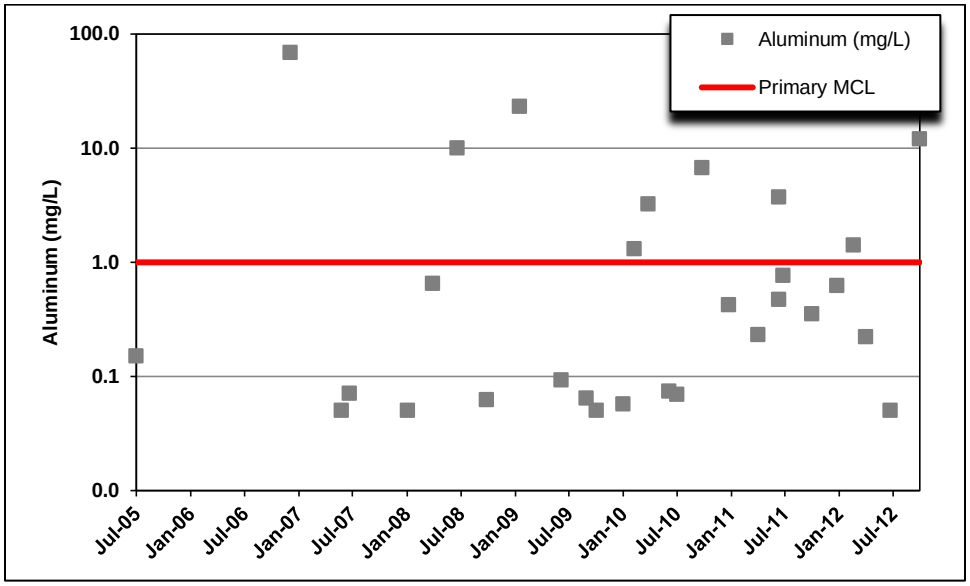
Turbidity exceeded the secondary MCL of 5 NTU in the annual samples collected between 2007 and 2012 in one of the six samples. Turbidity is discussed in more detail in Section 4.2.

4.4.2 Napa Berryessa Resort Improvement District Constituents Exceeding Maximum Contaminant Levels

Aluminum

NBRID collected 29 aluminum samples between July 2005 and October 2012 and nine of them exceeded the primary MCL of 1 mg/L, as shown in **Figure 4-9**. Four samples were at least 10 times the primary MCL. The secondary MCL of 0.2 mg/L was exceeded in 16 of the 29 samples. There is no seasonal pattern in the high concentrations because they occurred during both wet and dry seasons. The highest aluminum concentration of 68 mg/L occurred in December 2006. NBRID ascribed the high levels of aluminum to erosion of natural deposits in the Consumer Confidence Reports. Despite the high levels of aluminum in the source water, the treated water aluminum levels were below MCLs.

Figure 4.9. Aluminum Concentrations at the NBRID WTP Intake



Antimony

NBRID collected 28 antimony samples between July 2005 and October 2012. All but one of the samples was reported as <0.006 mg/L. One sample, collected in December 2006 had a concentration of 0.036 mg/L, which exceeded the primary MCL of 0.006 mg/L. This was the same sample that had the extremely high aluminum concentration. Since all of the samples collected since that time have been <0.006 mg/L, it is assumed that the one high sample was an anomaly.

Arsenic

NBRID collected 10 arsenic samples between July 2005 and October 2012. Eight of the samples were reported as <0.002 mg/L; however, two samples had concentrations of 0.053 mg/L (June, 2008) and 0.044 mg/L (September, 2009), which exceeded the primary MCL of 0.01 mg/L. The four samples collected after September 2009 have all been reported as <0.002 mg/L.

Iron

NBRID collected 15 iron samples between July 2005 and December 2012. Only one sample, collected in June 2008, exceeded the secondary MCL of 0.3 mg/L at a concentration of 1.1 mg/L. Nine of ten samples collected after that were reported as <0.1 mg/L and the other sample was 0.12 mg/L. Since all of the later samples were well below the MCL, it is assumed that the one high sample was an anomaly.

