Nacimiento Water Project
Watershed Sanitary Survey
Five-Year Update (2016 – 2020)

Prepared By:
County of San Luis Obispo
Department of Public Works
Utilities Division
Water Quality Laboratory

Nacimiento Water Project, San Luis Obispo County

2020 Watershed Sanitary Survey Five-Year Update

System Information

SWRCB-DDW System No.:	4010080
System Name:	San Luis Obispo County – Nacimiento Water Project
Survey Period:	January 1, 2016 through December 31, 2020
Initial Survey Completed:	2011
Updates Completed:	2016, 2021

Preparer Information

Name of Agency and Address:	County of San Luis Obispo Public Work Department County Government Center, Room 206 San Luis Obispo, CA 93408

Survey Description

Name of Watershed:	Nacimiento Water Project
Total Watershed Size in acres:	208,060 acres
Location:	San Luis Obispo County and Monterey County

Agencies using this watershed as a source of supply:

Nacimiento Water Project Participants:

- City of Paso Robles
- Templeton Community Services District
- Atascadero Mutual Water Company
- City of San Luis Obispo
- SMR Mutual Water Company (Santa Margarita Ranch)

Other Participants:

- County Service Area 10 - Cayucos
- Heritage Ranch Community Services District
- Laguna Vista Boat Club
- Monterey County Parks Department
- Northshore S & B
- Nacimiento Parks Department (Oak Shores)

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Watershed Sanitary Survey Checklist

Conditions	Significant	Not Significant	Comments
I. General Conditions			
A. Changes in available water supply	X		Drought may impact water supply
B. Construction of water diversion or reservoir projects		X	
C. Relocation of intakes		X	
II. Contaminant Sources			
A. Wastewater Treatment			
1. Treatment plant effluent discharges	X		
2. Storage, transport, treatment, disposal to land	X		
3. Residential septic systems		X	
4. Commercial/industrial septic systems		X	
B. Reclaimed Water		X	
C. Urban Areas	X		
D. Agricultural Crop Land Use	X		
E. Pesticide/Herbicide Use	X		
F. Grazing Animals	X		
G. Concentrated Animal Facilities (feedlots, etc.)		X	
H. Wild Animal Populations		X	
I. Mines			
1. Active		X	
2. Inactive	X		
J. Disposal Facilities			
1. Solid waste		X	
2. Hazardous waste		X	
K. Logging		X	
L. Recreation			
1. Reservoir body contact	X		
2. Reservoir non-body contact	X		
M. Unauthorized Activity			
1. Illegal dumping		X	
2. Underground storage tank leaks		X	
3. Other			
N. Traffic Accidents/Spills			
1. Transportation corridors		X	
2. History of accidents/spills		X	
O. Groundwater Discharges			
1. Natural discharge		X	
2. Gas, oil, geothermal wells		X	
P. Seawater Intrusion		X	
Q. Geologic Hazards			
1. Landslides	X		
2. Earthquakes	X		
3. Floods	X		
4. Other		X	
R. Fires	X		
III. Growth			
A. Population/General Urban Area Increase		X	
B. Land Use Changes		X	
C. Industrial Use Increase		X	
IV. Water Quality			
A. Changes in Raw Water Quality		X	
B. Difficulty Meeting Drinking Water Standards		X	

Terms, Acronyms, and Abbreviations	
BMAA	beta-Methylamino-L-alanine
DLR	Detection Limit for the Purposes of Reporting
DOC	Dissolved Organic Carbon
EPA	Environmental Protection Agency (United States)
ft	Feet
FEMA	Federal Emergency Management Agency
FT	Floating Toilet
Hg	Mercury
HWL	High Water Level
MCWRA	Monterey County Water Resources Agency
mg/L	Milligrams per liter
µg/L	Micrograms per liter
µmhos/cm	Micromhos/cm
MSL	Mean sea level
MTBE	Methyl *tert*-butyl ethylene
N	Nitrogen
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
NWP	Nacimiento Water Project
OS	Oak Shores (Community of)
P	Phosphorus
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PWD	Public Works Department
RWQCB	Regional Water Quality Control Board (Central Coast Region)
SDWA	Safe Drinking Water Act
SLO	San Luis Obispo
SLOCFC&WCD	San Luis Obispo County Flood Control and Water Conservation District
SOC	Synthetic Organic Chemical(s) or Semi-volatile Organic Chemical(s)
SSO	Sanitary Sewer Overflow
SUVA	Specific Ultraviolet Absorbance
SWRCB	(California) State Water Resources Control Board
SWTR	(Federal) Surface Water Treatment Rule
TOC	Total Organic Carbon
TTHM	Total Trihalomethanes
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UV254	Ultraviolet Absorbance at 254 nm
VOC	Volatile Organic Chemical(s)
WQ	Water Quality
WTP	Water Treatment Plant

Executive Summary

The California Surface Water Treatment Rule (CA ADC § 64665) requires every public water system using surface water to conduct a comprehensive sanitary survey of its watersheds. This Watershed Sanitary Survey (WSS) covers the Nacimiento Reservoir raw water source of supply delivered by the San Luis Obispo County Flood Control and Water Conservation District (District) to Nacimiento Water Project (NWP) participants. The purpose of the survey is to identify actual or potential sources of local source water contamination which might adversely affect the quality and treatability of water used as the domestic supply for the NWP participants. The WSS update will be used to evaluate source water quality issues and as a basis for future watershed management and planning efforts. The initial WSS was completed in 2011; this report is the second five-year update and covers data from 2016 through 2020.

There was a large wildfire within the watershed in 2016. The Chimney Fire started August 13, 2016, at Running Deer Rd & Chimney Rock Rd south of Lake Nacimiento. The fire was extinguished after 25 days. The fire burned a total of 64,344 acres. 94% of the fire was within the Nacimiento Watershed and the fire burned 47% of the watershed tributary to Nacimiento Lake. The fire appears to have had little effect on the water quality of Lake Nacimiento. The most significant change was an increase in turbidity following the heavy rain event in January 2017. A considerable amount of debris was washed into the lake. There was an increase in iron, manganese, and aluminum as well. These are historically higher following a heavy rain event.

Evaluation of the watershed analytical data shows that the condition of the watershed remains very good. The evaluation of the Nacimiento Water Project monitoring program since the initial watershed assessment and background data collection is an ongoing process. As new regulations, public concerns, and changes in the reservoir and watershed occur, the spectrum of analytical and field monitoring will change as well.

Summary of Previous Watershed Sanitary Surveys

The Nacimiento Reservoir and its watershed are both large and complex. Public agencies and private parties have varying jurisdictional authority on the watershed and reservoir. The reservoir serves as a raw water source of supply for supplemental water. The District has an allocation of 17,500 acre-feet per year of Nacimiento Reservoir water. Additional uses include recreation, agriculture, military, and in the past mining. Common types of recreation include fishing, swimming, boating, and water skiing. Common agricultural uses in the watershed include grazing, cropland, and viticulture. These additional uses are potential contaminant sources and present risks to the reservoir as a drinking water source.

The greatest risks to the Nacimiento Reservoir as a drinking water supply come from extensive grazing, unlimited body contact recreation, numerous domestic wastewater facilities, and the potential for a large wildland fire. Urban development and agricultural cropland are increasing and may present future risks. Variable risk levels are presented by military activities and illicit commercial crops. These potential contaminant sources can lead to pathogen loading, solids loading, and algal growth, along with many other deleterious water quality effects.

A special contaminant of concern is mercury from abandoned mercury mines in the watershed. Although mercury currently does not present a risk to the reservoir as a drinking water supply, its presence in the environment has led to its accumulation in fish in Nacimiento Reservoir at levels that are unsafe for human consumption. Public awareness of this issue can lead to concerns about the safety of the water supply.

Control measures that will help reduce the risk from these potential contaminant sources include the use of best management practices in agricultural and industrial operations, implementation of stormwater pollution prevention practices in developed areas, and remediation of abandoned mercury mines.

Whereas the District has no jurisdictional authority in the watershed and therefore has little ability to directly affect watershed activities and watershed management practices, the County of San Luis Obispo (County) has land use approval authority over the lower portion of the Nacimiento watershed. Some existing control measures may protect water quality, but only to the degree that they are implemented and enforced. A large number of potential contaminant sources, the watershed's large size, and the reservoir's remote location make effective implementation and enforcement efforts difficult. Instead, the District must rely on developing cooperative efforts to protect water quality with individuals and entities that use the watershed and that may have jurisdictional authority. A well-designed water quality monitoring program is important to help the District identify significant water quality impacts from potential contaminant sources and to focus water quality protection efforts where they can be most effective.

Recommendations from Previous Watershed Sanitary Surveys

The District should support and pursue efforts to reduce the risk to Nacimiento Reservoir water quality from potential contaminant sources in the watershed and to increase consumer awareness

of the means and benefit of protecting this raw water supply. The District should work with other agencies and private parties to implement the following control measures:

- Encourage implementation of best management practices in agricultural and industrial operations (grazing, crop land, wineries, mines) to minimize:
    - Pathogen loading to the reservoir
        - Top priority: restrict direct access of cattle to the reservoir and its tributaries
    - Nutrient loading to the reservoir
    - Solids loading to the reservoir
- Encourage implementation of best management practices for stormwater pollution prevention in lakeside communities and public recreation areas
- Relocate the Oak Shores sewer interceptor system so that the laterals are realigned to a new sewer main to convey wastewater to the treatment plant and abandon the existing interceptor system
- Aid EPA remediation of Klau/Buena Vista mine site
- Advocate property development adherence to currently approved levels and uses (unless the proposed change would result in greater protection of water quality); discourage additional local subdivision and intensification of development; consider potential water quality impacts and advocate water quality protection when evaluating land use or development proposals
- Monitor water quality impacts by recreation and related activities in the watershed; identify, advocate, and implement control measures to minimize adverse water quality impacts

Some of these goals may be accomplished in part or in whole through public outreach and education, through securing funding for infrastructure improvements, or through regulatory action if necessary.

Additionally, the District should continue to monitor source water quality to accomplish the following:

- Identify and evaluate specific sources of contaminants of concern, including the magnitude of contamination and temporal and spatial trends
- Evaluate the effectiveness of control measures

Status: The District continues to encourage the implementation of best management practices in agricultural and industrial operations to minimize the loading of pathogens, nutrients, and solids to the reservoir. As cattle and other livestock have unrestricted access to the reservoir and its tributaries, this remains a possible concern. Nutrient data collected throughout the watershed in the last five years has been well below any SWRCB MCLs for drinking water.

The District has maintained a program to monitor source water quality to identify and evaluate specific sources of contaminants of concern by recreation, livestock grazing, and human impacts. Due to budget restraints, any significant efforts to accomplish the following recommendations have not occurred:

- Best management practices for stormwater pollution prevention in lakeside communities and public recreation areas
- Relocation of the Oak Shores sewer interceptor system including realignment of the laterals to a new sewer main to convey wastewater to the treatment plant. Abandon the existing interceptor system
- Advocate property development adherence to currently approved levels and uses, discourage additional local subdivision and intensification of development; consider potential water quality impacts and advocate water quality protection when evaluating land use or development proposals.

In 2014, a shift in water quality monitoring was planned for the next few years. Increased monitoring of nutrients such as nitrate, nitrite, ammonia, TKN, and phosphate will provide important information in evaluating the source and level of nutrient loading into the Nacimiento Reservoir.

Increased nutrient monitoring will enable the Project's participants to anticipate treatment needs for their individual uses of the Nacimiento raw water delivery.

The monitoring of other constituents will be reduced to maintain the current budget. The evaluation of the Nacimiento Water Project monitoring program since the initial watershed assessment and background data collection is an ongoing process. As new regulations, public concerns, and changes in the reservoir and watershed occur, the spectrum of analytical and field monitoring will change as well.

Status: No significant changes were made to the water quality monitoring schedule since the 2015 recommendations were implemented.

Watershed and Water Supply Delivery

Reservoir Description

System ID:	4010080
Source:	Nacimiento Reservoir (aka Lake Nacimiento)
Infrastructure:	Multi-port intake structure, 45-mile-long transmission main, three pump stations, three raw water storage reservoirs, and a SCADA system

The Nacimiento Reservoir is located within San Luis Obispo County. The Nacimiento Water Project is owned and operated by the District.

Nacimiento Reservoir is 18 miles in length and has approximately 165 miles of shoreline. At the maximum pool the reservoir's storage capacity is 377,900 acre-feet with a surface elevation of 800 feet (NGVD 29) and surface area of 5,727 acres. The maximum depth is 175 feet.

The primary source of water to the Nacimiento Reservoir is runoff from the surrounding hillsides during rain events.

Storage Pool Definitions[1]

Dead Pool

The storage between the bottom of the reservoir and elevation 670 feet. The volume of the Dead Pool is 10,300 acre-feet (AF) but water cannot flow by gravity out of the reservoir below elevation 670 feet.

Minimum Pool

The storage above the Dead Pool, elevation 670 feet, and below the Conservation Pool (defined below), elevation 687.8 feet, is the Minimum Pool. The volume of this pool is 12,000 AF which is reserved for the sole use of the County per the 1959 San Luis Obispo County Agreement.

Minimum Recreation Elevation

At an elevation of 730 feet most of the boat ramps around the reservoir are useable and most private property owners have access to the reservoir. The Agency, to the extent possible, will keep this elevation in mind when making the release schedule and consider a goal each year of keeping the Reservoir above 730 feet until after Labor Day.

Conservation Pool

The storage above the Minimum Pool, elevation 687.8 feet, and below the Flood Pool (defined below), elevation 787.75 feet, is used to store water for release to the Salinas Valley for groundwater recharge, operation of the Salinas River Diversion Facility, water supply, fish migration, and fish habitat requirements. The volume of the Conservation Pool is 289,013 AF. It is dedicated to storing winter inflow from the Nacimiento watershed for later release.

Flood Pool

The bottom of the Flood Pool is the concrete spillway elevation of 787.75 feet. The top of the Flood Pool is the top of the raised inflatable spillway gates, elevation 800.0 feet, which is the maximum reservoir elevation (See below). During the winter, flood protection is provided by maintaining empty space within the Flood Pool to temporarily store flood water. The maximum Flood Pool storage volume is 66,587 acre-feet. The actual volume of the Flood Pool reserved for flood protection will vary based on factors such as current conditions, time of year, and forecasted weather. If conditions allow, winter inflow stored in this pool can be used for later release to the Salinas Valley for groundwater recharge, operation of the Salinas River Diversion Facility water supply, fish migration, and fish habitat requirements.

Maximum Reservoir Elevation

The top of the raised inflatable spillway gate system is at elevation 800 feet, 377,900 AF. This is the maximum reservoir elevation and is the level at which the reservoir is full.

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1 From the Nacimiento Dam Operation Policy (MCWRA, 2018). Web source:
https://www.co.monterey.ca.us/government/government-links/water-resources-agency/projects-facilities/dams-and-reservoirs

Top of Dam

The top of the Dam is at elevation 825 feet (the dam crest). The Agency has flood easements around the reservoir up to this elevation. The Agency requires that any construction of habitable structures, or structures that can be damaged by inundation, be above elevation 825 feet. Construction of any structures, such as boat ramps, roads, or grading, that occurs below elevation 825 feet requires approval from the Agency prior to beginning work. The maximum reservoir elevation reached under the Probable Maximum Flood Analysis is 823 feet, two feet below the dam crest.

Nacimiento Water Project System Description

The Nacimiento Water Project (NWP) operates under a domestic water supply permit with permit number 04-06-10P-006, issued by the State Water Resources Control Board – DDW (DDW) on October 21, 2010. NWP is wholesale water system that supplies downstream public water systems with untreated surface water. The public water systems which have a share of the raw surface water include the City of Paso Robles, Templeton Community Services District, Atascadero Mutual Water Company, SMR Mutual Water Company (Santa Margarita Ranch), and the City of San Luis Obispo. Other participants include San Luis Obispo County Service Area No. 10/10A – Cayucos, Heritage Ranch Community Services District, Laguna Vista Boat Club**,** Monterey County Parks Department, Northshore S & B, and Nacimiento Parks Department (Oak Shores).

The NWP is in San Luis Obispo County. It operates a surface water intake at the Nacimiento Reservoir, three raw surface water storage reservoirs, three booster pump stations, four turnouts and a raw surface water distribution system. NWP only supplies untreated surface water to other public water systems and does not directly serve any population. NWP's supply is owned and operated by the District. The District has a formal agreement with the Monterey County Water Resources Agency (MCWRA) for an entitlement of 17,500 acre-feet of water from the Nacimiento Reservoir. The entitlement is subject to the availability of water in the Nacimiento Reservoir. The entitlement has been in place since 1959, but NWP only began delivering the untreated surface water to the participating public water systems in 2011. NWP can deliver 15,750 acre-feet of water (90 percent of the entitlement) to the participating public water systems. The untreated surface water is provided as a supplemental raw water supply to the participating public water systems.

Watershed Security

Intake protection is provided by a log boom on the lake and fencing along the shore. A new log boom was installed in 2008. It is located a minimum of 500’ away from the intake pipe at all points. Fencing is installed along the lake shore adjacent to the intake, and all around the intake building. No trespassing signs are posted at frequent intervals along the fence to prohibit public access to the lake near the intake and dam.

Due to the enormity of the Nacimiento Watershed, the reservoir’s remote location, and the diversity of potential contaminants, an effective management plan is difficult to both implement and enforce. Potential contaminants to the reservoir include:

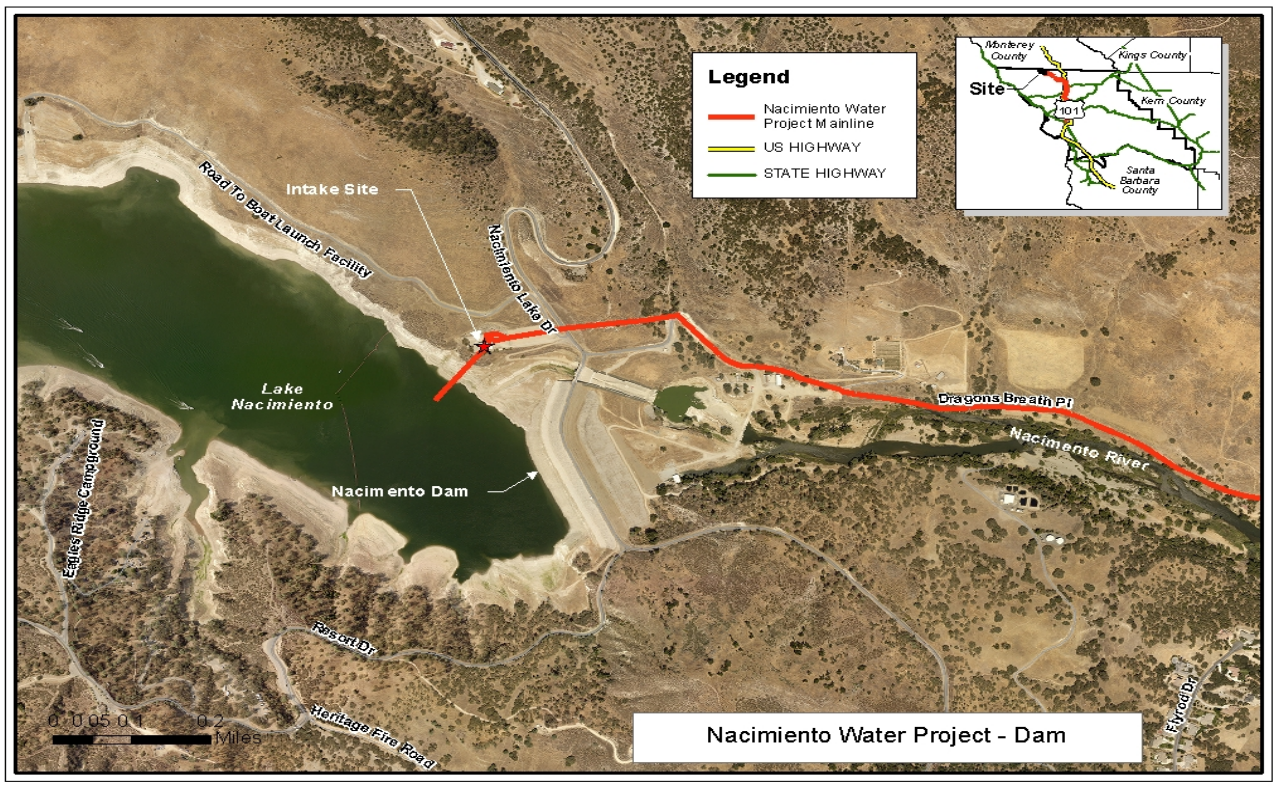
- Wastewater discharges (both domestic and viticulture)
- Wastewater collection systems
- Septic systems
- Chemical toilets and floating toilets
- Urban runoff
- Industrial runoff (wineries, mines, military facilities)
- Agriculture/cropland
- Herbicides/Pesticides
- Grazing animals
- Wild animals
- Mine runoff (inactive mercury mines)
- Mine runoff (active calcium carbonate mine)
- Hazardous material storage (petroleum products, wine production, water treatment, fueling stations)
- Recreational use (boating, body contact)
- Cultivation of marijuana
- Traffic accidents/spills
- Geologic hazards
- Fire

Intake Description

The Nacimiento Water Project Intake facility is located at Lake Nacimiento, just north of the Nacimiento Dam spillway, in north San Luis Obispo County (See Figure 1). Its purpose is to draw high-quality water from Lake Nacimiento for delivery to the Project's participating communities. The Intake consists of four main aspects:

- **Intake Shaft:** A 180-foot deep, 20-foot diameter vertical shaft and wet well were constructed at the Intake site to collect water pumped through the Project's pipeline. Shaft work included shaft excavation, design, and construction of an initial shaft support system, groundwater control, grouting, and construction of the final shaft lining.
- **Intake Tunnel:** A 500-foot long, 48-inch minimum diameter tunnel connects the bottom of the shaft to the intake pipe. Tunnel work was performed via micro tunneling and a "hot-tap" - one of the few performed to date.
- **Intake Pipe:** The intake pipe draws water via seven ports with hydraulic pressure system actuating valves and fish screens, which was installed along the Intake pipe at various depths of the reservoir for optimal quality control. The Intake pipe construction required marine and diving operations to perform underwater excavation, to construct pipe supports, and to install the intake pipe.
- **Log Boom:** The old log boom that provided a safety buffer around the Nacimiento Dam was removed and replaced with a new log boom to protect the new Intake facilities and to eliminate recreational body contact with the water within 500 feet of the Intake pipe.

Figure 1: Intake Structure Aerial Map



Facilities Description

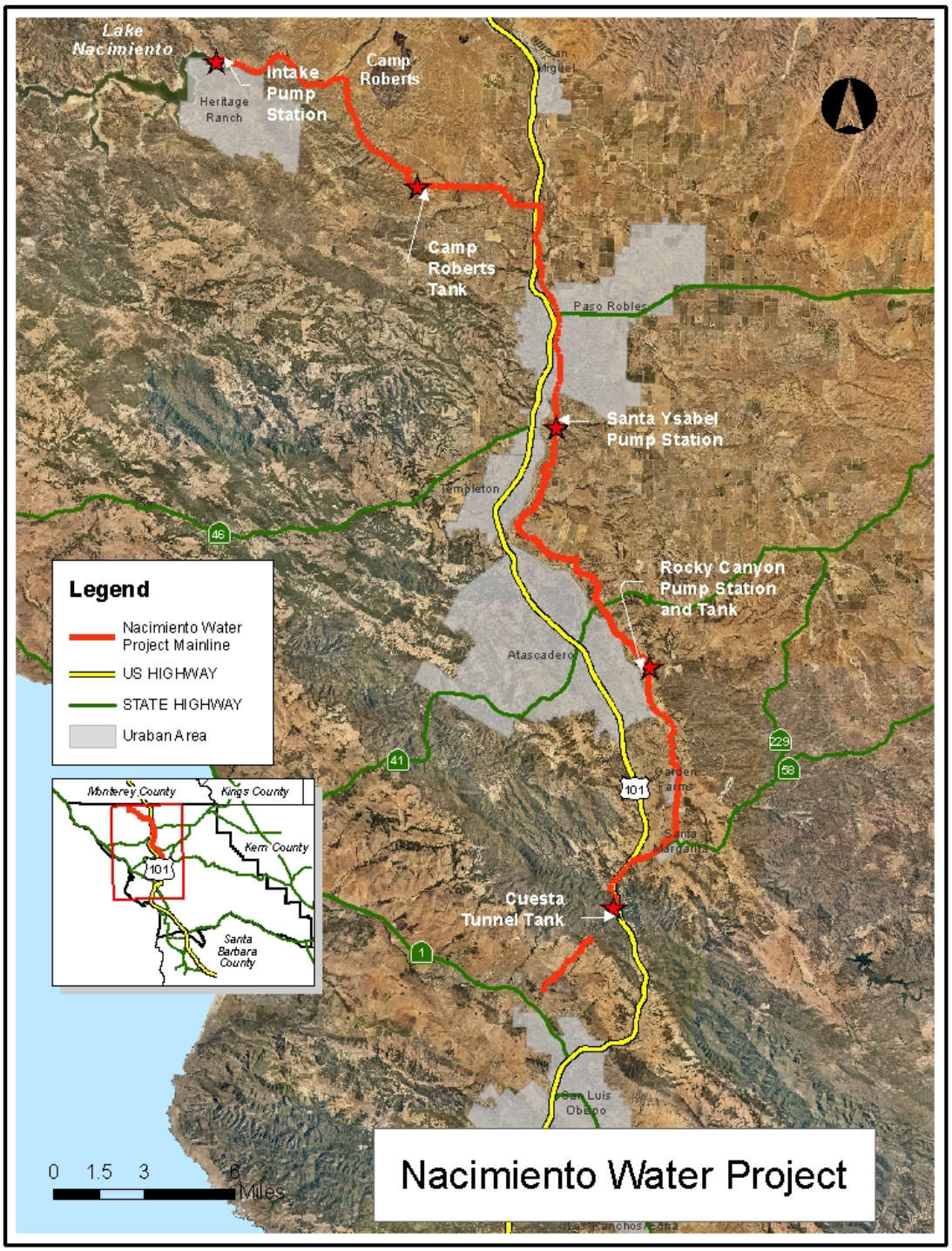
The Nacimiento Water Project Facilities (Facilities) are located on five main sites along the Project's 45-mile pipeline (See Figure 2). The ultimate purpose of the Facilities is to maintain water pressure within the Project's pipeline and to ensure efficient delivery of raw water from Lake Nacimiento to the Project's participants. The Facilities consist of three main parts:

- **Pump Stations:** Three pump stations – Intake, Santa Ysabel, and Rocky Canyon Pump Stations – maintain adequate water pressure for the transmission of water to all Project participants along the pipeline alignment. The Intake Pump Station is located at Lake Nacimiento over the top of the Intake shaft and contains five 450 horsepower pumps. The Santa Ysabel Pump Station is located near the south side of Paso Robles on Santa Ysabel Road and contains four 500 horsepower pumps. The Rocky Canyon Pump Station is located near the southeast side of Atascadero on Rocky Canyon Road and contains three 400 horsepower pumps. The pump station construction work included: construction of access roads; construction of pump station buildings, including installation of plumbing, HVAC systems, electrical transformers and metering, electrical equipment, lighting, grounding, conduit and cable; construction of short stretches of pipeline; installation of pumps and valves; construction of surge control facilities; installation of instrumentation and controls and flow metering; installation of a fiber optic communication network; and installation of corrosion control, and Three storage tanks – Camp Roberts, Rocky Canyon, and Cuesta appurtenant works.
- **Storage Tanks:** Tunnel Tanks– provide water storage and conserve pump energy needed to deliver water. The Camp Roberts Tank, located on Camp Roberts, has a storage capacity of 850,000 gallons. The Rocky Canyon Tank, located near the southeast side of Atascadero on Rocky Canyon Road (the same site as Rocky Canyon Pump Station), has a storage capacity of 850,000 gallons. The Cuesta Tunnel Tank, located off Highway 101 at the top of Cuesta Grade, has a storage capacity of 300,000 gallons.

Tank construction work included: excavation, foundation preparation, and slope protection; reinforced concrete tank foundation; site improvements, drainage facilities, and access road paving; construction of inlet and outlet piping, valves, and appurtenances; welded steel tank design, fabrication, and field erection; application and curing of tank coatings; and installation of cathodic protection and instrumentation and control systems.

- **Supervisory Control and Data Acquisition (SCADA):** A SCADA system and Project controls electronically control the completed Project. This work included the installation of SCADA equipment, software, electrical conduit, cable, and system configuration services.
- **Chemical Treatment:** No chemical treatment is provided at any point along the transmission main.

Figure 2: Facilities Aerial Map



Pipeline Description

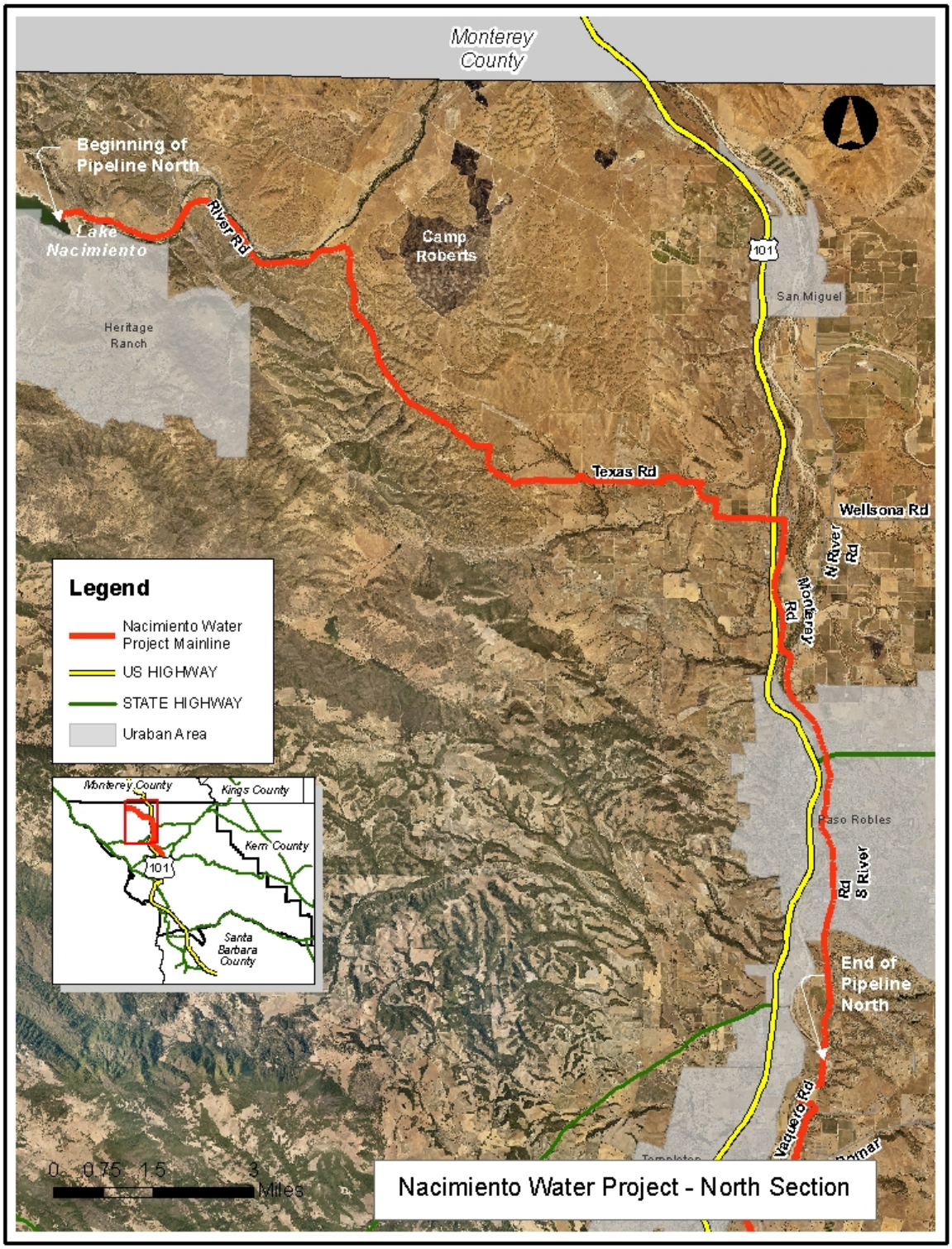
Pipeline North

The Nacimiento Water Project Pipeline North is the northern portion of the transmission line that delivers raw water from Lake Nacimiento to the Project's participants. Its alignment commences at the Intake Pump Station at Lake Nacimiento, continues through Camp Roberts and Paso Robles, and ends just south of Paso Robles at the Paso Robles Turnout on Santa Ysabel Road. (See Figure 3)

The pipeline north consists of three main parts:

- **Pipeline*:*** Approximately 22 miles of 36-inch to 30-inch diameter steel pipeline was installed as the northern portion of the Project's pipeline. Pipeline work included trenching, pipeline installation, and backfilling; sheeting, shoring, and bracing; performance of trenchless construction at road and highway crossings; application of pipeline linings and coatings; installation of appurtenances and corrosion monitoring stations; pavement restoration; traffic and pedestrian control; protection and location of existing utilities; performance of pipeline pressure and leakage testing; unexploded ordnance (UXO) detection and avoidance on Camp Roberts; hazardous materials removal and disposal; and site restoration.
- **Horizontal Directional Drilling***:* Two HDD River crossings were performed: one beneath the Nacimiento River on Camp Roberts, having an approximate length of 1750-feet and a minimum depth of 40-feet; and one beneath the Salinas River, just north of Paso Robles, near the intersection of Monterey Road and Highway 101, having an approximate length of 1,260-feet and an approximate depth of 42-feet.
- **Fiber Optic Cable:** A fiber optic communication line aids in Project operations and control. The contractor installed pull boxes and installed and tested fiber optic conduit and cable.

Figure 3: Pipeline North Section Aerial Map



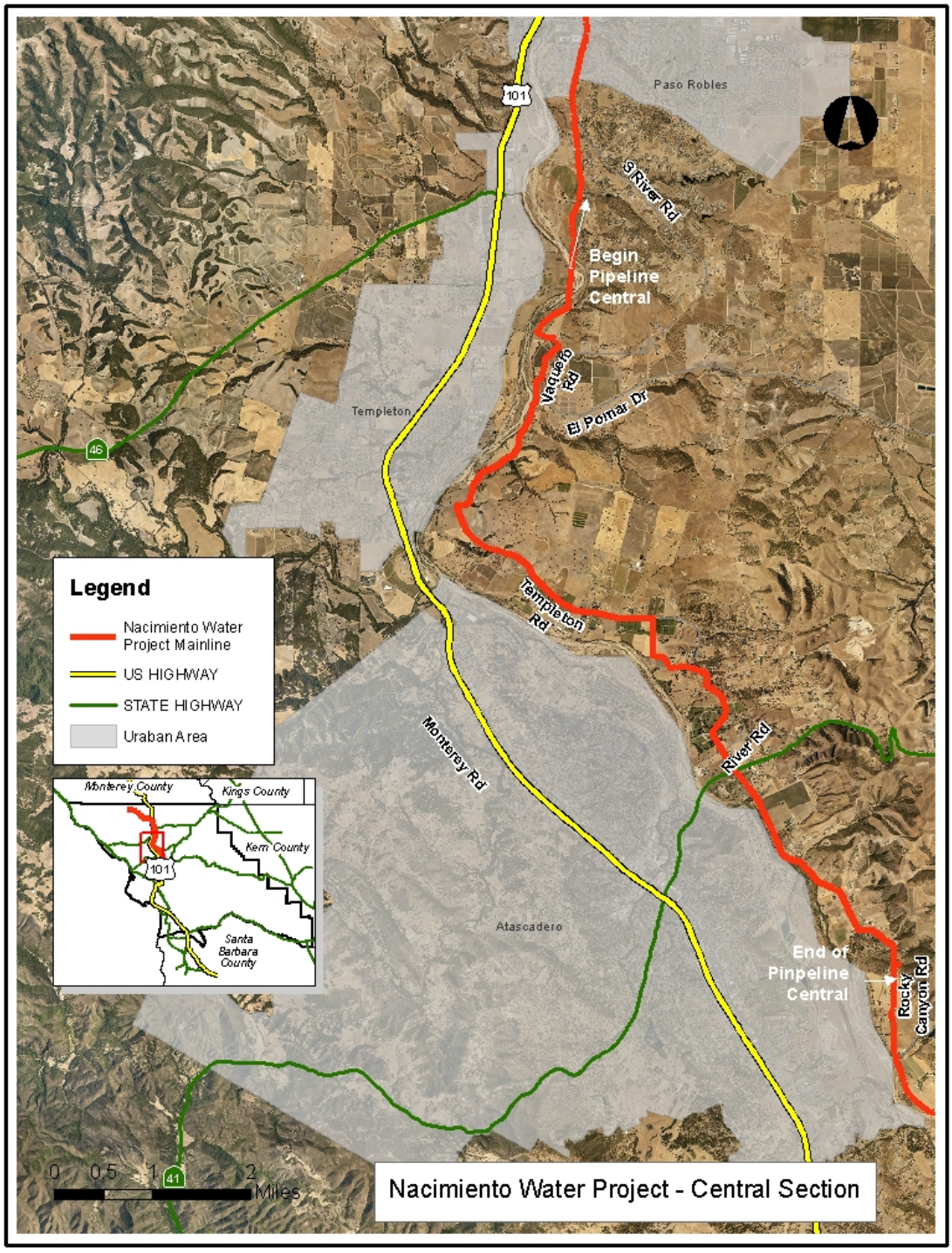
Pipeline Central

The Nacimiento Water Project Pipeline Central is the central portion of the transmission line that delivers raw water from Lake Nacimiento to the Project's participants. Its alignment commences just south of Paso Robles at the Paso Robles Turnout on Santa Ysabel Road, continues south through Templeton and the east side of Atascadero, and ends at the Rocky Canyon Tank and Pump Station in south Atascadero on Rocky Canyon Road. (See Figure 4)

The Pipeline Central consists of five main parts:

- **Pipeline:** Approximately 11 miles of 24-inch to 18-inch diameter ductile iron pipeline was installed as the central portion of the Project's pipeline. Pipeline work included trenching, pipeline installation, and backfilling; sheeting, shoring, and bracing; performance of trenchless construction at road and highway crossings; application of pipeline linings and coatings; installation of appurtenances and corrosion monitoring stations; pavement restoration; traffic and pedestrian control; protection and location of existing utilities; hazardous materials removal and disposal; and site restoration.
- **Turnouts:** Three turnouts deliver water from the Project's main pipeline to the City of Paso Robles, Templeton Community Services District (TCSD), Atascadero Mutual Water Company (AMWC). The Paso Robles Turnout is located just south of Paso Robles on Santa Ysabel Road and consists of approximately 3,100-feet of 24-inch diameter ductile iron and welded steel pipeline with one horizontal directional drilling (HDD) river crossing. The TCSD Turnout is in Templeton off of Templeton Road and consists of approximately 3,950-feet of 8-inch diameter ductile iron and welded steel pipeline with one HDD river crossing. The AMWC Turnout is located just northeast of Atascadero, off Templeton Road, and consists of approximately 2,300-feet of 18-inch diameter ductile iron and welded steel pipeline with one HDD river crossing. Construction consisted of turnout facility construction, including installation of flow meters, isolation valves, flow control valves, and electrical and instrumentation and control systems.
- **Horizontal Directional Drilling (HDD):** Four HDD river crossings were performed beneath the Salinas River: one located at the Paso Robles Turnout, having an approximate length of 1,930-feet and an approximate depth of 94-feet; one located just south of Santa Ysabel Road, having an approximate length of 3,000-feet and an approximate depth of 167-feet; one located at the TCSD Turnout, having an approximate length of 860-feet and an approximate depth of 45-feet; and one located at the AMWC Turnout, having an approximate length of 1,060-feet and an approximate depth of 52-feet.
- **Fiber Optic Cable:** A fiber optic communication line aids in Project operations and control. The contractor installed pull boxes and installed and tested of fiber optic conduit and cable.
- **Templeton Road Realignment**: An approximate half-mile stretch of the northern portion of Templeton Road was realigned to improve traffic safety. This work included demolition, grading, paving, and utility relocation.

Figure 4: Pipeline Central Aerial Map



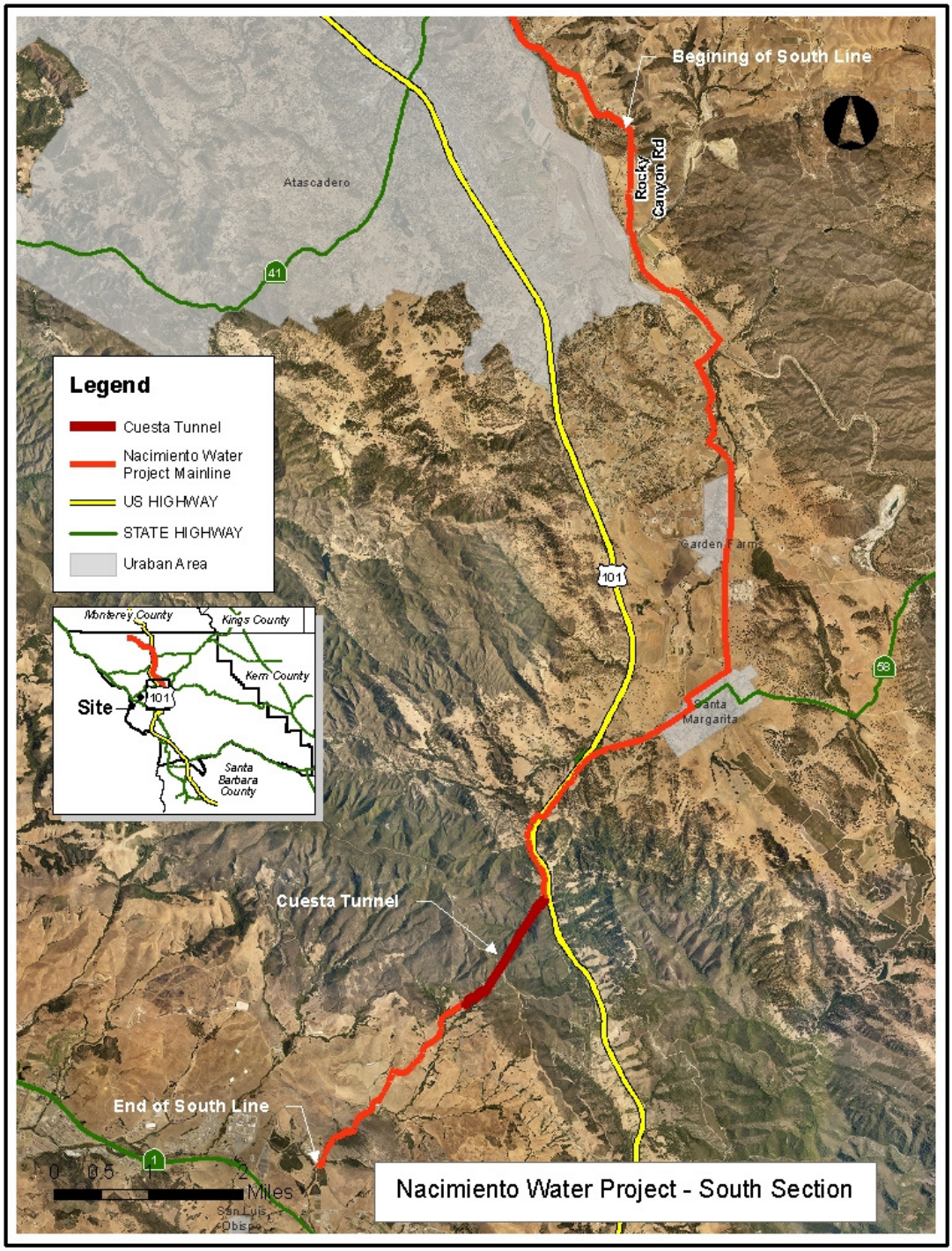
Pipeline South

The Nacimiento Water Project Pipeline South is the southern portion of the transmission line that delivers raw water from Lake Nacimiento to the Project's participants. Its alignment commences at the Rocky Canyon Tank and Pump Station in south Atascadero on Rocky Canyon Road, continues south through Santa Margarita and the Cuesta Tunnel (at the top of Cuesta Grade), and ends just north of San Luis Obispo at the San Luis Obispo Turnout on Stenner Creek Road. (See Figure 5)

The Pipeline South consists of three main parts:

- **Pipeline:** Approximately 12 miles of 18-inch to 12-inch diameter ductile iron pipeline were installed as the southern portion of the Project's pipeline. Pipeline work included trenching, pipeline installation, and backfilling; sheeting, shoring, and bracing; performance of trenchless construction at road and highway crossings; application of pipeline linings and coatings; installation of appurtenances and corrosion monitoring stations; pavement restoration; traffic and pedestrian control; protection and location of existing utilities; hazardous materials removal and disposal; and site restoration.
- **Turnouts:** One turnout delivers water from the Project's main pipeline to the City of San Luis Obispo and CSA-10A. The San Luis Obispo Turnout is located on the north side of San Luis Obispo off Stenner Creek Road and consists of approximately 305-feet of 12-inch diameter welded steel pipeline and a turnout facility. Turnout facility work included installation of flow meters, isolation valves, flow control valves, and electrical and instrumentation and control systems.
- **Fiber Optic Cable:** A fiber optic communication line aids in Project operations and control. The contractor installed pull boxes and installed and tested of fiber optic conduit and cable.

Figure 5: Pipeline South Aerial Map



Water Delivery Entitlement

The Nacimiento Reservoir is operated by the Monterey County Water Resources Agency (MCWRA). As a multi-use facility, Nacimiento Dam and Reservoir is operated with consideration to many factors including dam safety, flood protection, groundwater recharge, operation of the Salinas River Diversion Facility (SRDF), water supply, fish migration, fish habitat requirements, agriculture, and recreation. This Operation Policy defines parameters and describes guidelines and requirements the Agency will follow to operate the Dam and meet the challenges of balancing the competing interests involved in operating this multi-use facility.