Manganese

NBRID collected nine manganese samples between July 2005 and June 2011. Only one sample, collected in June 2008, exceeded the secondary MCL of 0.05 mg/L at a concentration of 0.11 mg/L. The June 2008 sample also had high arsenic and iron concentrations. Five manganese samples collected after that date were all reported as <0.02 mg/L, indicating that the June 2008 sample was an anomaly.

Turbidity

Turbidity exceeded the secondary MCL of 5 NTU in the annual samples collected between 2005 and 2011 in one sample collected in June 2008. The turbidity level was 39 NTU. This is the same sample that had the high metals concentrations. Turbidity is discussed in more detail in Section 4.2.

5.0 FINDINGS AND RECOMMENDATIONS

The 2001 Update contains a number of recommendations to protect water quality and prevent contaminants from entering Lake Berryessa. These recommendations and Napa County Department of Public Works (Napa County) and Solano County Water Agency (SCWA) responses are discussed in this section. This is followed by a discussion of findings and recommendations from this Sanitary Survey Update

5.1 2001 Findings and Recommendations

1. Evaluate the need for a comprehensive watershed management plan

A comprehensive watershed management plan has not been developed; however the Lake Berryessa Watershed Partnership serves as a forum for addressing water quality issues, boater education, and invasive species. This group, consisting of Solano Resource Conservation District, SCWA, Napa County, the U.S. Bureau of Reclamation (Reclamation), and other agencies and organizations meets quarterly to discuss issues related to these topics.

2. Restrict access to drinking water intakes

The Lake Berryessa Resort Improvement District (LBRID) and Napa Berryessa Resort Improvement District (NBRID) water treatment plant (WTP) intakes do not have any facilities to restrict access to the public. The LBRID intake is upstream of Lake Berryessa on Putah Creek in an area that receives little use. The NBRID intake is in the lake, in a more heavily used area but there have been no water quality problems or vandalism problems in the many years it has been in place. Napa County considers this to be a low priority.

3. Use Method 1623 for Giardia and Cryptosporidium testing

Method 1623 was used by the SCWA water systems that conducted Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) monitoring on the Putah South Canal. LBRID and NBRID were not required to conduct LT2ESWTR monitoring for *Giardia* and *Cryptosporidium* due to their small size.

4. Continue to improve emergency and incident notification systems

Spills of hazardous material, including sewage spills, are required to be reported to the California Emergency Management Agency and are recorded in the Response Information Management System (RIMS) database. In addition, spills of untreated, partially treated, and treated wastewater in the Lake Berryessa watershed must be reported to the State Water Resources Control Board (State Water Board) California Integrated Water Quality System (CIWQS) database since it is illegal to discharge wastewater to surface waters in the watershed. In addition, wastewater collection and treatment agencies must

report spills to the California Department of Public Health, who routinely notifies downstream water agencies.

SCWA and SID staff participates in emergency response training every three years in conjunction with Reclamation staff.

5. Coordinate water quality monitoring and
6. Coordinate data management

There is limited monitoring conducted on Lake Berryessa. The LBRID and NBRID data are maintained in Excel spreadsheets by Napa and are available to anyone who requests the information. Reclamation maintains an online database of the Lake Berryessa and Putah Creek data that is available at: www.usbr.gov/mp/mp150/mp157/env_query_station.cfm?pCode=LB_WQ .

7. Support and expand public water education programs

This is one of the primary functions of the Lake Berryessa Watershed Partnership. In the last several years the Partnership has funded two interns during the summer months to provide boater education. SCWA has hired six interns for the summer of 2013. The interns will be overseen by the Partnership. They will be responsible for boater education on ways to protect water quality and will focus on inspections and education on zebra and quagga mussels.