The Nacimiento Water Project (NWP) is a raw water supply only. No treatment is provided before the water reaches participating agencies' (participants) turnouts. The Project is operated per the water delivery entitlement contracts signed by the San Luis Obispo County Flood Control & Water Conservation District and participating agencies. Each contract specifies the maximum number of acre-feet per year that each agency may take, the maximum instantaneous rate of flow to be delivered to each agency, and the maximum amount of water to be delivered in any one month.

The District is entitled to no less than 17,500 acre-feet of water per year (AFY) from the Nacimiento Reservoir. A portion of that water, 1,750 AFY, is held for lakeside uses, leaving 15,750 AFY available for use in other areas of San Luis Obispo County.

The City of Paso Robles, City of San Luis Obispo, Atascadero Mutual Water Company, Templeton Community Services District, Cayucos (CSA 10A), and SMR Mutual Water Company held entitlement to a combined 9,655 AFY of water at the end of 2020.

This left 6,095 AFY of "Reserve Water" that was not yet contractually committed. The Nacimiento Water Project infrastructure has an existing capacity to deliver the full 15,750 AFY.

Each year, project participants submit three-year projections of specific delivery requests to the District. The District then develops a water delivery schedule for the project, taking participants' requests into account. On April 19, 2016, Nacimiento Project participants were granted an amendment to the Nacimiento Project Water Delivery Entitlement Contract to purchase all the water from the Reserve Water. The 2020 water entitlement amounts are in Table 1, below:

Table 1: 2020 Entitlement Contact Summary of the Nacimiento Water Project

Water Allocation Participant	Pre-April 19, 2016 Delivery Entitlement (AFY)	2016 Entitlement Change (AFY)	2020 Entitlement Contracts -- Project at Full Allocation (AFY)
City of Paso Robles	4,000	2,488	6,488
City of San Luis Obispo	3,380	2,102	5,482
Atascadero Mutual Water Company	2,000	1,244	3,244
Templeton Community Services District	250	156	406
County Service Area 10A (Cayucos)	25	15	40
Bella Vista Mobile Home Park (Cayucos)	0	10	10
SMR Mutual Water Company (Santa Margarita)	0	80	80
NACIMIENTO WATER PROJECT TOTAL	9,655	6,095	15,750
District's Project Reserve	6,095	-6,095	0
Reserved for Lakeside Use	1,750	0	1,750
TOTAL ALLOCATION	17,500		17,500

Inspection and Surveillance of the Watershed

Currently, the District's watershed inspection and surveillance program consists of the following ongoing practices:

- Observing conditions on the reservoir and the shoreline east of Lake Nacimiento Resort, including in the vicinity of the NWP intake structure (during monthly profile sample collection events that occur on the lake at the log boom near the Nacimiento Reservoir dam)
- Observing conditions on the reservoir and the shoreline west of Lake Nacimiento Resort (during monthly watershed sample collection events that occur on the lake at several locations around the perimeter of the main body of the lake)
- Observing conditions onshore and on the reservoir at the intake structure (during monthly sample collection events at the intake pump station)
- Observing conditions onshore and on the reservoir at the intake structure (during routine operational visits to the intake pump station, one to five times per week)
- Observing conditions onshore in the public recreation area of the Lake Nacimiento Resort including all campgrounds, day-use areas, and the marina (during monthly recreation area inspections)
- Collecting water samples for water quality monitoring and evaluating analytical results from various locations on the reservoir
- Gathering and evaluating data from other water quality monitoring programs that occur in the watershed
- Fostering cooperative working relationships and maintaining communication with public agencies that own property and/or have jurisdictional authority in the watershed
- Fostering positive relationships and maintaining communication with private associations and individuals who own property and/or have some other type of authority in the watershed
- Participating in the technical support group and in the stakeholder's group for the EPA Superfund investigation of the Klau/Buena Vista mines site, Las Tablas Creek, and Nacimiento Reservoir

The watershed is large and mostly undeveloped; many parts of it are inaccessible by land or by water. In the areas that are accessible by land, roads are narrow and winding, and travel is slow. Additionally, access to many areas is restricted (e.g., private lakeside communities, and most of Fort Hunter Liggett). Consequently, routine, frequent surveillance of most of the watershed is impractical.

Occasionally District staff have an opportunity to visit parts of the watershed that are remote or otherwise normally inaccessible. When such an opportunity presents itself, District staff attempt to be involved and will continue to do so.

Watershed Land Use

The Nacimiento Reservoir watershed encompasses 208,060 acres (325 square miles). Almost exactly half of this area, 104,480 acres, lies in Monterey County. The other half, 103,580 acres, lies in San Luis Obispo County. (See Figure 6)

The watershed can be divided into two major sections – the upper watershed, which drains into the Nacimiento River, and the lower watershed, which drains directly into the Nacimiento Reservoir. These two major sections are also nearly identical in size, with 104,670 acres in the upper watershed, and 103,390 acres in the lower watershed. The upper watershed lies almost entirely in Monterey County, and the lower watershed lies almost entirely in San Luis Obispo County.

The upper watershed is comprised largely of federally owned land (87%). The Nacimiento River originates in the Santa Lucia Mountains just south of Cone Peak, within the Los Padres National Forest (LPNF). The Forest is owned and managed by the United States Department of Agriculture Forest Service and covers 11,400 acres (11%) of the upper watershed. The river travels 10 miles through the forest before reaching Fort Hunter Liggett (FHL), a United States Department of the Army training installation, which occupies 79,960 acres (76%) of the upper watershed. The river travels 19 miles through FHL, then another 7 miles through privately owned land before reaching the 800' elevation which marks the beginning of the reservoir. Nearly all of the remaining 13% of the upper watershed is privately owned and zoned for agricultural use (13,310 acres).

The lower watershed is comprised largely of privately owned land, much of which is zoned for agricultural use (54,500 acres; 53% of lower watershed), along with rural lands (23,400 acres; 23% of lower watershed) and open space (11,250 acres; 11% of lower watershed). At maximum capacity Nacimiento Reservoir occupies 5,727 acres. The remaining 8,510 acres in the lower watershed are zoned for residential use or recreation.

The only significant public land ownership in the lower watershed is that which is owned by the Monterey County Water Resources Agency (MCWRA), which owns and operates the dam and the reservoir. MCWRA owns 10,062 acres of land in the lower watershed. Of this, 7,114 acres are above the 800' elevation and adjacent to the reservoir, and 2,948 acres are below the 800' elevation. Additionally, the Federal Bureau of Land Management owns 2,208 acres of land in the lower watershed. (See Figure 7)

A majority of the watershed is undeveloped open space. The only significant population centers in the watershed are located on the shore of Lake Nacimiento; the remainder of the watershed is rural and sparsely populated. Numerous small communities have been developed along the lakeshore.

Figure 6: Nacimiento Reservoir Watershed and Sub-watersheds

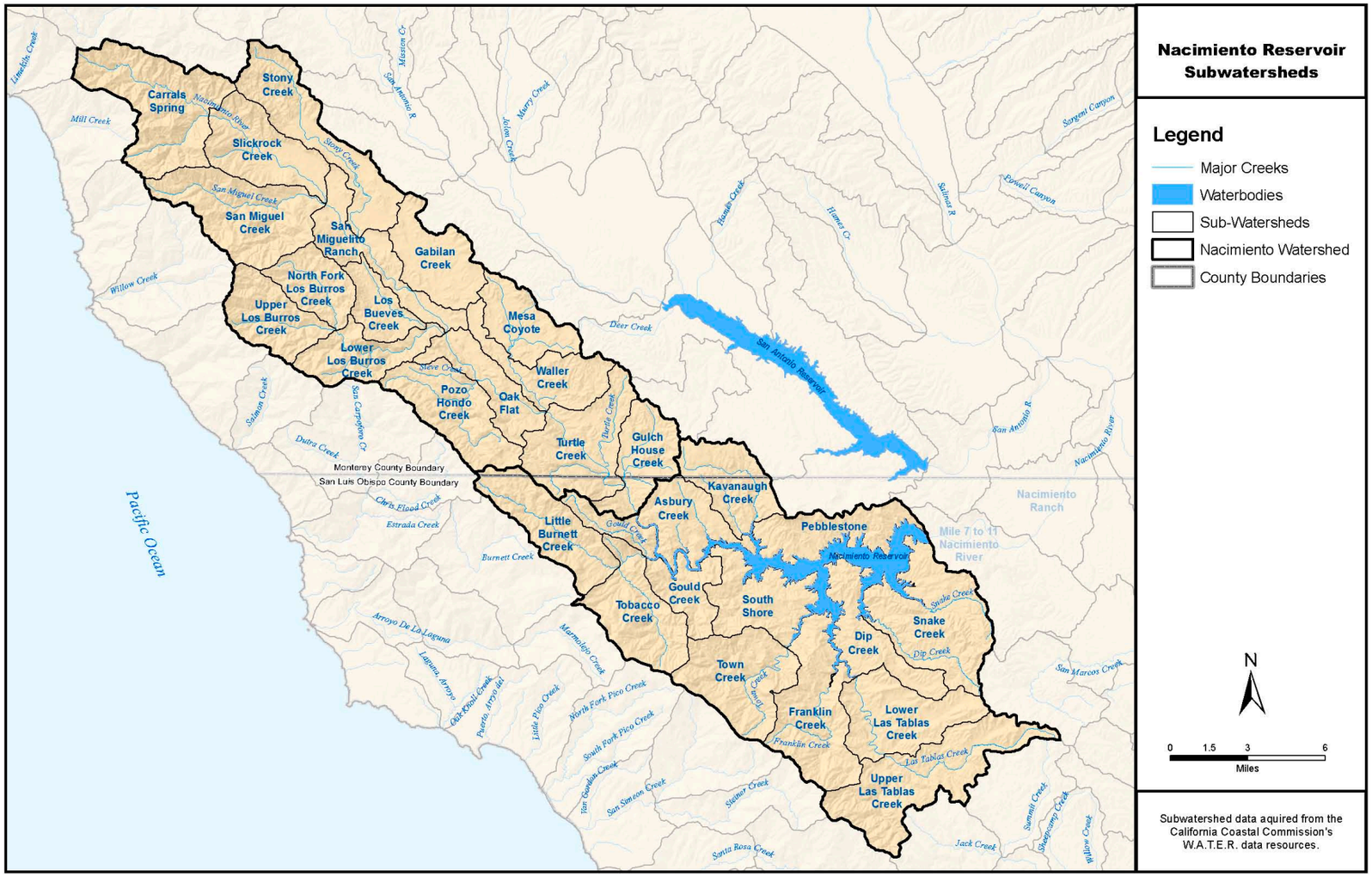
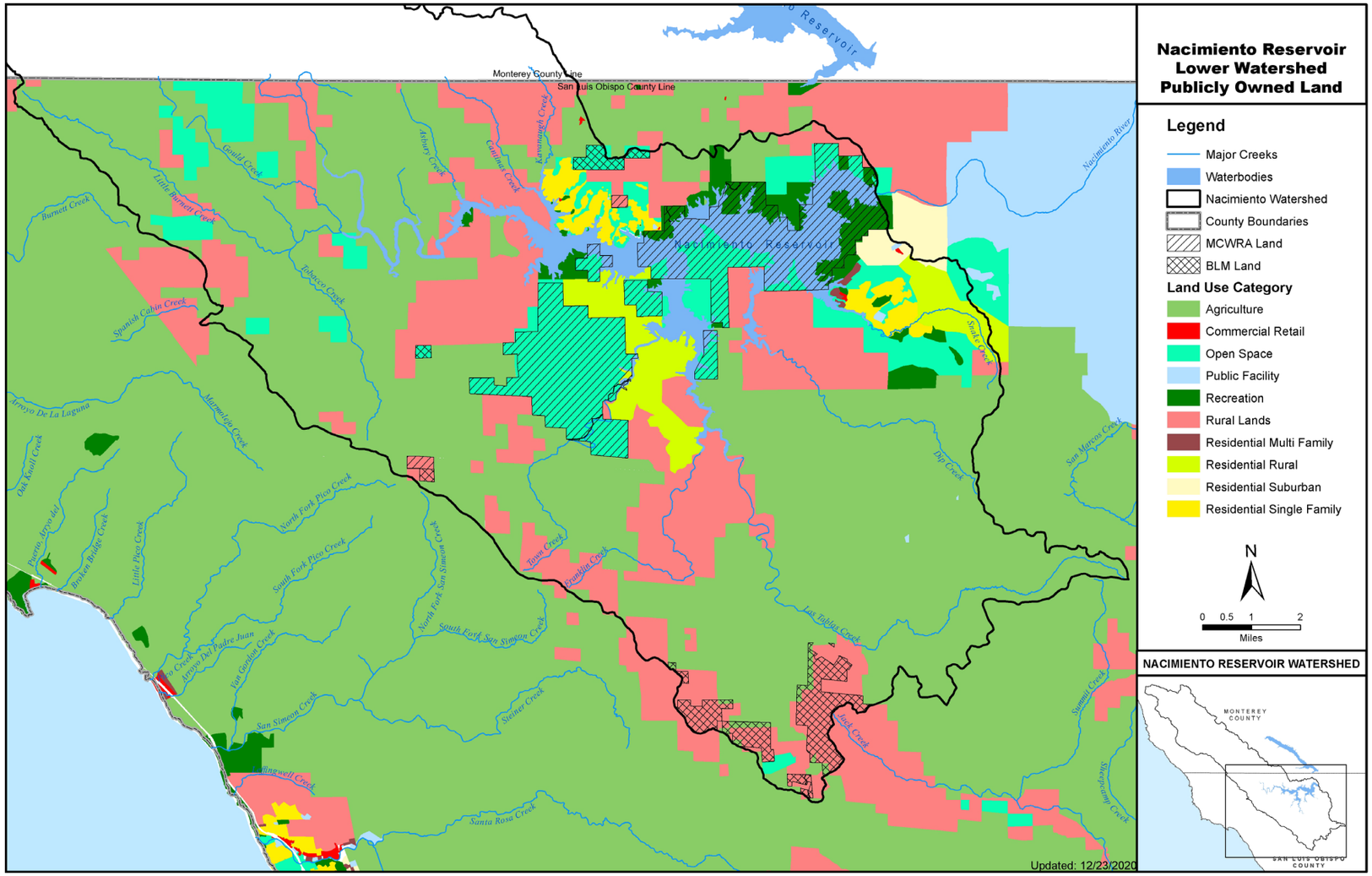


Figure 7: Nacimiento Reservoir Lower Watershed Land Use



Watershed Sanitary Survey - 2020 Update

Watershed Sanitary Survey Checklist of Potential Significant Concern

General

Changes in Available Water Quantity

The droughts between 2016 and 2020 have impacted the availability of water for the Nacimiento Reservoir's beneficial uses. The major beneficial uses of the Nacimiento Reservoir are:

- Municipal and Domestic Supply
- Agricultural Supply
- Ground Water Recharge
- Water Contact Recreation
- Non-Contact Water Recreation
- Wildlife Habitat
- Cold Fresh Water Habitat
- Warm Freshwater habitat
- Spawning, Reproduction, and/or Early Development
- Threatened, or Endangered Species
- Freshwater Replenishment
- Commercial and Sport Fishing

Between 2016 and 2020, the Nacimiento Reservoir spent 42% of the time under drought conditions, below 748' elevation. The reservoir's minimum elevation during that time was 703.60 feet (40,340 AF of Storage and 1,411 Acres of Surface Area) and 10.7% Capacity. The maximum elevation was 797.9 feet (365,935 AF of Storage and 5,624 Acre of Surface Area) and 96.8% Capacity.

The minimum elevation for recreational use (720') was not met 8.6% of days between 2016 and 2020 as shown in Appendix A Field Data.

Contaminant Sources

Wastewater

Wastewater Treatment Plant Effluent Discharges

Of the many residential communities located around Nacimiento Reservoir, only one is served by a wastewater system which disposes its effluent above ground within the Nacimiento Reservoir watershed; that is the community of Oak Shores. All other wastewater systems either use below ground onsite disposal (leach fields), or the effluent is disposed of outside the watershed. Although the Oak Shores wastewater system is located near the lake shore, it is more than 7 river miles away from the NWP intake structure. (See Figure 8)

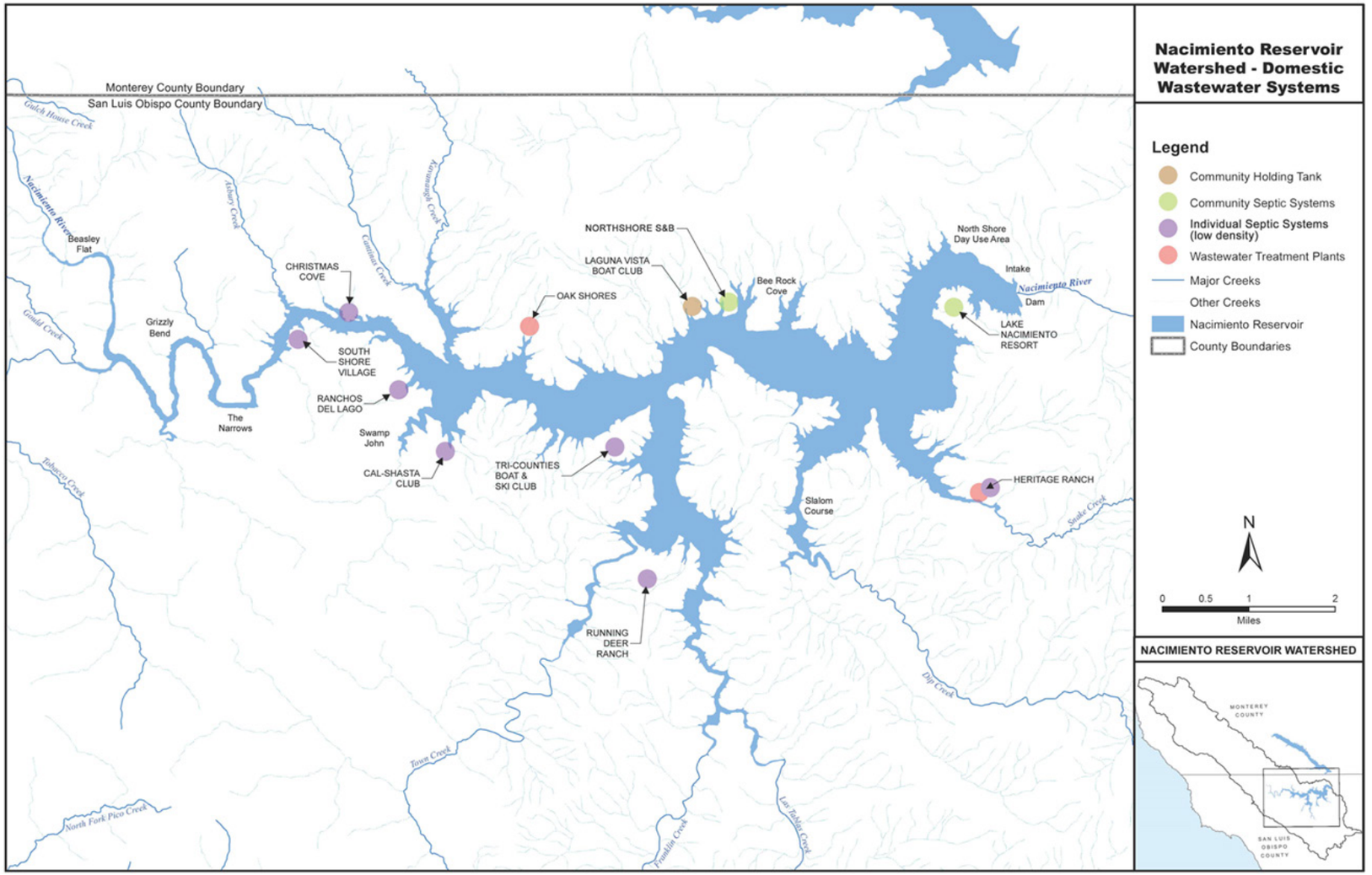
Sanitary Sewer Overflows

There were eleven incidents of Sanitary Sewer Overflows (SSO) from the Oak Shores collection system during 2016 – 2020 that required notification to the Regional Water Quality Control Board. Two of the spills were designated Category 2 SSOs (Spills greater than or equal to 1,000 gallons that do not reach surface water) and 9 were designated Category 3 SSOs (spills less than 1,000 gallons that do not reach surface water). The primary cause of the SSOs was debris in private laterals and the mainline. The spill discharges were all discharged directly to land or a storm drain system. None of the spills entered the Nacimiento Reservoir.

Wastewater Treatment Storage, Transport, Treatment, and Disposal to Land

The Oak Shores Wastewater Treatment Facility provides secondary treatment via two aeration ponds and two settling lagoons. The treatment plant is located approximately 1,000 ft horizontally away from and more than 100 ft above the High Water Level (HWL). It has a design capacity of 0.100 MGD; actual average flows from 2016 to 2020 varied from 0.0110 MGD in the winter to 0.1242 MGD during peak periods of summer. Disposal is to an evaporation/percolation pond and disposal area. Effluent is pumped nearly two miles from the treatment plant to a spray field that is located within the reservoir watershed, over 2,000 ft horizontally away from the HWL.

Figure 8: Nacimiento Reservoir Lower Watershed Wastewater Systems Overview



Campground Restrooms

Located less than one mile away from the NWP intake structure, lies the Lake Nacimiento Resort. This public recreation area is served by a community septic system that is operated by Monterey County Parks Department staff under the provisions of Central Coast RWQCB Order No. 96-26. The Resort has seven campgrounds. The total number of camp sites and amenities available at each campground varies throughout the year depending on the season and visitor demand. During the peak season in Summer, there are over 300 camp sites available, 33 flush toilets, and 8 chemical toilets. (See Table 2 and Figure 9 below)

Table 2: Nacimiento Resort Campgrounds

CAMPGROUND	Camp Sites	Flush Toilets (Vault)	Chemical Toilets	Showers	Fresh Water	Comments
Eagles Ridge	60	0	6	No	Yes	Walk-in Sites
Oak Knoll	40	6	0	Yes	Yes	Boat Trailer Spaces
Pine Knoll	120	7	0	Yes	Yes	Close to Water Access
Quails Roost	60	8	0	Yes	Yes	Not Recommended for RVs/Trailers
Rocky Canyon	14	6	0	Yes	Yes	Group Sites; Tent Camping Only
Sandy Point	12	6	2	Yes	Yes	Single and Group Sites
TOTAL	306	33	8			

Figure 9: Lake Nacimiento Campgrounds

Urban Areas

Possible contaminants such as nutrients, pathogens, and trash are a concern from urban runoff. The two largest population centers in the Nacimiento Reservoir watershed are the two private residential communities of Heritage Ranch and Oak Shores; both are located adjacent to the reservoir itself. Storm drains installed around the lake direct storm water flow directly to Nacimiento Reservoir. While a few storm drains may have an oil separator, most do not.

Agricultural Crop Land Use

Agriculture still occurs throughout the watershed. Crops include hay, silage, wine grapes, olives, peaches, persimmons, walnuts, and industrial hemp.

Pesticide/Herbicide Use

Pesticide and herbicide use occurs throughout the watershed. Over 2,100 events of pesticide and herbicide use were registered between 2016 and 2020. See section on Watershed Data Evaluation: Pesticide and Herbicide Use.

Grazing Animals

Cattle continue to be seen throughout the watershed year-round, often very near to or directly in the water. Cattle have unrestricted access to the reservoir itself in many places and have been observed by SLO County PWD staff during their monthly inspections on the north and south shores of the reservoir, on the shores of the Las Tablas Creek arm and Snake Creek arm, all along Las Tablas Creek from the Klau and Buena Vista mines site to the reservoir, and along the north shore of Nacimiento River in the area known as the Narrows. No fencing or other means of restriction exist to prevent cattle access to the reservoir.

Cattle grazing is a potential source of contaminants such as Giardia and *E. coli*. Cattle activity can also contribute to increased turbidity and nutrient levels. Such conditions can stimulate excessive growth of nuisance algae, which can have major effects on the filtration and treatment processes at a water treatment facility. Little monitoring was conducted at locations of these cattle sightings.

Despite the presence of cattle in the watershed, their numbers are small, the watershed is large, and they have not been seen grazing near the dam or intake structure.

Mines

Active

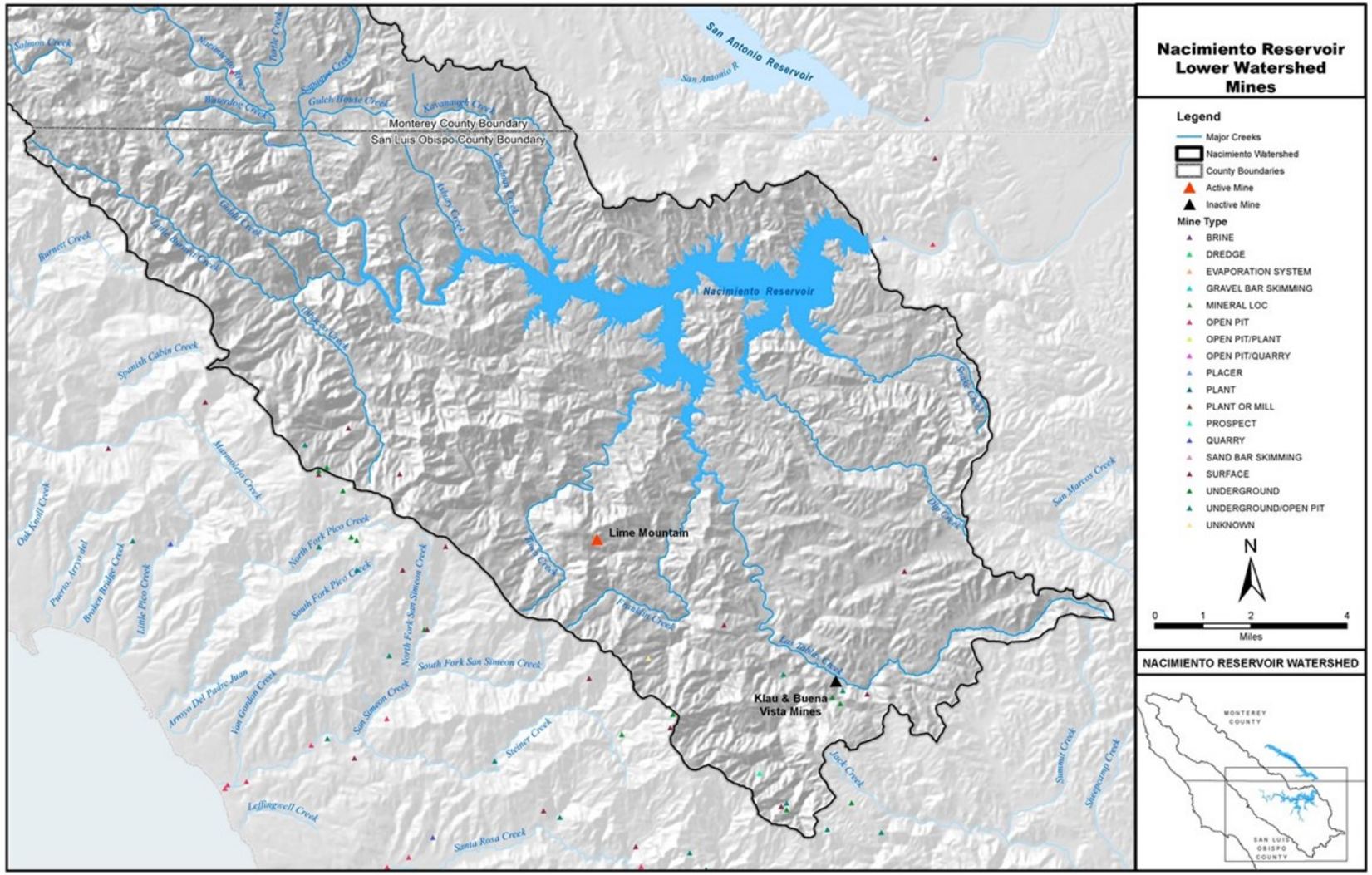
The Lime Mountain Company is an open pit calcium carbonate mine located in the lower watershed, at Lime Mountain, approximately 4 miles south of Nacimiento Reservoir. The mine continues to operate. No updated information could be found on the mine. The Initial Watershed Survey stated: "The mine is inspected annually by the SLO County Department of Planning and Building acting as an agent of the California Department of Conservation, Office of Mine Reclamation. Inspection reports from 2010 and 2011 indicate that all runoff is contained on site and no drainage concerns were identified." (See Figure 10)

Inactive

The Klau and Buena Vista mines are located about 6 miles south of Nacimiento Reservoir, in the Las Tablas Creek drainage. The mines have not been in operation since 1970 but continue to be a health concern. The most significant contaminant of concern is mercury, a metal that can be harmful to the human nervous system. Following initial actions to protect human health and the environment, site investigations and long-term cleanup planning are ongoing.

Because of the health hazards that mercury presents the San Luis Obispo County Health Department in 2009 issued a revised health advisory warning people to limit their consumption of fish from Lake Nacimiento. The advisory is still in effect. (Figure 10: Lower Watershed Mines)

Figure 10: Lower Watershed Mines



Geologic Hazards

Landslides

The majority of the Nacimiento Lower Watershed has a high to moderate potential for landslides which have the potential to contribute large amounts of suspended solids to the reservoir in a short period of time. (See Figure 11)

Floods[2]

Nacimiento Dam is classified as "Extremely High" downstream hazard potential dam by the Division of Safety of Dams of the California Department of Water Resources. A 2017 State law (Calif. Water Code Sections 6160-61) requires that an Emergency Action Plan and dam failure inundation maps be prepared for all dams so classified. The Monterey County Water Resources Agency has prepared maps to fulfill this requirement. These flood inundation maps are based on the latest flood simulation models and are estimates of the maximum flood depth, the flood arrival time, and the flood recession time that would occur in two different scenarios: an embankment failure at Nacimiento Dam[3], and a spillway failure at Nacimiento Dam[4].

Nacimiento Dam Failure Results

The peak flow through the breach is estimated to be 3,300,000 cfs and is estimated to occur one hour after the dam begins to fail. The flood wave would take an estimated 24 hours to reach the mouth of the Salinas River where the flow rate would be approximately 700,000 cfs. The simulation predicts flooding in portions of Camp Roberts and San Miguel, Bradley, the San Ardo oil field, San Ardo, portions of King City, Spreckels, portions of Salinas, and portions of Castroville and Moss Landing.

Nacimiento Spillway Failure Results

The peak flow is estimated to be 216,000 cfs and estimated to occur 6 minutes after spillway failure begins. An estimated 205,000 acre-feet of reservoir storage will be discharged within 3.5 days of failure, and the flood wave would take about 2 days to reach the mouth of Salinas River. The peak flow there would be about 40,000 cfs. Most of the flow would remain within the Salinas River channel and the FEMA 100-year flood plain, and most of the flood plain would drain within one week after failure. The simulation predicts a community adjacent to San Lorenzo Park in King City may experience some flooding, mostly in the streets, and there would also likely be shallow flooding along the southern edge of the City of Salinas.

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2 Monterey County's website: *https://www.co.monterey.ca.us/government/government-links/water-resources-agency/projects-facilities/dams-and-reservoirs*

3 Nacimiento Dam – Embankment Failure: *https://www.co.monterey.ca.us/home/showpublisheddocument/76700/637103528668370000*

4 Nacimiento Dam – Spillway Failure: *https://www.co.monterey.ca.us/home/showpublisheddocument/76702/637103531470300000*

Estimated flood inundation results for population centers and other locations affected by a Nacimiento Dam embankment failure (Full Dam Breach) can be seen below in Table 3.

Table 3: Flood Inundation

	Estimated Flood Elevation	Estimated Peak Flow	Estimated Flood Arrival Time	Estimated Peak Arrival Time	Estimated Time to Deflood
Camp Roberts	620	3,312,017	1:00	1:30	2:15
Bradley	585	2,581,650	1:42	2:10	3:43
San Miguel	620	2,581,650	1:45	2:13	3:46
San Ardo Oil Fields	508	2,459,861	2:06	2:28	4:47
San Ardo	456	2,275,146	2:48	3:14	4:46
San Lucas	370	1,935,096	4:00	4:28	6:17
King City	315	1,697,237	5:00	5:26	7:30
Greenfield	242	1,267,444	6:48	7:14	9:44
Soledad	183	1,187,513	8:36	8:57	10:51
Gonzalez	125	1,128,507	10:48	11:18	13:49
Chualar	90	903,687	12:48	13:09	16:50
Salinas	48	745,870	18:38	22:00	22:30
Castroville	15	<700,000	18:58	22:18	22:48
Moss Landing	15	<700,000	22:30	22:48	25:20

Nacimiento 100-Year Flood

A 100-year flood is a flood event that has a 1 in 100 chance (1% probability) of being equaled or exceeded in any given year. The map below shows the Federal Emergency Management Agency (FEMA) 100-year flood zone for the Nacimiento Reservoir Lower Watershed. (See Figure 12)

Earthquakes

Several earthquake faults run along the west side of the entire watershed. Lake Nacimiento, CA has a very high earthquake risk, with a total of 3,930 earthquakes since 1931. The USGS database shows that there is a 96.30% chance of a major earthquake within 50km of Lake Nacimiento, CA within the next 50 years. The largest earthquake within 30 miles of Lake Nacimiento, CA was a 6.5 Magnitude in 2003. Earthquakes can disrupt sewage collection lines and treatment facilities and can cause ruptures in hazardous material storage tanks, leading to spills of untreated sewage and hazardous material into the reservoir and watershed. (See Figure 13: Fault Hazards

Figure 11: Landslide Hazards

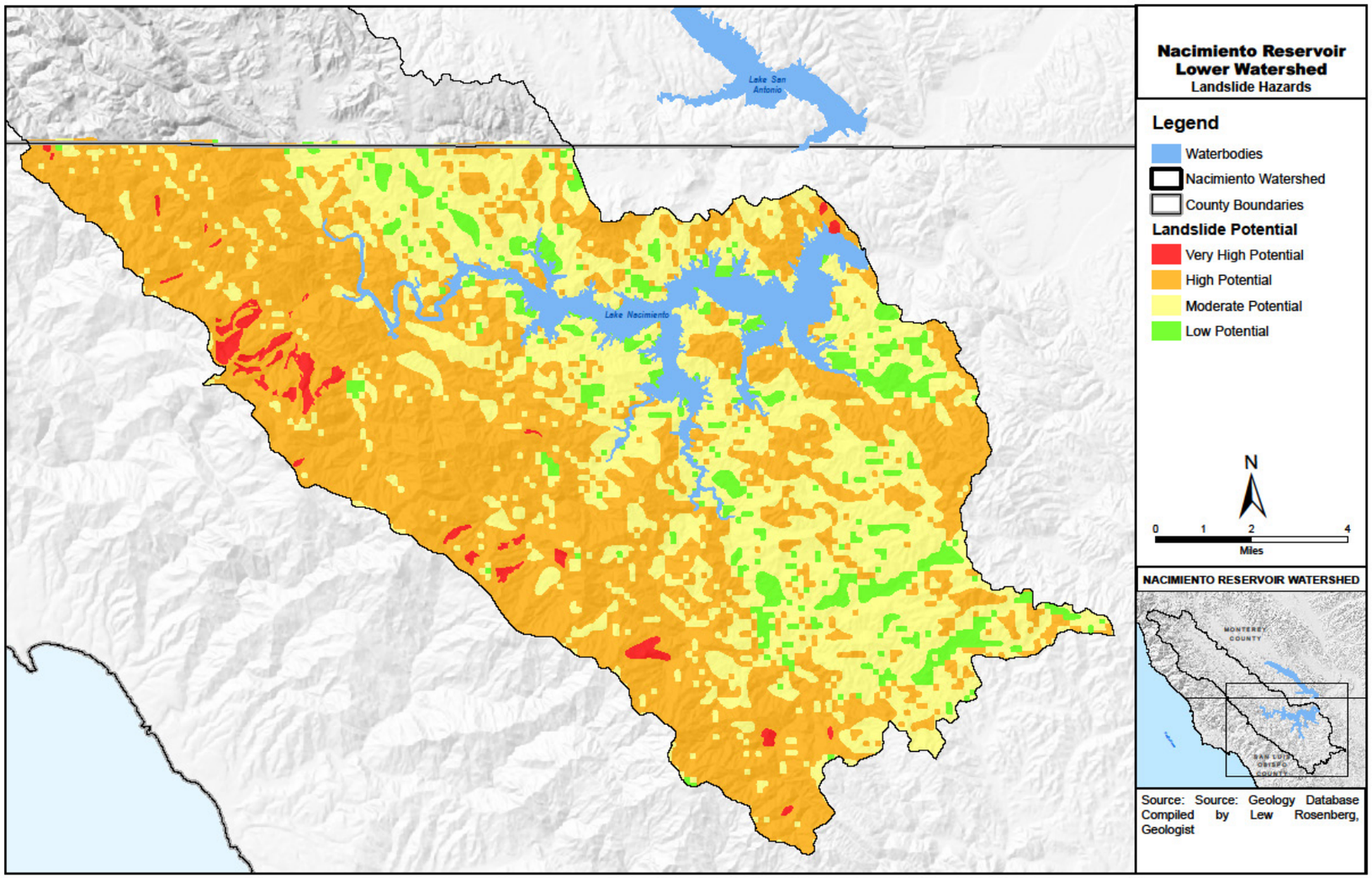


Figure 12: 100-Year Flood Zone

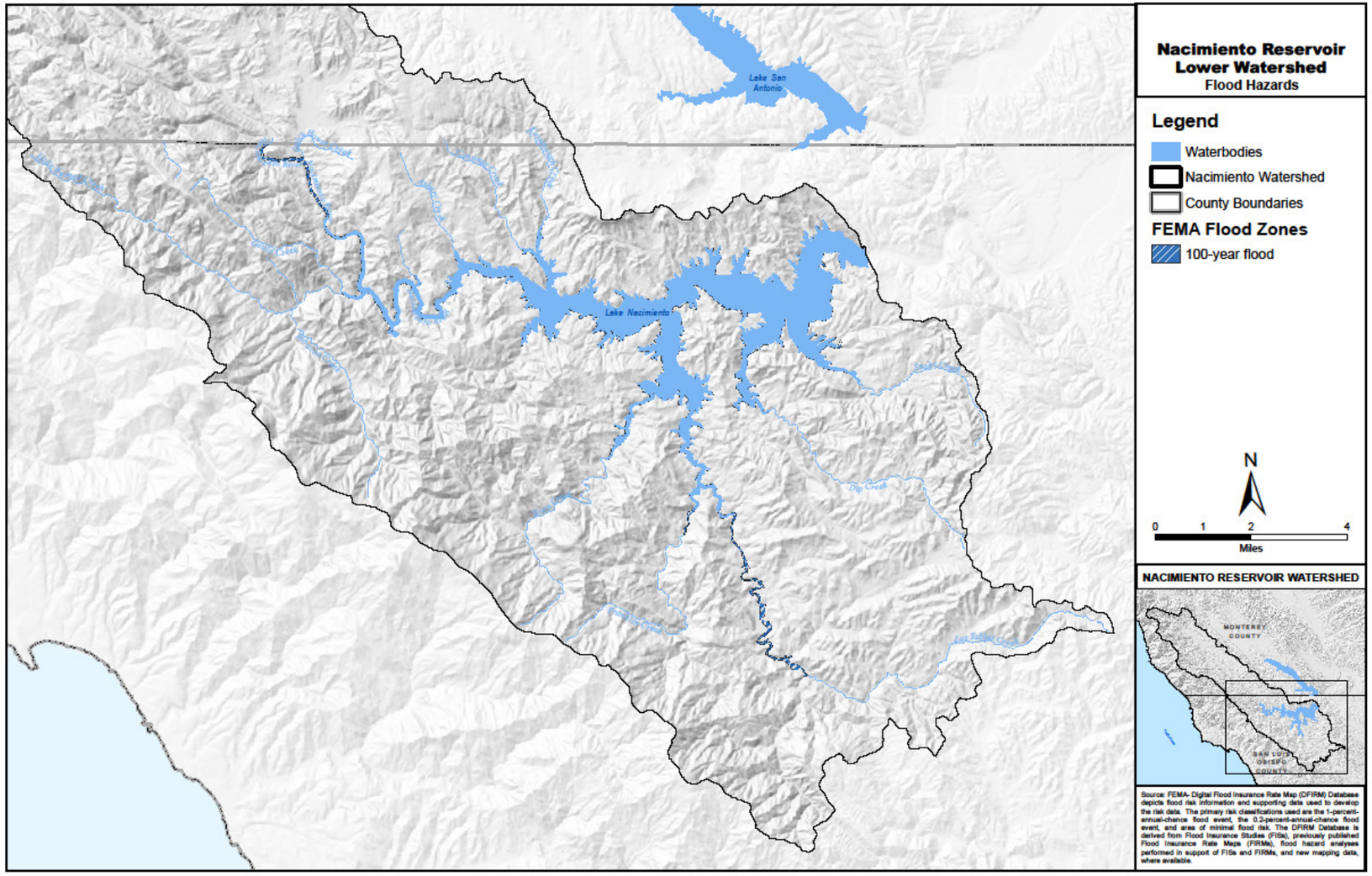
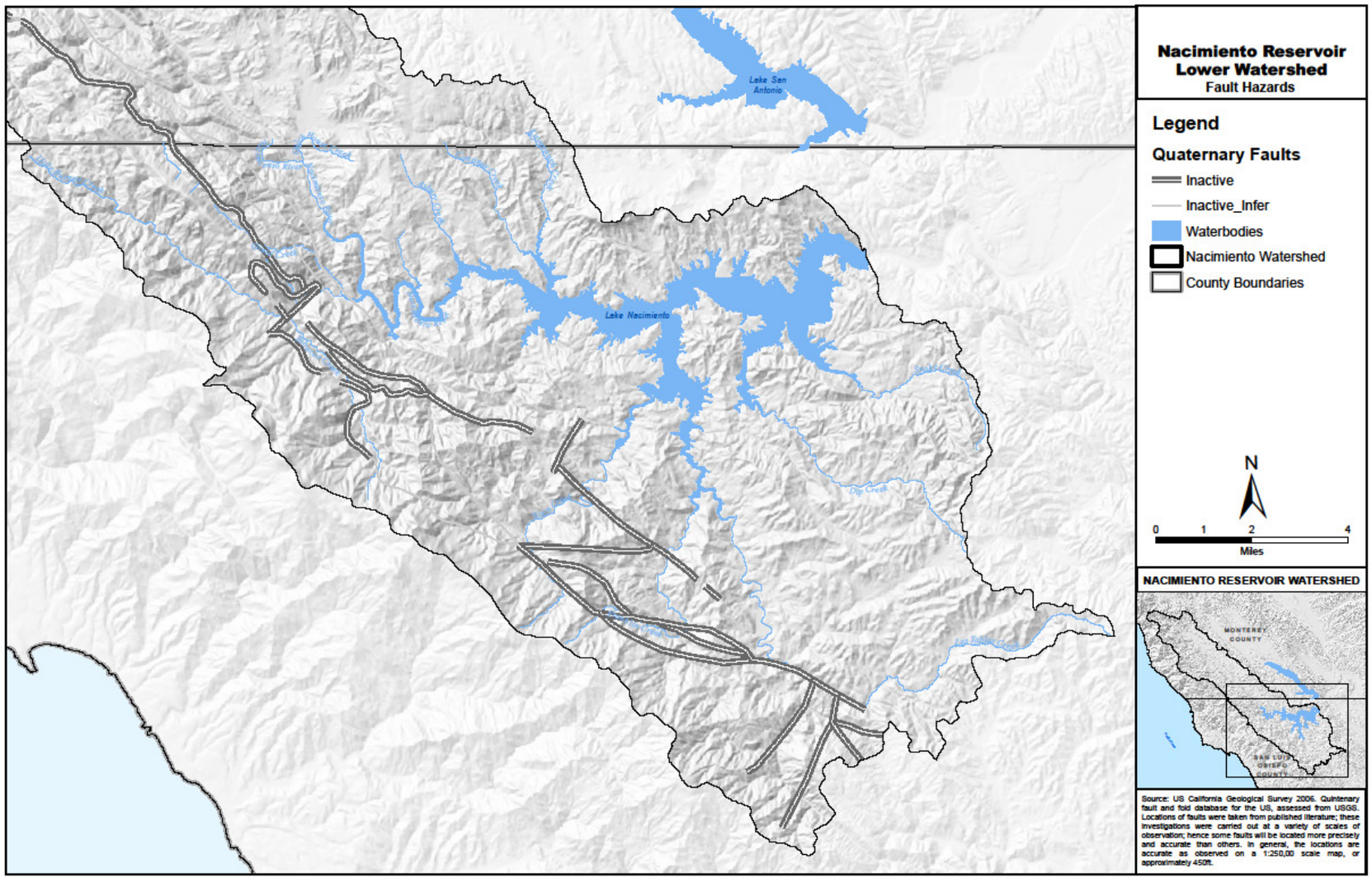


Figure 13: Fault Hazards



Recreation

Reservoir body contact

Body contact recreation is still allowed throughout the reservoir including swimming, wading, water skiing, and personal watercraft use. These activities have the potential for contamination by Pathogens (viruses, *E. coli, Cryptosporidium, Giardia*).

Reservoir non-body contact

Non-body contact recreation is still allowed throughout the reservoir and watershed including camping, hiking, horseback riding, fishing, and boating. These activities have the potential for contamination by invasive species (Quagga and Zebra Mussels) and petroleum products.

Floating Toilets

Floating toilets (FT) continue to be a concern in the Watershed. The FTs are located at different sites on the reservoir (See Figure 14). These are located at the Marina, Oak Shores, and Dip Creek. The number of sites vary and the number of FTs at each site vary (typically 0 to 6) due to season, lake levels, and demand. (See Figure 15 and Figure 16) They are cleaned at least twice a week during peak season and holding tank levels are checked upon each cleaning. Pump outs occur on an as needed basis.

Figure 14: Floating Toilet Locations

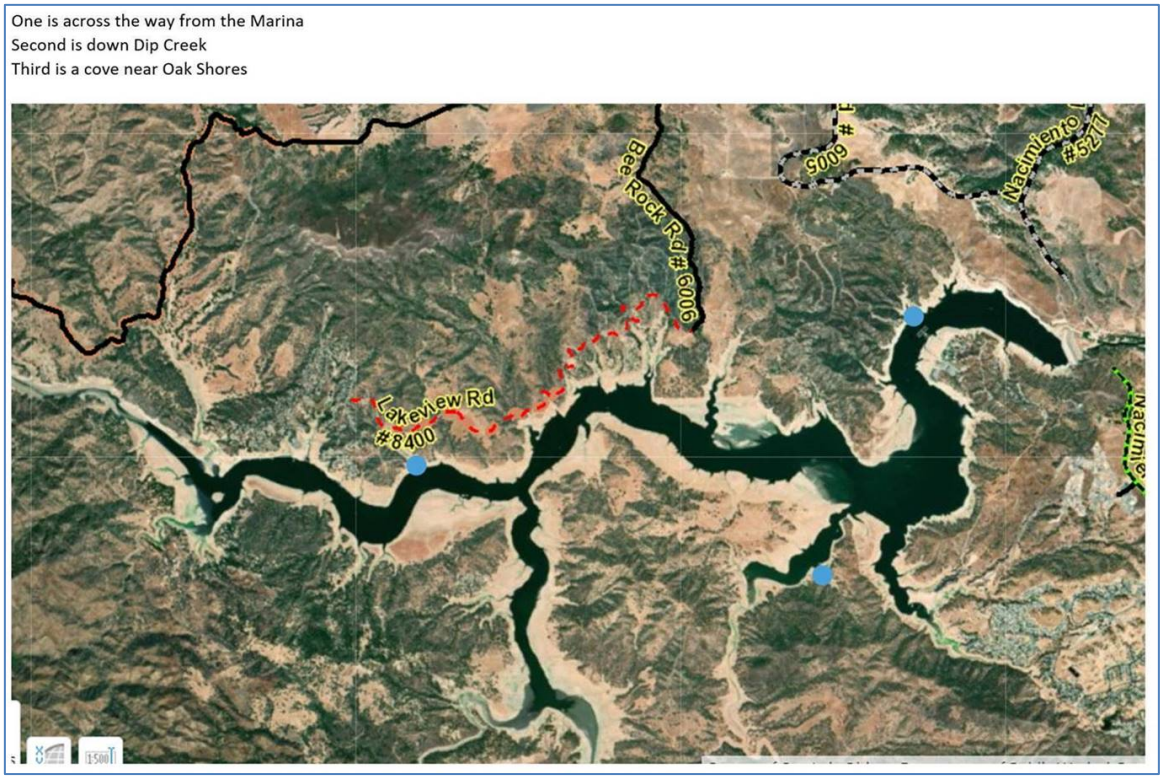


Figure 15: Floating Toilets Across from Lake Nacimiento Resort

Figure 16: Floating Toilets at Lake Nacimiento Resort Boat Dock

Despite efforts by Monterey County and their management partner Basecamp Hospitality to keep the FTs clean and sanitary, SLO County staff have reported the FTs to be in "Fair" to "Poor" condition in approximately 75% of their inspections. Conditions found include feces in the toilet bowl, FT floors, and on the FT deck; bad odors; and FTs non-flushable and/or overflowing. (See Figure 17)

Figure 17: Floating Toilet in Unsanitary "Poor" Condition

Replacing the FTs with onshore chemical toilets has been considered but there are concerns about the cleaning and maintenance. Since the property around Nacimiento Lake is privately owned, servicing chemical toilets would require extensive agreements and logistics. The FTs are provided through grants from the state to make it more convenient for boaters to use instead of having to go ashore. Monterey County staff feel it is still more sanitary to have the FTs than no toilet facilities at all and having visitors use the lake as a toilet.

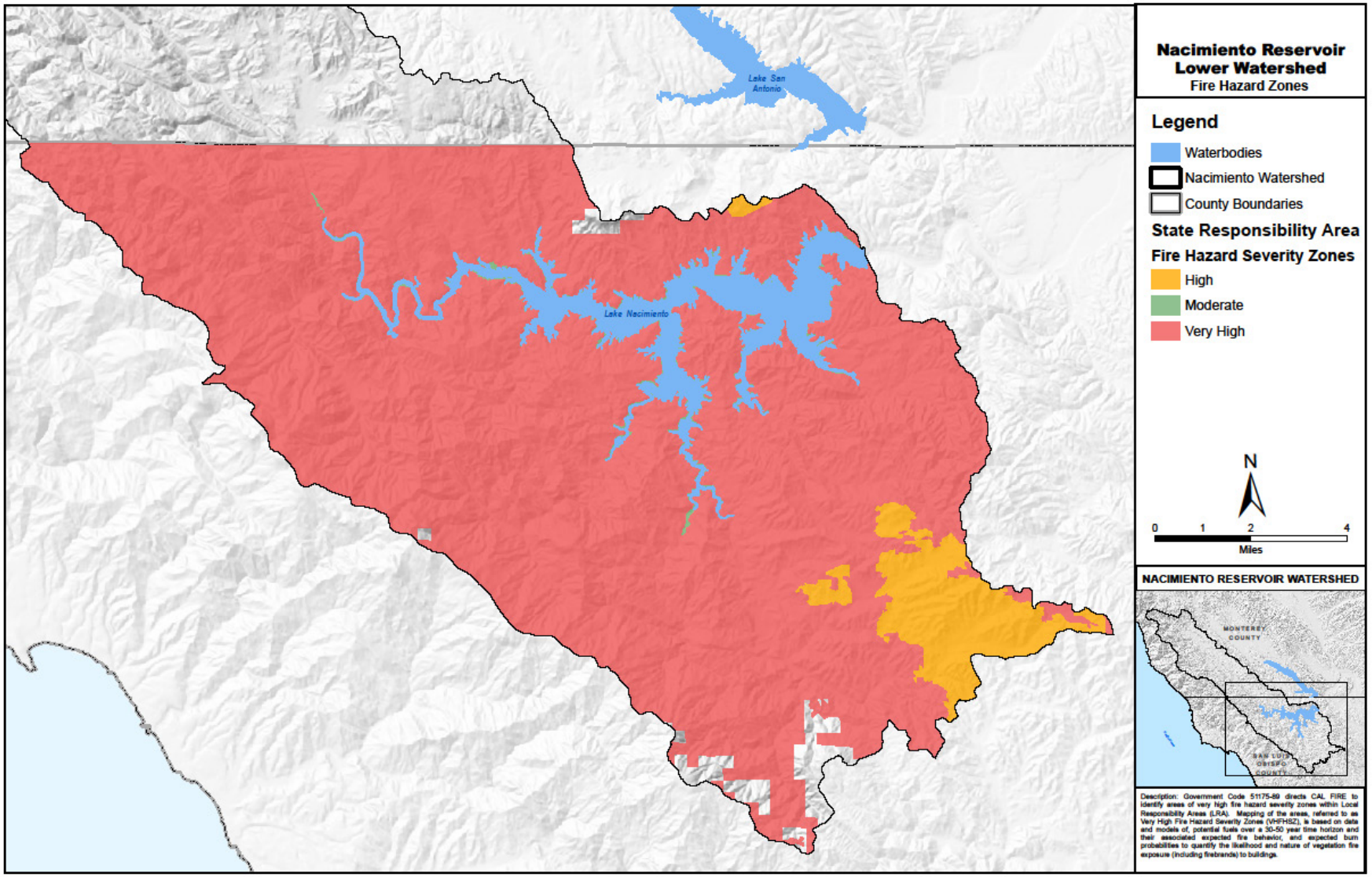
Further evaluation needs to occur as the draft "Guidelines for Evaluating Applications for Recreational Use Permits at Domestic Water Supply Reservoirs" (November 15, 2020) states "Floating restrooms should be prohibited unless special approval is obtained from DHS[5]".

Fires

The Nacimiento Reservoir Lower Watershed is at very high risk for fire (See Figure 18: Fire Hazard Zone Watershed Data Evaluation). As witnessed by the August 2016 Chimney Fire, the threat of fire is significant. The fire lasted 25 days and burned a total of 64,344 acres. 94% of the fire was within the Nacimiento Watershed and the fire burned 47% of the watershed tributary to Nacimiento Lake. See the "Watershed Events" section for more information.

5 Department of Health Services

Figure 18: Fire Hazard Zone Watershed Data Evaluation



Watershed Data Evaluation

This section will summarize water quality issues in the watershed based on data collected from analysis and field inspections over the past five years (2016 – 2020). The most significant impact to the watershed area over these years would be the decrease in the amount of rainfall in the watershed as well as throughout the state of California. Vegetation in the watershed has been visibly dry, and water levels in Lake Nacimiento and its watershed are significantly lower. As the drought continues, longer-term impacts can emerge and could alter or damage native ecosystems for both aquatic and riparian species.

Sample collection from locations at the reservoir and its tributaries, and reservoir are based on the use of Nacimiento Reservoir as a municipal water supply for the NWP participating agencies. The County has established a sampling and analysis program to assess the reservoir's water quality. Sample locations include the raw water from the Intake Pumping Station, the dam intake structure at various elevations, three (3) recreational sites on the reservoir (Nacimiento Resort, Heritage Ranch, and Oak Shores), and three (3) watershed tributaries in the Nacimiento watershed (Dip Creek, Las Tablas Creek, and the Narrows). Since the inflows are seasonal, analytical data for the tributaries may not be available for all sampling events. For Monitoring Locations, See Figure 21: Nacimiento Reservoir Tributaries and Park Locations.

Limnological monitoring (turbidity, temperature, dissolved oxygen, pH, and visibility*)* were conducted monthly at the reservoir intake structure at 5' intervals. Bacteriological, physical, iron, and manganese levels were monitored monthly at the available seven fixed elevation intakes at 20' intervals (780' – 660'). The monthly monitoring provided information on lake turnover and seasonal fluctuations aiding staff in intake selection. See Limnology Section below.

Monthly field inspections of artificial substrates deployed by County staff were performed to monitor for the presence of invasive mussels.

Quarterly samples were collected from the raw water pump station and any actively flowing tributaries. The samples were analyzed for general minerals, metals, and nutrients (nitrate, nitrite, total Kjeldahl nitrogen, and total phosphorus).

EPA has determined that perchlorate meets the State Drinking Water Act's criteria for regulating a contaminant. Perchlorate is analyzed annually.

Volatile Organic Chemicals (VOCs) and Non-Volatile Synthetic Organic Chemicals (SOCs): Source water monitoring for VOCs is required every 3 years and SOCs every 9 years. NWP was granted a waiver from monitoring most of the SOCs in 2013. Monitoring has been reduced to atrazine and simazine.

Radioactivity: Testing for gross alpha emitting elements (which include the alpha emitting radioactive elements Radium-226 and Uranium-238) is conducted every nine years on the raw water. Radiological monitoring was performed in 2010 and 2019 and will be due again in 2028. All results met radiological activity standards.

NWP shall continue to monitor the Nacimiento Reservoir raw surface water for inorganic chemicals according to the 9-year monitoring schedule. No change is expected in gross alpha concentrations in the foreseeable future.

Limnology

Limnology is the study of the chemical, physical, atmospheric, and biological conditions in freshwater. The County routinely monitors the Nacimiento reservoir and uses the limnological data to assess seasonal variability in water quality and to determine the cause of objectionable odors or particulate matter. The data is used to select the Nacimiento Reservoir intake(s) with the best quality water for delivery to the participating water agencies.

Nacimiento Reservoir is a large monomictic lake that does not stratify or de-stratify simultaneously across the entire lake but otherwise behaves normally. (USGS, USEPA 2015). The lake's significant depth means that a thick anoxic zone (water with dissolved oxygen less than 0.5 mg/L) can develop once stratification sets in. A thermocline forms gradually starting in March/April, and the reservoir becomes stratified, peaking in late summer (July/August/September). In the fall (October/ November) the thermocline gradually disappears. Temperatures are typically uniform from top to bottom in December and January.

In the Nacimiento Reservoir, dissolved oxygen (DO) can exhibit a negative heterograde curve. In this case, as the thermocline develops, dissolved oxygen is highest at the surface, then decreases through the thermocline, then rises in the hypolimnion before decreasing again (Biodiversity Institue of Ontario) (Government of British Columbia, Ministry of Environment) This uncommon pattern occurs most often when oxygen consumption from the decomposition of organic matter exceeds oxygen inputs as the rate of organic matter sinking from the epilimnion is slowed upon entering the colder, denser water of the thermocline. It may also occur due to respiratory demand from large concentrations of zooplankton, and certain lake mixing patterns.

Water quality determines the condition of water for particular purposes. Water quality tests will give information about the health of the waterway. By testing water over a period, the changes in the quality of the water can be seen. Desirable qualities for raw source water to be treated to acceptable drinking water standards are typified by adequate dissolved oxygen, pH in the range of 6.5 to 8.5, low algae, low odor and turbidity, low bacteria, low iron, and manganese, and free of contamination.

A summary of field data (temperature, dissolved oxygen, visibility, field notes, and lake elevations) can be found in Appendix A.

Bacteriology

Total coliform and E. coli MPNs are monitored routinely in the reservoir and watershed creeks as a potential indicator of pathogens in raw water delivery.

Raw Water – Intake in Use

A total of 62 bacteriological samples were collected from the raw water (intake in use) during January 2016 and December 2020. There were no water deliveries to participating agencies from 09/11/2019 through 04/20/2020 due to a significant leak in the pipeline. The average raw water total coliform was 2700 MPN/100mL and ranged from 11 to >24,000 MPN/100mL. The average raw water *E. coli* was 3 MPN/100mL and ranged from <1 to 34. Higher total coliforms were seen in the summer months (June – September) when typically, the reservoir levels are lower and temperatures higher. Overall, coliform MPNs are acceptable and do not pose a significant impact to water treatment by NWP participants.

Total coliform and *E. coli* levels are shown in the following Table 4 and graphs (See Figure 19 and Figure 20):

Table 4: Raw Water Intake in Use Coliform Summary

Date	Total Coliforms (MPN/100 mL)	*E. coli* (MPN/100mL)
Minimum	11	<1
Maximum	>24000	34
Average	2700	3
Median	370	1
Count	62	62

Figure 19: Raw Water Total Coliform MPN

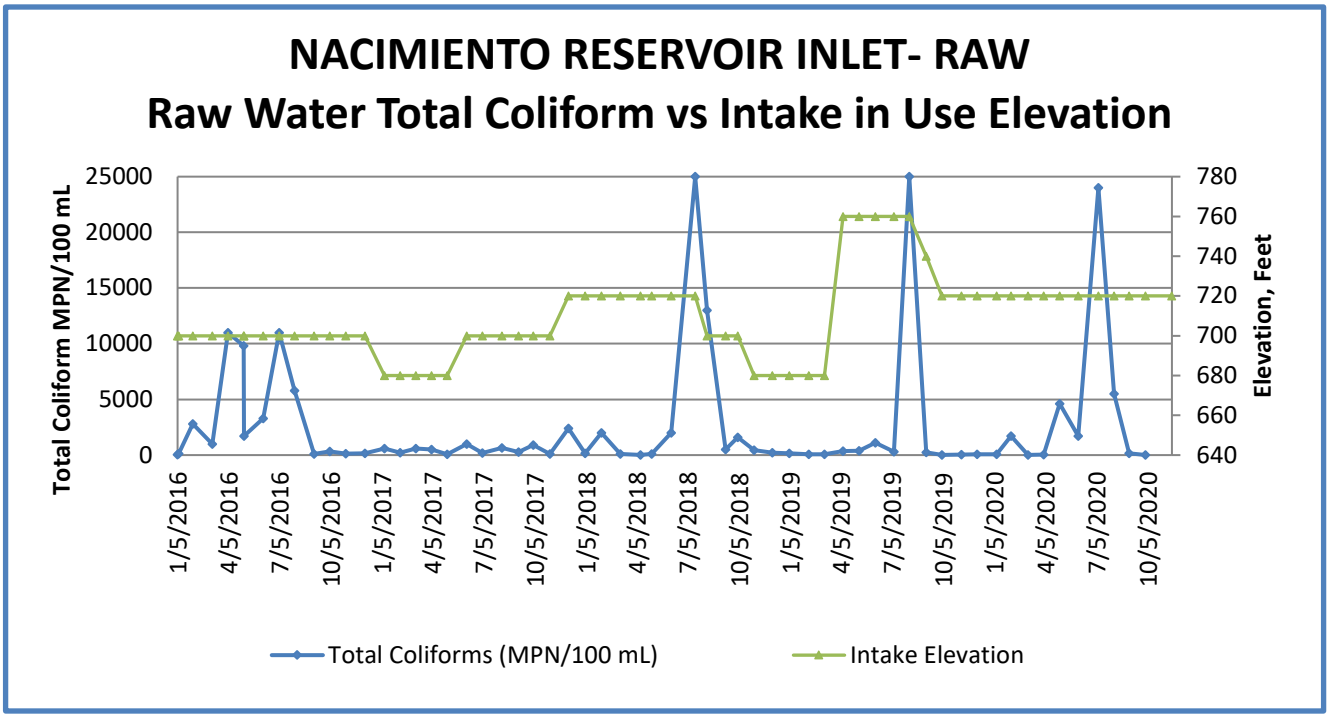
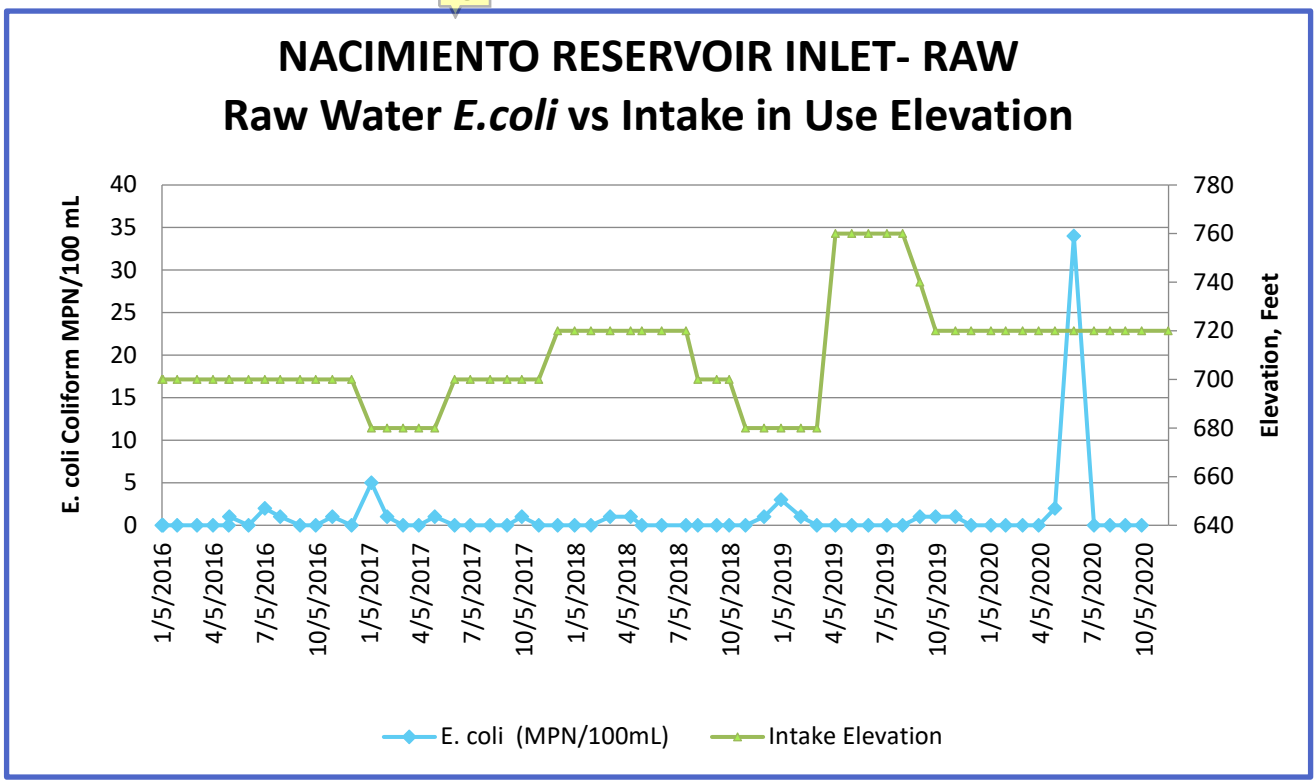


Figure 20: Raw Water E. coli MPN



Reservoir Intakes

In addition to the delivered raw water, bacteriological samples were collected once per month at the Nacimiento dam's intake structure at twenty-foot intervals. This data aids in intake selection for participating agencies. As water levels decreased, |fewer intakes were available for collection. Total coliforms vary greatly in individual intakes and throughout the months. Corresponding *E. coli* values are low. Total coliforms ranged from 3 MPN/100mL to greater than 24,000 MPN/100mL. *E. coli* throughout the intake profile ranged from less than 1 to 34 MPN/100mL.

See Table 5 below for a summary of bacteriological data for the reservoir intakes. All intake bacteriological data collected can be seen in Appendix B: Bacteriological Data.

Table 5: Reservoir Intakes (Bacteriological Data Summary 2015 – 2020)

NACIMIENTO PROJECT	Calculation	Total Coliform MPN/100mL	E. coli MPN/100mL
Elevation 780'	Minimum	21	<1
	Maximum	11000	1
	Median	390	<1
	Average	3800	<1
	Count	3	3
Elevation 760'	Minimum	40	<1
	Maximum	2400	9
	Median	570	3
	Average	900	4
	Count	4	4
Elevation 740'	Minimum	27	<1
	Maximum	3900	10
	Median	540	<1
	Average	1000	3
	Count	6	6
Elevation 720'	Minimum	24	<1
	Maximum	>24000	34
	Median	400	<1
	Average	2100	<1
	Count	55	55
Elevation 700'	Minimum	3	<1
	Maximum	3900	6
	Median	400	<1
	Average	960	1
	Count	15	16
Elevation 680'	Minimum	3	<1
	Maximum	3900	3
	Median	420	<1
	Average	1200	1
	Count	15	16
Elevation 660'	Minimum	3	<1
	Maximum	3900	4
	Median	500	<1
	Average	1700	1
	Count	15	16

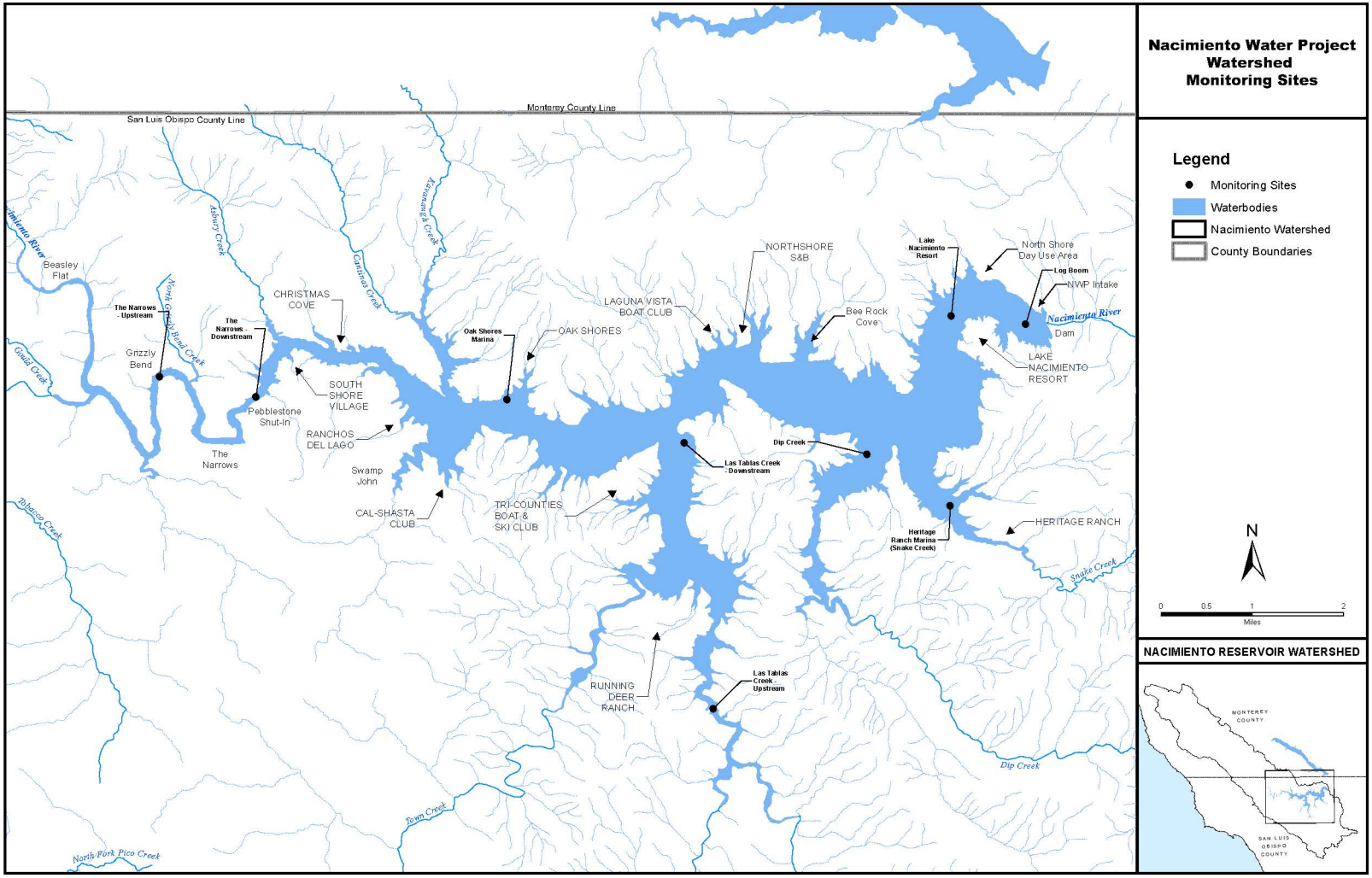
Creeks and Tributaries

To evaluate the source(s) of any bacteriological contamination to the reservoir, samples were collected from various creek tributaries and locations throughout the watershed area in the last Watershed Update (2011 – 2015). None of these locations exhibited a significant contribution to the reservoir and routine monitoring ceased for the 2016 – 2020 Watershed Update.

Raw Water Distribution

Bacteriological samples were collected in the last Watershed Sanitary Survey Update (2011 – 2015) from raw water tanks and distribution sites to ensure no additional coliform growth was occurring down the delivery system line. The results showed a minimal change to water quality down the delivery distribution. This collection ceased after evaluating the cost-benefit of this monitoring. There is no data from the raw water tanks or distribution pipeline for this 2015 – 2020 Update.

Figure 21: Nacimiento Reservoir Tributaries and Park Location



Cryptosporidium and Giardia

The Surface Water Treatment Rule (SWTR) was implemented in June,1989 to reduce illnesses caused by pathogens in drinking water. The disease-causing pathogens include *Legionella*, *Giardia lamblia, and Cryptosporidium*.

The SWTR requires water systems to filter and disinfect surface water sources. Some water systems are allowed to use disinfection only for surface water sources that meet the criteria for water quality and watershed protection.

The Nacimiento Project began initial (round 1) Long Term 2 Enhanced Surface Water Treatment Rule (LT2) monitoring in January 2014. In June 2014, the NWP ceased deliveries to project participants due to a significant pipeline leak; consequently, LT2 sampling was discontinued at that time as well. Leak investigation and repair efforts took several months, and the pipeline was not returned to service until April 3, 2015. This lengthy break in service negated the previous LT2 monitoring that was done and necessitated starting the sample collection cycle over again.

In the original 2014 sampling, no *Giardia* or *Cryptosporidium* was detected. See Table 6: LT2-ESWTR Monitoring (2014 - 2015)

Table 6: LT2-ESWTR Monitoring (2014 - 2015)

Collected Date	Cryptosporidium	Giardia	Total Coliform	E. coli	Intake Elevation
	Oocyst/L	Cysts/L	MPN/100mL	MPN/100mL	feet
01/06/2014	ND	ND	17	<1	700
02/03/2014	ND	ND	26	<1	700
03/03/2014	ND	ND	140	<1	700
04/02/2014	ND	ND	650	5	700
05/05/2014	ND	ND	61	<1	700
06/02/2014	ND	ND	43	<1	700
Minimum	ND	ND	17	<1	***
Maximum	ND	ND	650	5	***
Average	ND	ND	160	<1	***
Count	6	6	6	6	6
ND =Not Detected					
No water deliveries after June 2014, due to pipeline leak. New LT2-ESWTR monitoring began May 2015.					

The Nacimiento Project began a new initial Long Term 2 Enhanced Surface Water Treatment Rule monitoring program in May 2015. The monitoring site remained the same as the 2014 sampling

event (Nacimiento Reservoir Raw - Intake in Use). The 24-month monitoring ended in April 2017. See Table 7: LT2-ESWTR Monitoring (2015 - 2017)

Table 7: LT2-ESWTR Monitoring (2015 - 2017)

Collected Date	Cryptosporidium, Oocyst/L	Giardia, Cysts/L	Total Coliform, MPN/100mL	*E. coli*, MPN/100mL	Intake Elevation, feet
05/04/2015	ND	ND	310	<1	700 & 720
06/01/2015	ND	ND	440	<1	700 & 720
07/06/2015	ND	ND	460	1	700 & 720
08/03/2015	ND	ND	2500	<1	700 & 720
09/02/2015	ND	ND	770	<1	700 & 720
10/05/2015	ND	ND	16000	2	700 & 720
11/02/2015	ND	ND	1700	<1	700 & 720
12/01/2015	ND	ND	56	1	700
01/06/2016	ND	ND	55	<1	700
02/03/2016	ND	ND	140	<1	700
03/03/2016	ND	ND	2800	<1	700
04/02/2016	ND	ND	980	<1	700
05/03/2016	ND	ND	9800	<1	700
06/06/2016	ND	ND	1700	1	700
07/05/2016	ND	ND	3300	<1	700
08/01/2016	ND	ND	11000	2	700
09/05/2016	ND	ND	5800	1	700
10/03/2016	ND	ND	100	<1	700
11/01/2016	ND	ND	340	<1	700
12/05/2016	ND	ND	140	1	700
01/09/2017	ND	ND	160	<1	700
02/06/2017	ND	ND	580	5	680
03/06/2017	ND	ND	210	1	680
04/03/2017	ND	ND	580	<1	680
Minimum	ND	ND	55	<1	***
Maximum	ND	ND	16000	5	***
Average	ND	ND	2500	<1	***
Count	24	24	24	24	24
New LT2-ESWTR monitoring began May 2015. ND – Not Detected					

Nutrients

Contributions of nutrients in watersheds can be caused from a variety of sources and environmental circumstances. These include:

- domestic animal grazing
- agricultural cropland (especially viticulture)
- agricultural fertilizer (pesticides/herbicides)
- wastewater collection, treatment, and disposal
- urban runoff
- wild animals
- mine runoff
- hazardous materials storage
- recreational use
- unauthorized activity
- traffic accidents and spills
- geological events (earthquakes, landslides, mudslides)
- fires
- temperature
- runoff of nutrient-rich soil
- drought conditions

The growth of macrophytes (aquatic plants) and phytoplankton (algae) can be stimulated by nutrients like phosphorus and nitrogen. Nutrient-stimulated primary production is more often seen in lakes and estuaries. Man-made nutrient sources of nitrates and phosphorus (generally in the form of orthophosphate) are typically chemical fertilizers. Another potential source is domesticated animals kept close to creeks. These nutrients are soluble. When in abundance phosphorus and nitrogen can lead to over-fertilization of the lake. This will promote the growth of aquatic plants, which may deplete the oxygen from the water that many native species need to survive. The appearance of blue-green algal blooms is a good indication that the nutrient levels in the watershed have increased. Nitrogen and phosphorus levels are monitored in the reservoir's epilimnion, hypolimnion, and the raw water intake to determine nutrient loading on the Nacimiento Reservoir.

To maintain a healthy water system and to minimize algal growth, the EPA recommends that phosphate levels be below 0.10 mg/L and nitrate levels below 10 mg/L. Monitoring results of nutrient levels in the Nacimiento Reservoir are far below any human health concerns or EPA recommendations. The highest value for total nitrogen was seen in the Reservoir Inlet – Raw (0.58 mg/L). The highest value for total phosphorus was also at Reservoir Inlet – Raw (0.06 mg/L).

A summary of nutrients found in the Nacimiento Reservoir in 2016- 2020 can be found below Table 8: Nutrient Data Summary.

All Nutrient Data can be found in Appendix F: Nutrient Data.

Table 8: Nutrient Data Summary

Sample Location	Units	Ammonia	Nitrite as N	Nitrate as N	SUVA	Total Kjeldahl Nitrogen	Total Nitrogen	Total Phosphate as P
	Units	**mg/L**	**mg/L**	**mg/L**	**L/mg-m**	**mg/L**	**mg/L**	**mg/L**
	MCL	**—**	**1**	**10**	**—**	**—**	**—**	**—**
	DLR	**0.015**	**0.1**	**0.1**	**—**	**0.2**	**0.2**	**0.01**
Epilimnion	**Minimum**	ND	ND	ND	2.2	ND	ND	0.01
	Maximum	0.021	ND	0.48	3.4	ND	ND	0.05
	Median	ND	ND	ND	2.7	ND	ND	0.02
	Average	ND	ND	ND	2.8	ND	ND	0.02
	Count	8	19	19	11	6	6	8
Hypolimnion	**Minimum**	ND	ND	ND	1.9	ND	ND	0.01
	Maximum	0.139	ND	0.54	4.1	ND	ND	0.05
	Median	ND	ND	0.16	2.9	ND	ND	0.02
	Average	0.022	ND	0.19	2.9	ND	ND	0.02
	Count	8	19	19	11	6	6	8
Nacimiento Reservoir Inlet - Raw	**Minimum**	ND	ND	ND	2.0	ND	ND	0.01
	Maximum	ND	ND	0.54	4.2	0.58	0.58	0.06
	Median	ND	ND	0.17	2.2	0.26	0.26	0.02
	Average	ND	ND	0.19	2.7	0.26	0.26	0.03
	Count	8	22	22	4	5	5	8
	***ND = Not Detected**							

Algae

Drinking water limits

Algae is not regulated in drinking water systems. However, many constituents that derive from the presence of algae in source water are regulated, including TOC, odor, color, and turbidity. Additionally, certain algal toxins are under consideration for regulation.

Higher levels of algae may lead to higher levels of these constituents, as well as causing other deleterious effects on drinking water. Algae type, quantity, and behavior can each affect the level of concern. Typically, algae counts under 5000 Cells/mL are not problematic.

Algae Concerns

Algae are aquatic plants. Phytoplankton are microscopic algae which float freely in water. Other algae are macroscopic and may attach to surfaces. Algae can cause a multitude of problems in both surface water treatment plants and drinking water distribution. For instance, *Ceratium* (a common flagellated algae) can be a source of taste and odor problems. *Ceratium* is also known to be a significant filter clogger for surface water treatment plants. In the drinking water industry, discussions of algal-related problems typically include two groups of bacteria, cyanobacteria

and actinomycetes, along with true algae. Cyanobacteria are often referred to as blue-green algae. Under certain conditions algae growth may proliferate, resulting in an algal bloom.

Infrastructure Concerns

Algae are a significant concern in source water because of their impact on intakes, on surface water treatment processes, and on groundwater recharge ponds. Algae may clog the screens on intake portals, preventing or slowing the pumping of water from the reservoir to water purveyors and stressing intake pumps. In surface water treatment plants, algae can have the following effects (Plummer):

- affect treatment chemical effectiveness (coagulants and flocculant aids), resulting in a compromised treatment process
- increase chemical demand (coagulants and disinfectants),
- increase sludge production
- clog filters, resulting in plant shutdowns
- penetrate filters, resulting in shortened filter runs and increased filter backwashing
- breakthrough filters and pass into the distribution system, resulting in regrowth, slime accumulation, and loss of disinfectant residual.

In groundwater recharge ponds, algae can accumulate at the soil-water interface and under certain conditions may grow in the recharge pond, resulting in reduced recharge rates.

Drinking Water Health and Acceptance Concerns

Algae are a significant concern for finished drinking water because of health risks and consumer acceptance issues. In finished drinking water, algae may cause:

- presence of algal toxins such as neurotoxins, hepatotoxins, and dermatoxins
- formation of disinfection by-products
- unacceptable taste and odor

There are many different algae, which can have many different effects in water. Within each genus there are many species of concern. Some selected algal genera of concern are shown in Table 9 below.

Table 9: Selected Algal Genera and Water Quality Issues[6]

Algal Genus	Water Quality Issues				
	Taste&Odor	Filter-&screen clogger	Dermatoxin	Hepatotoxin	Neurotoxin
Blue-Greens (cyanobacteria)					
Anabaena	x	x	x	x	x
Anabaenopsis			x	x	
Aphanizomenon	x		x	x	x
Cylindrospermopsis			x	x	x
Lyngbya (Plectonema)	x		x	x	x
Microcystis			x	x	x
Oscillatoria	x		x	x	x
Diatoms					
Asterionella	x	x			
Cymbella		x			
Fragilaria		x			
Navicula		x			
Synedra	x	x			
Tabellaria	x	x			
Flagellates					
Ceratium	x	x			
Greens					
Chlorella		x			
Dinobryon	x	x			
Pandorina	x				
Spirogyra		x			
Staurastrum	x				
Trachelomonas		x			

6 Standard Methods of the Examination of Water and Wastewater, 19th edition
https://www.nalms.org/getting-to-know-cyanobacteria-the-basics-blooms-toxins-and-taxa-text/

Algal Toxins

Cyanotoxins are toxins produced by bacteria called cyanobacteria (also known as blue-green algae). Cyanobacteria, other freshwater algae, and their toxins are on the EPA's Contaminant Candidate List. Cyanobacteria are found almost everywhere, but particularly in lakes and in the ocean where, under high concentration of phosphorus conditions, they reproduce exponentially to form blooms. Blooming cyanobacteria can produce cyanotoxins in such concentrations that they poison and even kill animals and humans. Cyanotoxins can also accumulate in other animals such as fish and shellfish, and cause poisonings such as shellfish poisoning.

Cyanotoxins are some of the most powerful natural poisons known, including poisons that can cause rapid death by respiratory failure. The toxins include potent neurotoxins, hepatotoxins, cytotoxins, and endotoxins. symptoms or pruritic skin rashes. Algae that have been known to produce algal toxins have been found at County Reservoirs during warmer times of the year. The most common bloom-forming blue-green algae is *Microcystis*. It produces the cyanotoxin, Microcystin. *Microcystis* blooms resemble a greenish, thick, paint-like (sometimes granular) material that accumulates along shores (See Figure 22). Cylindrospermopsin is an alkaloid cyanotoxin produced by several freshwater genera, including *Cylindrospermopsis, Aphanizomenon, Anabaena, and Lyngbya.*

Figure 22: Example of Blue-Green Algal Bloom

Algal Toxin Monitoring

The County monitors algae levels from the raw water intakes monthly. In 2018, the lab acquired algal toxin screens and ELISA (Enzyme-linked immunosorbent assay) testing equipment. When blue-green algae counts exceed 2000 cells/mL, samples are tested on Test Strip Kits to determine a presence of algal toxins. If the test determines algal toxins are present, the County utilizes ELISA to identify the concentration of cyanobacteria cells and cyanotoxins in water. Additionally, if algal toxins are detected, the County will send samples to a certified Lab for confirmation. In 2020, Nacimiento Reservoir had high blue-green algae counts in August and October at or above 2000 cells/mL. Algal toxin screens were performed for the Inlet – Raw site in August because that would be the delivered water for the customers. In October, algal toxin screens were performed on Intake 720 which was also the intake in use for the Inlet -Raw site. No cyanotoxins were detected in either screen (see Table 10). All other blue-green algae counts were below the 2000 cells/mL.

Table 10: Potential Harmful Algae Bloom - Data Summary

Nacimiento Reservoir	Location	Blue-green Algae	Total Algae	Cylindrospermopsin Screen	Microcystin Screen
Collected Date		(Cells/mL)	(Cells/mL)	ng/L	ng/L
1/17/2017	Intake 2 (680')	3000	3400	—	—
8/1/2017	Intake 6 (760')	3500	3800	—	—
8/9/2018	Intake 4 (720')	2200	2300	—	—
8/6/2020	Inlet - Raw	800	890	< 0.5	< 0.5
8/6/2020	Intake 1 (660')	2000	2000	—	—
10/1/2020	Inlet - Raw	560	720	—	—
10/1/2020	Intake 4 (720')	3600	3900	< 0.5	< 0.5

HABs and Advisory Signage

San Luis Obispo County is not authorized to treat for algal blooms in the Nacimiento Reservoir. In SLO County managed reservoirs, the County is permitted to treat algae using copper sulfate and/or a non-copper algaecide before it becomes a problem. The California Water Quality Control Board regulates aquatic pesticide applications under a general NPDES permit. This permit regulates the frequency, application amount, and aquatic pesticide used for algae treatment.

On September 3, 2020, staff were informed of an unexplained death of a dog that had been playing in the reservoir near Oak Shores. To protect the public, additional samples were collected for cyanotoxins. Based on preliminary lab results (no Cyanotoxins were detected) and visual observations (no floating algal masses, no water “green” or “blue-green” in color), it was concluded that there was not a Harmful Algae Bloom (HAB) occurring.

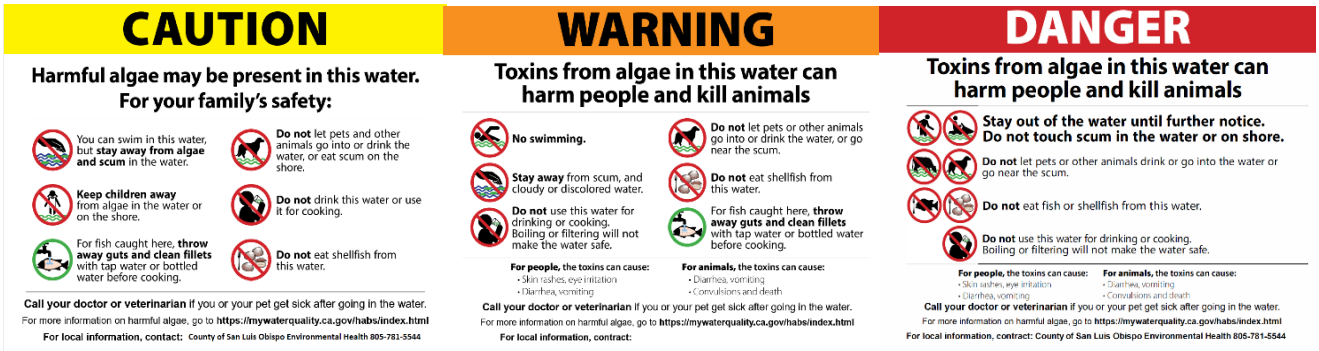
Harmful algae bloom general information and Caution signs were posted by Monterey County Parks as precaution. The State recommends each body of water post an advisory level, CAUTION,

WARNING, or DANGER, when HAB or confirmation testing trigger a notice. See sample signs in Figure 23 and Figure 24.

A follow-up sample was collected for cyanotoxin screening in October 2020, from the Intake in use (Intake #4 – 720'). No cyanotoxins were detected (See Table 10).

Figure 23: General Information Algal Toxin Signage

Figure 24: Warning Level Signage for Algal Toxins



Monitoring Conducted

Approximately 370 samples have been analyzed for algae over the span of this five-year survey. Samples were collected monthly from the reservoir intake structure at twenty-foot intervals. Additional algae samples were collected from various creeks and recreational areas throughout the watershed to identify the source of any noted algae.

In 2017, the SLO County Laboratory began using a flow imaging cytometer and particle analyzer to classify and count algae at Nacimiento Lake and other County monitored reservoirs. Enumeration of algae has helped with early detection of HABs. By knowing how much blue-green algae are in a sample we can determine the HAB risk factor by performing an algal toxin screen.

Total algae counts at the Nacimiento Intake structure range from not detected to 11,000 cells/mL. The average value is 250 cells/mL. Green algae range as high as 10,000 cells/mL, blue greens were as high as 4,000 cells/mL, and diatoms 3,400 cells/mL.

Algae are found throughout the water column year-round. In summer months higher algae levels generally occur in the upper level of the water column. Fairly uniform and significant numbers of algae have been found throughout the water column in winter months. Different algal groups have predominated on different occasions.

See summary of intake data below (Table 11). See all data collected in Appendix C: Algae Data.

Table 11: Algae Count Data Summary

	Algae - Total Count (number/mL)	Blue-greens (number/mL)	Cryptomonads (number/mL)	Diatoms (number/mL)	Dinoflagellates (number/mL)	Flagellates (number/mL)	Goldens (number/mL)	Greens (number/mL)
Intake #1- Elevation 660'								
Minimum	0	0	0	0	0	0	0	0
Maximum	140000	2000	110	200	25	63	13	140000
Average	2411	55	6	16	1	2	0	2333
Median	52	0	0	0	0	0	0	13
n	63	63	63	63	63	63	63	63
Intake #2- Elevation 680'								
Minimum	0	0	0	0	0	0	0	0
Maximum	3800	3000	470	870	43	130	13	2800
Average	281	100	15	28	3	4	0	128
Median	61	0	1	0	0	0	0	16
n	63	63	63	63	63	63	63	63
Intake #3- Elevation 700'								
Minimum	0	0	0	0	0	0	0	0
Maximum	3600	1500	81	350	73	160	75	3500

	Algae - Total Count (number/mL)	Blue-greens (number/mL)	Cryptomonads (number/mL)	Diatoms (number/mL)	Dinoflagellates (number/mL)	Flagellates (number/mL)	Goldens (number/mL)	Greens (number/mL)
Average	308	81	13	30	3	8	4	169
Median	110	0	5	2	0	0	0	31
n	62	62	62	62	62	62	62	62
Intake #4 - Elevation 720'								
Minimum	0	0	0	0	0	0	0	0
Maximum	3900	3600	200	904	55	130	240	2400
Average	513	186	17	59	4	10	9	221
Median	170	0	6	3	0	0	0	28
n	54	54	54	54	54	54	54	54
Intake #5 - Elevation 740'								
Minimum	0	0	0	0	0	0	0	0
Maximum	4000	960	160	3500	130	35	120	1100
Average	376	73	18	141	6	2	9	128
Median	150	0	6	11	0	0	0	40
n	39	39	39	39	39	39	39	39
Intake #6 - Elevation 760'								
Minimum	10	0	0	0	0	0	0	0
Maximum	3800	3500	170	1300	120	23	13	1400
Average	617	237	21	125	9	1	1	222
Median	250	0	6	9	0	0	0	80
n	23	23	23	23	23	23	23	23
Intake #7 - Elevation 780'								
Minimum	77	0	0	0	0	0	0	0
Maximum	1600	480	380	930	17	0	120	400
Average	490	60	102	208	5	0	13	95
Median	400	0	41	67	3	0	0	57
n	9	9	9	9	9	9	9	9

More information on Harmful Algae Blooms:

The State has an interactive map showing which sites were tested for HABs. To get to the map please use the following link:

https://mywaterquality.ca.gov/habs/where/freshwater_events.html

During the summer months approximately 75% of the lakes and rivers are associated with a recommended advisory. For more information on HABs , please visit the link below:

https://mywaterquality.ca.gov/habs/resources/faqs_for_hab_signs.html

Title 22 Metals

Metals occur naturally in the earth's crust. Some human activities, such as mining, can increase the amount of metals released from the earth into the environment. High levels of some metals may also enter surface water with runoff from urban areas and with runoff from burned areas following a wildfire. Some metals that enter source water can be a concern because of their effect on treatment processes. Some metals that reach the finished drinking water can be a concern because of potential health risks or aesthetic concerns.