8. Conduct limnological research on Lake Berryessa

The 2001 Update recommended a study of the reservoir dynamics to better understand the risks associated with hazardous materials spills. This work has not been done and is currently ranked as a low priority by Napa County and SCWA. Napa County and SCWA use meteorological data that are collected in the watershed and at the Reclamation office on the lake to plan their operations.

9. Continue MTBE monitoring

MTBE was banned as a gasoline additive in California in 2004 so monitoring for this compound is no longer needed in surface waters such as Lake Berryessa.

10. Support watershed hazardous materials round-ups, recycling, and waste reduction programs

Napa County has developed an extensive recycling guide (Napa County, 2012) that contains a discussion of how to dispose of various types of hazardous waste. There is a hazardous materials collection station at Lake Berryessa on Knoxville Berryessa Road.

11. Promote rangeland water quality management practices to protect water quality

Reclamation currently has only one grazing easement on the east side of the lake. Reclamation required cattle to be removed from its land in 1998 to better protect water quality. Managed grazing is now being considered to control excessive growth of vegetation that has become a fire hazard. The Natural Resources Conservation District and the University of California Cooperative Extension have developed a proposed management plan at the request of Reclamation.

12. Promote conservation easements

Napa County and SCWA have not actively participated in programs to promote conservation easements near Lake Berryessa. A bill has been introduced in Congress to create the Berryessa Snow Mountain Conservation Area. This would consist of 350,000 acres of land and would stretch from Lake Berryessa to Snow Mountain in northeast Lake County.

13. Locate and repair leaks in sewage collection systems

Section 3.2 contains a detailed discussion of the improvements that have been made and are currently being made to the sewage collection systems near the lake. These improvements, along with increased pond and sprayfield capacity at LBRID and NBRID, should greatly reduce wastewater spills near the lake.

14. Install emergency auxiliary pumps and power sources at the wastewater treatment plants

The requirement to have back-up or auxiliary facilities is now a standard provision in waste discharge requirements.

15. Strengthen emergency response procedures for sewage spills and hazardous material spills

There is an adequate program in place to respond to hazardous material spills in the watershed. As stated previously, SCWA and SID staff participates in emergency response training every three years in conjunction with Reclamation staff.

Most of the sewage spills in the watershed that have reached Lake Berryessa have been due to inadequate pond capacity to handle the greater volumes of water during storm events. Historically, there has been little that could be done to control the discharges during storm events. This is being addressed by improvements to collection systems to reduce infiltration and inflow and to the construction of significantly larger ponds.

16. Patrol and monitor the watershed

Due to the large size of the watershed, Napa and SCWA did not pursue this because it could be costly and have limited value. As discussed previously, the focus has been on activities nearest the lake and boater education.

17. Enforce waste discharge requirements and septic system regulations

The Central Valley Regional Water Quality Control Board (Central Valley Water Board) has the responsibility for enforcing waste discharge requirements. In recent years the Central Valley Water Board has issued numerous notices of violation, administrative civil liabilities, and cease and desist orders to bring local wastewater providers into compliance with increasingly stringent waste discharge requirements. LBRID and NBRID have had numerous violations, as described in Section 3.2. Septic systems (onsite wastewater systems) are regulated by the Environmental Health Division of the Planning, Building & Environmental Services Department in Napa County and by the Environmental Health Division of the Health Services Department in Lake County. Most of the problematic onsite wastewater systems are in the small communities of Lake County, as discussed in Section 3.2.

18. Provide technical assistance and evaluate effectiveness of bacterial screening test kits

This recommendation was not pursued because Napa County and SCWA ranked it as a low priority.

19. Compile and track data regarding hazardous waste discharges

This is done by the California Emergency Management Agency through RIMS and by the State Water Board through CIWQS. The Napa County Planning, Building, and Environmental Services Department also tracks discharges in Napa County.

20. Control erosion and reduce stormwater runoff at abandoned mine sites and other potential sources

This recommendation was not pursued because Napa County and SCWA ranked it as a low priority.

21. Support county health department efforts to remediate illegal solid waste disposal sites

The county health departments have responsibility for this activity.