Iron and Manganese

Drinking water limits

Iron Secondary MCL = 300 µg/L

Manganese Secondary MCL = 50 µg/L

Iron and manganese are two very abundant metals of significant concern. In source water, they are a concern because they can increase oxidant demand in the treatment process. If they are present in the reduced form in raw source water, they may oxidize in Ground Water Recharge Recovery system recharge ponds, forming fine suspended solids that may be filtered out and accumulate in the soil, thereby reducing injection capacity and decreasing soil permeability. (Carollo Engineers)

In finished drinking water iron and manganese can cause undesirable color and can stain clothes and plumbing fixtures. In both source water and finished water, iron and manganese can promote the growth of iron bacteria in the pipeline. Iron bacteria can cause corrosion in the pipeline and can also produce undesirable tastes and odors in finished water.

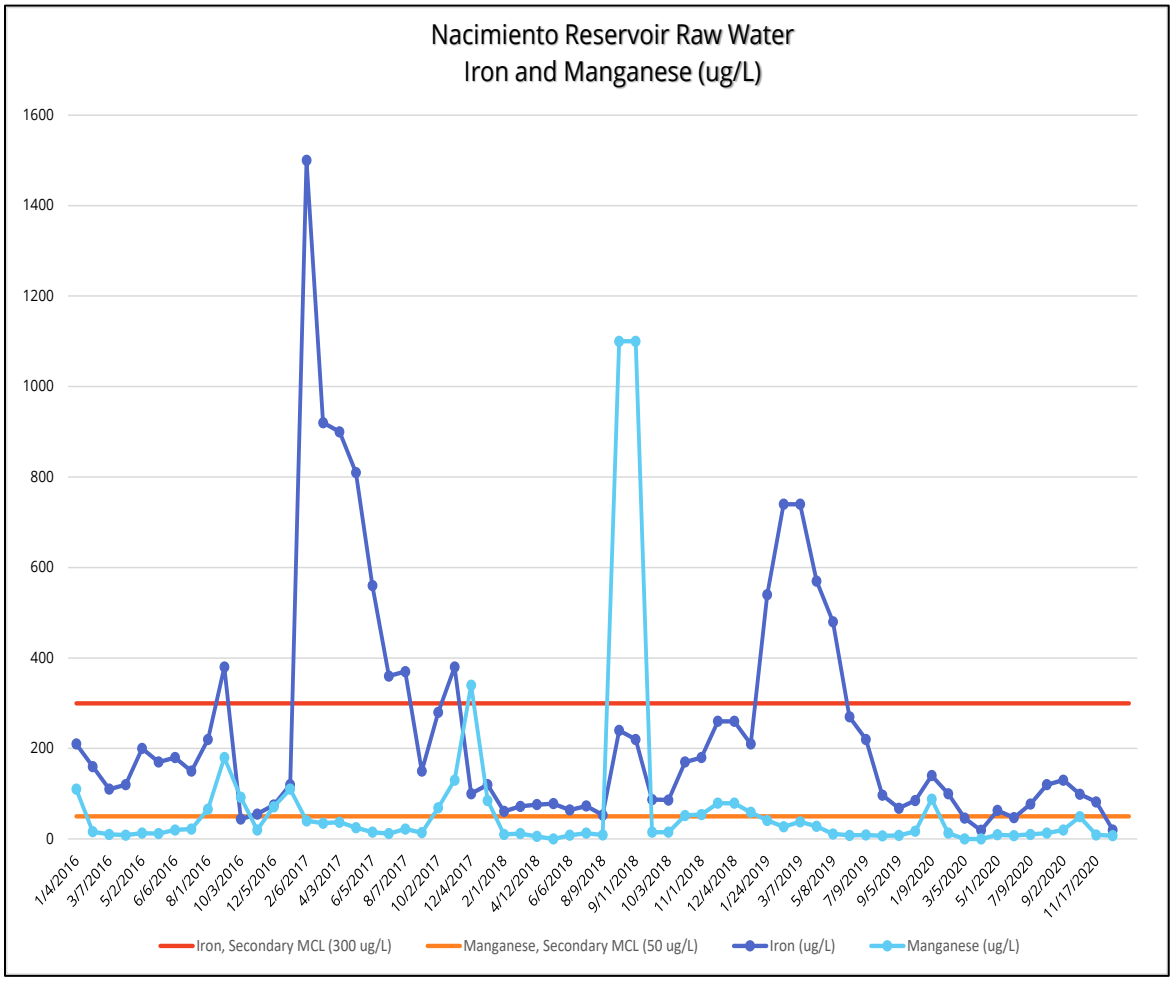
Over 300 samples have been collected and analyzed for iron (Fe) and manganese (Mn) during this Nacimiento 5-year update. Samples have been collected from the raw water intake in use, at the reservoir's intake structure at 10-foot intervals, and at various creeks in the watershed.

Both iron and manganese are found throughout the water column. Values vary widely, ranging from Not Detected to 3000 µg/L for iron. Manganese ranged from Not Detected to 1100 ug/L. Higher manganese values were seen in the lower elevations, below the thermocline (hypolimnion). Iron values vary all through the water column. Higher values for both iron and manganese occur more frequently in the cooler winter months.

In the raw water "Intake in Use", iron ranged from 19 to 1500 ug/L with an average value of 250 ug/L (See Figure 25). Manganese ranged from Not Detected to 1100 ug/L with an average value of 56 ug/L. The average results for both iron and manganese were above the secondary MCLs for drinking water. These metals are both easily oxidized and will most likely not present an issue for water treatment at the levels detected in the raw water. (See Summary of iron and manganese

in Table 12 and all iron and manganese data in Appendix E: Raw Water (Intake in Use): Aluminum, Iron, Manganese, Mercury Data.

Figure 25: Nacimiento Raw Water Iron and Manganese



Aluminum

Drinking water limits

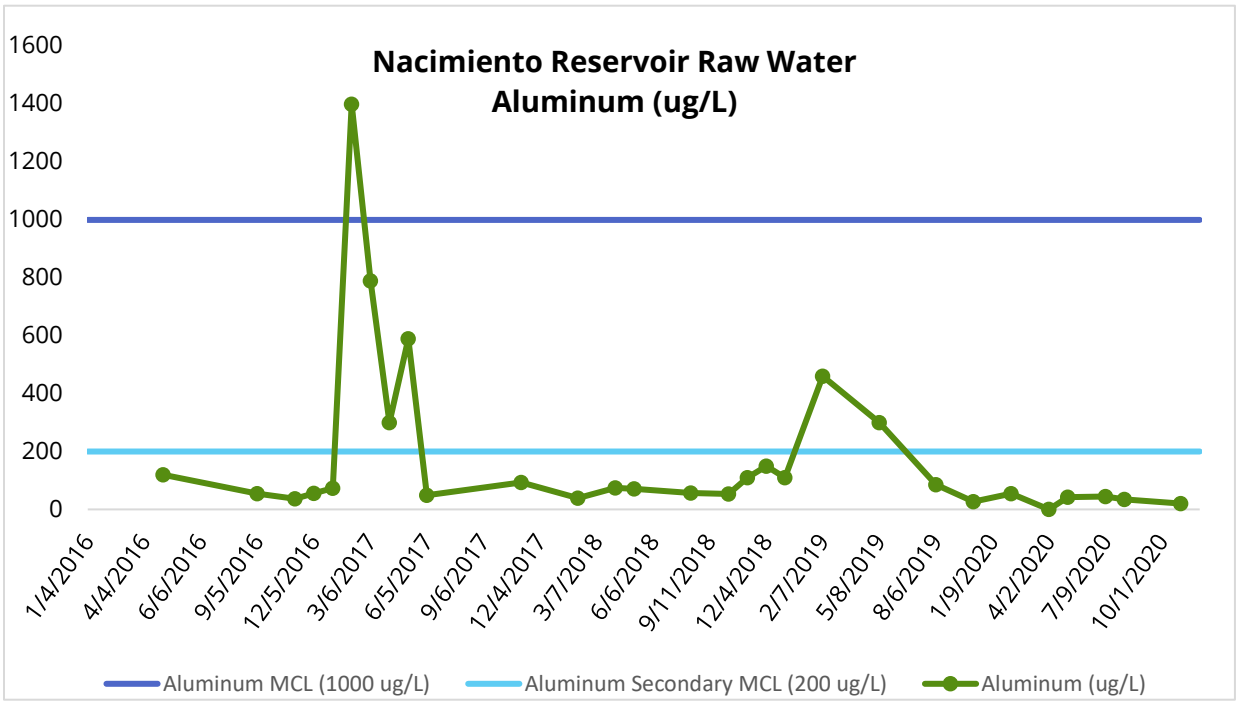
Primary MCL 1,000 µg/L

Secondary MCL 200 µg/L

Aluminum is the most abundant metal in the earth's crust. Aluminum may be a concern in the finished water because of associated health risks and due to aesthetic concerns. From a health risk standpoint, aluminum is a neurotoxin, and it has also been associated with Alzheimer's disease and other dementia related disease, although a causal link has not been established. (California EPA, Office of Environmental Health Hazard Assessment) From an aesthetic standpoint, excess aluminum in drinking water may cause unacceptable color. (USEPA)

Over 160 samples were collected for aluminum from 2016 thru 2020. Samples were collected from the intake depths in the upper and lower levels of the water column as well as the raw water intake in use. Aluminum is found throughout the water column. Results vary widely, ranging from not detected to 1400 µg/L in the raw water intake. Samples are collected quarterly and have in general shown higher levels in the winter months and at lower depths. However, high values were seen at various times and elevations throughout the year. (See Figure 26 and Appendix E: Raw Water (Intake in Use): Aluminum, Iron, Manganese, Mercury Data.

Figure 26: Nacimiento Raw Water Aluminum



Mercury

Drinking water limits

Mercury Primary MCL = 2 µg/L

There are many historical mercury mines in the Nacimiento Reservoir watershed. Consequently, mercury far above normal background levels have been released to the environment of the watershed. Natural processes convert the mercury to methylmercury. Methylmercury accumulates in the food chain resulting in mercury levels in some Nacimiento Reservoir fish to pose a significant health risk. (See section on Klau and Buena Vista Mercury Mines)

For the Nacimiento Water Project, mercury can be a concern in the source water because of its potential to reach consumers in the finished drinking water. In the source water, mercury would most likely be associated with suspended particles or with dissolved organic carbon. The actual risk to consumers is negligible, as the amount of mercury in the water column should be extremely

low, and any small amount that might be present should be removed by a properly functioning water treatment plant or groundwater recharge system. In the scientific literature extensive documentation of health effects from other exposure pathways can be found (fish consumption, vapors, etc.), but not a single instance of health effects from drinking water is documented. Nonetheless, these distinctions may not be known to consumers, or if known may not be fully grasped. Therefore, mercury is primarily a concern from the standpoint of public perception and consumer assurance.

During this 5-year survey update, 31 samples were collected at various locations on the reservoir and from the raw water intake in use. All samples had no detection of mercury (Table 12 and Appendix E: Title 22 Metals Data).

Table 12: Summary of Metals of Interest (Aluminum, Iron, Manganese, Mercury)

Collected Date	Aluminum	Iron	Manganese	Mercury
Units	ug/L	ug/L	ug/L	ug/L
MCL/MCL-2*	1000/200*	300*	50*	2
DLR:	50	100	20	1
Minimum	ND	19	ND	ND
Maximum	1400	1500	1100	ND
Average	180	250	56	ND
Median	71	120	17	ND
# of Samples	29	60	60	31
MCL = Maximum Contaminant Level		DLR = Detection Limit for Reporting Purposes		
***MCL-2 = Secondary Contaminant Level**		ND = Not Detected		

Trace Metals/Inorganics

Other metals are typically found in small (trace) amounts in water and therefore are often called “trace metals”. Regulated trace metals in drinking water include antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium, and thallium. Some trace metals are a concern in finished drinking water because they may pose health risks to consumers. The most well-known health risks are those posed by long term exposure to these metals, and many drinking water regulations are based on this kind of exposure. In recent years studies have shown that many metals can accumulate in deposits in finished drinking water distribution system pipes and may pose a health risk if they are released from the piping in large quantities at various intervals. See additional trace metals data in Appendix E.

Asbestos is required when a system’s Aggressive Index (AI) exceeds 11.5. From 2015 thru 2020, 23 AI were analyzed with an average of 11.2 and a range of 10.4 – 12.5. Asbestos was last sampled in May 2019. No asbestos was detected (<0.2 MFL). Asbestos is required every 9 years.

Samples for Physical analyses were collected monthly from the available reservoir intake levels.

General Physical

Odor

Drinking water limits

Secondary MCL 3.0 TON

Objectionable tastes and odors in domestic water supplies are often related to the occurrence of low oxygen levels and/or algal blooms. A frequent cause of musty, earthy odors, especially toward the end of the summer, is naturally occurring organic compounds derived from the decay of plant material in reservoirs. One of these compounds, known as MIB (2-methylisoborneal), has been detected in San Luis Obispo County reservoirs.

When reservoirs stratify, the lower hypolimnion becomes oxygen poor. This results in the formation of hydrogen sulfide gas giving off an objectionable rotten egg smell. Although unusual odor and taste can be objectionable, in general they are not harmful to health.

During the five years of this update, odors at the reservoir intake ranged from "Not detected" (ND) to 100 TON. Odors in the intake water were described mainly as:

- Balsamic
- Chemical
- Earthy
- Fishy
- Grassy
- Hydrogen sulfide
- Musty
- Woody

The majority of the odor samples were described as "musty" and/or "fishy" and ranged from ND to 100 TON. At times, the 680' and 660' elevation intakes had hydrogen sulfide odors that could be detected at levels as high as 100 TON when these lower intakes were oxygen deficient. Comparatively, the Nacimiento Reservoir has overall lower odors in the epilimnion than other reservoirs in San Luis Obispo County.

See data summary below for the Intake-In-Use and Reservoir Intakes in Table 13.

For all the Odor data collected, view Appendix D: Water Quality - General Physical Data.

Table 13: Summary of Physical Data Raw Water Intake in Use

Collected Date	Odor – Threshold, TON*	Turbidity, NTU*	Apparent Color, PCU*	True Color, PCU
MCL	**3.0**	**5.0**	**—**	**—**
DLR	**1.0**	**0.10**	**—**	**—**
Intake in Use				
Minimum	1.0	0.60	5.0	3
Maximum	100	45	34	20
Average	6.0	7.7	15	7
Median	3.0	3.6	13	6
Count	29	40	28	22
Intake #7 - Elevation 780'				

Collected Date	Odor – Threshold, TON*	Turbidity, NTU*	Apparent Color, PCU*	True Color, PCU
MCL	**3.0**	**5.0**	**—**	**—**
DLR	**1.0**	**0.10**	**—**	**—**
Minimum	1.7	2.1	10	6
Maximum	3.5	17	34	9
Average	2.6	6.5	18	8
Median	2.5	3.5	15	8
Count	4	4	4	4
Intake #6 - Elevation 760'				
Minimum	1.0	0.62	6	4
Maximum	7.0	38	58	10
Average	2.6	7.3	17	8
Median	2.5	2.6	10	8
Count	13	13	13	8
Intake #5 – Elevation 740’				
Minimum	1.0	0.64	4	4
Maximum	4.0	35	51	13
Average	2.1	5.9	17	8
Median	2.2	2.0	12	8
Count	18	20	19	13
Intake #4 - Elevation 720'				
Minimum	1.0	0.90	4	5
Maximum	4.0	91	100	14
Average	1.8	9.1	19	9
Median	1.7	2.7	12	8
Count	25	25	22	17
Intake #3 - Elevation 700'				
Minimum	1.0	1.16	4	4
Maximum	4	28	48	12
Average	2.0	6.4	16	7
Median	1.5	4.4	11	7
Count	31	31	27	23
Intake #2 - Elevation 680'				
Minimum	1.0	1.3	6	3
Maximum	4	28	39	10
Average	2.0	7.0	17	7
Median	1.9	5.6	14	7
Count	32	32	28	29
Intake #1 - Elevation 660'				
Minimum	1.0	1.3	8	4
Maximum	7	37	54	11
Average	2.3	7.3	17	7
Median	2.0	6.0	16	7
Count	31	32	28	29
***Indicates a Secondary Maximum Contaminant Level for Drinking Water**				

Turbidity

Drinking water limits

- Primary MCL: Treatment technique:
    - Conventional or direct filtration systems:
        - At no time can turbidity exceed 1 NTU
        - Samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month
    - Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- MCLG: Not established

Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites, and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.

Over 200 samples have been analyzed for turbidity throughout the Nacimiento Reservoir and Watershed during this 5-year update. The majority of these were collected at the dam intake structure at the various intake depths. Turbidity is found throughout the water column. Values vary widely, ranging from 0.62 to 91 NTU. Somewhat higher turbidity levels are seen in the lower levels of the water column than the upper level.

Turbidity appears to increase rapidly in the late fall and winter, then decrease slowly throughout spring and summer. The rapid increase in turbidity in late fall and winter is likely associated with runoff from rain events.

See data summary of turbidity for the Intake-In-Use and Reservoir Intakes (See Table 13).

For all the turbidity data collected, view Appendix E: Physical Data.

Water Quality – Chemical Monitoring

Synthetic Organic Carbons and Volatile Organic Compounds

Synthetic organic chemicals (SOCs) and Volatile organic chemicals (VOCs) in surface water result from the manufacture, use, and disposal of pesticides (herbicides, fungicides, insecticides, bactericides, rodenticides), petroleum products (gasoline, fuel oil, solvents), and other chemical products, including Styrofoam, plastics, cleaning compounds, paints, and fire retardants. These chemicals can enter surface water sources directly (such as fuel spills and in fire-fighting operations) or can be carried into the reservoir with stormwater runoff. (USDI Bureau of Reclamation)

Synthetic organic chemicals are a concern in finished drinking water because they have health risks. They are a concern in source water because of the potential for them to reach consumers in

the finished water. SWRCB currently regulates 27 VOCs and 33 SOCs in drinking water. In the Nacimiento Reservoir watershed, VOCs and SOCs which are most likely to contaminate the water are those associated with agricultural operations (pesticides), with urban land use (pesticides and petroleum products), and with vessels (fuel).

Monitoring is required by the SWRCB for VOCs every 3 years and SOCs every 9 years. Samples are collected at the Nacimiento Reservoir raw water (intake in use). VOCs were collected in May 2016, October 2017, and April 2021. No VOCs were detected in either sampling event. The next VOC monitoring event is scheduled in June 2022 to resume the 3-year monitoring schedule. SOCs were last collected in June 2013. There were no SOCs detected. The NWP was granted a waiver from the SWRCB for monitoring most of the SOCs in the 2013 Sanitary Survey Inspection except for atrazine and simazine. The next SOC monitoring event is scheduled in June 2022.

General Minerals

General mineral chemicals are general water quality indicators. If there is a change in these indicators this may indicate industrial, agricultural, grazing, or recreational runoff issues in the watershed. Samples were collected quarterly for general mineral analysis from the raw water (intake in use). From 2016 – 2018, general minerals were collected quarterly from the current epilimnion and hypolimnion. The constituents met all drinking water MCLs.

See Table 14 (below) for general mineral data summary. All data collected can be viewed in Appendix F: General Mineral Data.

Table 14: General Mineral Data Summary

Collected Date	Aggressive Index	Calculated Langelier Index	SUVA-C	Alkalinity, Total as CaCO3	Carbonate as CaCO3	Bicarbonate as CaCO3	Hydroxide Alkalinity as CaCO3	Chloride	Fluoride, (without predistillation)	Nitrite as Nitrogen	Nitrate as Nitrogen	Sulfate	Total Hardness as CaCO3	Calcium	Magnesium	Sodium	Total Dissolved Solids	Specific Conductance	Temperature	pH	Methylene Blue Activated Substances	Intake in Use Elevation
(units)	—	—	L/mg-M	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	umhos/cm	°C	—	mg/L	feet
MCL	—	—	—	—	—	—	—	500*	2	1	10	500*	—	—	—	—	1000*	1600*	—	—	0.5*	—
DLR	—	—	—	—	—	—	—	1.0	0.1	0.1	0.1	0.5	—	—	—	—	—	4	—	—	0.1	—
Nacimiento Reservoir - Raw Water (Intake in Use)																						
Minimum	10.4	-1.64	2.0	66	ND	66	ND	4.0	0.09	ND	ND	13	83.9	17	7.5	6.3	98	190	10.7	7.19	ND	680
Maximum	12.5	0.67	4.2	130	12	130	ND	7.9	0.24	ND	0.54	40	150	34	30	13	380	330	23.8	8.56	ND	760
Average	11.2	-0.80	2.7	93	ND	93	ND	5.2	0.13	ND	0.2	27	122	26	14	8.7	163	262	14.5	7.72	ND	706
Median	11.3	-0.80	2.3	93	ND	91	ND	5.3	0.12	ND	0.2	27	130	26	14	9.1	160	270	12.8	7.67	ND	700
Count	23	23	4	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Nacimiento Reservoir - Epilimnion																						
Minimum	10.9	-1.11	2.2	73	ND	73	ND	4.0	ND	ND	ND	19	101	22	11	6.7	110	200	11.7	7.69	ND	10
Maximum	12.7	0.93	3.4	119	17	119	ND	8.6	0.219	ND	0.34	37	154	33	18	12	200	330	25.9	8.61	ND	10
Average	11.8	-0.13	2.8	96	2	94	ND	5.7	0.142	ND	ND	26	126	27	14	8.6	151	259	18.9	8.15	ND	10
Median	11.9	-0.15	2.7	95	ND	95	ND	5.5	0.154	ND	ND	27	123	28	14	8.1	140	260	19.6	8.23	ND	10
Count	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Nacimiento Reservoir - Hypolimnion																						
Minimum	10.9	-1.25	1.9	70	ND	70	ND	4.0	ND	ND	ND	18	94	20	10	6.1	110	190	10.2	7.12	ND	60
Maximum	11.7	-0.18	4.1	126	ND	126	ND	8.0	0.249	ND	0.42	40	160	34	18	14	200	350	14.7	7.80	ND	60
Average	11.2	-0.83	2.9	93	ND	93	ND	5.4	0.132	ND	0.13	27	123	26	14	8.4	149	256	12.1	7.53	ND	60
Median	11.2	-0.82	2.9	98	ND	98	ND	5.2	0.156	ND	0.15	27	120	28	14	8.1	150	260	11.9	7.54	ND	60
Count	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11

Water Quality Monitoring Programs

Pesticide and Herbicide Use

Pesticide and herbicide use occurs throughout the watershed. Over 2,100 events of pesticide and herbicide use were registered between 2016 and 2020. Pesticide/herbicide usage is required to be reported to the County Agriculture Commissioner's Office. All registered pesticide/herbicide usage was in the Adelaida area (township 26S range 10E sections 13-17, 20-23, 25-26, 28-29, 35-36; township 26S range 11E sections 19-21, 29-30; and township 27S range 10E section 3). Of the 64,809 acres of land treated in 2016 - 2020, 97.5% of registered pesticides/herbicides were used on wine grapes. (See Table 15). A Summary of Pesticide/herbicides usage and the acreage of various commodities treated can be seen below (Table 15 and Table 16). Pesticides and herbicides registered for use throughout the entire watershed and the amounts applied in 2016 - 2020 are shown in Appendix G.

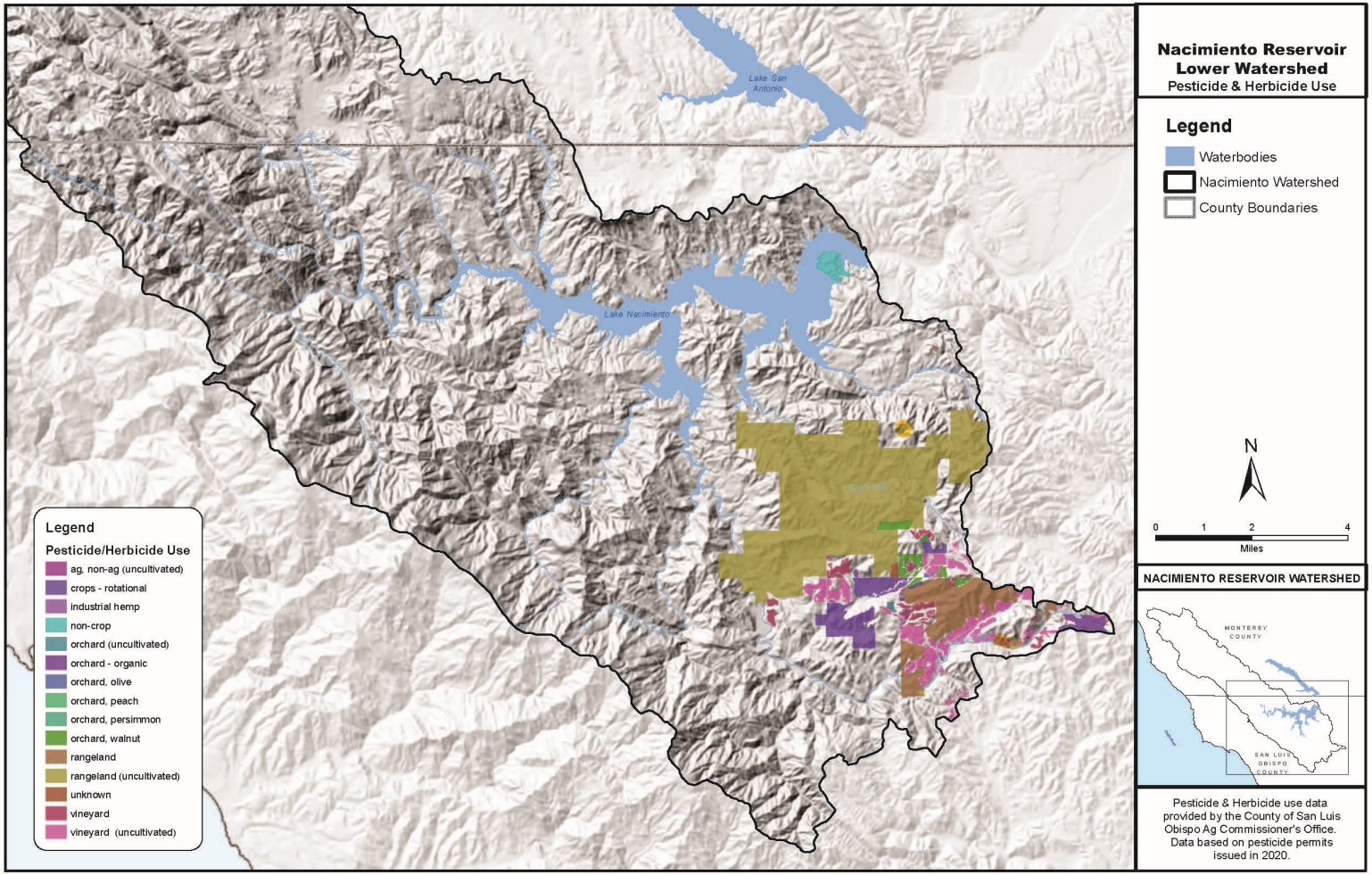
Table 15: Commodity Pesticide Treated Amounts 2016-2020

Commodity	Treated Amount (Acre)
2016 Commodity Pesticide Treated Amount	
Forage Hay/Silage	192
Grape, Wine	9703.51
Uncultivated Ag	2.56
Walnut	87
Total	9985
2017 Commodity Pesticide Treated Amount	
Grape, Wine	9084.26
Oat	80
Olive	8
Walnut	22
Total	9194
2018 Commodity Pesticide Treated Amount	
Forage Hay/Silage	21
Grape, Wine	11628
Uncultivated Ag	4
Walnut	22
Total	11675
2019 Commodity Pesticide Treated Amount	
Grape, Wine	13301.35
Grape, Wine Organic	4.61
Olive	6
Rangeland	300
Vertebrate/Park	0.01
Walnut	22
Total	13634
2020 Commodity Pesticide Treated Amount	
Grape	18.33
Grape, Wine	9691.8
Olive	35
Rangeland	351
Uncultivated Ag	5
Walnut	20
Walnut Organic	215
Total	10336

Table 16: Summary of Pesticide Treated Amounts

Summary of All Pesticide Usage 2016 - 2020			
Year	**Treated Area (Acres)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
2016	9985	1689	2785
2017	9194	1779	2322
2018	11675	1705	2236
2019	13634	1403	4592
2020	10336	1919	3709
Average	**10965**	**1699**	**3129**
5-Year Total	**64809**	**10184**	**18429**

Figure 27: Nacimiento Reservoir Lower Watershed Pesticide and Herbicide Use



Source: San Luis Obispo County Public Works Department (2020)

San Luis Obispo County Flood Control and Water Conservation District

The District currently conducts three water quality monitoring programs in Nacimiento Reservoir in support of the Nacimiento Water Project, as described below. Additionally, the District monitors for the presence of invasive mussels; a brief program description is included here as well.

SWRCB Required Monitoring

The District conducts monitoring in accordance with its Domestic Water Supply Permit (No. 04-06-10P-006) issued by the State Water Resources Control Board on October 21, 2010, as follows:

Location: Intake in Use

Duration: Ongoing. Began in 2010.

Table 17: Required Monitoring

Constituent (individual or group)	Frequency
Coliform bacteria, E. coli bacteria	Monthly
General Mineral	Annual
General Physical	Annual
Inorganic Chemicals	Annual
Asbestos, Cyanide	Every 9 years
Radiological (Gross Alpha only)	Every 9 years
Regulated VOCs	Every 3 years
Regulated SOCs (Atrazine, Simazine only)	Every 9 years

Source Water Assessment and Protection

In 1993, in anticipation of the potential development of the Nacimiento Water Project, the District began to conduct some limited monitoring in Nacimiento Reservoir. The initial purpose of this monitoring was to aid project evaluation, to aid project design decisions, and to provide information for potential treatment alternatives. Since project completion in 2010, some monitoring has continued for the purposes of treatment plant design and source water assessment and protection.

Samples have been collected at various depth intervals. Most often, two samples have been collected per sampling event, one from the upper portion of the water column and one from the lower portion of the water column. These sites are referred to as epilimnion and hypolimnion respectively, even when there is no temperature stratification in the lake. The exact depth from which these two samples have been collected varies.

Table 18: Source Water Monitoring

Location:	Log boom near dam at east end of reservoir.
Duration:	Ongoing. Partial profiles began in 2006; complete profiles began in 2011 and have continued through 2020.
Frequency:	Varied. Typically monthly or quarterly
Constituents:	Varied. Primarily total coliforms, E. coli, algae, general physical, general minerals, inorganic chemicals

Lake-wide Monitoring

In fall 2011 the District began monitoring at various sites around the reservoir for the purpose of source water assessment and protection. All sites are collected on the reservoir itself. Stream sampling is neither practical nor meaningful due to lack of year-round stream flow, difficult topography, lack of roads in some areas, and long driving times in others.

Table 19: Lake-wide Monitoring

Location:	Oak Shores Marina, the Narrows, Las Tablas Creek arm, Dip Creek arm, Heritage Ranch marina, Lake Nacimiento Resort marina
Duration:	Ongoing. Began November 2011
Frequency:	Monthly
Constituents:	Total coliforms, E. coli, algae, general physical, nutrients

Intake Selection

The Nacimiento Water Project intake structure has 7 portals located at 20 ft. intervals, ranging from elevation 660' to 780' (NAVD88). The concentration of many water quality constituents varies from top to bottom and over time, and is dependent on several factors, including lake stratification, surface runoff, and other factors. Several constituents are monitored at various depths through the water column to aid District staff in selecting the best water quality for downstream use. The best water quality is that which:

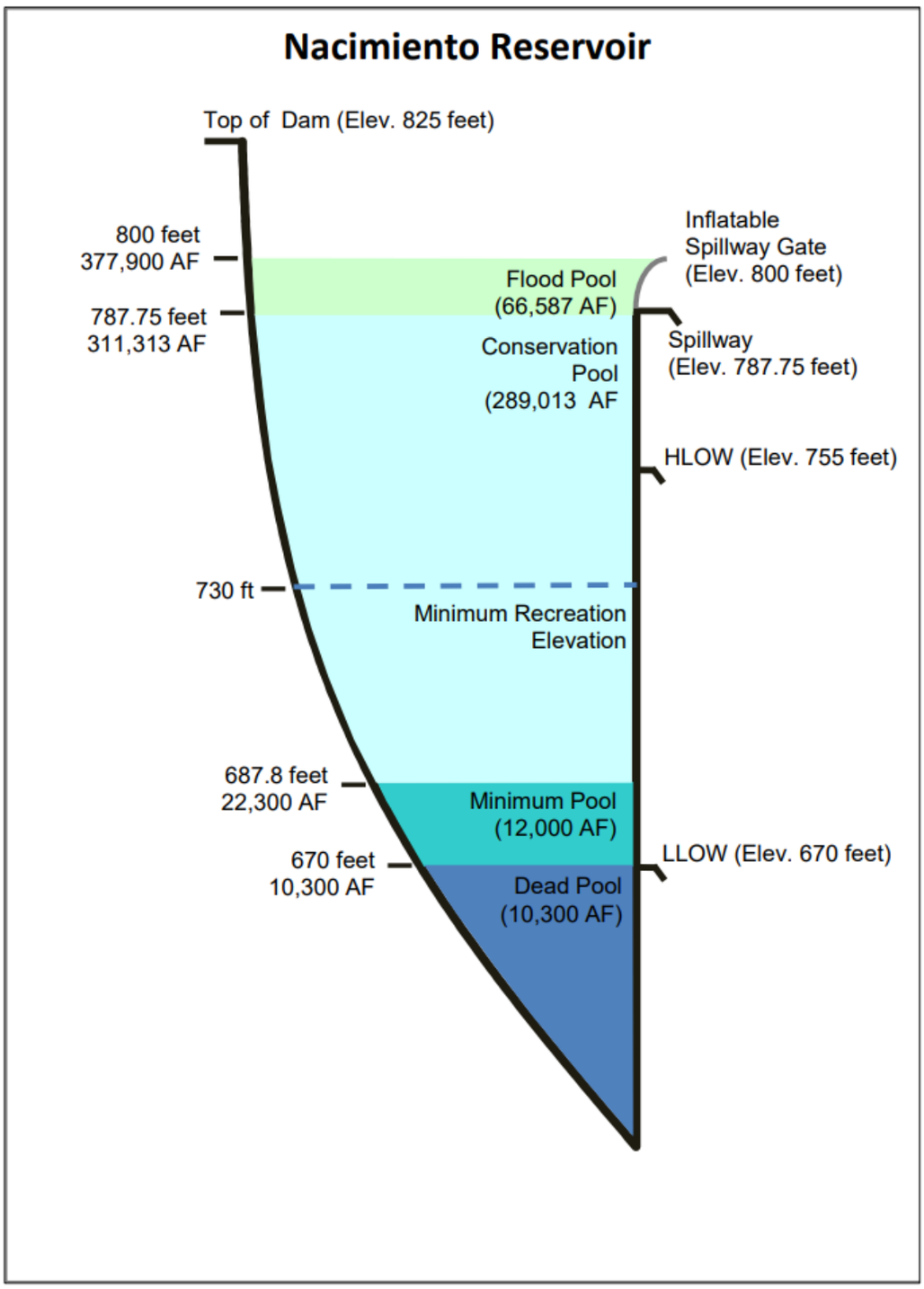
- Minimizes health risks to consumers
- Is most aesthetically acceptable to consumers
- Minimizes treatment costs
- Minimizes operating costs

Some key components to consider in the overall use and selection of an intake are described for various elevations in the Nacimiento Reservoir in the following table (Table 20).

Table 20: Key Elevations of Nacimiento Reservoir

KEY ELEVATIONS OF LAKE NACIMIENTO RESERVOIR		
Elevation (ft above MSL, NGVD 29)	**Storage (acre-feet)**	**Description**
800.0	377,900	Elevation at which Lake Nacimiento is considered full; top of spillway; maximum physical permanent water elevation
782.5	285,050	Bottom of the FERC Flood Pool; maximum water surface elevation during January and February without maximum releases being made
777.3	260,000	Top of the Water Conservation Pool; bottom of the MCWRA Flood Pool
766.5	212,700	Both launch ramps at Lake Nacimiento Resort are operational in a range of two to three feet above this elevation
755.0	168,350	Minimum elevation at which water can be released from the High-Level Gates
748.0	144,200	Elevation defined in MOA with Fish & Game, below which drought conditions are defined to exist, and the minimum release can be reduced from 25 cfs to 10 cfs
730.0	92,150	Elevation above which most boat ramps around the Lake are operational
687.8	22,300	Minimum pool, lowest Lake elevation at which water is available to MCWRA for release
670.0	10,300	Minimum elevation (at which) water can be released from the Low-Level Outlet Works; physical minimum pool; lowest possible Lake elevation (at which) water can flow from outlet works by gravity.
Source: Monterey County Water Resources Agency, provided to Nacimiento and San Antonio Watershed Committee, September 2008		

Figure 28: Key Elevations of Nacimiento Reservoir



Invasive Mussel Prevention Program

Quagga and Zebra mussels are invasive species of bivalves that originate from the Black and Caspian Seas. Using their byssal threads, these mussels can latch onto any surface, damage boats, infrastructure, and water delivery systems, and will reproduce by the millions every year. Since they were first discovered in the Great Lakes in the 1980s, these invasive mussels have "hitchhiked" their way into 29 states within the U.S., including Arizona, Nevada, Colorado, and California, all since 2005.

Invasive Mussel Substrate Monitoring

Monitoring for the presence of invasive mussels began in June 2008 and is ongoing. Prevention is an important not only for the lake's infrastructure but to the public and economy too. The County has a State approved mussel prevention program. The monitoring program is a cooperative effort among several agencies, with resources (staff and/or infrastructure) currently

provided by the District, Monterey County Parks Department, Monterey County Water Resources Agency, Oak Shores Community Association, and Heritage Ranch Owners Association.

In addition to vessel inspections, Lab staff check substrates monthly for invasive mussels. Monitoring sites are located at the Heritage Ranch Marina, Oak Shores Marina, and the Log Boom at the Dam Intake structure. Additionally, staff performs visual and tactile inspections of infrastructure surfaces that may be seen or felt below the surface of the water, and of surfaces that become exposed as the reservoir surface elevation decreases. See Figure 16 for an example of an infested boat.

Vessel Inspection Program

The Invasive Mussel Prevention Program consists of issuing and verifying possession of a signed and stamped permit and/or inspecting all watercraft vessels for aquatic invasive mussels before entering Lake Nacimiento.

Park Rangers and onsite staff are trained to inspect vessel for aquatic invasive mussels.

To help **PREVENT** the spread of Quagga and Zebra mussels to the County's reservoirs, officials at lakes Nacimiento, Lopez and Santa Margarita expect all boaters to comply with a **"CLEAN, DRAIN, DRY"** program. All watercrafts must be **"CLEAN, DRAIN, and DRY"** upon arrival at any local lakes.

All watercraft owners/operators are required to meet the following screening objectives before launching:

- all vessels must carry a signed and stamped permit with them at all times
- inspect all exposed surfaces -- small mussels feel like sandpaper to the touch
- wash the hull of each watercraft thoroughly
- remove all plant and animal material
- drain all water and dry all areas (including the lower outboard unit)
- clean and dry all live-wells, and dispose of any unused bait in the trash
- empty and dry any buckets and compartments
- any vessel that has been on an infested water body in the **last 30 days will be prohibited from launching.**

To find out more about mussel prevention and how to help stop the spread please visit the following link: *https://www.usgs.gov/ecosystems/invasive-species-program/maps*

Resident Vessel Inspection Program

Mussel infested boat prevented from launching at Nacimiento Lake

On July 29, 2017, a Lake Nacimiento Mussel Prevention Program volunteer screener, trained by the San Luis Obispo County Flood Control District, discovered hundreds of invasive mussels attached to a boat attempting to launch at the Heritage Ranch boat ramp. The vessel owner was prohibited from launching into Lake Nacimiento. The owner claimed he was unaware that the mussels were on the vessel he had just purchased from Arizona. California Department of Fish and Wildlife (CDFW) was notified, and a quarantine notice was issued the next day for the Arizona boat.

Invasive mussels have not been found in local San Luis Obispo County lakes to date, due in part to inspection program efforts, along with responsible boat owners' prevention efforts. Since 2010, Monterey County Parks, Monterey County Water Resources Agency, San Luis Obispo County Flood Control District, and the Nacimiento Regional Water Management Advisory Committee have worked together to plan, advise, and organize the Mussel Prevention Program at Lake Nacimiento.

The County appreciates boaters' assistance in protecting local water resources. The public can assist in educating others about the importance of responsible boating by remembering to **CLEAN**, **DRAIN**, and **DRY** all boats and equipment before visiting local lakes and being prepared to have boats inspected. See Figure 29 below of a mussel-infested boat propeller.

Figure 29: Boat Propeller Infested with Mussels

Watershed Events

Chimney Fire

The Chimney Fire started August 13, 2016, at Running Deer Rd & Chimney Rock Rd south of Lake Nacimiento. (Longitude/Latitude: -120.98316/35.70595) The fire was extinguished after 25 days on September 6, 2016. The fire burned a total of 64,344 acres. 94% of the fire was within the Nacimiento Watershed and the fire burned 47% of the watershed tributary to Nacimiento Lake. A total of 49 residences and 21 other structures were destroyed, and 8 were damaged. Cal Fire investigators concluded the blaze began when a vehicle ignited dry grasses adjacent to a dirt road. A fire retardant was applied by airdrop to aid in extinguishing the fire. See the Chimney fire map, MSDS, and water quality data.

The retardant used was Phoscheck MVP FX, made by ICL Performance Products. Phoscheck is composed of monoammonium phosphate and diammonium phosphate. Since Phoschek is a mixture of various formulations of ammonia and phosphate, this chemical will dissolve in water and is expected to break down to its main components of ammonia and phosphate. Both of these chemicals are nutrients for algae, and their elevated levels may result in a large increase in the amount of algae growth in the reservoirs. As noted previously in the Algae section of this report, algae growth in water reservoirs can negatively impact the operation of the water treatment plant and could cause significant aesthetic problems in treated drinking water.

San Luis Obispo County staff collected samples monthly from the Reservoir Intake, Oak Shores, Las Tablas Creek, and the Narrows to see what effect the fire and runoff of fire debris from future rains would have on the reservoir water quality. Analyses included General Physicals, General Minerals, Nutrients, and Inorganic Metals.

The first rain came November 21, 2016 and dropped 0.81”. Only 1.07” of rain fell in December. The month of January 2017 brought a total of 8.13” of rain and increased the lake elevation by 56.1 feet. Runoff into the lake due to the rain had little impact on Nacimiento Lake’s Water Quality. The main increase was in the water’s turbidity which went from 3.5 NTU (pre-rain) to 45 NTU (post-rain). Other significant increases were in Aluminum (37 ug/L to 1400 ug/L) and Iron (55 ug/L to 1800 ug/L).

A handout was prepared for Nacimiento Water Project Participants on the Effects of Wildfire and Drinking Water Utilities based on the EPA (2013) website. See Appendix H.

Figure 30: Debris in Lake Nacimiento Following Heavy Rain in January 2017

Chimney Fire Incident Information

Date/Time Started: August 13, 2016 4:03 pm

Duration: 25 days

Administrative Unit: CAL FIRE San Luis Obispo Unit

County: San Luis Obispo County

Location: Running Deer Rd & Chimney Rock Rd south of Lake Nacimiento

Acres Burned: 46,344 acres

Containment: 100% contained

Structures Destroyed: 49 residences and 21 other structures destroyed, 8 damaged

Evacuations: All evacuation orders have been lifted.

Road Closures: All road closures have been lifted.

Injuries: 1

Cause: Investigators conclude that a vehicle ignited dry grasses adjacent to a dirt road, starting the blaze.

Cooperating Agencies: California Highway Patrol, California State Parks, San Luis Obispo County Sheriff, Red Cross, California Department of Corrections and Rehabilitation, California Conservation Corps, PG&E, San Luis Obispo Air Quality Board, San Luis Obispo

Public Works, Paso Robles Fire Department, Monterey Co. Water Resource Board, California Department of Fish and Wildlife, US Army Camp Roberts, CAL-OES, San Luis Obispo County OES, Monterey County Sheriff, Monterey County OES, Fort Hunter Liggett, and Los Padres National Forest.

Longitude/Latitude: -120.98316/35.70595

Conditions: The Chimney fire is now fully contained. There may be lingering smoke that is not a threat to escape control lines. Should you see a large dark column of smoke, you should report it by calling 911. Crews will be in the fire area for several days continuing suppression repair work. Now is the time to prepare your home for a wildfire.

The Chimney Fire started August 13, 2016, at Running Deer Rd & Chimney Rock Rd south of Lake Nacimiento. (Longitude/Latitude: -120.98316/35.70595) The fire was extinguished after 25 days on September 6, 2016. The fire burned a total of 64,344 acres. 94% of the fire was within the Nacimiento Watershed and the fire burned 47% of the watershed tributary to Nacimiento Lake. A total of 49 residences and 21 other structures were destroyed, and 8 damaged. Cal Fire investigators conclude the blaze began when a vehicle ignited dry grasses adjacent to a dirt road. A fire retardant was applied by air drop to aid in extinguishing the fire. See Appendix H for theChimney Fire Incident Map.

The retardant used was PHOS-CHEK®MVP-Fx (Phoschek), made by ICL Performance Products. Phoscheck is composed of monoammonium phosphate and diammonium phosphate. The MSDS can be found in Appendix H. Since Phoschek is a mixture of various formulations of ammonia and phosphate, this chemical will dissolve in water and is expected to break down to its main components of ammonia and phosphate. Both chemicals are nutrients for algae, and their elevated levels may result in a large increase in the amount of algae growth in the reservoirs. As noted previously in the Algae section of this report, algae growth in water reservoirs can negatively impact the operation of water treatment plant and could cause significant aesthetic problems in treated drinking water. See Appendix H for the Material Safety Data Sheet on Phoschek. San Luis Obispo County staff collected samples monthly from the Reservoir Intake, Oak Shores, Las Tablas Creek, and the Narrows to see what effect the fire and runoff of fire debris from future rains would have on the reservoir water quality. Analyses included General Physicals, General Minerals, Nutrients, and Inorganic Metals.

The fire seemed to have little effect on the water quality of Lake Nacimiento. The most significant change was an increase in turbidity following the heavy rain event in January 2017. A considerable amount of debris was washed into the lake. (See Figure 30: Debris in Lake Nacimiento Following Heavy Rain in January 2017) There was an increase in iron, manganese, and aluminum as well. These are historically higher following a heavy rain event.

Investigations and Future Projects

Klau and Buena Vista Mercury Mines[7]

Background

Klau/Buena Vista Mine is in San Luis Obispo County, California, about 12 miles west of Paso Robles. The site consists of two abandoned mercury mine sites (Klau and Buena Vista) located on adjacent properties on a northwest-southeast ridge of the Santa Lucia Range in the California coastal mountains. Mercury mining and ore processing operations took place at the mines between 1868 and 1970. Buena Vista Mines, Inc. has owned the Buena Vista Mine at least since 1957 and the Klau Mine since at least 1964. The most significant contaminant of concern is mercury, a metal that can be harmful to the human nervous system. Following initial actions to protect human health and the environment, site investigations and long-term cleanup planning are ongoing.

What Has Been Done to Clean Up the Site?

The site is being addressed through federal actions.

Emergency Response and Removal

Short-term removal work involved site stabilization, which reduced the discharge of acid mine drainage (AMD) and discharge into Las Tablas Creek. In 2000, EPA removed 120,000 cubic yards of contaminated materials from the drainage channel and secured it in an on-site repository to prevent immediate threats to human health and the environment. In 2002, EPA stabilized a sinkhole on site and also stabilized a slope failure on site. In 2006, EPA removed the mercury processing building (retort) and some mercury-laden soils. Contaminated materials stored on site are temporarily capped and will be addressed in the site's long-term cleanup.

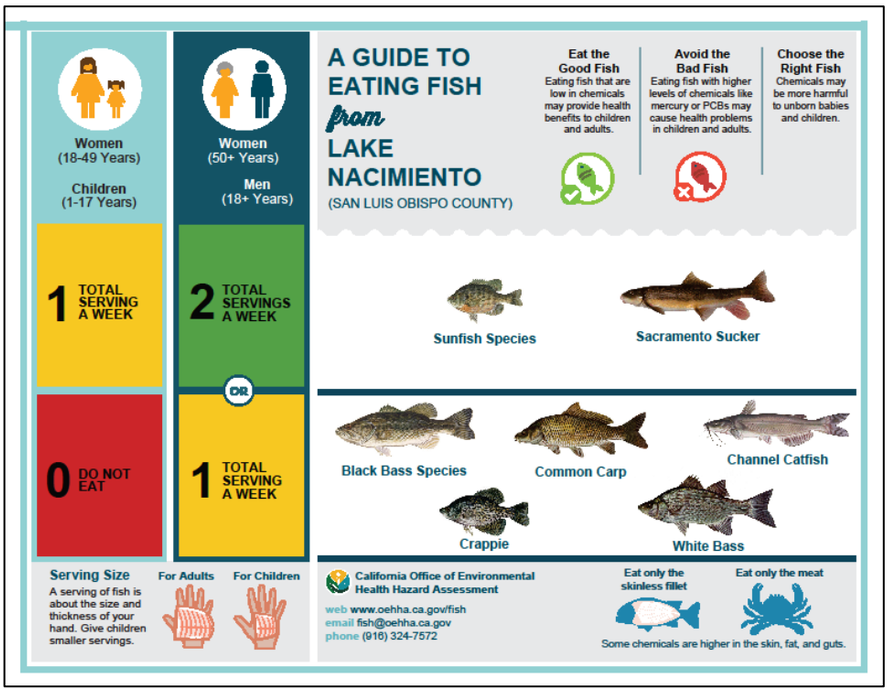
7 Klau Buena Vista Mercury Mines EPA
https://cumulis.epa.gov/supercpad/CurSites/csitinfo.cfm?id=0903986&msspp=med

Mercury Levels[8]

Mercury occurs in deposits throughout the world. Mercury, also called Quicksilver, is a naturally occurring heavy metal that can be found in the mountains surrounding Lake Nacimiento. It will naturally leach out of the soil and move downstream towards lower ground. In 1868 the Klau Mine opened and while in operation produced 18,000 iron flasks of mercury. The mine closed in 1960. It has since been declared a Super Fund Clean-up Site. Mercury contamination from the mines site washes down into Las Tablas Creek and then into Lake Nacimiento, and then settles to the bottom of the lake in the sediment.

Because of the health hazards that mercury presents the San Luis Obispo County Health Department in 2009 issued a revised health advisory warning people to limit their consumption of fish from Lake Nacimiento. The advisory is still in effect. See "A Guide to Eating Fish from Lake Nacimiento" below. (See Figure 31).

Figure 31: Guide to Eating Fish Public Announcement



Interlake Tunnel Project[9]

Monterey County Water Resources Agency (MCWRA) is proposing building a tunnel to divert water from Lake Nacimiento into Lake San Antonio. The Nacimiento Regional Water Management Advisory Committee (NRWMAC) is concerned about how the tunnel might affect Lake Nacimiento lake levels, recreation activities, property values, and water availability.

Technical Memorandum

The proposed Interlake Tunnel is a gravity flow water conveyance tunnel approximately 12,000 feet long connecting Nacimiento and San Antonio reservoirs in San Luis Obispo and Monterey Counties, respectively. The conceptual design of the tunnel project envisions a reinforced concrete-lined tunnel with an inside finished diameter of 10 feet and a slope from Nacimiento to San Antonio of 0.4%. The tunnel will have an invert elevation in Nacimiento Reservoir at approximately 745' Mean Sea Level with an inlet structure equipped with debris racks and stop logs to facilitate tunnel maintenance. The outlet structures in San Antonio will include a valve facility housing and a spherical valve for the operation of the tunnel. The outlet structure will terminate in the San Antonio reservoir with an energy dissipation structure.

6 Mercury Levels
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0903986
https://oehha.ca.gov/advisories/lake-nacimiento

9 Interlake Tunnel Project: Monterey County Water Resources Agency

New Statewide NPDES Permit

On September 15, 2015, all water purveyors were required to submit a permit application for the new statewide National Pollutant Discharge Elimination System (NPDES) permit.

The NPDES Program is a federal program that has been delegated to the State of California for implementation through the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCB). In California, NPDES permits are also referred to as waste discharge requirements (WDRs) that regulate discharges to waters of the United States.

The new permit requires any discharge of a pollutant from a drinking water system, regardless of the size of the system, to be regulated by an NPDES permit if the discharge(s) flow into a water of the U.S.

The NPDES program fulfills Clean Water Act requirements and assures water purveyors that they will not be exposed to regulatory enforcement for discharging without a permit. The new permit minimizes monitoring and solely requires annual reporting. The Nacimiento Water Project had previously held a general NPDES "Low Threat to Water Quality" permit regulated under an RWQCB permit. The termination of the current Regional permit coverage will be coordinated with the SWRCB issuance of Notice of Applicability.

The current and new permit covers the following discharges for the Nacimiento Water Project:

- Raw Water Delivery to Participating Agencies
- Pipeline from Nacimiento Lake to San Luis Obispo
- Storage Tanks
- Pump Stations
- Turnout

System Compliance with New and Future Regulations

Per- and polyfluoroalkyl substances (PFAS) Information

Drinking water containing perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS) – and the larger family of per- and polyfluoroalkyl substances (PFAS) – has become an increasing concern due to the persistence of these chemicals in the environment and their tendency to accumulate in groundwater. Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water.[10]

PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. The most extensively produced and studied PFAS chemicals are per-fluoro-octane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutane sulfonic acid (PFBS). These chemicals are very persistent in the environment and the human body – meaning they do not break down and can accumulate over time.

Although no longer manufactured in the United States, they are still produced internationally and can be imported into the United States in consumer goods such as carpet, leather and apparel, textiles, paper and packaging, coatings, rubber, and plastics. PFAS can be found in:

- Food packaged in PFAS-containing materials, processed with equipment that used PFAS, or grown in PFAS-contaminated soil or water.
- Commercial household products, including stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams (a major source of groundwater contamination at airports and military bases where firefighting training occurs).
- Workplace, including production facilities or industries (e.g., chrome plating, electronics manufacturing, or oil recovery) that use PFAS.
- Drinking water, typically localized and associated with a specific facility (e.g., manufacturer, landfill, wastewater treatment plant, firefighter training facility).
- Living organisms, including fish, animals, and humans, where PFAS can build up and persist over time.

10 *https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/pfoa_pfos_guidelines_faq_factsheet.pdf*

There is evidence that exposure to PFAS can lead to adverse health outcomes in humans. Studies indicate that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemicals have caused tumors in animals. The most consistent findings are increased cholesterol levels among exposed populations, with more limited findings related to:

- low infant birth weights,
- effects on the immune system,
- cancer (for PFOA), and
- thyroid hormone disruption (for PFOS and PFBS).

Many chemicals in this group have been a concern because they do not break down in the environment, can move through soils and contaminate drinking water sources, and they build up (bioaccumulate) in fish and wildlife. PFAS have been found in rivers and lakes and in many types of animals on land and in the water.

While toxicity studies have raised important concerns, there is still much we do not know about the effects of PFAS on human health and the environment. Out of the hundreds of known PFAS compounds, only a small number have been studied extensively. We do not know how much PFAS exposure is safe for humans or whether there are important differences in toxicity between different PFAS compounds. And we do not fully understand how PFAS compounds break down in the environment over time and how they travel.[11]

In August 2019, the California State Water Resources Control Board (State Water Board), Division of Drinking Water (DDW) established notification levels (NL) for perfluorooctane sulfonate (PFOS) at 6.5 parts per trillion (ppt)[12] and perfluorooctanoic acid (PFOA) at 5.1 ppt[13].

Notification levels are nonregulatory, health-based advisory levels established for contaminants in drinking water for which maximum contaminant levels have not been established. Notification levels are established as precautionary measures for contaminants that may be considered candidates for establishment of maximum contaminant levels but have not yet undergone or completed the regulatory process prescribed for the development of maximum contaminant levels and are not drinking water standards.

A response level has also been established for these analytes. A response level (RL) is set higher than a notification level and represents a recommended chemical concentration level at which water systems consider taking a water source out of service or provide treatment if that option is available to them. Starting in January 2020, water systems that receive an order and detect levels of PFAS substances that exceed their response level, shall take a water (See Table 21).

Table 21: PFAS Notification Limit Table

Analyte	Notification Level, ng/L	Response Level, ng/L (running four quarter average)
PFOA	5.1	10
PFOS	6.5	40

Not all public water systems are required to test for PFAS. A public water system may have received an order because it may be at risk for potential contamination by PFAS due to its proximity to adjacent facilities known to use, produce, or store PFAS or because of proximity to a public water system whose water supply is contaminated by PFAS. A list of public water systems and sources that are required to be sampled are located at the link below. The State Water Resources Control Board, Division of Water Quality information can be found at:

https://www.waterboards.ca.gov/water_issues/programs/pfas/[14]

11 Monitoring Monday – Let's look at PFAS; State Water Resource Control Board, March 2021

12 Notification Level Issuance *https://www.waterboards.ca.gov/drinking_water/programs/documents/pfos_nl_issuance%20.pdf*

13 PFOA NL Issuance *https://www.waterboards.ca.gov/drinking_water/programs/documents/pfos_nl_issuance%20.pdf*

14 State Water Resources Control Board Per- and Poly-fluoroalkyl Substances (PFAS) Water Monitoring Fact Sheet, *https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/pfos_and_pfoa/pfas%20faq_final.pdf*

At this time, the Nacimiento Water Project is not required to test for PFAS substances.

ADDITIONAL RESOURCES:

A guide to the PFAS found in our environment: Chemical structures and origins of per- and polyfluoroalkyl substances that are polluting our world.

www.waterboards.ca.gov/pfas/

- www.waterboards.ca.gov/pfas/drinking_water.html
- www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/PFOA_PFOS.html
- www.waterboards.ca.gov/pfas/non_drinking_water.html
- Per- and Polyfluoroalkyl Substances (PFAS) Sampling Guidelines for Non-Drinking Water

1,2,3 -Trichloropropane (1,2,3 - TCP)

Background

On December 14, 2017, the California Water Resources Control Board Division of Drinking Water (DDW) adopted a regulation promulgating a Maximum Contaminant Level (MCL) for 1,2,3-trichloropropane (TCP) of 0.000005 milligrams per liter (mg/L, or 5 parts per trillion or 5 ppt). This regulation required Community Water Systems (CWS) and Nontransient Noncommunity (NTNC) Water Systems to begin initial sampling of TCP from their drinking water sources. Initial sampling began January 1, 2018, with the requirement of four quarterly samples to be completed during the year.

TCP is produced as a chemical intermediate. It was formerly used as a paint and varnish remover, solvent, and degreasing agent. It evaporates readily from surface soil and surface water and travels quickly from subsurface soil to groundwater. In the pure form, it is likely to exist as a dense nonaqueous phase liquid. Primary human exposure routes are inhalation of ambient air and ingestion of drinking water. EPA has classified TCP as “likely to be carcinogenic to humans.” Short-term exposure may cause eye and throat irritation; long-term exposure has led to liver and kidney damage and reduced body weight in animal studies. A federal maximum contaminant level (MCL) has not been established for TCP in drinking water; federal and state health- based screening levels have been established. Remediation technologies available to treat TCP contamination in groundwater and soil include granular activated carbon (GAC), dechlorination by hydrogen release compound (HRC®), and reductive dechlorination by zero-valent zinc and others. [15]

Monitoring

Monitoring for the presence of TCP began in August 2017. Two consecutive quarters were collected with no TCP detected. An additional four (4) consecutive quarters were collected from May 2018 thru February 2019. No TCP was detected. California has established a state MCL of 0.005 µg/L (Cal/EPA 2017).

Conclusions and Recommendations

Conclusions

- Many variables can influence constituent concentrations in both the short term and the long term. These include seasonal temperature differences, drought conditions, fires, runoff events, and dam operation. They also include changes in potential contaminant sources such as the extent of recreational use of the reservoir and surroundings, increased urban development, changes in agricultural uses and practices, changes in military base operations, and other factors.
- The two highest risk sources remain the same as the initial survey, grazing livestock and body contact recreation. Both occur extensively and without any meaningful

15 EPA - Technical Fact Sheet – 1,2,3-Trichloropropane (TCP), November 2017
https://www.epa.gov/sites/production/files/2017-10/documents/ffrrofactsheet_contaminants_tcp_9-15-17_508.pdf

restrictions on and around the reservoir itself. Additionally, grazing occurs extensively throughout the lower watershed.

- No significant changes have occurred in the Nacimiento Watershed or the water quality of the reservoir raw water since the last survey. No significant home building or changes in land use occurred in the last five years or are planned at this time.
- A special contaminant of concern is mercury, not because of any actual risk to the drinking water supply, but rather because of public perception concerns. No mercury was detected in the over 50 samples analyzed from the Nacimiento Lake and Watershed.
- The Chimney Fire in September 2016, lasted 25 days and burned a total of 64,344 acres. 94% of the fire was within the Nacimiento Watershed.
- Although the County has land use authority over the lower Nacimiento watershed, they have no jurisdictional authority in the watershed, and therefore have little ability to directly affect watershed activities and watershed management practices. Some existing control measures may protect water quality, but only to the degree that they are implemented and enforced. Many potential contaminant sources, the watershed's large size, and the reservoir's remote location make effective implementation and enforcement efforts difficult.
- The Emergency Response Plan was updated in August 2015 for the Nacimiento Project. The County will continue to follow current and future regulations.

Recommendations

Recommendation 1 – Drought impacts

Continue to monitor the reservoir and watershed. The present drought and changing climate situation on our planet should be considered when planning mitigation of drastic changes to supply and water quality. As drought becomes a predictably regular pattern in the future, the Nacimiento Water Project should anticipate the badly needed rain events to result in a lower quantity and quality of water entering the reservoir from rain runoff. Water quality data should continue to be monitored monthly from the raw water intakes and reservoir tributaries for general physical and metals such as aluminum and iron.

Recommendation 2 – Invasive Mussel Inspection Program

Maintain the current County Invasive Mussel Inspection Program. Invasive mussels have not been found in local San Luis Obispo County lakes to date, due in part to inspection program efforts, along with responsible boat owners' prevention efforts. Since 2010, cooperation between Monterey and San Luis Obispo County agencies have worked together to plan, advise, and organize the Mussel Prevention Program at Lake Nacimiento. Nacimiento boaters have played a major role in protecting local water resources by assisting in local boat inspections and educating locals and visitors to **CLEAN**, **DRAIN**, and **DRY** all boats and equipment before visiting local lakes and being prepared to have boats inspected. This group effort should continue and adapt to future rules, regulations, and findings.

Recommendation 3 – Algae and Algal Toxin Monitoring

Continue to monitor algae and algal toxins at the intake structure and throughout the reservoir to avoid water experiencing algal blooms, taste and odor issues, or problematic filter clogging algae.

Recommendation 4 – Limnological Monitoring

Continue monthly limnological monitoring that provides information on lake turnover and seasonal fluctuations that aids staff in intake selection.

Recommendation 5 – Water Quality Monitoring

The evaluation of the Nacimiento Water Project monitoring program since the initial watershed assessment and background data collection is an ongoing process. As new regulations, public concerns, and changes in the reservoir and watershed occur, the spectrum of analytical

and field monitoring will change as well. The current monitoring plan for the watershed and reservoir are listed in the following table (see Table 22).

Table 22: Summary of Water Quality Monitoring

Summary of Water Quality Monitoring	Nacimiento Reservoir Raw	Reservoir Intakes Elevation in Feet (780, 760, 740, 720, 700, 690, 660)	Next Sampling Event
Bacteriological (Coliform MPN)	Monthly	Monthly	_
Algae Enumeration and Identification	Monthly	Monthly	_
Physical (odor, turbidity, color, pH, dissolved oxygen, temperature)	Monthly	Monthly	_
Iron and Manganese	Monthly	_	_
Aluminum and Mercury	Quarterly	_	_
General Mineral	Quarterly	_	_
Title 22 Metals, Perchlorate	Quarterly	_	_
Volatile Organic Carbons	Every 3 Years	_	2022
EPA 525.2 (Atrazine, Simazine)	Every 9 Years	_	2022
Gross alpha, Asbestos	Every 9 Years	_	2028

Recommendation 6 – Floating Toilets

Further evaluation needs to occur regarding removing floating toilets from the reservoir, as the draft "Guidelines for Evaluating Applications for Recreational Use Permits at Domestic Water Supply Reservoirs" (November 15, 2020) states "Floating restrooms should be prohibited unless special approval is obtained from DHS". Chemical toilets located on-shore should be considered.

Bibliography

American Water Works Association. "Watershed Sanitary Survey Guidance Manual", 1993.

Anthony, Jon. Monterey County Park Ranger Supervisor

Carollo Engineers. "Nacimiento Water Project TM-8 (Water Quality) Review Technical Memorandum for Atascadero Mutual Water Company (draft)." February 2006.

Homefacts. https://www.homefacts.com/earthquakes/California/San-Luis-Obispo-County/Lake-Nacimiento.html

Klau Buena Vista Mercury Mine: Carter Jessop, Superfund Project Manager, U.S. EPA, Region 9, 75 Hawthorne Street (SFD-7), San Francisco, CA 94105

Plummer, Jeanine D. "Algae and Their Effects on Drinking Water Quality." 2005

San Luis Obispo County Flood Control and Water Conservation District. "Nacimiento Water Project Initial Watershed Sanitary Survey." 2014

San Luis Obispo County Public Works Department. "Nacimiento Water Project Emergency Response Plan." 2010.

USEPA. 2012. <http://water.epa.gov/drink/contaminants/basicinformation

USGS. Mercury in the Environment. October 2010. <http://www.usgs.gov/themes/factsheet/146-00

USGS Open-File 2015-1092. Sickles, James M. “Mercury and Methylmercury at Lake Nacimiento, California.” USEPA Region 9, San Francisco.

Wikipedia. <https://en.wikipedia.org/wiki/Cyanotoxin

Appendix A: Field Data

Nacimiento Reservoir Temperature Profile, ºC versus Depth, Feet

NACIMIENTO RESERVOIR TEMPERATURE PROFILE, ºC VERSUS DEPTH, FEET																												
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**	**105'**	**110'**	**115'**	**120'**	**125'**	**130'**	**135'**	**140'**
1/4/16	10.4	10.3	10.3	10.2	10.1	10.1	10.1	10.1	10	10	9.9	9.9	9.9	9.9	9.9	9.8	9.8	9.7	9.7										
2/5/16	11.8	11.7	11.7	11.7	11.6	11.6	11.5	11.3	10.7	10.6	10.5	10.4	10.2	10.1	10	10	9.9	9.9	9.9	9.9									
3/10/16	16.2	15	14.5	14.2	13.4	12.8	12	11.6	11.4	11.4	11	10.8	10.7	10.6	10.4	10.4	10.2	10.2	10.1	10.1	10.1	10.1							
4/7/16		19.4	18.6	17.4	15.9	15.1	13.8	13.2	12.7	11.9	11.7	11.2	10.9	10.6	10.5	10.4	10.4	10.3	10.3	10.3	10.3	10.3	10.3	10.3					
5/5/16	20.8	20.8	20.8	20.7	19.5	16.1	13.9	13.1	12.7	12.4	12.3	12.1	11.9	11.7	11.4	11	10.8	10.7	10.6	10.5	10.5	10.5	10.4						
6/9/16	23.5	23.2	23.2	22.6	20.7	18.1	16.4	14.8	13.3	12.7	12.4	12.3	12.1	11.8	11.4	11.1	11	11	10.8	10.7	10.7	10.6	10.6						
7/7/16	25.4	24.4	24.2	24	21.7	20.7	17.4	15.3	16.2	13.4	12.8	12.7	14.7	12.1	11.6	11.2	13.4	10.9	10.8	10.8	10.7	10.7	10.7						
8/4/16	24.8	24.7	24.6	24.6	24.3	22.3	19.7	16.2	14.2	13.5	13.1	12.9	12.6	12.1	11.7	11.4	11.2	11.1	11	10.9	10.9	10.9	10.8						
8/31/16	22.5	23	22.9	22.7	22.6	22.5	20.5	17.5	15.1	14	13.4	13.1	12.7	12.2	11.9	11.6	11.3	11.2	11.1	11									
10/5/16	20.6	20.6	20.6	20.6	20.6	20.6	20.4	18.9	17.3	15.5	14.5	13.8	13.2	12.6	12	11.5	11.3	11.2											
11/2/16	18.5	18.5	18.4	18.4	18.3	18.2	18.2	18.2	18	17.8	15.3	14.3	13.4	12.3	11.8	11.6													
12/1/16	15.1	14.9	14.9	14.9	14.9	14.9	14.8	14.8	14.8	14.8	14.7	14.6	14	12.8	11.9	11.5	11.4	11.3	11.3	11.2									
1/17/17	11.5	11.5	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.3	11.3	11.2	11.2	11.1	11.1						
2/8/17	12	11.8	11.7	11.7	11.6	11.6	11.4	10.9	10.7	10.6	10.5	10.5	10.4	10.4	10.3	10.3	10.3	10.3	10.2	10.2	10.1	9.9	9.8	9.8	9.7	9.7	9.6		
3/10/17	12.6	12.2	12.1	12	11.9	11.9	11.8	11.8	11.7	11.3	11	10.8	10.7	10.7	10.6	10.6	10.5	10.5	10.5	10.4	10.3	10.3	10.2	10.2	10.1	10	10		
4/4/17	16.8	16.4	15.5	15.3	14.4	13	11.9	11.8	11.6	11.5	11.2	11.1	10.9	10.8	10.8	10.7	10.7	10.6	10.6	10.5	10.4	10.4	10.4	10.3	10.3	10.2	10.2	10.1	10.1
5/3/17	22.2	21.2	19.6	19.2	17.3	14.8	13.4	12.3	11.6	11.3	11.4	11.4	11.3	11.1	11	10.9	10.9	10.8	10.8	10.8	10.8	10.7	10.7	10.7	10.6	10.5	10.4	10.3	
6/6/17	23.7	23.5	22.7	22.1	20.7	17.8	15.7	15.6	14.2	12.4	12	11.8	11.7	11.5	11.4	11.4	11.3	11.2	11.1	11.1		11	10.9	10.8	10.8	10.8			
7/5/17	25.2	24.8	24.5	24.2	22.3	19.1	18.8	16.3	14	13.3	12.7	12.3	12	11.9	11.8	11.6	11.5	11.5	11.5	11.4	11.4	11.3	11.2	11.1	11	10.8	10.7		
8/1/17	24.5	26.2	25.9	25.8	24.3	20.4	17.9	15.6	14	13	12.6	12.3	11.9	11.9	11.8	11.8	11.8	11.8	11.7	11.7	11.6	11.4	11.3	11.1					
9/6/17	27.2	27.2	27.2	26.7	24.4	23.4	19.5	17.1	15.5	14.4	13.9	13.2	12.8	12.6	12.4	12.3	12.3	12.2	12.1	11.9	11.6	11.4	11.3	11.2	11.1				
10/5/17	21.1	21.2	21.2	21.3	21.3	21.3	21.3	19.1	15.8	14.6	13.9	13.5	13.3	13	12.9	12.8	12.7	12.5	12.1	11.8	11.6	11.5	11.3	11.2	11.1	11.1	11		

NACIMIENTO RESERVOIR TEMPERATURE PROFILE, °C VERSUS DEPTH, FEET																												
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**	**105'**	**110'**	**115'**	**120'**	**125'**	**130'**	**135'**	**140'**
11/1/17	18.4	18.3	18.2	18.2	18.2	18.2	18.2	18.2	18.1	15.6	14.8	14.2	13.8	13.4	13.3	13.1	12.9	12.7	12.2	11.8	11.5								
12/4/17	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15	14.9	14.6	14.2	13.7	13.4	13.2	13	12.5	12	11.6	11.4								
1/3/18	11.8	11.8	11.8	11.7	11.7	11.6	11.5	11.5	11.5	11.5	11.5	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.3	11.3	11.3	11.3							
2/1/18	12.7	12.2	12	11.8	11.7	11.6	11.5	11.5	11.5	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.3	11.3	11.3	11.3	11.3	11.3							
3/7/18	12.4	12.3	11.8	11.6	11.6	11.5	11.5	11.5	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.3	11.3	11.2	11.1	11	11	11							
4/12/18	18.3	18.3	18.3	18.3	14.1	13.5	13.1	12.7	12.2	12	11.7	11.6	11.5	11.5	11.5	11.3	11.3	11	11.2	11.1	11.1	11.1	11.1	11.1	11.1				
5/2/18	19.6	19.6	19.6	16.8	15.1	13.8	12.8	12.4	12.3	12.1	12	11.9	11.8	11.7	11.7	11.6	11.5	11.4	11.4	11.3	11.3								
6/6/18	20.2	20.2	20	20	19.7	18	15.7																						
7/20/18	26.8	26.6	26.1	24.8	24.8	22.9	20.2	18.7	17.7	15.9	15.1	14.5	13.8	13.1	12.6	12.3	11.9												
8/9/18	26.4	26	25.9	25.8	25.4	24.9	23.9	22.7	19.8	18.9	17.2	16.2	14.7	13.3	12.4	12.1	11.9												
9/11/18	23.7	23.7	23.3	23.3	23.3	23.3	23.2	23.2	23.1	22.7	17.2	13.4	12.4	12.1	12														
10/3/18	22.2	22.2	22	21.8	21.8	21.6	21.5	21.3	21.1	18	14.1	13	12.4	12.2															
11/1/18	17.9	17.9	17.9	17.9	17.8	17.8	17.8	17.8	17.8	17.8	15	12.7	12.3	12.1															
12/4/18	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.5	13.5	13.3	13.2	13	12.8															
1/3/19	11.5	11.3	11.2	11.2	11.2	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1															
1/24/19	11.9	11.7	11.5	11.5	11.5	11.5	11.5	11.4	11.5	11.4	11.4	11.3	11.3	11.2	11.2	11.1	10.9	10.8											
2/7/19	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.4	11.4	11.4	11.4	11.3	11.3	11.2	11.2	11.2	11	11								
3/7/19	12.7	12.7	12.7	12.5	12.5	12.3	12.2	12.1	11	10.8	10.8	10.8	10.8	10.7	10.7	10.7	10.6	10.5	10.5	10.4	10.4				10.4				
4/9/19	18.1	18	16.5	15.2	13.4	12.1	11.7	11.6	11.4	11.2	11.1	11	10.9	10.8	10.8	10.7	10.7	10.6	10.6	10.5	10.5		11						
5/8/19	21.1	21.1	21.1	20.8	20.1	15.1	12.9	12	11.6	11.3	11.2	11.1	11	11	11	10.9	10.8	10.8	11	10.9	10.7								
6/6/19	24.2	23.3	20.5	19.3	18.5	17.6	15.5	13.2	12.2	11.8	11.5	11.3	11.3	11.1	11.1	11	11	11	10.9	10.8	10.8								
7/9/19	24.4	24.3	24.2	23.5	21.3	17.7	15	12.8	12.2	11.8	11.7	11.5	11.5	11.3	11.2	11.2	11.2	11.2	11.1	11	10.8				11				
8/6/19	25.9	25.8	25	24.1	20.9	18.5	16.5	14.4	13.3	12.6	12	11.8	11.6	11.5	11.5	11.4	11.4	11.4	11.3	11.2	11.1		11.2						
9/5/19	25.7	25.6	25.4	24.6	21	18.8	16.2	15	13.7	12.7	12.3	12.1	11.9	11.8	11.7	11.7	11.7	11.6	11.5	11.4	11.3	12.1							
10/3/19	21.1	21.1	21.1	21.1	21.1	21	18.2	17.9	14	13.3	12.7	12.5	12.2	12.1	11.9	11.9	11.9	11.7	11.5	11.4	11.4								

NACIMIENTO RESERVOIR TEMPERATURE PROFILE, °C VERSUS DEPTH, FEET																												
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**	**105'**	**110'**	**115'**	**120'**	**125'**	**130'**	**135'**	**140'**
11/7/19	16.9	16.5	16.4	16.3	16.3	16.2	16.1	15.9	15.4	13.4	12.9	12.6	12.4	12.1	12.1	12	12	11.9	11.8	11.7	11.3								
12/5/19	13.7	13.7	13.6	13.5	13.5	13.5	13.4	13.4	13.3	13.2	13.2	13.1	12.7	12.4	12.3	12.2	12.1	11.8	11.6	11.5	11.3								
1/9/20	11.9	11.9	11.8	11.8	11.8	11.8	11.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.6	11.4	11.4	11.4	11.3	11.2	11.2								
2/4/20	11.6	11.6	11.5	11.5	11.2	11.1	11	11	11	11	11	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9								
3/5/20	16	15.7	14.5	13.9	12.4	11.5	11.2	11.1	11	11	11	10.9	10.9	10.9	10.9	10.8	10.8	10.8	10.7	10.7	10.7								
4/2/20	15.3	14.8	14.6	14.4	14.2	13.6	12.9	12.5	11.8	11.5	11.3	11.2	11.1	11.1	11	11	11	11.1	10.9	10.9	10.9								
5/1/20	20.8	20.8	20.7	20.1	18.9	17.9	14.9	13.5	12.6	12.2	11.9	11.6	11.4	11.4	11.3	11.3	11.2	11.1	11.1	11	11								
6/3/20	24.2	24	23.6	23.3	22.7	19.7	16.6	14	13.1	12.6	12.3	12	11.8	11.7	11.7	11.5	11.5	11.3	11.2	11.1	11.1								
7/9/20	24.5	24.4	24.4	24.3	23.9	23.5	18.5	16.7	14.7	13.8	13.4	12.9	12.5	12.2	12.1	12	11.7	11.6	11.4	11.4	11.3								
8/6/20	24.9	24.8	24.7	24.6	24.6	24.5	23.4	20	18.4	16	14.8	13.8	13.4	13.1	12.7	12.3	11.8	11.5	11.4	11.3	11.3								
9/2/20	24.8	24.7	24.6	24.6	24.5	24.4	24.4	23	21.4	19.6	18.7	17	15.8	14.4	13.4	13.3	12.4	11.9	11.4	11.4	11.4								
10/1/20	23.7	23.3	23.2	23.1	23.1	23	22.7	22.6	22.5	22.3	21.2	19.5	16	14.5	13.3	12.7	12.1	11.7	11.5	11.5	11.4								
11/17/20	16.9	16.8	16.7	16.7	16.6	16.3	16.3	16.2	16.2	16.2	16.1	16	15.9	15.7	15	12.7	12.5	12	11.8	11.9	11.9								
12/3/20	14.6	14.2	14.1	14	14	14	14	13.9	13.9	13.8	13.8	13.7	13.7	13.6	13.5	13.4	13.2	12.1	12.1	12.1	12.1								

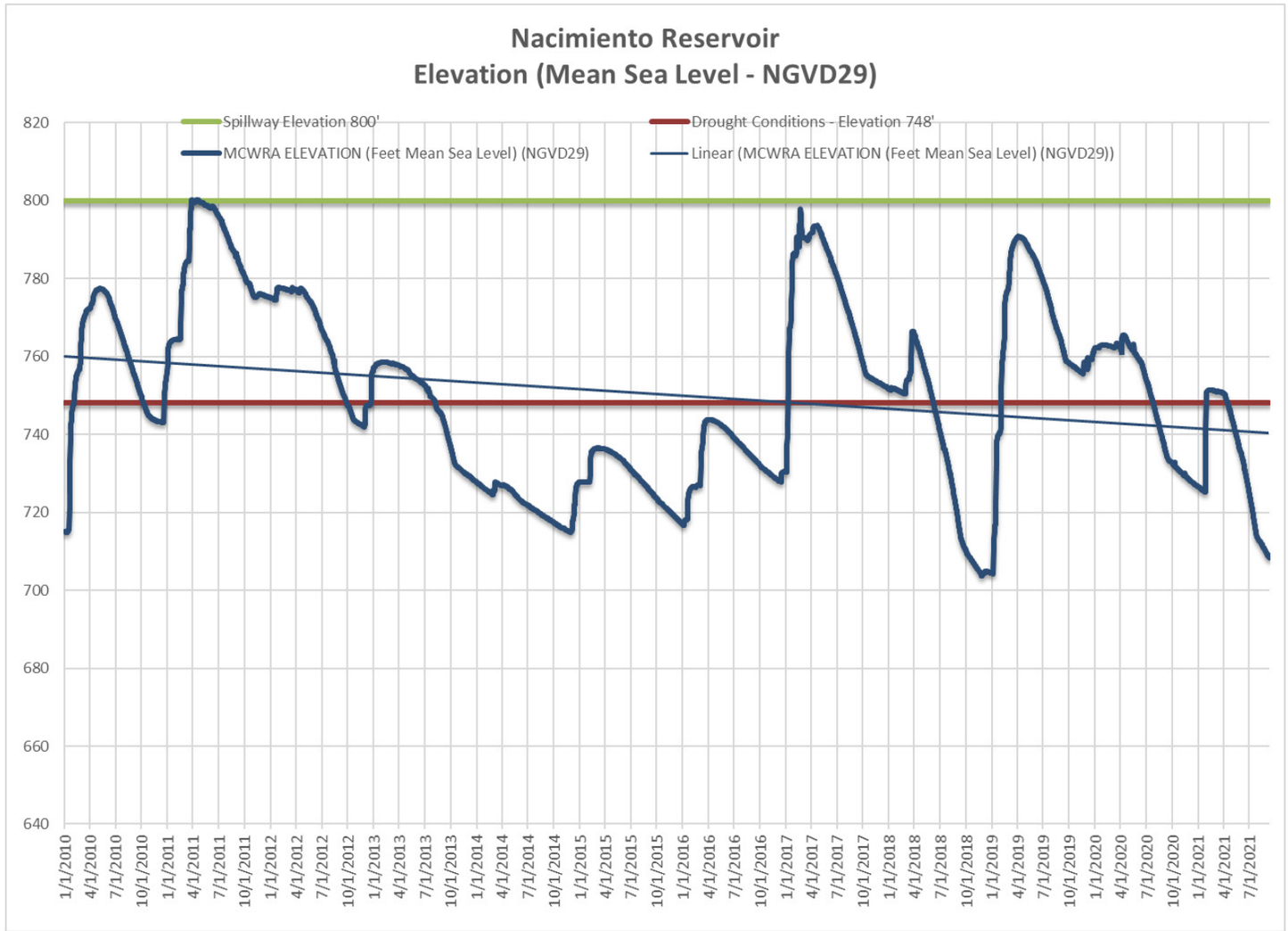
Nacimiento Reservoir Dissolved Oxygen Profile, Dissolved Oxygen versus Depth, Feet

NACIMIENTO RESERVOIR DISSOLVED OXYGEN PROFILE, MG/L VERSUS DEPTH, FEET																												
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**	**105'**	**110'**	**115'**	**120'**	**125'**	**130'**	**135'**	**140'**
1/4/16	7.71	7.29	6.87	6.40	6.24	6.19	6.23	6.16	6.24	6.23	6.23	6.24	6.23	6.20	6.21	6.23	6.14	6.24	6.27										
2/5/16	10.33	9.95	9.70	9.17	8.91	9.02	9.05	9.41	5.86	4.36	3.82	3.62	3.68	3.69	3.38	3.37	3.24	3.16	2.96	2.99									
3/10/16	10.63	10.36	9.28	8.75	7.75	6.93	6.61	6.37	6.14	4.66	4.31	3.92	3.44	3.10	3.10	2.63	2.68	2.63	2.56	2.57	2.48	2.36							
4/7/16		8.79	8.59	8.09	7.13	6.52	6.28	5.89	4.88	4.18	3.51	2.88	2.58	2.02	2.06	1.96	1.87	1.77	1.69	1.64	1.63	1.63	1.63	1.64					
5/5/16	8.60	8.48	8.37	8.46	8.07	5.69	5.61	5.38	4.90	4.48	4.20	3.83	3.50	3.24	2.82	2.41	2.24	2.13	2.09	2.12	2.05	2.02	2.13						
6/9/16	7.06	7.00	7.01	6.69	5.50	4.03	3.16	2.99	2.90	2.81	2.46	2.22	1.92	1.63	1.29	1.18	1.05	1.03	1.01	0.96	0.90	0.89	0.86						
7/7/16	6.85	6.51	6.51	6.43	4.80	2.46	2.03	1.84	1.88	1.89	1.80	1.64	1.26	1.13	1.10	1.15	1.09	1.13	1.01	0.99	0.98	0.96	0.94						
8/4/16	7.26	6.88	6.08	6.00	3.64	3.09	1.61	1.62	1.58	1.53	1.52	1.30	1.36	1.34	1.32	1.32	1.35	1.36	1.32	1.30	1.29	1.27	1.30						
8/31/16	7.32	5.93	5.60	5.09	4.94	4.78	1.54	0.92	0.82	0.82	0.81	0.80	0.79	0.80	0.75	0.78	0.80	0.79	0.78	0.77									
10/5/16	5.52	5.37	5.35	5.29	5.30	5.11	3.70	0.95	0.55	0.55	0.51	0.50	0.53	0.52	0.51	0.48	0.47	0.41											
11/2/16	5.56	5.58	5.20	5.81	5.03	4.15	4.59	3.79	2.20	0.63	0.48	0.48	0.47	0.49	0.46	0.45													
12/1/16	5.79	5.35	5.40	5.28	5.20	5.01	5.02	5.03	5.04	4.84	3.76	3.32	0.41	0.44	0.43	0.44	0.42	0.41	0.38	0.38									
1/17/17	7.88	7.80	7.80	7.80	7.55	7.61	7.71	7.56	7.58	7.32	7.05	7.04	7.31	7.42	7.32	6.76	5.45	5.44	5.12	4.68	4.37	4.75	4.74						
2/8/17	8.88	8.63	8.28	8.14	8.38	8.29	8.06	7.14	7.18	7.15	7.15	7.32	7.28	7.64	7.89	7.86	7.89	7.58	7.77	7.60	7.94	8.34	8.48	8.47	8.45	8.63	8.70		
3/10/17	9.57	8.86	8.90	8.91	8.79	8.42	8.03	7.96	7.81	7.16	7.01	6.97	7.05	6.80	7.06	6.93	6.90	7.07	7.02	6.97	7.09	7.01	7.14	7.03	7.33	7.06	7.02		
4/4/17	9.96	9.09	7.60	7.88	7.09	6.47	6.84	6.70	6.48	6.64	6.21	6.35	6.43	6.44	6.14	6.25	6.36	6.24	6.51	6.30	6.33	6.38	6.19	6.05	5.99	5.88	5.84	5.83	5.81
5/3/17	8.51	8.54	7.99	7.79	6.70	7.75	7.35	7.03	7.92	6.84	6.14	6.11	6.25	6.32	6.25	6.46	6.43	6.21	6.37	6.37	6.30	6.15	6.07	5.70	5.40	6.33	5.25	5.29	
6/6/17	7.80	7.66	7.32	7.41	5.06	2.51	2.80	2.65	3.29	4.32	4.67	4.45	5.02	5.10	4.82	5.26	5.06	5.12	4.71	4.37		4.16	4.08	4.03	3.96	3.69			
7/5/17	7.67	7.10	5.53	5.33	0.69	0.43	0.36	0.42	1.72	2.74	3.24	3.81	4.24	4.51	4.65	4.86	4.46	4.77	4.34	4.29	4.02	3.82	3.35	3.23	2.97	3.03	3.00		
8/1/17	6.77	6.49	6.70	6.38	0.88	0.57	0.46	0.48	0.85	1.74	2.68	3.24	3.78	3.70	3.76	3.53	3.25	3.20	3.32	2.96	2.66	2.40	2.22	2.17					
9/6/17	6.80	7.30	7.20	6.20	2.10	0.73	0.85	0.89	0.92	0.92	0.89	1.00	1.60	1.80	2.10	2.00	1.30	0.87	0.73	0.70	0.70	0.70	0.77	0.91	0.90				
10/5/17	6.30	6.20	6.10	6.50	6.50	6.50	6.70	0.74	0.81	0.84	0.85	0.82	0.79	0.78	0.75	0.73	0.72	0.72	0.74	0.73	0.73	0.73	0.72	0.72	0.72	0.71	0.72		
11/1/17	5.80	5.70	5.60	5.60	5.90	5.50	5.50	5.00	4.80	0.90	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80								