22. Promote stormwater compliance

All construction projects that disturb one or more acres must comply with the State Water Board's Construction General Permit. The Construction General Permit became effective July 1, 2010. Specific industrial activities must comply with the General Industrial Permit, which was adopted in 1997.

Municipalities with populations between 10,000 and 99,999, and smaller communities which meet specific criteria such as high growth rates, must comply with the Phase II Small MS4 General Permit, originally adopted in 2003 and revised in February 2013. None of the communities in the Lake Berryessa watershed falls under this permit.

Napa County is part of the Napa County Stormwater Management Program, which includes the cities in the Napa Valley. The FY06/07 Annual Report (last one available on the website) briefly discusses the Putah Creek watershed but states that most of the stormwater activities are concentrated in the Napa Valley since 95 percent of the county's population resides in the Napa Valley. However, the stormwater ordinances and pre- and post-construction inspections apply to the Lake Berryessa watershed that is in Napa County.

The Lake County Clean Water Program is focused on Clear Lake and does not address the portion of the County that is in the Lake Berryessa watershed.

23. Review environmental impact reports and negative declarations for proposed development in the watershed

There have been no major projects in the watershed. The focus recently was on the Pensus plans for major recreational facilities at Lake Berryessa. SCWA routinely reviews environmental documents for significant projects. Napa County reviews environmental documents for all projects in the Napa County part of the watershed.

24. Improve public information and environmental education materials

The Lake Berryessa Partnership focuses on educating the boating public about water quality impacts of boating. The Napa County and Lake County websites have extensive information on disposing of hazardous waste, stormwater pollution prevention, onsite wastewater system management, and watershed management.

25. Assure development of hazardous materials management plans

Napa County Planning, Building, and Environmental Services and the Lake County Health Services Department require that hazardous materials business plans be developed. Business owners are required to certify on an annual basis that the plans are complete, accurate, and up to date. Businesses must also electronically submit their hazardous materials management plans to the California Environmental Reporting System (CERS).

26. Restrict the use of bilge pumps and discharge of contaminated water to the lake

As discussed in Section 3.1.3, one of the key activities of the Lake Berryessa Partnership is boater education. Free bilge pads are distributed at several resorts and there are containers for disposal of used bilge pads.

27. Restrict applications of pesticides and herbicides

As discussed in Section 3.3, sulfur is the pesticide applied to wine grapes (the dominant crop in the watershed) in the greatest quantity in Napa and Lake counties. This is followed by petroleum distillates. Very few pesticides are applied for which there are maximum contaminant levels and none of them have been detected in monitoring conducted at the WTP intakes of LBRID and NBRID.

28. Identify and eliminate fuel leaks from fueling stations at Lake Berryessa

As discussed in Section 3.4, no fuel leaks from fueling stations have been reported to the RIMS database. This does not appear to be a significant problem at Lake Berryessa.

29. Track new and developing federal, state, and local regulations

This is routinely done by both SCWA and Napa County.

5.2 2013 Findings and Recommendations

There have been few changes in the Lake County portion of the Lake Berryessa watershed since the 2001 Update was prepared. There have been major changes in the watershed near the lake due to the closure of many of the resorts and the decreased recreational opportunities at other resorts.

5.2.1 Recreational Use of Lake Berryessa

Finding

Recreational use of Lake Berryessa has declined since the 2001 Update was completed due to the expiration of the concessionaire contracts in 2008 and 2009 and the subsequent removal of over 1,300 mobile homes and the closure of many facilities. Reclamation is actively pursuing concessionaires to operate the recreation areas on an interim basis and will be requesting proposals for long term management of the recreation areas in the future. It is unknown at this time what types of recreational facilities will be in the long-term plan and whether those facilities will greatly increase recreational usage of Lake Berryessa. Both SCWA and Napa County are participating in meetings of the newly formed Lake Berryessa Community Forum Coordinating Team.