NACIMIENTO RESERVOIR DISSOLVED OXYGEN PROFILE, MG/L VERSUS DEPTH, FEET																												
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**	**105'**	**110'**	**115'**	**120'**	**125'**	**130'**	**135'**	**140'**
12/4/17	6.30	6.20	6.10	6.30	6.30	6.30	6.20	6.10	6.00	6.00	3.30	1.60	1.00	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90								
1/3/18	6.90	6.80	6.80	6.80	6.80	5.40	5.50	5.60	5.60	5.50	5.50	5.40	5.50	5.60	5.50	5.30	5.30	5.30	5.30	5.30	5.10	5.10							
2/1/18	11.56	10.80	10.00	8.50	8.02	7.56	7.38	6.31	5.55	5.33	5.38	5.31	5.41	5.02	4.86	4.78	4.26	4.45	4.40	4.18	4.09	4.03							
3/7/18	8.91	8.90	8.35	7.75	7.54	7.50	7.29	7.31	5.63	5.30	5.02	4.70	4.40	4.43	4.37	4.12	3.91	3.96	3.36	3.38	3.30	3.25							
4/12/18	9.93	9.89	9.71	9.71	9.67	9.26	8.81	8.47	7.93	7.29	7.23	7.04	6.81	6.70	6.61	6.41	6.28	6.25	6.10	6.08	6.01	5.89	5.89	5.77	5.64				
5/2/18	8.58	8.51	8.66	7.78	7.39	7.30	7.05	6.94	6.67	6.66	6.61	6.40	6.08	5.83	5.68	5.42	5.30	5.12	5.10	5.10	5.03								
6/6/18	8.08	7.64	8.04	7.65	6.49	5.43	4.98	4.97	5.13	5.10	5.50	5.68	4.97	4.58	4.49	4.21	3.95	3.63	3.60	3.59									
7/20/18	8.02	8.07	8.00	5.90	5.88	2.64	2.24	2.04	2.07	2.08	2.11	2.15	2.02	2.00	2.03	2.03	2.03												
8/9/18	8.28	7.94	7.66	7.44	7.18	6.64	2.41	2.07	1.91	1.93	1.90	1.96	2.15	2.23	2.42	2.37	2.36												
9/11/18	5.79	5.80	5.10	5.27	5.00	4.78	4.67	4.63	3.92	2.22	2.70	3.13	2.98	2.94	2.88														
10/3/18	8.10	7.60	5.90	5.10	4.60	2.50	1.50	1.20	0.68	0.06	0.04	0.05	0.06	0.05															
11/1/18	5.20	5.03	4.44	4.22	3.80	3.62	3.60	3.61	3.66	2.90	0.05	0.05	0.02	0.02															
12/4/18	5.60	5.60	5.50	5.40	5.30	5.10	5.00	4.70	4.60	3.90	1.30	0.08	0.05	0.04															
1/3/19	5.94	5.65	5.59	5.37	5.49	5.53	5.48	5.67	5.89	5.40	5.54	5.70	5.46	5.08															
1/24/19	10.20	9.40	9.70	9.30	9.60	9.50	9.30	8.30	8.00	7.40	7.30	7.20	7.10	6.80	6.60	6.30	5.50	5.20											
2/7/19	8.90	8.60	8.40	4.60	8.30	7.90	7.90	7.80	7.60	7.40	7.40	7.10	7.10	7.10	7.00	6.80	6.40	6.30	5.80	5.54	4.80								
3/7/19	10.20	9.75	9.75	9.68	9.73	8.99	8.84	8.86	8.02	8.00	7.76	7.99	7.92	7.38	7.42	7.80	7.03	6.48	6.57	6.49	6.80				6.60				
4/9/19	10.10	10.10	8.30	6.30	5.60	6.40	6.50	6.70	6.80	6.70	6.80	6.80	6.70	6.80	6.80	6.70	6.60	6.50	6.49	6.40	6.30		6.00						
5/8/19	7.90	7.70	7.60	7.50	5.70	3.30	4.50	4.70	4.90	5.40	5.90	5.90	5.80	5.70	5.90	5.80	5.90	5.90	6.20	6.00	5.90	6.20							
6/6/19	8.10	8.20	7.70	6.70	5.20	3.70	2.50	2.70	2.70	2.50	3.00	3.10	3.00	2.90	3.00	3.00	2.90	3.00	2.90	2.80	2.80								
7/9/19	9.20	8.90	8.70	8.00	7.40	3.30	2.10	2.50	2.90	3.00	3.50	3.50	4.00	4.10	4.00	4.20	4.20	4.00	4.00	4.10	4.00				4.70				
8/6/19	8.20	7.80	6.50	4.40	3.90	2.20	2.00	1.10	1.10	2.50	3.20	3.90	3.90	4.00	3.90	4.10	4.00	3.70	3.40	3.20	3.10		3.90						
9/5/19	7.63	7.30	6.53	3.31	0.12	0.06	0.08	0.07	0.07	0.82	1.82	2.17	2.21	2.32	2.46	2.51	1.48	1.37	1.25	1.21	1.14	1.81							
10/3/19	6.96	6.56	6.44	6.25	6.18	5.56	3.11	1.11	1.00	0.79	0.22	0.55	0.97	1.11	0.59	0.37	0.11	0.04	0.03	0.03	0.03								
11/7/19	7.40	6.98	6.73	6.24	6.20	5.73	5.34	4.30	0.18	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03								

NACIMIENTO RESERVOIR DISSOLVED OXYGEN PROFILE, MG/L VERSUS DEPTH, FEET																													
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**	**105'**	**110'**	**115'**	**120'**	**125'**	**130'**	**135'**	**140'**
12/5/19	6.47	6.45	6.19	6.01	5.79	5.70	5.62	5.80	5.71	5.59	5.10	3.69	0.87	0.06	0.04	0.04	0.04	0.05	0.04	0.03	0.03								
1/9/20	5.38	5.29	5.16	4.64	4.69	4.42	4.32	4.62	4.63	4.73	4.51	4.31	4.26	4.17	2.02	1.00	0.08	0.07	0.07	0.06	0.06								
2/4/20	9.36	9.30	9.04	8.85	6.45	6.11	6.17	6.03	6.20	6.19	6.07	6.06	6.20	5.86	5.90	5.65	5.67	5.77	5.80	5.85	5.81								
3/5/20	10.77	10.98	11.42	11.39	9.43	7.08	6.59	7.11	6.98	6.87	6.94	6.87	6.74	6.49	6.48	6.33	6.44	6.34	6.17	6.02	6.07								
4/2/20	10.23	9.93	9.54	8.99	8.72	8.04	7.39	6.43	5.38	5.48	5.62	5.55	5.49	5.31	5.45	5.47	5.74	5.37	4.92	4.38	4.02								
5/1/20	8.28	8.20	8.10	8.35	8.89	8.75	7.01	5.60	4.89	4.66	4.52	4.36	4.40	4.12	3.86	3.84	3.49	3.18	2.88	2.75	2.62								
6/3/20	8.03	7.81	7.71	7.87	7.80	7.26	5.98	4.78	4.29	4.16	3.86	3.95	3.77	3.40	3.09	3.00	2.70	1.97	1.66	1.55	1.54								
7/9/20	7.00	6.74	6.62	6.86	6.65	6.27	3.77	3.29	2.66	2.63	2.54	2.66	2.32	1.80	1.37	1.03	0.54	0.19	0.08	0.07	0.07								
8/6/20	7.61	7.95	7.83	7.66	7.46	7.00	4.23	2.41	1.51	1.32	1.50	0.89	0.61	0.14	0.09	0.10	0.10	0.11	0.11	0.11	0.11								
9/2/20	6.51	6.45	6.42	6.32	5.53	5.09	4.73	0.61	0.09	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.08	0.08	0.07	0.07								
10/1/20	8.64	8.29	8.05	7.80	7.32	7.19	5.09	4.38	3.02	1.57	0.42	0.22	0.15	0.15	0.16	0.17	0.17	0.17	0.17	0.18	0.19								
11/17/20	7.78	7.51	7.38	7.26	7.15	5.68	5.40	5.32	4.92	4.76	4.96	4.84	4.46	3.70	1.71	0.92	0.40	0.32	0.27	0.26	0.26								
12/3/20	7.32	6.60	6.24	5.87	6.02	5.90	5.85	6.09	6.12	5.80	5.26	5.44	5.40	4.55	4.24	3.00	1.81	0.93	0.69	0.50	0.36								

Nacimiento Reservoir Elevation



Daily Water Surface Elevation (ft. msl) for Water Year 2016

DAILY WATER SURFACE ELEVATION (FT. MSL) FOR NACIMIENTO RESERVOIR FOR WATER YEAR 2016												
Date	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1	723.50	721.20	719.15	716.95	726.30	726.95	743.70	743.15	741.50	739.10	736.90	734.40
2	723.45	721.15	719.05	716.85	726.40	726.95	743.70	743.10	741.45	739.00	736.80	734.30
3	723.35	721.10	718.95	716.75	726.45	726.95	743.70	743.05	741.40	738.90	736.70	734.25
4	723.25	721.00	718.85	716.65	726.50	726.90	743.70	743.00	741.35	738.85	736.60	734.20
5	723.15	720.95	718.75	716.55	726.50	728.00	743.70	742.95	741.30	738.80	736.50	734.10
6	723.10	720.90	718.70	716.80	726.50	731.95	743.70	742.90	741.20	738.70	736.40	734.05
7	723.00	720.85	718.65	717.40	726.50	733.40	743.70	742.90	741.10	738.65	736.30	733.95
8	722.90	720.75	718.60	717.85	726.50	735.60	743.70	742.85	741.00	738.55	736.20	733.90
9	722.85	720.70	718.50	718.10	726.55	736.40	743.70	742.80	740.90	738.50	736.10	733.80
10	722.80	720.65	718.45	718.10	726.55	736.80	743.70	742.70	740.85	738.40	736.00	733.75
11	722.70	720.60	718.40	718.10	726.60	737.10	743.70	742.70	740.75	738.35	735.95	733.70
12	722.60	720.50	718.30	718.15	726.60	737.90	743.70	742.65	740.70	738.30	735.90	733.60
13	722.55	720.40	718.25	718.15	726.55	738.40	743.70	742.65	740.60	738.20	735.80	733.50
14	722.50	720.35	718.20	718.15	726.50	739.90	743.70	742.60	740.50	738.10	735.75	733.45
15	722.45	720.30	718.10	718.15	726.45	741.20	743.65	742.50	740.45	738.00	735.70	733.35
16	722.40	720.20	718.05	718.15	726.45	741.90	743.60	742.45	740.40	737.95	735.60	733.25
17	722.30	720.10	718.00	718.20	726.45	742.30	743.60	742.35	740.30	737.85	735.50	733.15
18	722.20	720.05	717.95	718.20	726.50	742.60	743.55	742.30	740.25	737.80	735.45	733.10
19	722.15	720.00	717.85	718.20	726.80	742.90	743.50	742.25	740.15	737.75	735.40	733.05
20	722.10	719.90	717.80	723.30	726.85	743.00	743.50	742.20	740.05	737.70	735.30	732.95
21	722.05	719.85	717.70	724.10	726.90	743.15	743.50	742.15	739.95	737.60	735.20	732.90
22	721.95	719.80	717.60	724.45	726.95	743.30	743.45	742.05	739.90	737.55	735.15	732.80
23	721.90	719.70	717.55	725.00	726.95	743.35	743.45	742.00	739.80	737.45	735.10	732.70
24	721.80	719.65	717.45	725.30	727.00	743.45	743.40	741.95	739.70	737.35	735.05	732.65
25	721.70	719.60	717.35	725.60	727.00	743.50	743.40	741.90	739.60	737.30	734.95	732.60
26	721.65	719.50	717.30	725.75	727.00	743.55	743.30	741.85	739.50	737.25	734.85	732.50
27	721.60	719.40	717.25	725.90	727.00	743.60	743.30	741.80	739.45	737.20	734.75	732.40
28	721.55	719.35	717.20	725.95	726.95	743.65	743.25	741.75	739.35	737.15	734.70	732.30
29	721.45	719.30	717.10	726.00	726.95	743.65	743.20	741.70	739.30	737.10	734.60	732.25
30	721.35	719.25	717.05	726.05	---	743.70	743.20	741.60	739.20	737.00	734.55	732.20
31	721.25	---	717.00	726.20	---	743.70	---	741.55	---	736.95	734.50	---

Daily Water Surface Elevation (ft. msl) for Water Year 2017

DAILY WATER SURFACE ELEVATION (FT. MSL) FOR NACIMIENTO RESERVOIR FOR WATER YEAR 2017												
Date	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1	732.10	730.20	728.45	730.45	786.55	790.60	791.65	792.35	786.65	780.60	773.80	766.20
2	732.00	730.15	728.40	730.40	786.55	790.40	791.70	792.20	786.45	780.40	773.50	766.00
3	731.90	730.10	728.30	730.40	786.50	790.40	791.75	792.00	786.30	780.20	773.30	765.75
4	731.85	730.05	728.25	735.70	786.25	790.40	791.75	791.85	786.10	780.00	773.10	765.50
5	731.75	730.00	728.20	737.40	786.05	790.40	791.80	791.65	785.90	779.80	772.90	765.30
6	731.70	729.95	728.10	739.40	785.80	790.40	791.85	791.45	785.70	779.60	772.70	765.00
7	731.65	729.90	728.05	741.80	786.70	790.35	791.85	791.25	785.50	779.40	772.40	764.75
8	731.55	729.80	728.00	743.00	789.90	790.30	792.90	791.05	785.30	779.20	772.20	764.50
9	731.50	729.70	728.00	751.50	790.60	790.35	793.40	790.90	785.10	779.00	772.00	764.25
10	731.40	729.60	727.95	753.70	790.20	790.40	793.40	790.75	784.80	778.80	771.70	763.95
11	731.35	729.50	728.00	761.30	790.10	790.40	793.50	790.50	784.50	778.60	771.50	763.70
12	731.25	729.50	728.00	764.60	790.40	790.40	793.45	790.35	784.35	778.35	771.30	763.45
13	731.20	729.45	727.95	766.00	790.70	790.25	793.40	790.10	784.15	778.10	771.00	763.10
14	731.15	729.40	727.90	766.90	790.95	790.15	793.50	789.95	784.00	777.90	770.70	762.90
15	731.10	729.30	727.85	767.35	790.35	790.05	793.50	789.80	783.80	777.70	770.50	762.70
16	731.00	729.20	729.30	767.60	789.10	790.00	793.45	789.50	783.55	777.50	770.10	762.50
17	731.00	729.10	730.10	767.80	788.20	789.95	793.40	789.30	783.30	777.25	769.95	762.00
18	731.00	729.05	730.25	768.00	792.30	789.90	793.40	789.10	783.20	777.00	769.75	761.75
19	730.95	729.00	730.30	769.30	794.00	789.85	793.50	788.90	783.00	776.75	769.45	761.40
20	730.90	728.95	730.30	771.10	794.25	789.80	793.50	788.70	782.80	776.50	769.10	761.20
21	730.80	728.95	730.30	774.50	797.70	789.85	793.60	788.50	782.60	776.30	768.90	760.95
22	730.70	728.90	730.30	777.35	797.90	790.15	793.45	788.30	782.40	776.10	768.70	760.70
23	730.65	728.85	730.30	782.40	796.40	790.40	793.35	788.10	782.20	775.85	768.40	760.40
24	730.60	728.80	730.30	784.50	794.90	790.45	793.20	787.95	781.95	775.60	768.20	760.15
25	730.55	728.70	730.50	785.40	793.30	790.70	793.10	787.80	781.70	775.40	767.95	759.80
26	730.50	728.65	730.55	785.90	792.15	791.00	793.05	787.60	781.50	775.20	767.70	759.50
27	730.45	728.60	730.55	786.15	791.40	791.25	792.90	787.40	781.40	774.95	767.40	759.30
28	730.40	728.60	730.50	786.35	790.95	791.40	792.85	787.20	781.30	774.70	767.20	759.00
29	730.35	728.55	730.50	786.50	---	791.50	792.75	787.10	781.00	774.50	766.95	758.80
30	730.30	728.50	730.50	786.55	---	791.60	792.55	786.95	780.85	774.25	766.70	758.45
31	730.25	---	730.45	786.55	---	791.60	---	786.80	---	774.00	766.45	---

Daily Water Surface Elevation (ft. msl) for Water Year 2018

DAILY WATER SURFACE ELEVATION (FT. MSL) FOR NACIMIENTO RESERVOIR FOR WATER YEAR 2018												
Date	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1	758.20	754.35	753.10	751.75	751.30	750.30	765.65	758.70	750.25	740.90	731.70	718.90
2	757.90	754.30	753.05	751.70	751.30	752.80	765.50	758.40	749.90	740.60	731.30	718.50
3	757.65	754.25	753.00	751.65	751.25	753.70	765.30	758.00	749.60	740.20	730.90	718.10
4	757.40	754.20	752.95	751.65	751.20	753.80	765.10	757.70	749.30	739.90	730.50	717.70
5	757.15	754.15	752.90	751.60	751.20	753.90	764.90	757.40	749.00	739.60	730.10	717.20
6	756.90	754.10	752.85	751.50	751.15	753.90	764.70	757.10	748.70	739.30	729.80	716.80
7	756.65	754.00	752.80	751.45	751.10	754.00	764.40	756.90	748.40	739.00	729.40	716.20
8	756.30	754.00	752.75	751.45	751.10	753.95	764.10	756.65	748.10	738.70	729.10	715.80
9	756.10	753.95	752.70	751.60	751.05	754.00	763.90	756.40	747.70	738.35	728.80	715.20
10	755.90	753.90	752.65	752.00	751.00	754.00	763.70	756.20	747.30	738.00	728.35	714.80
11	755.60	753.85	752.60	751.90	750.95	754.10	763.50	755.95	747.10	737.70	727.90	714.40
12	755.40	753.80	752.55	751.90	750.90	754.05	763.30	755.70	746.80	737.40	727.50	713.70
13	755.30	753.80	752.50	751.90	750.90	754.10	763.00	755.45	746.50	737.10	727.10	713.40
14	755.20	753.75	752.50	751.90	750.85	754.85	762.70	755.25	746.15	736.70	726.60	713.10
15	755.10	753.70	752.45	751.85	750.80	755.10	762.50	755.00	745.80	736.40	726.30	712.80
16	755.10	753.70	752.40	751.85	750.80	755.20	762.30	754.80	745.50	736.20	726.00	712.70
17	755.00	753.65	752.35	751.80	750.75	755.75	762.10	754.55	745.20	736.20	725.60	712.60
18	754.95	753.60	752.30	751.80	750.70	756.00	761.85	754.30	744.90	736.10	725.10	712.40
19	754.90	753.55	752.25	751.75	750.65	756.10	761.65	754.00	744.60	736.10	724.70	712.40
20	754.90	753.50	752.20	751.75	750.60	756.05	761.40	753.70	744.20	735.80	724.35	712.05
21	754.85	753.45	752.15	751.70	750.55	756.10	761.20	753.50	743.95	735.50	723.95	711.80
22	754.75	753.40	752.15	751.70	750.50	760.10	760.90	753.20	743.65	735.10	723.50	711.55
23	754.70	753.35	752.15	751.65	750.50	765.00	760.80	752.90	743.35	734.80	723.10	711.30
24	754.65	753.30	752.10	751.65	750.45	766.00	760.60	752.60	743.10	734.50	722.60	711.15
25	754.60	753.25	752.00	751.60	750.40	766.30	760.30	752.30	742.70	734.10	722.10	711.00
26	754.55	753.25	751.90	751.50	750.35	766.40	760.00	752.00	742.45	733.75	721.70	710.90
27	754.50	753.25	751.85	751.55	750.35	766.30	759.75	751.70	742.10	733.30	721.35	710.80
28	754.50	753.20	751.85	751.50	750.30	766.30	759.50	751.40	741.80	733.00	720.90	710.65
29	754.45	753.15	751.80	751.45	---	766.30	759.25	751.10	741.50	732.60	720.50	710.50
30	754.40	753.10	751.75	751.40	---	766.25	759.00	750.90	741.20	732.40	720.00	710.35
31	754.35	---	751.70	751.35	---	766.25	---	750.60	---	732.00	719.50	---

Daily Water Surface Elevation (ft. msl) for Water Year 2019

DAILY WATER SURFACE ELEVATION (FT. MSL) FOR NACIMIENTO RESERVOIR FOR WATER YEAR 2019												
Date	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1	710.20	706.50	704.45	704.40	740.80	777.90	790.50	789.20	785.20	779.45	771.80	764.50
2	710.00	706.40	704.45	704.30	741.60	778.80	790.60	789.10	785.00	779.25	771.50	764.30
3	709.80	706.30	704.40	704.30	748.30	780.50	790.70	789.00	784.90	778.95	771.10	764.10
4	709.70	706.20	704.40	704.20	752.60	781.00	790.80	788.80	784.70	778.80	770.80	763.90
5	709.50	706.10	704.40	704.20	756.60	781.55	790.95	788.70	784.60	778.65	770.50	763.50
6	709.30	706.00	704.50	704.30	758.10	782.30	790.75	788.60	784.40	778.50	770.35	763.20
7	709.20	705.90	704.80	710.95	758.85	784.20	790.70	788.45	784.25	778.35	770.05	762.80
8	709.10	705.80	704.80	713.00	759.45	785.20	790.70	788.30	784.00	778.20	769.75	762.50
9	709.00	705.70	704.80	713.50	760.30	785.85	790.60	788.15	783.85	778.00	769.45	762.25
10	708.90	705.60	704.80	715.00	761.20	786.50	790.60	788.00	783.70	777.75	769.25	761.95
11	708.80	705.50	704.80	715.60	762.30	786.90	790.60	787.85	783.50	777.55	769.00	761.70
12	708.70	705.40	704.80	716.60	763.00	787.30	790.60	787.70	783.30	777.30	768.80	761.30
13	708.60	705.30	704.80	717.00	763.50	787.60	790.55	787.55	783.10	777.05	768.50	761.00
14	708.50	705.20	704.80	717.70	764.80	787.90	790.50	787.40	782.90	776.80	768.30	760.70
15	708.40	705.10	704.80	718.80	770.70	788.10	790.50	787.25	782.70	776.60	768.00	760.40
16	708.30	705.00	704.80	723.10	772.70	788.30	790.50	787.15	782.50	776.30	767.80	760.10
17	708.15	704.90	704.70	733.00	773.80	788.50	790.45	787.00	782.30	776.05	767.60	759.80
18	708.00	704.80	704.70	737.10	774.60	788.75	790.45	786.85	782.10	775.80	767.35	759.50
19	707.90	704.70	704.70	738.30	775.10	788.80	790.45	786.75	781.90	775.50	767.20	759.20
20	707.85	704.60	704.70	738.90	775.55	789.00	790.35	786.70	781.70	775.20	767.00	759.00
21	707.75	704.50	704.70	739.30	776.00	789.30	790.25	786.60	781.50	774.90	766.80	758.90
22	707.65	704.30	704.70	739.50	776.30	789.45	790.20	786.50	781.20	774.75	766.60	758.80
23	707.50	704.20	704.70	739.70	776.65	789.60	790.00	786.40	781.05	774.50	766.40	758.80
24	707.40	704.00	704.60	739.90	776.80	789.80	790.00	786.30	781.00	774.10	766.20	758.70
25	707.30	703.90	704.60	740.00	777.00	789.95	790.00	786.15	780.80	773.90	766.00	758.65
26	707.20	703.80	704.60	740.10	777.10	789.95	789.95	786.00	780.55	773.65	765.80	758.60
27	707.10	703.70	704.60	740.30	777.25	790.00	789.80	785.90	780.30	773.30	765.60	758.50
28	707.00	703.60	704.50	740.40	777.65	790.25	789.70	785.75	780.10	773.00	765.35	758.45
29	706.90	703.80	704.50	740.50	---	790.40	789.60	785.65	779.85	772.75	765.15	758.40
30	706.75	704.50	704.40	740.55	---	790.45	789.40	785.50	779.60	772.45	764.90	758.35
31	706.65	---	704.40	740.60	---	790.50	---	785.40	---	772.10	764.70	---

Daily Water Surface Elevation (ft. msl) for Water Year 2020

DAILY WATER SURFACE ELEVATION (FT. MSL) FOR NACIMIENTO RESERVOIR FOR WATER YEAR 2019												
Date	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1	710.20	706.50	704.45	704.40	740.80	777.90	790.50	789.20	785.20	779.45	771.80	764.50
2	710.00	706.40	704.45	704.30	741.60	778.80	790.60	789.10	785.00	779.25	771.50	764.30
3	709.80	706.30	704.40	704.30	748.30	780.50	790.70	789.00	784.90	778.95	771.10	764.10
4	709.70	706.20	704.40	704.20	752.60	781.00	790.80	788.80	784.70	778.80	770.80	763.90
5	709.50	706.10	704.40	704.20	756.60	781.55	790.95	788.70	784.60	778.65	770.50	763.50
6	709.30	706.00	704.50	704.30	758.10	782.30	790.75	788.60	784.40	778.50	770.35	763.20
7	709.20	705.90	704.80	710.95	758.85	784.20	790.70	788.45	784.25	778.35	770.05	762.80
8	709.10	705.80	704.80	713.00	759.45	785.20	790.70	788.30	784.00	778.20	769.75	762.50
9	709.00	705.70	704.80	713.50	760.30	785.85	790.60	788.15	783.85	778.00	769.45	762.25
10	708.90	705.60	704.80	715.00	761.20	786.50	790.60	788.00	783.70	777.75	769.25	761.95
11	708.80	705.50	704.80	715.60	762.30	786.90	790.60	787.85	783.50	777.55	769.00	761.70
12	708.70	705.40	704.80	716.60	763.00	787.30	790.60	787.70	783.30	777.30	768.80	761.30
13	708.60	705.30	704.80	717.00	763.50	787.60	790.55	787.55	783.10	777.05	768.50	761.00
14	708.50	705.20	704.80	717.70	764.80	787.90	790.50	787.40	782.90	776.80	768.30	760.70
15	708.40	705.10	704.80	718.80	770.70	788.10	790.50	787.25	782.70	776.60	768.00	760.40
16	708.30	705.00	704.80	723.10	772.70	788.30	790.50	787.15	782.50	776.30	767.80	760.10
17	708.15	704.90	704.70	733.00	773.80	788.50	790.45	787.00	782.30	776.05	767.60	759.80
18	708.00	704.80	704.70	737.10	774.60	788.75	790.45	786.85	782.10	775.80	767.35	759.50
19	707.90	704.70	704.70	738.30	775.10	788.80	790.45	786.75	781.90	775.50	767.20	759.20
20	707.85	704.60	704.70	738.90	775.55	789.00	790.35	786.70	781.70	775.20	767.00	759.00
21	707.75	704.50	704.70	739.30	776.00	789.30	790.25	786.60	781.50	774.90	766.80	758.90
22	707.65	704.30	704.70	739.50	776.30	789.45	790.20	786.50	781.20	774.75	766.60	758.80
23	707.50	704.20	704.70	739.70	776.65	789.60	790.00	786.40	781.05	774.50	766.40	758.80
24	707.40	704.00	704.60	739.90	776.80	789.80	790.00	786.30	781.00	774.10	766.20	758.70
25	707.30	703.90	704.60	740.00	777.00	789.95	790.00	786.15	780.80	773.90	766.00	758.65
26	707.20	703.80	704.60	740.10	777.10	789.95	789.95	786.00	780.55	773.65	765.80	758.60
27	707.10	703.70	704.60	740.30	777.25	790.00	789.80	785.90	780.30	773.30	765.60	758.50
28	707.00	703.60	704.50	740.40	777.65	790.25	789.70	785.75	780.10	773.00	765.35	758.45
29	706.90	703.80	704.50	740.50	---	790.40	789.60	785.65	779.85	772.75	765.15	758.40
30	706.75	704.50	704.40	740.55	---	790.45	789.40	785.50	779.60	772.45	764.90	758.35
31	706.65	---	704.40	740.60	---	790.50	---	785.40	---	772.10	764.70	---

Appendix B: Bacteriological Data

Appendix B: Bacteriological Data

Date	Total Coliforms (MPN/100 mL)	*E. coli* (MPN/100mL)	Intake Elevation
1/5/16	120	<1	700
1/7/16	55	<1	700
2/1/16	140	<1	700
3/7/16	2800	<1	700
4/4/16	980	<1	700
5/2/16	11000	<1	700
5/3/16	9800	<1	700
6/6/16	1700	1	700
7/5/16	3300	<1	700
8/1/16	11000	2	700
9/5/16	5800	1	700
10/3/16	100	<1	700
11/1/16	340	<1	700
12/5/16	140	1	700
1/9/17	160	<1	700
2/6/17	580	5	680
3/6/17	210	1	680
4/3/17	580	<1	680
5/1/17	490	<1	680
6/5/17	60	1	680
7/3/17	980	<1	700
8/7/17	200	<1	700
9/6/17	650	<1	700
10/2/17	270	<1	700
11/1/17	920	1	700
12/4/17	110	<1	700
1/3/18	2400	<1	720
2/1/18	150	<1	720
3/7/18	2000	<1	720
4/12/18	110	1	720

Date	Total Coliforms (MPN/100 mL)	*E. coli* (MPN/100mL)	Intake Elevation
5/2/18	25	1	720
6/6/18	100	<1	720
7/19/18	2000	<1	720
8/9/18	>24000	<1	720
9/11/18	13000	<1	700
10/3/18	490	<1	700
11/1/18	1600	<1	700
12/4/18	460	<1	680
1/3/19	210	1	680
2/7/19	170	3	680
3/7/19	60	1	680
4/9/19	68	<1	680
5/8/19	370	<1	760
6/6/19	400	<1	760
7/9/19	1100	<1	760
8/6/19	310	<1	760
9/5/19	>24000	<1	760
10/3/19	250	1	740
11/7/19	24	1	720
12/5/19	35	1	720
1/9/20	79	<1	720
2/4/20	63	<1	720
3/5/20	1700	<1	720
4/2/20	25	<1	720
5/1/20	50	<1	720
6/3/20	4600	2	720
7/9/20	1700	34	720
8/6/20	24000	<1	720
9/2/20	5500	<1	720
10/1/20	160	<1	720
11/17/20	11	<1	720
12/3/20	110	<1	720

Appendix C: Algae Data

Appendix C: Algae Data

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
Nacimiento Reservoir - Intake #7 - Elevation 780'								
2/8/17	400	0	310	77	0	0	0	11
3/8/17	77	0	66	11	0	0	0	0
4/4/17	930	0	380	380	0	0	0	160
5/2/17	400	0	0	0	0	0	0	400
6/6/17	510	60	0	400	9	0	0	40
3/7/19	183	0	100	0	17	0	0	66
4/9/19	167	0	41	5	11	0	0	110
5/8/19	140	0	9	67	3	0	0	57
6/6/19	1600	480	8	930	5	0	120	8
Nacimiento Reservoir - Intake #6 - Elevation 760'								
1/17/17	1600	330	0	0	0	0	0	1300
2/8/17	110	0	33	77	0	0	0	0
3/8/17	22	0	0	22	0	0	0	0
4/4/17	1300	0	0	1300	0	0	0	0
5/2/17	810	0	0	0	0	0	0	810
6/6/17	1100	0	0	1000	0	23	0	45
7/5/17	630	440	0	9	0	0	0	180
8/1/17	3800	3500	4	16	1	9	0	270
9/6/17	86	70	0	7	2	0	0	7
4/12/18	330	170	6	60	0	0	0	90
2/7/19	25	0	10	0	0	0	0	15
3/7/19	108	0	41	0	23	0	0	44
4/9/19	167	0	23	7	27	0	0	110
5/8/19	130	0	10	3	6	0	0	110
6/6/19	250	0	3	240	3	0	0	8
7/9/19	470	360	13	14	1	0	13	78
8/6/19	585	229	10	47	23	0	6	270

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
9/5/19	2100	360	170	33	120	0	0	1400
1/9/20	150	0	51	7	0	0	0	94
2/4/20	320	0	100	43	0	0	0	180
3/5/20	82	0	2	0	0	0	0	80
4/2/20	10	0	0	0	0	0	0	10
5/1/20	15	0	15	0	0	0	0	0
Nacimiento Reservoir - Intake #5 - Elevation 740'								
4/7/16	71	0	40	30	0	0	0	0
5/5/16	380	0	8	28	0	25	0	320
1/17/17	290	0	66	11	0	0	0	210
2/8/17	22	0	0	22	0	0	0	0
3/8/17	11	0	0	11	0	0	0	0
4/4/17	120	0	120	0	0	0	0	0
5/2/17	0	0	0	0	0	0	0	0
6/6/17	500	0	0	420	0	0	0	80
7/5/17	270	170	0	10	0	0	0	88
8/1/17	1000	960	1	0	1	1	0	48
9/6/17	200	150	22	12	2	0	0	12
10/4/17	430	300	0	10	1	1	110	12
11/1/17	200	200	1	0	1	0	0	0
12/4/17	750	200	0	36	0	0	0	510
1/3/18	120	0	0	120	0	0	0	0
2/1/18	4000	160	0	3500	1	0	120	240
3/7/18	1800	84	1	590	1	0	0	1100
4/12/18	350	280	4	36	0	0	0	30
5/2/18	67	21	7	34	1	0	0	4
6/6/18	44	0	3	0	1	0	40	0
2/7/19	16	0	6	4	1	0	0	5
3/7/19	129	0	35	20	31	0	0	43
4/9/19	118	0	13	3	6	0	6	90
5/8/19	52	0	6	19	7	0	0	20

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
6/6/19	380	0	3	330	0	0	0	43
7/9/19	96	45	6	3	10	0	0	32
8/6/19	332	35	0	54	4	0	34	205
9/5/19	990	40	160	28	130	0	0	630
10/3/19	70	0	7	0	3	0	0	60
11/7/19	11	0	11	0	0	0	0	0
12/5/19	18	0	10	8	0	0	0	0
1/9/20	270	0	65	65	0	0	0	140
2/4/20	370	0	22	0	0	0	0	350
3/5/20	52	0	5	0	0	0	0	47
4/2/20	150	0	35	75	0	0	0	40
5/1/20	300	0	0	0	0	0	0	300
6/3/20	48	0	23	0	9	0	0	16
7/9/20	150	0	27	43	5	35	30	6
8/6/20	540	200	40	0	0	0	0	300
Nacimiento Reservoir - Intake #4 - Elevation 720'								
2/1/16	400	0	33	10	8	0	0	350
3/10/16	25	0	5	20	0	0	0	0
4/7/16	76	0	15	60	0	0	0	0
5/5/16	480	0	0	83	0	25	5	370
6/9/16	23	0	0	0	0	0	0	23
7/7/16	700	0	45	81	5	23	0	540
8/4/16	3300	380	140	290	30	130	0	2400
8/31/16	2500	680	55	180	25	120	0	1400
10/5/16	2100	250	10	5	0	63	240	1500
11/2/16	1100	250	0	0	0	23	5	850
12/1/16	240	25	0	3	0	0	30	180
1/17/17	760	220	55	77	11	0	0	400
2/8/17	33	0	11	22	0	0	0	0
3/8/17	22	0	11	0	0	0	0	11
4/4/17	0	0	0	0	0	0	0	0

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
5/2/17	0	0	0	0	0	0	0	0
6/6/17	280	0	0	260	0	0	0	24
7/5/17	58	30	0	0	0	0	0	28
8/1/17	360	300	1	1	1	9	0	46
9/6/17	29	20	2	0	2	0	0	5
10/4/17	400	310	20	1	1	0	0	72
11/1/17	170	170	0	1	0	0	0	0
12/4/17	780	140	0	40	0	0	0	600
1/3/18	40	0	0	0	0	0	0	40
2/1/18	850	0	6	640	0	0	8	200
3/7/18	1900	36	0	904	0	0	20	930
4/12/18	250	130	3	120	0	0	0	0
5/2/18	170	140	0	24	0	0	0	8
6/6/18	90	0	4	61	0	0	0	25
7/19/18	310	300	0	0	0	0	0	13
8/9/18	2300	2200	1	0	12	0	0	110
2/7/19	14	0	2	0	0	0	0	12
3/7/19	88	0	14	0	20	0	0	54
4/9/19	49	0	8	3	10	0	0	28
5/8/19	110	0	10	49	9	0	6	33
6/6/19	360	90	6	24	1	0	10	10
7/9/19	61	0	4	40	4	0	0	13
8/6/19	317	240	1	20	0	3	16	37
9/5/19	300	0	16	37	21	0	0	230
10/3/19	11	0	7	0	0	0	0	4
11/7/19	44	0	11	0	11	22	0	0
12/5/19	18	0	18	0	0	0	0	0
1/9/20	130	0	29	80	0	0	0	21
2/4/20	520	0	0	0	0	0	0	520
3/5/20	110	0	5	20	0	0	0	88
4/2/20	15	5	10	0	0	0	0	0

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
5/1/20	35	0	5	0	0	0	30	0
6/3/20	70	0	9	0	9	0	0	52
7/9/20	75	0	37	3	3	10	10	12
8/6/20	500	450	40	0	0	10	0	0
9/2/20	150	0	40	0	0	0	0	110
10/1/20	3900	3600	15	5	55	35	20	140
11/17/20	860	100	200	5	0	45	75	440
12/3/20	230	0	5	0	0	0	0	5
Nacimiento Reservoir - Intake #3- Elevation 700'								
1/4/16	25	0	0	0	0	0	0	25
2/1/16	350	0	33	8	0	0	0	310
3/10/16	38	0	13	0	0	0	0	25
4/7/16	23	0	5	15	0	0	0	3
5/5/16	400	0	10	30	0	18	0	340
6/9/16	110	0	0	110	0	0	0	0
7/7/16	83	0	40	8	0	25	0	10
8/4/16	1800	200	81	88	73	160	0	1200
8/31/16	1200	320	81	130	33	150	0	470
10/5/16	1300	520	13	5	0	30	60	640
11/2/16	600	150	0	5	0	30	35	380
12/1/16	220	0	0	5	0	5	5	200
1/17/17	3600	55	22	0	0	0	66	3500
2/8/17	77	0	66	11	0	0	0	0
3/8/17	130	0	0	130	0	0	0	0
4/4/17	40	0	40	0	0	0	0	0
5/2/17	0	0	0	0	0	0	0	0
6/6/17	210	0	0	160	0	0	0	52
7/5/17	70	30	0	4	0	0	0	36
8/1/17	370	350	4	0	0	4	0	14
9/6/17	0	0	0	0	0	0	0	0
10/4/17	450	410	0	0	7	1	0	32

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
11/1/17	120	110	4	0	1	0	0	6
12/4/17	480	110	0	60	0	0	0	310
1/3/18	120	0	0	0	0	0	0	120
2/1/18	310	20	0	230	1	0	0	60
3/7/18	680	12	0	204	0	0	0	470
4/12/18	200	200	0	8	0	0	0	0
5/2/18	130	60	0	73	0	0	0	0
6/6/18	17	10	1	4	1	0	0	1
7/19/18	50	45	1	0	0	0	0	4
8/9/18	1500	1500	7	1	0	0	0	39
9/11/18	160	60	60	0	3	0	0	40
10/1/18	66	0	4	0	10	0	6	46
11/5/18	75	0	9	0	6	0	0	60
12/3/18	87	0	0	0	0	0	0	87
1/3/19	270	24	3	4	0	0	0	240
2/7/19	58	0	6	1	0	0	0	51
3/7/19	24	0	3	0	10	0	0	11
4/9/19	40	0	5	10	5	0	0	20
5/8/19	45	0	3	12	3	0	0	27
6/6/19	72	0	4	60	1	0	0	7
7/9/19	20	0	6	3	2	0	0	9
8/6/19	32	20	1	0	0	0	0	11
9/5/19	300	0	10	28	18	0	0	240
10/3/19	60	0	1	3	2	0	0	54
11/7/19	66	0	66	0	0	0	0	0
12/5/19	25	0	13	10	0	0	0	3
1/9/20	110	0	7	99	0	0	0	0
2/4/20	390	0	36	0	0	0	0	350
3/5/20	600	0	10	350	0	0	0	240
4/2/20	5	0	5	0	0	0	0	0
5/1/20	320	0	5	0	0	0	0	310

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
6/3/20	54	0	33	0	5	0	0	16
7/9/20	110	20	37	0	0	35	0	15
8/6/20	10	0	10	0	0	0	0	0
9/2/20	45	0	15	0	0	0	0	30
10/1/20	460	350	5	0	0	10	0	90
9/2/20	45	0	15	0	0	0	0	30
10/1/20	460	350	5	0	0	10	0	90
11/17/20	180	0	0	15	0	0	75	85
12/3/20	190	100	0	0	0	0	0	90
Nacimiento Reservoir - Intake #2- Elevation 680'								
1/4/16	15	0	3	0	0	0	0	13
2/1/16	190	0	25	13	0	0	0	150
3/10/16	30	0	10	0	0	0	0	20
4/7/16	5	0	3	0	0	0	0	3
5/5/16	390	0	0	55	0	13	0	330
6/9/16	0	0	0	0	0	0	0	0
7/7/16	140	0	73	10	3	40	0	10
8/4/16	980	0	53	45	43	45	0	790
8/31/16	1200	20	66	166	25	130	0	820
10/5/16	440	270	0	15	0	4	3	150
11/2/16	350	50	5	3	0	20	13	260
12/1/16	210	38	3	0	0	0	0	170
1/17/17	3400	3000	0	11	0	0	0	340
2/8/17	520	0	470	44	0	0	0	0
3/8/17	11	0	0	11	0	0	0	0
4/4/17	40	0	40	0	0	0	0	0
5/2/17	81	0	0	81	0	0	0	0
6/6/17	200	0	0	150	0	0	0	48
7/5/17	14	0	0	2	0	0	0	12
8/1/17	620	580	0	0	0	4	0	40
9/6/17	0	0	0	0	0	0	0	0

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
10/4/17	220	140	0	0	0	0	0	80
11/1/17	100	100	0	0	3	0	0	0
12/4/17	210	170	1	0	4	0	0	30
1/3/18	0	0	0	0	0	0	0	0
2/1/18	40	0	0	39	1	0	0	0
3/7/18	3800	72	1	870	1	0	0	2800
4/12/18	300	260	0	36	0	0	0	8
5/2/18	250	180	7	48	0	0	0	12
6/6/18	66	0	0	36	0	0	0	30
7/19/18	34	0	1	30	0	0	0	3
8/9/18	32	20	0	0	0	0	0	12
9/11/18	320	160	0	1	0	0	0	160
10/1/18	26	0	0	0	10	0	0	16
11/5/18	170	0	21	0	13	0	0	140
12/3/18	61	0	11	0	0	0	0	50
1/3/19	190	48	0	3	0	0	0	140
2/7/19	36	0	11	0	0	0	0	25
3/7/19	54	0	17	0	11	0	0	26
4/9/19	49	0	10	0	5	0	0	34
5/8/19	50	0	3	24	3	0	0	20
6/6/19	39	0	3	30	0	0	0	6
7/9/19	16	0	6	3	1	0	0	6
8/6/19	0	0	0	0	0	0	0	0
9/5/19	270	0	9	13	6	0	0	240
10/3/19	17	0	1	0	0	0	0	16
11/7/19	0	0	0	0	0	0	0	0
12/5/19	8	0	8	0	0	0	0	0
1/9/20	63	0	7	0	14	0	0	42
2/4/20	390	0	29	0	14	0	0	350
3/5/20	390	0	0	0	0	0	0	390
4/2/20	0	0	0	0	0	0	0	0

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
5/1/20	20	0	20	0	0	0	0	0
6/3/20	32	0	9	0	23	0	0	0
7/9/20	39	0	10	0	5	20	0	4
8/6/20	1200	1200	0	0	0	0	0	10
9/2/20	10	0	5	0	0	0	0	5
10/1/20	90	0	0	55	0	0	0	35
11/17/20	85	0	0	0	0	0	0	85
12/3/20	86	0	0	0	0	0	0	86
Nacimiento Reservoir - Intake #1- Elevation 660'								
1/4/16	300	0	30	13	0	0	0	260
2/1/16	20	0	8	0	0	0	0	13
3/10/16	25	0	5	20	0	0	0	0
4/7/16	430	0	0	83	0	13	0	340
5/5/16	0	0	0	0	0	0	0	0
6/9/16	71	0	15	30	0	3	0	23
7/7/16	600	0	18	35	25	0	0	520
8/4/16	880	13	38	180	0	63	0	590
8/31/16	62	0	3	53	0	3	3	0
10/5/16	400	63	15	0	0	8	13	300
11/2/16	0	0	0	0	0	0	0	0
12/1/16	2900	440	110	66	0	0	0	2300
1/17/17	22	0	11	11	0	0	0	0
2/8/17	22	0	0	22	0	0	0	0
3/8/17	0	0	0	0	0	0	0	0
4/4/17	0	0	0	0	0	0	0	0
5/2/17	230	0	3	200	0	0	0	28
6/6/17	100	88	0	17	0	0	0	0
7/5/17	370	360	0	0	1	1	0	4
8/1/17	0	0	0	0	0	0	0	0
9/6/17	440	180	3	0	0	0	0	260
10/4/17	43	40	1	0	1	0	0	1

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
11/1/17	120	70	0	0	3	0	0	45
12/4/17	0	0	0	0	0	0	0	0
1/3/18	61	0	0	30	1	0	0	30
2/1/18	300	0	1	48	0	0	0	250
3/7/18	85	64	0	20	0	0	0	1
4/12/18	140	84	0	41	0	0	0	12
5/2/18	110	0	0	70	0	0	0	40
6/6/18	0	0	0	0	0	0	0	0
7/19/18	32	20	0	0	0	0	0	12
8/9/18	22	15	0	0	0	0	0	7
9/11/18	22	15	0	0	0	0	0	7
10/1/18	52	10	6	0	0	0	0	36
11/5/18	110	0	0	1	3	0	0	110
12/3/18	79	0	1	0	0	0	0	78
12/4/18	79	0	1	0	0	0	0	78
1/3/19	200	24	0	3	0	0	0	170
2/7/19	20	0	4	3	0	0	0	13
3/7/19	33	0	9	0	11	0	0	13
4/9/19	22	0	10	1	0	0	0	11
5/8/19	29	0	2	2	2	0	0	23
6/6/19	11	0	4	1	0	0	0	6
7/9/19	12	0	4	2	2	0	0	4
8/6/19	0	0	0	0	0	0	0	0
9/5/19	340	0	3	17	11	0	0	310
10/3/19	7	0	0	0	0	0	0	7
11/7/19	0	0	0	0	0	0	0	0
12/5/19	30	0	10	3	0	0	0	18
1/9/20	170	0	0	0	0	0	0	170
2/4/20	240	0	22	50	0	0	0	170
3/5/20	260	0	0	0	10	0	0	250
4/2/20	220	0	0	0	0	0	0	220

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
5/1/20	25	0	20	0	0	0	0	5
6/3/20	0	0	0	0	0	0	0	0
7/9/20	24	0	10	2	2	10	0	0
8/6/20	2000	2000	0	0	0	0	0	0
9/2/20	0	0	0	0	0	0	0	0
10/1/20	0	0	0	0	0	0	0	0
11/17/20	140000	0	0	0	0	51	10	140000
12/3/20	100	0	0	0	0	0	0	100
Nacimiento Reservoir - Inlet Raw								
9/26/16	530	140	5	0	3	25	0	360
12/5/16	270	25	0	8	0	10	15	210
1/9/17	950	44	0	11	0	0	0	900
2/6/17	260	110	0	0	0	0	0	150
3/6/17	22	0	0	0	0	0	0	22
4/3/17	40	0	0	20	20	0	0	0
5/1/17	0	0	0	0	0	0	0	0
6/5/17	130	0	0	100	2	0	0	30
7/3/17	60	15	0	41	4	0	0	0
8/7/17	280	270	3	0	3	0	0	3
9/6/17	9	0	7	0	0	0	0	2
10/2/17	130	0	8	4	0	0	0	120
11/1/17	110	100	1	0	0	0	0	12
12/4/17	320	30	0	45	6	0	0	240
1/3/18	0	0	0	0	0	0	0	0
2/1/18	1200	0	0	590	0	0	0	570
3/7/18	2300	170	1	490	0	0	0	1600
4/12/18	140	0	0	130	0	0	0	6
5/2/18	110	60	1	24	1	0	0	22
6/6/18	33	0	3	1	4	0	0	25
7/19/18	4	0	0	0	1	0	0	3
8/9/18	87	70	0	0	0	0	0	17

Collected Date	Algae - Total Count (Cells/mL)	Blue-greens (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
9/11/18	3	0	0	0	0	0	0	3
10/1/18	56	0	0	0	1	0	0	55
11/1/18	82	0	0	1	9	0	0	72
12/4/18	74	0	3	1	0	0	0	70
1/3/19	80	0	3	5	0	0	0	72
2/7/19	38	0	3	0	0	0	0	35
3/7/19	33	0	9	0	3	0	0	21
4/9/19	23	0	10	2	2	0	0	9
5/8/19	18	0	4	9	3	0	0	2
6/6/19	1300	0	3	1300	3	0	0	4
7/9/19	31	17	3	4	1	0	0	6
8/6/19	233	47	10	24	12	0	0	140
9/5/19	320	0	8	17	10	0	0	280
1/9/20	360	0	80	75	0	0	0	200
2/4/20	230	0	50	7	0	0	0	170
3/5/20	240	0	25	0	0	0	0	220
4/2/20	75	20	5	10	0	0	0	40
5/1/20	30	0	5	0	0	0	0	25
6/3/20	220	0	36	0	87	0	0	100
7/9/20	71	0	20	12	4	20	0	15
8/6/20	890	800	0	0	0	10	0	80
9/2/20	200	0	0	5	0	0	0	190
10/1/20	720	560	10	5	0	5	20	120
11/17/20	5	0	0	0	0	0	0	5
12/3/20	0	0	0	0	0	0	0	0

Appendix D: Water Quality – General Physical Data

Appendix D: General Physical Data

Date	Odor (Ton)	Turbidity* (NTU)	Apparent Color (CFU)	True Color (CFU)	Odor Type
Nacimiento Reservoir - Intake 1 (Elevation 660')					
1/4/16	3.8	6.6	—	5	Balsamic/Fishy
2/1/16	3.0	3.5	—	5	Fishy
3/10/16	3.0	3.4	—	6	Fishy/Disagreeable
4/7/16	1.9	2.1	—	6	Fishy/Musty
9/11/18	4.0	5.1	15	11	Fishy
10/1/18	7.0	6.5	16	11	Fishy/Musty
11/5/18	2.0	9.5	16	7	Earthy
12/3/18	1.5	6.3	13	4	Musty
1/3/19	3.2	6.9	13	4	Fishy
2/7/19	3.0	37.0	54	9	Fishy
3/7/19	3.0	17.0	29	7	Fishy/Musty
4/9/19	1.0	14.0	29	8	Fishy/Musty
5/8/19	1.0	11.0	24	7	Musty
6/6/19	2.0	9.6	22	10	Fishy
7/9/19	2.0	6.4	18	9	Musty
8/6/19	1.0	8.5	15	8	Musty
9/5/19	2.5	3.5	16	11	Earthy
10/3/19	3.5	3.7	15	7	Fishy/Grassy
11/7/19	1.0	11.0	24	9	Fishy/Musty
12/5/19	1.8	2.4	9	7	Balsamic/Fishy
1/9/20	2.0	6.2	20	11	Fishy
2/4/20	2.0	5.8	16	7	Fishy
3/5/20	1.0	6.2	15	5	Musty
4/2/20	1.0	1.3	8	—	Musty
5/1/20	2.0	2.6	8	—	Fishy/Grassy
6/3/20	1.5	2.0	8	—	Musty
7/9/20	1.0	4.8	10	7	Musty
8/6/20	1.5	5.0	14	7	Fishy/Musty
9/2/20	2.5	4.0	15	7	Fishy/Musty
10/1/20	4.0	3.9	19	8	Sulfurous
11/17/20	2.0	12.0	16	5	Fishy
12/3/20	ND	4.3	11	5	None
Nacimiento Reservoir - Intake 2 (Elevation 680')					

Date	Odor (Ton)	Turbidity* (NTU)	Apparent Color (CFU)	True Color (CFU)	Odor Type
1/4/16	3.2	5.7	—	5	Fishy
2/1/16	3.0	3.0	—	5	Fishy
3/10/16	2.3	3.7	—	6	Fishy
4/7/16	1.9	1.9	—	7	Fishy/Disagreeable
9/11/18	4.0	4.1	10	6	Sulfurous
10/1/18	4.0	5.6	13	6	Fishy/Musty
11/5/18	3.0	9.2	15	8	Fishy
12/3/18	1.5	5.9	11	4	Grassy/Musty
1/3/19	3.0	7.8	13	5	Fishy
2/7/19	3.5	28.0	39	6	Fishy
3/7/19	2.4	18.0	29	8	Fishy/Musty
4/9/19	1.0	16.0	32	7	Fishy/Musty
5/8/19	1.0	14.0	27	8	Musty
6/6/19	2.0	10.0	24	10	Fishy
7/9/19	2.0	7.3	21	10	Fishy/Musty
8/6/19	1.0	10.0	18	9	Earthy
9/5/19	3.0	7.4	18	9	Earthy
10/3/19	2.5	7.2	21	7	Fishy/Grassy
11/7/19	1.0	9.5	15	10	Fishy
12/5/19	1.5	5.5	20	10	Musty/Sweet
1/9/20	2.0	6.9	22	10	Fishy
2/4/20	1.9	5.3	14	7	Fishy
3/5/20	1.0	3.9	12	5	Fishy
4/2/20	1.0	1.3	8	—	Musty
5/1/20	1.0	2.2	8	—	Fishy/Grassy
6/3/20	1.5	3.2	10	7	Musty
7/9/20	1.0	4.1	12	6	Musty
8/6/20	1.0	3.9	14	7	Fishy/Musty
9/2/20	3.0	2.9	12	7	Musty
10/1/20	1.0	2.6	6	—	Grassy
11/17/20	1.6	5.0	13	3	Fishy
12/3/20	1.0	4.5	11	3	Fishy
Nacimiento Reservoir - Intake 3 (Elevation 700')					
1/4/16	3.2	4.7	—	5	Fishy
2/1/16	3.0	4.3	—	7	Fishy/Musty
3/10/16	2.3	3.3	—	8	Fishy

Date	Odor (Ton)	Turbidity* (NTU)	Apparent Color (CFU)	True Color (CFU)	Odor Type
4/7/16	2.0	3.6	—	12	Fishy
9/11/18	4.0	4.8	9	6	Musty
10/1/18	4.0	3.8	8	6	Fishy
11/5/18	1.5	8.6	12	7	Earthy/Fishy
12/3/18	1.5	5.2	9	4	Fishy/Musty
1/3/19	3.2	7.1	12	5	Fishy
1/24/19	4.0	13.0	19	5	Fishy
2/7/19	2.0	28.0	37	7	Fishy
3/7/19	2.2	21.0	35	8	Fishy/Musty
4/9/19	1.0	18.0	35	9	Fishy/Musty
5/8/19	1.0	12.0	29	9	Fishy
6/6/19	2.5	9.6	24	11	Fishy
7/9/19	2.0	6.4	21	11	Musty
8/6/19	1.5	5.8	20	10	Earthy/Musty
9/5/19	3.0	4.4	48	10	Earthy
10/3/19	4.0	1.7	9	4	Fishy
11/7/19	1.5	3.0	9	—	Fishy
12/5/19	1.5	4.4	11	5	Sweet/Disagreeable
1/9/20	2.0	4.3	14	9	Fishy
2/4/20	1.5	4.0	13	8	Fishy
3/5/20	1.0	2.3	10	5	Musty
4/2/20	1.0	1.2	8	—	Musty
5/1/20	1.0	1.2	8	—	Grassy
6/3/20	1.2	5.0	8	—	Musty
7/9/20	1.0	2.8	8	—	Musty
8/6/20	1.0	1.6	9	—	Fishy/Musty
9/2/20	1.0	1.5	6	—	Musty
10/1/20	1.0	1.6	4	—	Grassy
11/17/20	2.0	3.9	8	—	Fishy
12/3/20	1.0	3.7	9	3	Fishy
Nacimiento Reservoir - Intake 4 (Elevation 720')					
2/1/16	3.0	4.7	—	8	Fishy
3/10/16	2.0	4.5	—	10	Fishy/Musty
4/7/16	1.7	2.6	—	14	Fishy/Disagreeable
1/24/19	1.8	91.0	100	13	Fishy/Disagreeable
2/7/19	2.0	30.0	43	8	Fishy

Date	Odor (Ton)	Turbidity* (NTU)	Apparent Color (CFU)	True Color (CFU)	Odor Type
3/7/19	1.5	25.0	42	8	Fishy
4/9/19	1.0	18.0	34	10	Fishy
5/8/19	1.0	10.0	26	10	Fishy
6/6/19	4.0	2.4	9	6	Fishy
7/9/19	2.0	5.4	20	13	Musty
8/6/19	1.8	2.7	14	7	Earthy/Fishy
9/5/19	2.0	2.5	14	10	Fishy
10/3/19	2.5	2.2	14	7	Fishy
11/7/19	1.5	2.2	7	—	Fishy
12/5/19	1.5	2.8	10	5	Musty/Sweet
1/9/20	2.0	4.7	13	8	Fishy
2/4/20	2.0	3.9	13	8	Fishy
3/5/20	1.0	2.0	10	6	Musty
4/2/20	1.0	0.9	8	—	Musty
5/1/20	1.0	0.9	7	—	Grassy
6/3/20	1.5	3.4	8	—	Musty
7/9/20	1.0	1.3	7	—	Fishy
8/6/20	3.0	1.2	4	—	Fishy
9/2/20	1.5	1.6	5	—	Musty
10/1/20	1.0	2.4	4	—	Grassy
11/17/20	1.0	2.9	<1	—	Fishy
12/3/20	1.0	3.1	8	3	Fishy
Nacimiento Reservoir - Intake 5 (Elevation 740')					
4/7/16	2.4	1.0	—	10	Fishy
2/7/19	2.8	35.0	49	8	Fishy
3/7/19	2.0	23.0	41	8	Fishy
4/9/19	1.0	14.0	32	8	Fishy/Musty
5/8/19	1.0	11.0	27	10	Fishy
6/6/19	3.0	6.3	51	10	Fishy
7/9/19	ND	3.8	18	13	None
8/6/19	2.9	2.1	12	7	Fishy
9/5/19	3.0	2.1	14	6	Fishy
10/3/19	4.0	1.6	7	4	Musty
11/7/19	2.8	1.7	8	—	Fishy
12/5/19	1.5	1.8	10	6	Fishy/Sweet
1/9/20	2.4	3.7	13	7	Fishy/Disagreeable

Date	Odor (Ton)	Turbidity* (NTU)	Apparent Color (CFU)	True Color (CFU)	Odor Type
2/4/20	2.3	3.2	12	7	Fishy
3/5/20	1.0	1.8	9	—	Fishy
4/2/20	ND	0.6	6	—	None
5/1/20	1.0	1.0	5	—	Fishy
6/3/20	1.5	0.9	5	—	Fishy
7/9/20	2.0	1.6	4	—	Fishy
8/6/20	2.0	1.0	4	—	Fishy
Nacimiento Reservoir - Intake 6 (Elevation 760')					
2/7/19	2.9	38.0	58	10	Fishy
3/7/19	3.0	18.0	35	8	Fishy
4/9/19	1.5	12.0	29	10	Fishy/Musty
5/8/19	2.0	6.7	21	8	Fishy
6/6/19	2.5	4.4	10	8	Fishy/Musty
7/9/19	7.0	1.5	8	—	Fishy
8/6/19	2.5	2.5	8	—	Fishy
9/5/19	4.0	2.1	6	4	Fishy
1/9/20	2.9	3.3	13	7	Fishy
2/4/20	2.5	2.6	12	7	Fishy
3/5/20	1.0	1.8	7	—	Musty
4/2/20	1.0	1.0	6	—	Musty
5/1/20	1.0	0.6	6	—	Fishy
Nacimiento Reservoir - Intake 7 (Elevation 780')					
3/7/19	3.5	17.0	34	9	Fishy
4/9/19	1.7	4.5	18	8	Fishy
5/8/19	2.5	2.1	11	7	Fishy/Grassy
6/6/19	2.5	2.5	10	6	Fishy/Musty
Nacimiento Reservoir Inlet – Raw					
5/2/16	—	3.2	—	—	—
11/1/16	—	1.9	—	—	—
12/5/16	—	3.1	—	—	—
1/9/17	—	3.5	—	—	—
2/6/17	—	45.0	—	—	—
3/6/17	—	26.2	—	—	—
4/3/17	—	24.1	—	—	—
5/1/17	—	20.2	—	—	—
6/5/17	—	13.9	—	—	—

Date	Odor (Ton)	Turbidity* (NTU)	Apparent Color (CFU)	True Color (CFU)	Odor Type
8/7/17	—	8.6	—	—	—
11/1/17	—	5.3	—	—	—
5/2/18	1.5	1.8	22	—	Musty
8/9/18	3.0	2.6	—	5	Musty/Fishy
9/11/18	100.0	2.8	28	20	Chlorinous
10/1/18	3.0	3.1	8	6	Fishy
11/1/18	3.0	5.3	13	6	Earthy/Fishy
11/1/18	3.0	8.6	—	6	Earthy/Fishy
12/4/18	3.5	5.3	12	4	Chlorinous/Fishy
1/3/19	3.2	6.2	13	5	Fishy
1/24/19	4.0	12.0	18	5	Fishy
2/7/19	3.0	18.0	28	6	Fishy
3/7/19	3.5	19.0	34	7	Musty/Fishy
4/9/19	1.0	15.0	30	8	Fishy
5/8/19	1.5	14.0	30	9	Musty
6/6/19	2.0	6.8	20	10	Fishy
7/9/19	4.0	4.7	17	9	Fishy
8/6/19	4.0	2.9	15	6	Fishy
9/5/19	2.0	2.0	8	5	Fishy
11/7/19	4.0	—	7	—	Fishy
1/9/20	4.0	3.7	13	8	Fishy
2/4/20	2.0	3.2	11	8	Fishy
3/5/20	1.0	1.8	9	6	Fishy
4/2/20	1.0	0.6	6	—	Musty/Fishy
5/1/20	2.5	1.3	8	—	Fishy
6/3/20	2.0	1.0	6	—	Musty
7/9/20	1.5	2.0	6	—	Musty/Fishy
8/6/20	—	1.5	13	3	—
9/2/20	2.5	1.9	11	3	Musty/Fishy
10/1/20	3.0	2.0	6		Fishy
11/17/20	1.0	0.6	5	—	Musty
12/3/20	ND	0.5	4	4	None

***Indicates a Secondary Maximum Contaminant Level**

DLR: Detection Limit Required (for the Purposes of Reporting)

MCL: Maximum Contaminant Limit for Drinking Water

ND: Not Detected

Appendix E: Title 22 Metals Data

Raw Water (Intake in Use): Aluminum, Iron, Manganese, Mercury Data

Appendix E: Title 22 Metals Data

Collected Date	Aluminum (ug/L)	Iron (ug/L)	Manganese (ug/L)	Mercury (ug/L)
1/4/16	---	210	110	ND
2/1/16	---	160	16	ND
3/7/16	---	110	10	ND
4/4/16	---	120	9	ND
5/2/16	120	200	13	ND
6/6/16	---	180	20	ND
7/5/16	---	150	22	ND
8/1/16	---	220	66	ND
9/5/16	54	380	180	ND
10/3/16	---	44	92	ND
11/1/16	37	55	20	ND
12/5/16	56	75	71	ND
1/9/17	73	120	110	ND
2/6/17	1400	1500	40	ND
3/6/17	790	920	35	ND
4/3/17	300	900	37	ND
5/1/17	590	810	25	ND
6/5/17	49	560	15	ND
7/3/17	---	360	12	ND
8/7/17	---	370	22	ND
9/6/17	---	150	14	---
10/2/17	---	280	69	---
11/1/17	93	380	130	---
12/4/17	---	100	340	---
1/3/18	---	120	85	---
2/1/18	39	61	10	ND
3/7/18	---	72	12	---
4/12/18	74	76	6	---
5/2/18	71	78	ND	ND
6/6/18	---	64	8	---

Collected Date	Aluminum (ug/L)	Iron (ug/L)	Manganese (ug/L)	Mercury (ug/L)
7/19/18	---	73	13	---
8/9/18	57	53	9	ND
9/11/18	---	240	1100	---
10/1/18	53	87	15	---
10/3/18	---	86	15	---
11/1/18	130	170	52	ND
12/4/18	150	260	79	---
1/3/19	110	210	59	---
1/24/19	---	540	41	---
2/7/19	460	740	27	ND
3/7/19	---	740	38	---
4/9/19	---	570	28	---
5/8/19	300	480	11	ND
6/6/19	---	270	8	---
7/9/19	---	220	9	---
8/6/19	86	97	7	ND
9/5/19	---	68	8	---
11/7/19	27	85	17	ND
1/9/20	---	140	88	---
2/4/20	55	100	13	ND
3/5/20	---	46	ND	---
4/2/20	ND	19	ND	---
5/1/20	42	63	9	ND
6/3/20	---	47	8	---
7/9/20	45	77	10	---
8/6/20	35	120	13	---
9/2/20	---	130	20	---
10/1/20	---	99	49	---
11/17/20	20	82	9	ND
12/3/20	---	20	7	---

Additional Title 22 Metals

Collected Date	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Boron (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Cyanide (ug/L)	Lead (ug/L)	Nickel (ug/L)	Perchlorate (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)
5/2/2016	ND	ND	40	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
9/5/2016	—	ND	45	ND	ND	ND	ND	ND	—	ND	ND	—	ND	ND	—
11/1/2016	ND	ND	30	ND	ND	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
12/5/2016	ND	ND	46	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
1/9/2017	ND	ND	43	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
2/6/2017	ND	ND	36	ND	—	ND	ND	ND	ND	ND	12	—	ND	ND	ND
3/6/2017	ND	ND	31	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
4/3/2017	ND	ND	32	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
5/1/2017	ND	ND	32	ND	—	ND	ND	ND	ND	ND	10	—	ND	ND	ND
6/5/2017	ND	ND	30	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
8/7/2017	—	—	—	—	—	—	—	ND	—	—	—	—	—	—	—
11/1/2017	ND	ND	32	ND	ND	—	ND	ND	—	ND	ND	—	ND	ND	ND
2/1/2018	ND	5.9	33	ND	—	ND	ND	—	ND	ND	ND	—	ND	ND	ND
5/2/2018	ND	5.0	36	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
8/9/2018	ND	ND	41	ND	—	ND	ND	ND	ND	ND	ND	—	ND	ND	ND
11/1/2018	ND	2.0	57	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12/4/2018	—	—	—	—	ND	—	—	ND	—	—	—	—	—	—	ND
2/7/2019	ND	ND	58	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/8/2019	ND	ND	37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/6/2019	ND	ND	33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/7/2019	ND	ND	36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2/4/2020	ND	ND	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/2/2020	—	ND	36	ND	—	ND	ND	—	—	—	ND	—	ND	ND	ND
5/1/2020	ND	2.9	37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/9/2020	ND	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8/6/2020	—	—	40	ND	ND	ND	ND	ND	—	—	17	—	—	ND	ND

Appendix F: General Mineral and Nutrient Data Water Quality

General Mineral Data - Raw Water

Appendix F: General Mineral and Nutrient Data Water Quality

Collected Date	Aggressive Index	Calculated Langelier Index	SUVA-C (L/mg-M)	Alkalinity, Total as CaCO3 (mg/L)	Carbonate as CaCO3 (mg/L)	Bicarbonate as CaCO3 (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Fluoride, (without predistillation) (mg/L)	Nitrite as Nitrogen (mg/L)	Nitrate as Nitrogen (mg/L)	Sulfate (mg/L)	Total Hardness as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductance (umhos/cm)	Temperature (°C)	pH	Methylene Blue Activated Substances (mg/L)	Depth (Ft)
MCL	—	—	—	—	—	—	—	500*	2	1	10	500*	—	—	—	—	1000*	1600*	—	—	0.5*	—
DLR	—	—	—	—	—	—	—	—	0.1	0.1	0.1	0.5	—	—	—	—	—	4	—	—	0.1	—
Nacimiento Reservoir - Epilimnion																						
2/1/16	12.4	0.27	2.4	119	ND	119	ND	7.5	0.166	ND	ND	37	154	33	18	12	180	330	11.7	8.37	ND	10
5/5/16	11.3	-0.57	2.8	90	ND	90	ND	5.7	0.141	ND	ND	26	123	28	13	9	170	260	20.8	8.32	ND	10
8/4/16	12.2	0.43	2.2	107	ND	107	ND	6.4	0.107	ND	ND	28	139	29	16	9.7	170	230	24.6	8.33	ND	10
11/2/16	10.9	-1.11	2.6	110	ND	110	ND	6.3	0.123	ND	ND	27	135	28	16	10	200	300	18.4	7.85	ND	10
2/8/17	11.1	-1.02	3.2	80	ND	80	ND	8.6	ND	ND	0.34	19	105	23	12	6.7	110	210	11.7	7.89	ND	10
5/2/17	11.6	-0.31	3.4	73	ND	73	ND	4.0	0.172	ND	ND	19	101	22	11	6.7	110	200	19.6	8.21	ND	10
8/1/17	12.1	0.3	2.7	88	6	82	ND	4.1	0.16	ND	ND	26	116	23	14	8.1	130	250	25.9	8.36	ND	10
11/1/17	11.5	-0.37	3.2	95	ND	95	ND	5.1	0.118	ND	ND	29	120	27	12	8	140	260	18.2	7.69	ND	10
2/1/18	11.9	-0.15	2.9	96	ND	96	ND	5.0	0.206	ND	ND	28	130	28	14	8.1	130	270	12.0	7.84	ND	10
5/2/18	12	0.14	2.7	95	ND	95	ND	5.5	0.148	ND	ND	27	120	27	13	7.3	140	260	19.6	8.23	ND	10
8/9/18	12.7	0.93	2.3	107	17	90	ND	4.4	0.219	ND	ND	24	140	30	15	8.9	180	280	25.9	8.61	ND	10

Collected Date	Aggressive Index	Calculated Langelier Index	SUVA-C (L/mg-M)	Alkalinity, Total as CaCO3 (mg/L)	Carbonate as CaCO3 (mg/L)	Bicarbonate as CaCO3 (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Fluoride, (without predistillation) (mg/L)	Nitrite as Nitrogen (mg/L)	Nitrate as Nitrogen (mg/L)	Sulfate (mg/L)	Total Hardness as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductance (umhos/cm)	Temperature (°C)	pH	Methylene Blue Activated Substances (mg/L)	Depth (Ft)
MCL	—	—	—	—	—	—	—	500*	2	1	10	500*	—	—	—	—	1000*	1600*	—	—	0.5*	—
DLR	—	—	—	—	—	—	—	—	0.1	0.1	0.1	0.5	—	—	—	—	—	4	—	—	0.1	—
Nacimiento Reservoir - Hypolimnion																						
2/1/16	11.7	-0.18	1.9	126	ND	126	ND	8.0	0.180	ND	ND	40	160	34	18	14	200	350	10.2	7.70	ND	60
5/5/16	11.2	-0.86	2.6	104	ND	104	ND	6.8	0.158	ND	0.21	32	143	32	15	10	190	320	11.9	7.54	ND	60
8/4/16	11.3	-0.82	3.0	100	ND	100	ND	6.0	0.094	ND	0.15	27	129	28	14	8.9	150	270	11.2	7.43	ND	60
11/2/16	11.4	-0.61	2.2	107	ND	107	ND	6.3	0.119	ND	ND	27	139	28	17	9.9	190	290	13.4	7.60	ND	60
2/8/17	10.9	-1.25	3.5	72	ND	72	ND	4.1	ND	ND	0.42	20	112	20	15	6.3	120	190	10.4	7.80	ND	60
5/2/17	10.9	-1.12	3.8	72	ND	72	ND	4.0	0.161	ND	ND	18	105	22	11	6.2	110	200	13.3	7.67	ND	60
8/1/17	11.0	-1.06	2.6	70	ND	70	ND	4.9	0.142	ND	0.34	20	101	20	12	8.1	120	210	11.9	7.53	ND	60
11/1/17	10.9	-1.19	4.1	79	ND	79	ND	4.1	ND	ND	ND	21	94	21	10	6.1	110	210	13.8	7.12	ND	60
2/1/18	11.5	-0.61	2.4	98	ND	98	ND	5.2	0.197	ND	0.17	29	130	29	14	8.2	150	280	11.0	7.47	ND	60
5/2/18	11.5	-0.62	2.9	99	ND	99	ND	5.0	0.156	ND	0.15	27	120	28	13	7.5	110	260	11.8	7.64	ND	60
8/9/18	11.2	-0.82	3.3	95	ND	95	ND	5.4	0.249	ND	ND	33	120	26	13	7.4	190	240	14.7	7.29	ND	60

General Mineral Data - Watershed Creeks

Collected Date	Aggressive Index	Calculated Langelier Index	Alkalinity, Total as CaCO3 (mg/L)	Carbonate as CaCO3 (mg/L)	Bicarbonate as CaCO3 (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Fluoride, (without predistillation) (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Nitrate + Nitrite (as N)	Total Organic Nitrogen (mg/L)	Sulfate (mg/L)	Total Hardness as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminum (ug/L)	Copper (ug/L)	Iron (ug/L)	Manganese (mg/L)	Zinc (ug/L)	Methylene Blue Activated Substances	Total Dissolved Solids (mg/L)	Electrical Conductivity @ 25C	Suspended Solids (mg/L)	SUVA-C (UV-254 / DOC)*100 (L/mg-M)	pH (SU)	pH- Field (SU)	Temperature (°C)
MCL	—	—	—	—	—	—	500*	2*	10*	1*	10*	—	500*	—	—	—	—	—	200*	1000*	300*	50*	5000*	0.5*	1000*	1600*	—	—	—	—	—
DLR	—	—	1	—	1	—	1	0.1	0.1	0.1	0.2	1	0.5	—	1	1	1	1	20	10	10	5	15	0.1	2	4	1	—	—	—	—
Dip Creek																															
5/13/19	12.3	—	78.7	3.4	75	0	4.7	ND	ND	ND	ND	—	25	99	21	11	8.1	1.3	130	ND	150	5.7	ND	ND	130	220	—	—	8.54	—	23.0
5/1/20	12.3	0.46	92.4	9.6	83	0	4.7	0.150	ND	ND	ND	—	32	130	28	14	9.2	1.6	35	ND	32	1.8	ND	ND	160	270	—	—	8.41	8.48	22.3
Chimney Fire - Las Tablas Creek																															
8/31/16	12.9	1.10	116	18	99	0	6.3	ND	ND	ND	ND	4.6	28	139	32	14	10	—	—	ND	40	12	—	ND	170	290	5.2	—	8.90	8.40	25.7
11/2/16	11.2	-0.75	116	0	116	0	6.6	0.123	ND	ND	ND	4.4	28	137	28	16	11	—	—	ND	—	27	—	ND	200	310	3.2	2.2	8.14	7.32	18.8
Las Tablas Creek - Downstream																															
3/8/17	11.7	-0.38	60	0	60	0	3.6	0.129	0.19	ND	ND	4.1	16	101	19	13	6.1	—	—	—	—	—	—	ND	110	170	12	3.5	8.32	8.21	13.5
4/4/17	12.4	0.45	79.5	9.2	70.3	0	4.4	0.119	ND	ND	ND	3.8	24	98.7	22	11	7.0	—	—	—	—	—	—	ND	120	210	3.1	3.2	8.68	8.71	19.3
6/6/17	11.9	0.08	71	0	71	0	4.6	0.130	ND	ND	ND	3.7	27	111	24	12	7.5	—	—	—	—	—	—	ND	140	240	2.6	2.9	8.48	8.23	25.4
5/13/19	12.2	—	84.6	0	85	0	4.6	ND	ND	ND	ND	—	25	98	21	11	7.5	1.2	70	ND	140	6.5	ND	ND	130	220	—	—	8.54	8.35	22.2
5/1/20	12.7	0.85	94.2	7	87	0	4.8	0.130	ND	ND	ND	—	34	130	29	14	9.5	1.2	97	ND	140	5.7	ND	ND	160	280	—	—	8.45	8.85	22.2
Las Tablas Creek - Upstream																															
5/1/20	12.3	0.42	96.2	9.6	87	0	4.8	ND	ND	ND	ND	—	34	130	29	14	9.4	1.2	30	ND	29	2.6	ND	ND	180	280	—	—	8.49	8.41	22.7
Chimney Fire - Oak Shores																															
8/31/16	13.0	1.23	119	28	91	0	6.4	0.100	ND	ND	ND	5.2	28	142	31	16	11	—	—	ND	56	13	—	ND	180	300	4.8	—	9.04	8.48	25.0
11/2/16	10.8	-1.14	115	0	115	0	6.6	0.123	ND	ND	ND	4.6	28	136	18	16	11	—	—	ND	180	42	—	ND	190	310	5.3	2.3	8.05	7.06	18.5

Collected Date	Aggressive Index	Calculated Langelier Index	Alkalinity, Total as CaCO3 (mg/L)	Carbonate as CaCO3 (mg/L)	Bicarbonate as CaCO3 (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Fluoride, (without predistillation) (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Nitrate + Nitrite (as N)	Total Organic Nitrogen (mg/L)	Sulfate (mg/L)	Total Hardness as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminum (ug/L)	Copper (ug/L)	Iron (ug/L)	Manganese (mg/L)	Zinc (ug/L)	Methylene Blue Activated Substances	Total Dissolved Solids (mg/L)	Electrical Conductivity @ 25C	Suspended Solids (mg/L)	SUVA-C (UV-254 / DOC)*100 (L/mg-M)	pH (SU)	pH- Field (SU)	Temperature (°C)
Watershed - Oak Shores																															
1/11/17	10.8	-1.26	58	0	58	0	3.0	ND	0.38	ND	ND	4.9	8.9	91	12	15	4.4	—	—	—	—	—	—	ND	130	130	95	4.3	7.55	6.43	13.3
3/8/17	12.0	-0.02	61	0	61	0	3.5	0.129	0.16	ND	ND	3.6	16	87	18	10	5.8	—	—	—	—	—	—	ND	120	170	12	4.1	8.52	8.56	14.4
4/4/17	12.4	0.50	79.8	7.6	72.2	0	4.4	0.129	ND	ND	ND	2.9	24	101	22	12	6.8	—	—	—	—	—	—	ND	130	220	3.0	3.4	8.70	8.77	19.8
6/6/17	12.3	0.48	84	8	76	0	4.7	0.120	ND	ND	ND	3.4	25	104	24	11	8.6	—	—	—	—	—	—	ND	150	230	2.5	3.3	8.57	8.58	24.8
Chimney Fire - Narrows																															
8/31/16	12.9	1.13	120	23	97	0	6.5	0.102	ND	ND	ND	5.0	28	146	31	17	10	—	—	ND	120	24	—	ND	180	300	2.8	—	8.93	8.42	25.6
11/2/16	11.1	-0.86	122	0	122	0	6.7	0.138	ND	ND	ND	4.8	29	148	30	18	10	—	—	ND	390	50	—	ND	200	320	—	2.3	8.03	7.16	18.1
The Narrows - Downstream																															
12/1/16	11.6	-0.54	120	0	120	0	6.8	0.157	ND	ND	ND	5.0	31	157	32	19	10	—	—	—	—	—	—	ND	200	330	4.4	2.1	8.13	7.59	13.2
3/8/17	11.9	-0.08	62	0	62	0	3.6	0.135	0.16	ND	ND	3.4	15	87	20	9	6.1	—	—	—	—	—	—	ND	110	170	16	3.6	8.41	8.45	14.3
4/4/17	12.0	0.10	93.8	8	85.8	0	5.1	0.140	ND	ND	ND	2.2	25	121	24	15	8.3	—	—	—	—	—	—	ND	150	250	1.8	3.1	8.35	8.29	17.9
6/6/17	12.2	0.42	102	19	83	0	5.2	0.130	ND	ND	ND	2.9	28	125	27	14	7.3	—	—	—	—	—	—	ND	150	270	3.2	3.3	8.51	8.35	25.1
5/13/19	12.1	—	103	0	100	0	5.8	ND	ND	ND	ND	—	35	130	29	15	11	1.2	39	ND	62	6.3	ND	ND	190	360	—	—	8.40	8.28	21.1
5/1/20	12.1	0.32	115	6.42	130	0	4.9	ND	ND	ND	ND	—	35	150	31	18	10	ND	ND	ND	18	2.9	ND	ND	190	320	—	—	8.48	8.20	22.1
The Narrows - Upstream																															
5/1/20	12.5	0.60	148	8.4	160	0	5.6	0.110	ND	ND	ND	—	40	190	36	24	13	ND	33	ND	56	11	ND	ND	240	390	—	—	8.47	8.35	23.6

Nutrient Data

Collection Date	Ammonia (mg/L)	Nitrite as N (mg/L)	Nitrate as N (mg/L)	SUVA (L/mg-M)	Total Organic Nitrogen (mg/L)	TKN (mg/L)	Total Phosphate as P (mg/L)
Epilimnion							
2/1/16	—	ND	ND	2.4	5.3	—	—
5/5/16	—	ND	ND	2.8	4.9	—	—
8/4/16	—	ND	ND	2.2	4.4	—	—
11/2/16	—	ND	ND	2.6	4.1	—	—
2/8/17	—	ND	0.34	3.2	4.6	—	—
5/2/17	—	ND	ND	3.4	3.4	—	—
8/1/17	—	ND	ND	2.7	3.7	—	—
11/1/17	—	ND	ND	3.2	2.9	—	—
2/1/18	—	ND	ND	2.9	3.2	—	—
5/2/18	—	ND	ND	2.7	3.6	—	—
8/9/18	—	ND	ND	2.3	4.8	—	—
11/1/18	ND	ND	0.12	—	—	—	0.02
2/7/19	0.021	ND	0.48	—	—	—	0.05
5/8/19	0.016	ND	0.17	—	—	—	0.02
8/6/19	ND	ND	ND	—	—	—	0.013
11/7/19	ND	ND	0.20	—	—	—	0.01
2/4/20	ND	ND	ND	—	—	—	0.036
5/1/20	ND	ND	ND	—	—	—	0.01
8/6/20	ND	ND	ND	—	—	—	0.01
Hypolimnion							
2/1/16	—	ND	0.16	1.9	4.3	—	—
5/5/16	—	ND	0.21	2.6	4.8	—	—
8/4/16	—	ND	0.15	3.0	4.5	—	—
11/2/16	—	ND	ND	2.2	4.2	—	—
2/8/17	—	ND	0.42	3.5	4.7	—	—
5/2/17	—	ND	ND	3.8	3.8	—	—
8/1/17	—	ND	0.34	2.6	3.6	—	—
11/1/17	—	ND	ND	4.1	3.3	—	—
2/1/18	—	ND	0.17	2.4	3.1	—	—
5/2/18	—	ND	0.15	2.9	3.3	—	—
8/9/18	—	ND	ND	3.3	4.1	—	—
11/1/18	0.139	ND	ND	—	—	—	0.07
2/7/19	0.018	ND	0.52	—	—	—	0.05

Collection Date	Ammonia (mg/L)	Nitrite as N (mg/L)	Nitrate as N (mg/L)	SUVA (L/mg-M)	Total Organic Nitrogen (mg/L)	TKN (mg/L)	Total Phosphate as P (mg/L)
5/8/19	0.021	ND	0.44	—	—	—	0.02
8/6/19	ND	ND	0.31	—	—	—	0.013
11/7/19	ND	ND	0.54	—	—	—	0.01
2/4/20	ND	ND	0.16	—	—	—	0.036
5/1/20	ND	ND	0.12	—	—	—	0.01
8/6/20	ND	ND	ND	—	—	—	0.01
Nacimiento Reservoir Inlet - Raw							
5/2/16	—	ND	0.19	—	—	—	—
9/5/16	—	ND	ND	—	—	—	—
11/1/16	—	ND	ND	—	—	—	—
12/5/16	—	ND	ND	—	—	—	—
1/9/17	—	ND	0.21	—	—	—	—
2/6/17	—	ND	0.36	—	—	—	—
3/6/17	—	ND	0.40	—	—	—	—
4/3/17	—	ND	0.41	—	—	—	—
5/1/17	—	ND	0.39	—	—	—	—
6/5/17	—	ND	0.41	—	—	—	—
8/7/17	—	ND	0.36	4.2	—	—	—
11/1/17	—	ND	ND	—	—	—	—
5/2/18	—	ND	ND	2.4	3.3	—	—
8/9/18	—	ND	0.15	2.1	4.3	—	—
11/1/18	ND	ND	0.12	2.0	4.2	ND	0.0185
2/7/19	ND	ND	0.54	—	—	0.58	0.03
5/8/19	ND	ND	0.42	—	—	—	0.05
8/6/19	ND	ND	ND	—	—	—	0.024
11/7/19	ND	ND	0.30	—	—	—	0.007
2/4/20	ND	ND	ND	—	0.26	0.26	0.017
5/1/20	ND	ND	ND	—	0.19	0.20	0.01
8/6/20	ND	ND	ND	—	0.25	0.26	0.06

Appendix G: Pesticide and Herbicide Use

Pesticide Treated Amount by Product

Appendix G: Pesticide and Herbicide Use

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
2016 Pesticide Treated Amount by Product			
ABOUND FLOWABLE (CA,	24	2.9	-----
ACIDIPHACTANT	21	0.7	-----
BANVEL HERBICIDE	71	1.3	-----
BRANDT LIME SULFUR	20	200.0	-----
CHAMPION++ FUNGICIDE/BACTERICIDE	24	-----	36.0
CHATEAU(R) HERBICIDE	40	-----	23.9
CHOICE WEATHER MASTE	21	2.4	-----
CHOICE WEATHER MASTER	89	1.5	-----
DIURON 4L HERBICIDE	1	0.6	-----
DOUBLE NICKEL 55	5	-----	-----
DU PONT GLEAN HERBICIDE	71	0.1	-----
DU PONT GLEAN HERBICIDE5	50	-----	-----
DUPONT KOCIDE 3000 F	546	-----	546.0
DUSTING SULFUR	19	-----	380.0
ELEVATE 50 WDG FUNGICIDE	4	-----	3.7
ELEVATE 50WDG	24	-----	24.0
FLAME	1	0.1	-----
FLINT FUNGICIDE	505	4.0	41.7
FORFEIT 280	5	3.2	-----
FREEWAY	114	4.0	-----
GF-120 NF NATURALYTE FRUIT FLY BAIT	87	2.0	-----
GLY STAR ORIGINAL	11	6.9	-----
GLY STAR PLUS	122	49.9	-----
GOAL 2XL	66	16.7	-----
GOAL 2XL HERBICIDE	8	2.0	-----
GOALTENDER	23	4.3	-----
GOPHER GETTER TYPE 2 BAIT BY WILCO	10	-----	4.0
HERBIMAX	151	18.4	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
HONCHO PLUS HERBICIDE	15	6.8	-----
INSPIRE SUPER	24	3.8	-----
INTREPID 2F	24	1.7	-----
JMS STYLET-OIL	1375	750.2	-----
KALIGREEN	51	-----	203.5
KOCIDE 3000	61	-----	61.5
LUNA EXPERIENCE (CA)	47	2.2	-----
MACHO 2.0 FL	128	14.8	-----
MAD DOG PLUS	2	1.0	-----
MAGNIFY	32	1.5	-----
MAKAZE	18	12.9	-----
MAKAZE (CA)	7	8.6	-----
METTLE 125 ME FUNGICIDE	12	0.5	-----
MICRO-SULF	40	-----	100.0
MICROTHIOL DISPERSS	223	-----	650.2
MICROTHIOL SPECIAL MICRONIZED WETTABLE SULFUR	31	-----	76.0
MILSTOP (CA)	6	-----	18.9
NO FOAM A	73	1.6	-----
ORGANIC JMS STYLET-OIL	101	138.0	-----
OXYSTAR 2E	30	2.8	-----
PHT AD-MAX 90	47	2.2	-----
PRISTINE FUNGICIDE	262	11.7	13.9
PRISTINE(R) FUNGICID	350	28.0	203.3
PROWL(R) H2O HERBICI	3	1.3	-----
PYGANIC CROP PROTECT	24	12.0	-----
PYGANIC CROP PROTECTION EC 1.4 II	36	4.9	-----
PYGANIC CROP PROTECTION EC 5.0 II	37	4.9	-----
QUINTEC	766	35.8	-----
RALLY 40 WSP	286	5.8	29.8
RALLY 40W AGRICULTURAL FUNGICIDE IN WATER SOLUBLE POUCHES	137	4.1	-----
RALLY 40W AGRICULTURAL FUNGICIDE IN WATER-SOLUBLE POUCHES	12	-----	3.0

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
RAMIK OATS KILLS GRO	19	-----	76.0
REAPER 0.15 EC	2	0.3	-----
RED-TOP DUSTING SULFUR	5	-----	5.0
REIGN	6	1.3	-----
RELY 280 HERBICIDE	23	8.6	-----
ROUNDUP POWERMAX HERBICIDE	89	4.0	-----
ROUNDUP READY-TO-USE POISON IVY & TOUGH BRUSH KILLER	10	5.0	-----
ROUNDUP WEATHERMAX HERBICIDE	20	10.0	-----
SERENADE OPTI	5	-----	6.3
SHARK EW	41	0.4	-----
SONATA	10	10.0	-----
SPREADER 90	1315	111.1	-----
SULFUR 6L	12	6.0	-----
SULFUR DF	12	0.0	120.0
SUPER SIX LIQUID SUL	94	23.5	-----
SURF-90	114	1.0	-----
TEBUSTAR 45 WSP	262	7.8	3.0
TEBUSTAR 45WSP	19	-----	4.8
THE FRUIT DOCTOR COMPRESSED SULFUR DIOXIDE	200	-----	10.0
THIOLUX	38	-----	113.7
TORINO	24	0.6	-----
TRI-TEK	32	32.5	-----
UNFOAMER	5	0.0	-----
VANGARD WG	11	0.9	-----
VANGARD WG (CA)	36	-----	22.5
VENUE	5	0.2	-----
VINTRE	524	45.5	-----
VIVANDO FUNGICIDE	83	6.6	-----
VIVANDO(R) FUNGICIDE	56	6.1	-----
WARFOX	8	0.2	-----
WRANGLER	325	5.1	-----
WRANGLER (CA)	107	5.7	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
WRANGLER INSECTICIDE	16	0.2	-----
YELLOW JACKET FLOWABLE SULFUR	36	18.0	-----
ZEAL(R) MITICIDE(1)	29	0.1	4.6
Total	**9985**	**1689**	**2785**
2017 Pesticide Treated Amount by Product			
(VW&R) P.C.Q. RAT AND MOUSE BAIT	62	-----	70.0
70% NEEM OIL	12	1.2	-----
ABOUND FLOWABLE	19	2.2	-----
ABOUND FLOWABLE FUNGICIDE	23	2.7	-----
AGRI-MEK SC MITICIDE/INSECTICIDE	2	0.1	-----
ALIAS 4F	19	2.4	-----
AMERICOP 40 DF	19	-----	19.0
AZA-DIRECT	61	15.2	-----
AZOXYSTAR	32	5.0	-----
BADGE X2	7	-----	7.2
BRANDT LIME SULFUR	12	123.3	-----
BRANDT ORGANICS ECOSPREADER	65	4.1	-----
BRANDT SUPER WETTER	199	1.5	-----
BWC SPREADER 90	38	3.0	-----
CHATEAU HERBICIDE SW	9	-----	1.7
CHATEAU(R) HERBICIDE	10	-----	5.6
CHOICE WEATHER MASTE	4	0.4	-----
CONTINGENT	6	1.6	-----
COPPER SULFUR DUST	6	-----	55.0
COSAVET DF	27	-----	194.3
COSAVET DF EDGE	20	-----	60.0
CREDIT 41 EXTRA	36	29.7	-----
CROP OIL	30	3.8	-----
CROP-SURE GLYPHOSATE PLUS HERBICIDE	8	3.0	-----
DU PONT MATRIX HERBICIDE	9	-----	0.7
DUPONT KOCIDE 3000 F	271	-----	271.0
DYNE-AMIC	193	13.9	-----
ELEVATE 50 WDG FUNGICIDE	20	-----	20.0