Recommendation

SCWA and Napa County should continue to track recreational development activities at Lake Berryessa through participation in the Lake Berryessa Community Coordinating Team. SCWA and Napa County should work with this group and Reclamation to ensure that protection of water quality is considered as plans are developed for the recreation areas.

Finding

The Lake Berryessa Watershed Partnership provides valuable services to educate the boating public and day users on protection of water quality. SCWA has recently increased its contribution to the Partnership and is funding six interns, rather than two interns for the summer of 2013. These interns explain good water quality practices to both groups. Interns also work with Reclamation to educate boaters about the threat of aquatic invasive species, most recently zebra mussels and quagga mussels.

Recommendation

SCWA and Napa County should continue to support and participate in the Lake Berryessa Watershed Partnership.

Finding

Quagga mussels were first detected in California in 2007 and zebra mussels were first found in 2008. Although the mussels do not pose a threat to drinking water quality, they certainly pose a threat to operations of water conveyance and treatment facilities. There is currently not a good management program for invasive species in Napa County. The Napa County Sheriff's Department has jurisdiction if a boater willfully enters a water body knowing that zebra or quagga mussels are on the vessel. At this point, the interns supported by the Lake Berryessa Partnership are the only ones conducting boat inspections at Lake Berryessa. Funding is needed to set up a formal boat inspection program and boat washing stations at Lake Berryessa.

Recommendation

SCWA should work with Napa County to determine if funding can be obtained to support a more formal inspection program at Lake Berryessa.

5.2.2 Wastewater Treatment Facilities

Finding

There is a long history of wastewater spills to Lake Berryessa from the small communities and the resorts. The largest spills have been from LBRID (4.1 million gallons in 2011) and NBRID (10.5 million

gallons in 2010 to 2011). An expansion of the LBRID pond system is being designed to handle the large volumes of wastewater combined with stormwater during wet weather periods. Construction of the expanded pond system is contingent on LBRID obtaining grant funding. The NBRID treatment plant is being replaced and the ponds are being expanded. The LBRID improvements must be completed by January 2014 and the NBRID improvements must be completed by November 2013. These improvements should greatly reduce the spills to Lake Berryessa.

Recommendation

None

Finding

The wastewater collection and treatment systems at the former Putah Creek, Rancho Monticello, Lake Berryessa Marina, and Spanish Flat resorts were demolished and closed by Reclamation. The Steele Canyon system is no longer operational. Reclamation may construct new WWTFs to attract long-term concessionaires.

Recommendation

Napa County and SCWA should review plans for new facilities to ensure that adequate pond capacity is provided and that the ponds are located as far from Lake Berryessa as feasible. While this is the responsibility of the Central Valley Water Board, it will be useful to monitor and participate in discussions about the facilities that are needed to prevent future spills.

5.2.3 Agriculture/Pesticide Use

Finding

The 2001 Update states that vineyard acreage was rapidly increasing in the Lake Berryessa watershed and there was concern over the impacts on water quality. It is difficult to tell from the available information if wine grape acreage has increased in the Coyote and Collayomi valleys of Lake County or the Pope Valley of Napa County. Sulfur is the pesticide used in the greatest quantities by far in both counties. Smaller amounts of other pesticides are used; some of which have maximum contaminant levels. Most wine grapes are irrigated with drip irrigation, which limits runoff from the vineyards and lessens the potential for pesticides to enter water bodies.

Recommendation

None

5.2.4 Microbiological Contaminants

Finding

LBRID and NBRID conducted *E. coli* monitoring to comply with the LT2ESWTR during the period covered by this Sanitary Survey Update. The *Escherichi coli* levels were below the level that would have triggered *Cryptosporidium* monitoring to determine if greater removal of *Cryptosporidium* was required. Based on the microbiological data collected at the LBRID and NBRID WTP intakes, 2-log removal of *Cryptosporidium*, 3-log removal of *Giardia*, and 4-log removal of viruses is the appropriate level of treatment.

Recommendation

None

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