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
FLINT FUNGICIDE	395	2.1	38.4
FORFEIT 280	107	44.8	-----
FREEWAY	81	5.0	-----
FUJIMITE SC	12	3.0	-----
GF-120 FRUIT FLY BAIT	30	1.0	-----
GLY STAR ORIGINAL	10	6.3	-----
GLY STAR PLUS	60	26.4	-----
GLYPHOSATE ORIGINAL	10	5.0	-----
GLYSTAR K-PLUS	40	10.0	-----
GOAL 2XL	58	39.4	-----
GOAL 2XL HERBICIDE	6	6.0	-----
GRAMOXONE SL 2.0 (HI	13	6.3	-----
HERBIMAX	29	3.6	-----
HONCHO PLUS HERBICIDE	9	0.7	-----
IAP DUSTING SULFUR	5	-----	50.0
INSPIRE SUPER	18	3.4	-----
JMS STYLET-OIL	1033	510.0	-----
KALIGREEN	123	0.0	347.0
KINETIC	9	0.6	-----
KOCIDE 3000	19	0.0	18.7
LI 700	86	6.2	-----
LIFELINE	13	7.8	-----
LIQUID AMS	45	5.6	-----
LUNA EXPERIENCE	637	41.9	-----
MACHO 2.0 FL	80	1.7	-----
MAKAZE	45	22.4	-----
MANA ALIAS 4F	38	0.5	-----
METTLE 125 ME	242	9.4	-----
METTLE 125 ME (CA &	69	1.9	-----
MICROTHIOL DISPERSS	204	0.3	511.1
MILSTOP (CA)	5	-----	27.0
MILSTOP BROAD SPECTRUM FOLIAR FUNGICIDE	53	-----	261.5
MIRAGE PLUS	3	1.5	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
MOVENTO	19	1.2	-----
NEEMIX 4.5	105	1.3	-----
NO FOAM A	40	0.5	-----
OMNI OIL 6	19	9.4	-----
ORGANIC JMS STYLET-O	10	10.0	-----
ORGANIC JMS STYLET-OIL	173	152.1	-----
OROBOOST	20	2.5	-----
OXYSTAR 2E	62	7.8	-----
PHT AD-MAX 90	272	314.5	-----
PHT LATRON B-1956	45	3.0	-----
PREMIUM MSO - METHYL	6	0.8	-----
PRISTINE FUNGICIDE	35	4.1	13.9
PRISTINE(R) FUNGICID	29	0.0	29.5
PYGANIC CROP PROTECTION EC 1.4	6	1.4	-----
PYGANIC CROP PROTECTION EC 1.4 II	63	14.0	-----
QUEST (CA)	6	1.6	-----
QUINTEC	644	28.7	-----
RALLY 40 WSP	430	10.7	21.1
RALLY 40W AGRICULTURAL FUNGICIDE IN WATER SOLUBLE POUCHES	160	5.0	-----
RALLY 40W AGRICULTURAL FUNGICIDE IN WATER-SOLUBLE POUCHES	12	-----	3.0
RCO OMEGA GOPHER GRAIN BAIT	62	-----	68.0
RHYME FUNGICIDE	26	1.0	-----
ROUNDUP POWERMAX HER	13	7.8	-----
ROUNDUP ULTRA HERBIC	9	6.7	-----
ROUNDUP WEATHERMAX HERBICIDE	32	7.5	-----
SERENADE ASO	23	44.0	-----
SERENADE OPTI (CA &	15	-----	18.8
SONATA	5	5.0	0.0
SOVRAN(R) FUNGICIDE	91	1.3	15.8
SPREADER 90	385	10.2	-----
SPREADER-STICKER	12	1.1	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
SPRET	19	1.2	-----
SUPER SIX LIQUID SUL	259	58.5	-----
SURF-90	232	17.6	-----
SURFLAN AS AG	4	0.9	-----
TACTIC	12	1.0	-----
TOPSIN M WSB FUNGICIDE	15	-----	20.0
TORINO	18	0.5	-----
TRILOGY	100	16.4	-----
UNFOAMER	28	0.9	-----
VANGARD WG	12	1.0	-----
VANGARD WG (CA)	36	-----	22.2
VENUE HERBICIDE	9	0.1	-----
VINTRE	133	13.0	-----
VIVANDO FUNGICIDE	68	4.5	-----
VIVANDO(R) FUNGICIDE	69	8.2	-----
WARFOX	10	1.6	-----
WRANGLER	222	2.6	-----
WRANGLER INSECTICIDE	266	3.1	-----
YELLOW JACKET FLOWAB	12	3.0	-----
YELLOW JACKET FLOWABLE SULFUR	12	6.0	-----
YELLOW JACKET SPECIAL DUSTING SULFUR	10	-----	150.0
ZEAL MITICIDE	6	0.1	-----
ZEAL(R) MITICIDE(1)	10	-----	2.0
Total	**9194**	**1779**	**2322**
2018 Pesticide Treated Amount by Product			
ABOUND FLOWABLE FUNGICIDE	21	0.5	-----
ACOIDAL	11	1.0	33.0
ACTIVATOR 90	82	9.3	-----
ADVISE FOUR	45	2.1	-----
AMERICOP 40 DF	19	-----	19.0
ASSAIL 70WP INSECTICIDE	28	0.3	-----
AZA-DIRECT	118	7.3	-----
BADGE X2	53	-----	53.2

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
BRANDT LIME SULFUR	25	250.3	-----
BRANDT ORGANICS ECOSPREADER	21	0.3	-----
BRANDT SUPER WETTER	543	1.8	-----
CHAMPION++	12	0.3	12.0
CHATEAU HERBICIDE SW	28	2.8	2.1
CHATEAU(R) HERBICIDE	107	0.3	63.3
CHOICE WEATHER MASTE	12	1.7	-----
CHOICE WEATHER MASTER	16	0.3	-----
CORNERSTONE PLUS	67	37.5	-----
COSAVET DF EDGE	25	-----	75.0
CROP OIL	109	10.2	-----
DOUBLE NICKEL 55	5	-----	1.25
DU PONT GLEAN FERTILIZER COMPATIBLE HERBICIDE	21	3.8	0.0
DU PONT MATRIX HERBICIDE	28	-----	2.1
DUSTING SULFUR	38	-----	380.0
DYNE-AMIC	595	30.0	-----
ELEVATE 50WDG	123	3.4	123.0
FLINT EXTRA	211	10.1	-----
FLINT FUNGICIDE	32	0.7	1.9
FOAM MELTER	41	0.3	-----
FORFEIT 280	16	0.3	-----
FREEWAY	334	8.2	-----
GF-120 FRUIT FLY BAIT	22	2.3	-----
GLY STAR ORIGINAL	15	0.3	-----
GLY STAR PLUS	72	10.3	-----
GOAL 2XL	124	38.5	-----
GOALTENDER	41	6.6	-----
GRAMOXONE SL 2.0	6	6.0	-----
HERBIMAX	28	4.8	-----
HONCHO PLUS HERBICIDE	28	1.7	-----
INSPIRE SUPER	22	5.0	-----
JMS STYLET-OIL	1622	643.0	-----
KALIGREEN	19	-----	91.1

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
KAPUT GROUND SQUIRREL BAIT	15	6.3	25.0
KOCIDE 3000	264	8.8	263.58
LATRON B-1956 SPREADER STICKER	12	1.8	-----
LI 700	57	18.6	-----
LIFELINE	36	24.3	-----
LIQUID AMS	155	26.5	-----
LUNA EXPERIENCE	34	2.7	-----
MACHO 2.0 FL	53	13.5	-----
MAKAZE	12	6.3	-----
METTLE 125 ME	134	8.8	-----
METTLE 125 ME FUNGICIDE	215	0.3	-----
MICROTHIOL DISPERSS	182	3.4	482.5
MICROTHIOL DISPERSS MICRONIZED WETTABLE SULFUR	12	-----	5
MILSTOP (CA)	15	-----	75.9
MONTANA 2F INSECTICIDE	16	2.6	-----
MOVENTO	37	2.6	-----
M-PEDE INSECTICIDE-MITICIDE-FUNGICIDE	57	44.7	-----
NEALTA(R) MITICIDE	78	10.4	-----
NORDOX 75 WG	21	-----	21.0
ORGANIC JMS STYLET-OIL	132	116.3	-----
OXYSTAR 2E	31	0.3	-----
PHT AD-MAX 90	160	4.4	-----
PREMIUM MSO - METHYL	69	5.4	-----
PRISTINE FUNGICIDE	50	0.3	-----
PRISTINE(R) FUNGICID	329	-----	248.2
PROWL(R) H2O HERBICI	6	6.4	-----
PYGANIC CROP PROTECTION EC 5.0	99	0.3	-----
PYGANIC CROP PROTECTION EC 5.0 II	95	4.1	-----
QUEST (CA)	69	7.2	-----
QUINTEC	838	21.7	-----
RALLY 40 WSP	536	-----	83.9

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
RALLY 40W AGRICULTURAL FUNGICIDE IN WATER SOLUBLE POUCHES	16	19.2	-----
RALLY 40WSP	21	0.3	-----
RCO AVALON MIXED GRA	90	-----	60.0
REGALIA (CA)	10	0.8	-----
RELY 280 HERBICIDE	53	14.6	-----
ROUNDUP POWERMAX HER	116	66.0	-----
ROUNDUP POWERMAX HERBICIDE	36	11.1	-----
SERENADE OPTI (CA &	10	-----	12.5
SERIFEL(R) BIOFUNGIC	5	-----	2.5
SONATA	20	5.3	-----
SOVRAN	41	0.3	-----
SOVRAN FUNGICIDE	41	0.3	-----
SPREADER 90	553	8.6	-----
SPRET	59	3.4	-----
SURF-90	180	12.9	-----
SURFLAN AS AG	12	6.3	-----
TACTIC	12	0.8	-----
TEBUSTAR 45 WSP	28	0.3	-----
TEBUSTAR 45WSP	45	-----	11.3
TOPSIN M WSB	12	-----	12.0
TORINO	53	1.7	-----
UNFOAMER	98	2.4	-----
VANGARD WG	53	0.3	-----
VANGARD WG (CA)	20	-----	8.8
VENUE	53	1.3	-----
VENUE HERBICIDE	16	0.3	-----
VINTRE	362	18.7	-----
VIVANDO FUNGICIDE	40	5.1	-----
VIVANDO(R) FUNGICIDE	328	34.1	-----
WARFOX	15	0.3	-----
WEEVIL-CIDE TABLETS	4	0.3	-----
WRANGLER	312	6.3	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
WRANGLER INSECTICIDE	60	0.3	-----
YELLOW JACKET FLOWAB	237	35.9	-----
ZEAL(R) MITICIDE(1)	52	-----	7.0
ZP AG OATS	10	-----	60.0
Total	**11675**	**1705**	**2236**
2019 Pesticide Treated Amount by Product			
AD-MAX 90	3	6.4	-----
ADVISE FOUR	47	0.4	-----
AGRISOLUTIONS ADVISE MAX	28	0.7	-----
ALION HERBICIDE	4	0.4	-----
AMERICOP 40 DF	46	3.7	106.8
ASSAIL 70WP INSECTICIDE	60	0.3	-----
BRANDT SUPER WETTER	513	0.9	-----
CAPSTONE	100	100.3	-----
CHAMPION++	12	7.4	12.0
CHATEAU HERBICIDE SW	34	-----	25.0
CHATEAU(R) HERBICIDE	79	3.0	43.6
CHECKMATE VMB-F	460	2.9	-----
CHLOROPHACINONE .005% CDFA 10965-50006-ZA	0	-----	200.0
CHOICE WEATHER MASTE	16	5.9	-----
CHOICE WEATHER MASTER	35	2.5	-----
CONTINGENT	4	7.7	-----
CORNERSTONE PLUS	67	41.8	-----
CORNERSTONE PLUS BY WINFIELD	23	10.4	-----
COSAVET DF	85	1.1	341.0
COSAVET-DF EDGE	30	-----	75.0
CROP OIL	92	12.8	-----
CROSSHAIR	100	17.3	-----
DYNE-AMIC	128	17.3	-----
ELEVATE 50 WDG FUNGICIDE	23	3.0	23.0
ELEVATE 50WDG	5	0.3	5.0
FERVENT 475SC FUNGICIDE	42	5.0	-----
FLINT EXTRA	500	7.2	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
FLINT FUNGICIDE	230	0.3	28.8
FOAM MELTER	20	0.3	-----
FORFEIT 280	40	27.5	-----
FREEWAY	434	10.5	-----
GF-120 FRUIT FLY BAIT	22	0.8	-----
GF-120 NF NATURALYTE FRUIT FLY BAIT	4	0.3	-----
GLY STAR ORIGINAL	2	0.3	-----
GLY STAR PLUS	38	0.3	-----
GLY STAR PRO	9	17.7	-----
GOAL 2XL	47	4.1	-----
GOALTENDER	80	16.1	-----
GROUNDED W	4	1.2	-----
HERBIMAX	51	128.1	-----
INSPIRE SUPER	11	5.5	-----
JET-AG	5	0.3	-----
JMS STYLET-OIL	193	57.5	-----
KALIGREEN	422	0.3	808.6
KINETIC	132	16.4	0.0
KOCIDE 3000	264	4.9	263.6
LI 700	58	4.7	-----
LIFELINE HERBICIDE	30	0.3	-----
LIQUID AMS	108	27.3	-----
LUNA EXPERIENCE	293	15.6	-----
MAKAZE	4	2.0	-----
METTLE 125 ME	77	6.7	-----
MICROTHIOL DISPERSS	75	-----	235.8
MILSTOP BROAD SPECTRUM FOLIAR FUNGICIDE	46	-----	182.0
MILSTOP SP	230	0.9	920.0
MOVENTO	460	14.6	-----
M-PEDE INSECTICIDE	30	30.3	-----
MSO CONCENTRATE WITH	28	8.8	-----
MSO CONCENTRATE WITH LECI-TECH	35	4.9	-----
NORDOX 75 WG	26	-----	48.0

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
OMNI OIL 6	527	269.0	-----
ORGANIC JMS STYLET-O	29	10.3	-----
ORGANIC JMS STYLET-OIL	64	74.6	-----
OROBOOST	29	0.9	-----
PHT AD-MAX 90	264	12.6	-----
PRISTINE FUNGICIDE	586	3.5	61.3
PRISTINE(R) FUNGICID	317	-----	197.7
PROLIVO 300SC FUNGICIDE	59	3.1	-----
QUEST	17	1.9	-----
QUEST (CA)	64	18.7	-----
QUINTEC	853	28.0	-----
RALLY 40 WSP	435	6.2	68.9
RALLY 40W AGRICULTURAL FUNGICIDE IN WATER SOLUBLE POUCHES	65	5.2	-----
RALLY 40WSP	76	0.3	18.8
RELY 280	10	5.3	-----
RELY 280 HERBICIDE	35	9.0	-----
ROUNDUP POWERMAX HER	92	57.0	-----
ROUNDUP POWERMAX HERBICIDE	57	12.2	-----
SCALA BRAND SC FUNGICIDE	14	2.4	-----
SERENADE ASO	23	23.3	-----
SERENADE OPTI	5	0.3	-----
SERENADE OPTI WETTAB	9	-----	11.5
SHARK EW	11	0.3	-----
SONATA	32	23.3	-----
SPREADER 90	1165	6.1	-----
SUPER SPREAD MSO	100	25.3	-----
SURF-90	878	78.0	-----
TACTIC	12	1.0	-----
TEBUSTAR 45 WSP	282	-----	57.5
THIOLUX	287	-----	836.7
TOPSIN M WSB	12	-----	12.0
TOTAL TNV HERBICIDE	52	17.3	-----

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
UNFOAMER	90	2.2	-----
VANGARD WG	10	0.3	-----
VENUE HERBICIDE	18	0.3	-----
VINTRE	223	3.1	-----
VITICURE	53	0.3	-----
VIVANDO FUNGICIDE	77	3.3	-----
VIVANDO(R) FUNGICIDE	317	26.6	-----
WEEVIL-CIDE TABLETS	19	-----	1.7
WILBUR-ELLIS DUSTING SULFUR	3	-----	3.0
WRANGLER	33	0.6	-----
WRANGLER INSECTICIDE	81	0.6	-----
YELLOW JACKET FLOWAB	172	3.3	-----
YELLOW JACKET FLOWABLE SULFUR	4	1.1	-----
ZEAL MITICIDE	10	-----	-----
ZEAL MITICIDE(1)	26	-----	4.8
Total	**13634**	**1403**	**4592**
2020 Pesticide Treated Amount by Product			
ABOUND FLOWABLE FUNGICIDE	32	3.7	-----
ACOIDAL	107	2.1	107.0
ADVISE FOUR	76	10.5	-----
AMERICOP 40 DF	346	-----	345.7
BANTER SC MITICIDE	9	1.1	-----
BELAY INSECTICIDE	32	1.5	-----
CAPSTONE	121	121.0	-----
CHECKMATE VMB-F	9	0.1	-----
CHOICE WEATHER MASTER	28	5.4	-----
CLEAN CROP THIOLUX DRY FLOWABLE- MICRONIZED WETTABLE SULFUR	13	-----	39.0
CONTINGENT	53	6.7	-----
CORNERSTONE PLUS BY WINFIELD	18	13.5	-----
COSAVET DF	9	0.0	21.5
COSAVET-DF EDGE	253	4.2	734.3
CROP OIL	15	-----	-----

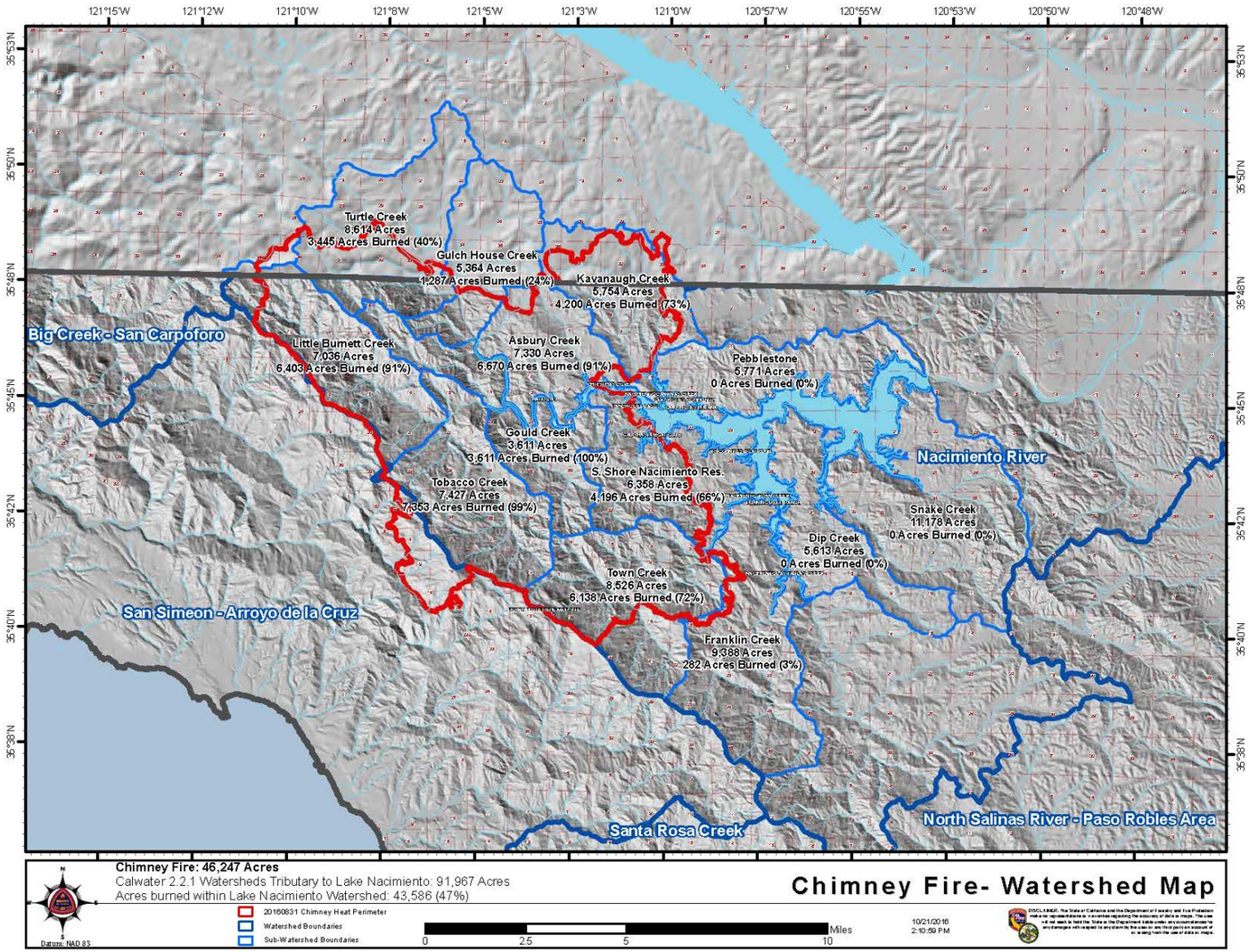
Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
CROSSHAIR	109	3.4	-----
DOUBLE L SPREADER-BUFFER	18	7.5	-----
DOUBLE NICKEL LC	0	1.2	-----
DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	1	-----	10.0
DYNE-AMIC	406	28.4	-----
FERVENT 475SC FUNGICIDE	35	2.2	-----
FLINT EXTRA	89	2.3	-----
FREEWAY	198	10.0	-----
FUSILADE DX HERBICIDE	7	0.9	-----
GF-120 NF NATURALYTE FRUIT FLY BAIT	250	37.9	-----
GLY STAR PLUS	11	2.5	-----
GLY STAR PRO	20	6.0	-----
GOALTENDER	75	13.3	-----
GOWAN SPREADER 90	660	-----	-----
HERBIMAX	16	4.5	-----
INSPIRE SUPER	12	3.4	-----
JMS STYLET-OIL	460	318.8	-----
KALIGREEN	75	3.5	374.8
KINETIC	63	2.4	-----
KOCIDE 3000	20	0.9	20.0
LI 700	82	6.0	-----
LIFELINE HERBICIDE	27	17.1	-----
LIME SULFUR SOLUTION	55	550.0	-----
LIME SULPHUR SOLUTION	18	18.0	-----
LUNA EXPERIENCE	177	10.5	-----
MACHO 4.0	291	36.3	-----
MAKAZE	24	17.7	-----
METTLE 125 ME	590	10.0	-----
METTLE 125 ME FUNGICIDE	42	0.9	-----
MICROTHIOL DISPERSS	206	-----	601.3
MICROTHIOL DISPERSS MICRONIZED WETTABLE SULFUR	125	-----	626.0
MILSTOP BROAD SPECTRUM FOLIAR FUNGICIDE	101	-----	374.6

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
MILSTOP SP	9	-----	25.0
MONTANA 4F INSECTICIDE	53	0.5	-----
MOVENTO	41	14.1	-----
MSO CONCENTRATE WITH LECI-TECH	34	7.1	-----
NEALTA MITICIDE	17	1.8	-----
OMNI OIL 6	585	294.0	-----
ORGANIC BIOLINK SURFACTANT & PENETRANT	18	4.5	-----
ORGANIC JMS STYLET-OIL	23	8.5	-----
OROBOOST	8	0.5	-----
PRISTINE FUNGICIDE	34	7.0	17.0
PROLIVO 300SC FUNGICIDE	51	2.4	-----
PYGANIC CROP PROTECTION EC 5.0 II	80	0.0	-----
QUEST	64	3.0	-----
QUINTEC	416	19.1	-----
RALLY 40WSP	329	0.2	82.1
REFER 280 SL	53	18.2	-----
REGALIA	24	8.4	-----
RELY 280	9	5.0	-----
RHYME FUNGICIDE	130	-----	-----
ROUNDUP POWERMAX HERBICIDE	11	21.4	-----
SCALA BRAND SC FUNGICIDE	29	3.9	-----
SCYTHE HERBICIDE	1	-----	-----
SERENADE ASO	1	0.5	-----
SERENADE OPTI	0	-----	0.5
SONATA	1	1.3	-----
SOVRAN FUNGICIDE	76	-----	21.2
SPREADER 90	597	28.0	-----
SUPER SPREAD MSO	121	30.3	-----
SUPPRESS HERBICIDE EC	5	-----	-----
SURF-90	444	37.2	-----
TACTIC	12	0.6	-----
TEBUSTAR 45 WSP	124	-----	18.9
THIOLUX	126	-----	245.8

Pesticide Treated Amount by Product			
Product	**Treated Amount (Acre)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
TOPSIN M WSB FUNGICIDE	12	-----	12.0
TORINO	113	4.7	-----
TOTAL TNV HERBICIDE	15	-----	-----
TUSCANY SC HERBICIDE	17	0.4	-----
ULTRA PRO	12	2.9	-----
UNFOAMER	108	2.4	-----
VANGARD WG	12	-----	7.5
VENUE HERBICIDE	72	1.2	-----
VINTRE	290	19.4	-----
VIVANDO FUNGICIDE	441	46.9	-----
WEEDAR 64 BROADLEAF HERBICIDE	5	0.8	-----
WEEVIL-CIDE TABLETS	43	-----	-----
WILBUR-ELLIS DUSTING SULFUR	18	-----	25.0
WRANGLER INSECTICIDE	133	1.7	-----
YELLOW JACKET FLOWABLE SULFUR	144	36.0	-----
Total	**10336**	**1919**	**3709**

Appendix H: Chimney Fire

Chimney Fire Watershed Map



MSDS for Fire Retardant PHOS-CHEK®MVP-Fx

ICL Performance Products LP

Material Safety Data Sheet

RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: PHOS-CHEK® MVP-Fx
Reference Number: AST10195
Date: June 6, 2014

Company Information:

ICL PERFORMANCE PRODUCTS LP
622 Emerson Road - Suite 500
St. Louis, Missouri 63141

Emergency telephone: In USA call CHEMTREC: 1 800 424 9300

Outside the USA, including ships at sea, call CHEMTREC's international and maritime telephone number (collect calls accepted):
+1 (703) 527-3887

In Canada call CANUTEC: 1 613 996 6666

General Information: +1 800 424 6169 (Worldwide)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No.	% w/w
Monoammonium Phosphate	7722-76-1	75-85
Diammonium Phosphate	7783-28-0	8-12
Performance Additives+	Trade Secret	< 15

+ Components are Company Trade Secret - Business Confidential. ICL Performance Products LP is withholding the specific chemical identity under provision of the OSHA Hazard Communication Rule Trade Secrets (1910.1200(i)(1)). The specific chemical identity will be made available to health professionals in accordance with 29 CFR 1910.1200 (i)(1) (2) (3) (4)..

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance and Odor: Pinkish colored mixture of powdered and granular components with little or no odor.

WARNING STATEMENTS

CAUTION
MAY CAUSE EYE, SKIN, AND RESPIRATORY TRACT IRRITATION

POTENTIAL HEALTH EFFECTS

Likely Routes of Exposure: Skin contact and dust inhalation

EYE CONTACT: This product is minimally irritating

SKIN CONTACT: This product is no more than slightly toxic.

INHALATION: May cause nasal and respiratory tract irritation based on toxicity information of components.

INGESTION: Practically non toxic. No significant adverse health effects are expected to develop if only small amounts (less than a mouthful) are swallowed.

Refer to Section 11 for toxicological information.

4. FIRST AID MEASURES

IF IN EYES OR ON SKIN, immediate first aid is not likely to be required. However, this material can be removed with water. Remove material from eyes, skin and clothing. Wash heavily contaminated clothing before reuse.

IF INHALED, remove to fresh air. If breathing, immediate first aid is not likely to be required. If breathing is difficult, give oxygen. If not breathing give artificial respiration. Get medical attention.

IF SWALLOWED, immediate first aid is not likely to be required. A physician or Poison Control Center can be contacted for advice.

5. FIRE FIGHTING MEASURES

FLASH POINT: Not combustible

HAZARDOUS PRODUCTS OF COMBUSTION: Not applicable

EXTINGUISHING MEDIA: Not applicable

UNUSUAL FIRE AND EXPLOSION HAZARDS: None known

FIRE FIGHTING EQUIPMENT: Not applicable

6. ACCIDENTAL RELEASE MEASURES

In case of spill, sweep, scoop or vacuum and remove. Flush residual spill area with water.

Refer to Section 13 for disposal information and Sections 14 and 15 for reportable quantity information.

7. HANDLING AND STORAGE

HANDLING

Avoid breathing dust. Keep container closed. Use with adequate ventilation.

Emptied container retains dust and product residue. Observe all labeled safeguards until container is cleaned, reconditioned, or destroyed. The reuse of this material's container for nonindustrial purposes is prohibited and any reuse must be in consideration of the data provided in the MSDS.

STORAGE: Product is stable under normal conditions of storage and handling.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

EYE PROTECTION: This product does not cause significant eye irritation or eye toxicity requiring special protection. Use good industrial practice to avoid eye contact.

SKIN PROTECTION: Although this product does not present a significant skin concern, minimize skin contamination by following good industrial practice. Wearing protective gloves is

recommended. Wash hands and contaminated skin thoroughly after handling.

RESPIRATORY PROTECTION: Avoid breathing dust. Use NIOSH/MSHA approved respiratory protection equipment when airborne exposure is excessive. Consult respirator manufacturer to determine appropriate type equipment for given application. Observe respirator use limitations specified by NIOSH/MSHA or the manufacturer. Respiratory protection programs must comply with 29 CFR 1910.134.

VENTILATION: Provide natural or mechanical ventilation to minimize exposure. If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

AIRBORNE EXPOSURE LIMITS:

OSHA and ACGIH have not established specific exposure limits for this material. However, OSHA and ACGIH have established limits for particulates not otherwise classified (PNOC) which are the least stringent exposure limits applicable to dusts.

OSHA PEL	ACGIH TLV
15 mg/m^3 (total dust) 8-hr TWA	10 mg/m^3 (inhalable) 8-hr TWA
5 mg/m^3 (respirable) 8-hr TWA	3 mg/m^3 (respirable) 8-hr TWA

Components referred to herein may be regulated by specific Canadian provincial legislation. Please refer to exposure limits legislated for the province in which the substance will be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Pinkish powder
Odor:	Essentially odorless
Viscosity:	401-800 centipoise @ 21 °C (70 °F) when dissolved in water at the recommended level of 0.96 lbs./gal. of water.
pH:	5.0-6.0

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

STABILITY: Product is stable under normal conditions of storage and handling.

MATERIALS TO AVOID: None known

HAZARDOUS DECOMPOSITION PRODUCTS: Ammonia and phosphoric acid may be formed when these products are heated above 90 °C (194 °F).

HAZARDOUS POLYMERIZATION: Does not occur.

11. TOXICOLOGICAL INFORMATION

Oral - rat LD50: > 5,050 mg/kg practically nontoxic
Dermal - rabbit LD50: > 2,020 mg/kg; No More Than Slightly Toxic
Eye Irritation - rabbit: 6/110.0; minimally irritating
Skin Irritation - rabbit: 0.0/8.0 (24-hr. exp.); nonirritating

12. ECOLOGICAL INFORMATION

Coldwater fish: 96-hr LC_{50} Rainbow trout: 2183 mg/L, Practically Nontoxic

13. DISPOSAL CONSIDERATIONS

This material when discarded is not a hazardous waste as that term is defined by the Resource, Conservation and Recovery Act (RCRA), 40 CFR 261. Dry material may be landfilled or recycled

in accordance with local, state and federal regulations. Consult your attorney or appropriate regulatory officials for information on such disposal.

14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

US DOT: Not regulated for transportation
Canadian TDG: Not regulated for transportation

15. REGULATORY INFORMATION

TSCA Inventory: All Components Listed
DSL Inventory: Listed
WHMIS Classification: Not Controlled

SARA Hazard Notification
Hazard Categories Under Title III Rules (40 CFR 370): Not Applicable
Section 302 Extremely Hazardous Substances: Not Applicable
Section 313 Toxic Chemical(s): Not Applicable

CERCLA Reportable Quantity: Not applicable

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contains all the information required by the Canadian Controlled Products Regulation.

Refer to Section 11 for OSHA/HPA Hazardous Chemical(s) and Section 13 for RCRA classification.

16. OTHER INFORMATION

	Health	Fire	Reactivity	Additional Information
Suggested NFPA Rating	1	1	0	
Suggested HMIS Rating	1	1	0	E

Reason for revision: New Product Supersedes MSDS dated: n/a
Product Use: Fire Retardant

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Responsible Care ® is a registered trademark of the American Chemistry Council.

AST10195.doc

Chimney Fire Water Quality Monitoring

CHIMNEY FIRE		Background before first rain event				Post 1st Rain (10/29/16)					
Collection Date:		8/31/2016	8/31/2016	8/31/2016	9/5/2016	11/2/2016	11/2/2016	11/2/2016	11/1/2016	11/2/2016	11/2/2016
Analysis	Reporting Units	The Narrows	Oak Shores	Las Tablas Creek	Reservoir Inlet - Raw 700'	The Narrows	Oak Shores	Las Tablas Creek	Reservoir Inlet - Raw 700'	Epilimnion 720' elev (10')	Hypolimnion 670' elev (60')
GENERAL MINERAL											
Intake Depth from Surf	Feet	2'	2'	2'	***	2'	2'	2'	20'	10'	60'
Aggressive Index	***	12.9	13.0	12.9	11.3	11.1	10.8	11.2	11.0	10.9	11.4
Langelier Index	***	1.13	1.23	1.10	-0.72	-0.86	-1.14	-0.75	-0.95	-1.11	-0.61
Total Alkalinity	mg/L	120	119	116	93	122	115	116	106	110	107
Carbonate as CaCO3	mg/L	23	28	18	0	0	0	0	0	0	0
Bicarbonate as CaCO3	mg/L	97	91	99	93	122	115	116	106	110	107
Hydroxide Alkalinity as CaCO3	mg/L	0	0	0	0	0	0	0	0	0	0
Total Hardness as CaCO3	mg/L	146	142	139	130	148	136	137	134	135	139
Calcium	mg/L	31	31	32	25	29.6	18.4	28.2	27.2	28.0	28.2
Magnesium	mg/L	17	16	14	15	18.1	16.0	16.3	16.2	15.7	16.6
Sodium	mg/L	10	11	10	8.7	11	10	11	10	10	9.9
Bromide	mg/L	***	***	***	0.021	***	***	***	0.021	0.020	0.020
Chloride	mg/L	6.49	6.35	6.31	5.57	6.71	6.62	6.57	6.20	6.31	6.27
Fluoride	mg/L	0.102	0.100	0.095	0.119	0.128	0.123	0.123	0.117	0.123	0.119
Sulfate	mg/L	28.0	27.9	27.8	24.2	28.8	28.0	27.9	26.4	27.3	26.6
Suspended Solids	mg/L	2.8	4.8	5.2	3.4	11	5.3	3.2	1.7	***	***
Total Dissolved Solids	mg/L	180	180	170	190	200	190	200	190	200	190
MBAS	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
GENERAL PHYSICAL											
Odor	TON	5.5	3.5	3.5	30	2.0	2.5	3.0	6.5	2.0	***
Odor Type	***	Fishy	Earthy	Earthy	Fishy	Fishy	Fishy Grassy	Fishy	Fishy	Grassy	***
Dissolved Oxygen	mg/L	***	***	***	***	7.77	7.32	7.78	5.47	5.20	0.47
Specific Conductance	umhos/cm	303	298	293	248	322	310	308	294	298	292
pH (WQL)	***	8.93	9.04	8.90	7.49	8.03	8.05	8.14	7.56	7.85	7.60
pH (Field)	***	8.42	8.48	8.40	7.20	7.16	7.06	7.32	7.13	6.98	7.56
Temperature	° C	25.6	25.0	25.7	16.0	18.1	18.5	18.8	17.5	18.4	13.4
Color (True)	CU	***	***	***	***	9	7	6	***	***	***
Color (Apparent)	CU	***	***	***	***	17	13	10	***	***	***
Color (Field, Apparent)	CU	100	54	42	31.0	75	52	62	52	***	***
Turbidity (Field)	NTU	4.12	3.48	2.66	2.82	6.84	5.73	3.70	1.93	1.89	2.65
Turbidity (Lab)	NTU	4.12	3.48	2.66	2.82	6.84	5.73	3.70	1.93	1.89	2.65
METALS											
Aluminum	ug/L	31	31	17	54	260	150	70	37	***	***
Antimony	ug/L	***	***	***	***	***	***	***	<1	***	***
Arsenic	ug/L	1.7	1.1	1.0	1.0	1.8	1.4	1.5	1.3	***	***
Barium	ug/L	34	33	36	45	48	41	38	<100	***	***
Beryllium	ug/L	<1.0	<1.0	<1.0	<1.0	<1	<1	<1	<2.0	***	***
Boron	ug/L	52	51	51	<50	***	***	***	47	***	***
Cadmium	ug/L	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<0.5	<2.0	***	***
Copper	ug/L	<2.3	<2.3	<2.3	<1.0	<2.0	<2.0	<2.0	2.6	<2.0	<2.0
Chromium	ug/L	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	<1.0	<2.0	***	***
Cyanide	ug/L	<25	<25	<25	<5	<25	<25	<25	<25	***	***
Iron	ug/L	120	56	40	380	390	180	110	55	42	73
Lead	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.69	***	***
Manganese	ug/L	24	13	12	180	50	42	27	20	14	43
Mercury	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	***
Nickel	ug/L	<2.0	<2.0	<2.0	3.2	<5	<5	<5	3.7	***	***
Selenium	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	***
Silver	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	***
Strontium	ug/L	220	200	200	180	***	***	***	0.44	***	***
Thallium	ug/L	***	***	***	***	<1	<1	<1	***	<1	***
Zinc	ug/L	3.4	3.7	<1.9	<1.9	<20	<20	<20	<20	<20	<20

CHIMNEY FIRE				Big Rain Event 01/08/2017 - 01/10/2017 (2.2")				
Collection Date:		12/1/2016	12/5/2016	1/9/2017	1/11/2017	2/6/2017	2/8/2017	2/8/2017
Analysis	Reporting Units	The Narrows - down stream	Reservoir Inlet - Raw 700'	Reservoir Inlet - Raw 700'	Oak Shores	Reservoir Inlet Raw 680'	Epi 10' (780' elev)	Hypo 60' (730' elev)
GENERAL MINERAL								
Intake Depth from Surf	Feet	2'	2'	60'	2'	107'	10'	60'
Aggressive Index	***	11.6	10.6	11.4	10.8	10.4	11.1	10.9
Langelier Index	***	-0.54	-1.41	-0.64	-1.26	-1.64	-1.02	-1.25
Total Alkalinity	mg/L	120	101	110	58	81	80	72
Carbonate as CaCO3	mg/L	0	0	0	5	0	0	0
Bicarbonate as CaCO3	mg/L	120	101	110	58	81	80	72
Hydroxide Alkalinity as CaCO3	mg/L	0	0	0	0	0	0	0
Total Hardness as CaCO3	mg/L	157	143	146	91	108	105	112
Calcium	mg/L	31.8	29.0	17.4	12	22	23	20
Magnesium	mg/L	18.9	17.1	29.9	15	13	2	15
Sodium	mg/L	10	9.5	9.6	4.4	6.4	6.7	6.3
Bromide	mg/L	***	0.026	0.019	***	<0.010	<0.010	<0.010
Chloride	mg/L	6.76	6.32	6.59	3.0	4.3	8.62	4.12
Fluoride	mg/L	0.157	0.106	0.141	<0.100	0.107	<0.09	<0.09
Sulfate	mg/L	30.7	26.2	27.5	8.9	21.7	19.4	19.8
Suspended Solids	mg/L	***	***	2.5	95	18	***	***
Total Dissolved Solids	mg/L	200	190	180	150	98	110	120
MBAS	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
GENERAL PHYSICAL								
Odor	TON	3.5	4.0	6.0	6.0	7.0	2.0	***
Odor Type	***	Musty Fishy	Musty Fishy	Fishy	Grassy	Earthy	Earthy Musty	***
Dissolved Oxygen	mg/L	9.95	6.31	***	9.05	9.38	8.28	7.28
Specific Conductance	umhos/cm	327	320	297	128	210	210	190
pH (WQL)	***	8.13	7.83	7.75	7.55	8.08	7.89	7.80
pH (Field)	***	7.59	6.77	7.12	6.43	6.74	7.41	7.32
Temperature	° C	13.2	13.1	12.2	13.3	11.0	11.7	10.4
Color (True)	CU	***	***	***	***	***	19	***
Color (Apparent)	CU	***	***	***	***	***	60	***
Color (Field, Apparent)	CU	73	66	47	***	***	***	***
Turbidity (Field)	NTU	3.9	3.1	3.5	187	45	30.5	57.5
Turbidity (Lab)	NTU	3.9	3.1	3.5	187	***	***	***
METALS								
Aluminum	ug/L	60	56	73	3300	1400	***	***
Antimony	ug/L	<1	<1	<1	<1	<1	***	***
Arsenic	ug/L	1.4	1.4	1.5	<1	<1	***	***
Barium	ug/L	49	46	43	44	36	***	***
Beryllium	ug/L	<1	<1	<1	<1	<1	***	***
Boron	ug/L	***	***	***	***	***	***	***
Cadmium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	***	***
Copper	ug/L	<5.0	<5.0	2.5	5.2	<5.0	<5.0	17
Chromium	ug/L	<1	<1	<1	15	6.2	***	***
Cyanide	ug/L	<25	<25	<25	<25	<25	***	***
Iron	ug/L	130	75	120	6500	1500	1100	1800
Lead	ug/L	<0.5	<0.5	<0.5	1.7	0.74	***	***
Manganese	ug/L	30	71	110	120	40	28	45
Mercury	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	***	***
Nickel	ug/L	<5	<5	6.5	24	12	***	***
Selenium	ug/L	<5	<5	<5	<5	<5	***	***
Silver	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	***	***
Strontium	ug/L	***	***	***	***	***	***	***
Thallium	ug/L	<1	<1	<1	<1	<1	***	***
Zinc	ug/L	<1.0	2.0	2.5	16	6.5	<5.0	<5.0

CHIMNEY FIRE									
Collection Date:		3/6/2017	3/8/2017	3/8/2017	3/8/2017	4/3/2017	4/4/2017	4/4/2017	4/4/2017
Analysis	Reporting Units	Reservoir Inlet - Raw 680' elevation	Oak Shores	The Narrows	Las Tablas Creek	Reservoir Inlet - Raw 680' elevation	Oak Shores	The Narrows	Las Tablas Creek
GENERAL MINERAL									
Intake Depth from Surf	Feet	110'	2'	2'	2'	110'	2'	2'	2'
Aggressive Index	***	11.2	12.0	11.9	11.7	11.1	12.4	12.0	12.4
Langelier Index	***	-0.89	-0.02	-0.08	-0.38	-0.93	0.50	0.10	0.45
Total Alkalinity	mg/L	66	61	62	60	71.2	79.8	93.8	79.5
Carbonate as CaCO3	mg/L	0	0	0	0	0	7.6	8.00	9.2
Bicarbonate as CaCO3	mg/L	66	61	62	60	71.2	72.2	85.8	70.3
Hydroxide Alkalinity as CaCO3	mg/L	0	0	0	0	0	0	0	0
Total Hardness as CaCO3	mg/L	90.6	87	87	101	90.6	101	121	98.7
Calcium	mg/L	22	18	20	19	20.4	21.5	24.0	22.0
Magnesium	mg/L	9	10	9	13	9.6	11.6	14.5	10.7
Sodium	mg/L	13	5.8	6.1	6.1	6.4	6.8	8.3	7.0
Bromide	mg/L	0.011	***	***	***	<0.01	***	***	***
Chloride	mg/L	4.00	3.51	3.57	3.56	4.08	4.44	5.09	4.35
Fluoride	mg/L	0.106	0.129	0.135	0.129	0.106	0.129	0.140	0.119
Sulfate	mg/L	18.8	16.1	15.6	15.6	13.0	23.7	25.1	23.5
Suspended Solids	mg/L	8	12	16	12	3.6	3.0	1.6	3.1
Total Dissolved Solids	mg/L	110	120	110	110	110	130	150	120
MBAS	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
GENERAL PHYSICAL									
Odor	TON	1.4	6.0	6.5	6.5	3.0	2.0	2.0	2.5
Odor Type	***	Earthy Disagreeable	Fishy	Fishy	Fishy	Earthy	Fishy	Fishy	Fishy
Dissolved Oxygen	mg/L	6.96	11.56	11.49	11.14	6.14	10.92	9.72	11.1
Specific Conductance	umhos/cm	190	170	170	170	200	220	250	210
pH (WQL)	***	7.78	8.52	8.41	8.32	7.65	8.70	8.35	8.68
pH (Field)	***	7.67	8.56	8.45	8.21	7.58	8.77	8.29	8.71
Temperature	° C	10.8	14.4	14.3	13.5	12.4	19.8	17.9	19.3
Color (True)	CU	26	16	20	21	11	11	3	11
Color (Apparent)	CU	58	46	***	45	15	14	5	15
Color (Field, Apparent)	CU	***	239	229	240	***	***	***	***
Turbidity (Field)	NTU	26.2	22.3	23.7	22.9	24.1	4.59	2.13	4.56
Turbidity (Lab)	NTU	23.3	***	***	***	22	3.3	1.1	3.7
METALS									
Aluminum	ug/L	790	660	600	600	300	120	45	140
Antimony	ug/L	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	ug/L	<1	<1	<1	<1	<1	<1	<1	<1
Barium	ug/L	31	27	25	30	26	26	28	27
Beryllium	ug/L	<1	<1	<1	<1	<1	<1	<1	<1
Boron	ug/L	***	***	***	***	***	***	***	***
Cadmium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chromium	ug/L	4.0	3.1	2.9	3.2	1.9	1.2	<1	1.3
Cyanide	ug/L	<25	<25	<25	<25	<25	<25	<25	<25
Iron	ug/L	920	720	790	820	160	160	63	160
Lead	ug/L	0.58	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	ug/L	35	16	19	18	5.7	5.7	<5.0	6.3
Mercury	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel	ug/L	9.3	<5	<5	5.5	<5	<5	<5	<5
Selenium	ug/L	<5	<5	<5	<5	<5	<5	<5	<5
Silver	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Strontium	ug/L	***	<1	***	***	***	***	***	***
Thallium	ug/L	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	ug/L	12	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0

CHIMNEY FIRE											
Collection Date:		5/1/2017	5/2/2017	5/2/2017	6/5/2017	6/6/2017	6/6/2017	6/6/2017	8/1/2017	8/1/2017	8/7/2017
Analysis	Reporting Units	Reservoir Inlet - Raw 680' elevation	Epi 10' (780' elev)	Hypo 60' (730' elev)	Reservoir Inlet - Raw 680' elevation	Oak Shores	The Narrows	Las Tablas Creek	Epi @ 10' (765' elev)	Hypo @ 60' (715' elev)	Reservoir Inlet - Raw 700' elevation
GENERAL MINERAL											
Intake Depth from Surf	Feet	110'	10'	60'	105'	2'	2'	2'	10'	60'	70'
Aggressive Index	***	11.4	11.6	10.9	10.8	12.3	12.2	11.9	12.1	11.0	10.9
Langelier Index	***	-0.72	-0.31	-1.12	-1.28	0.48	0.42	0.08	0.3	-1.06	-1.2
Total Alkalinity	mg/L	74	73	72	78	84	102	71	88	70	70
Carbonate as CaCO3	mg/L	0	0	0	0	8	19	0	6	0	0
Bicarbonate as CaCO3	mg/L	74	73	72	78	76	83	71	82	70	70
Hydroxide Alkalinity as CaCO3	mg/L	0	0	0	0	0	0	0	0	0	0
Total Hardness as CaCO3	mg/L	104	101	105	83.9	104	125	111	116	101	102
Calcium	mg/L	26	22	22	21.3	23.6	27.0	23.8	23	20	21
Magnesium	mg/L	10	11	11	7.5	11.0	13.9	12.5	14	12	12
Sodium	mg/L	6.5	6.7	6.2	6.9	7.3	8.6	7.5	8.1	8.1	6.5
Bromide	mg/L	<0.10	<0.01	<0.01	<0.010	***	***	***	0.013	0.142	0.0068
Chloride	mg/L	4.27	4.04	4.04	4.22	4.66	5.24	4.63	4.88	4.06	3.98
Fluoride	mg/L	0.166	0.172	0.161	0.09	0.12	0.12	0.13	0.160	0.142	0.139
Sulfate	mg/L	19.4	19.3	18.0	20.7	25.1	27.9	26.6	25.9	19.6	19.2
Suspended Solids	mg/L	4.2	***	***	3.6	2.5	3.2	2.6	***	***	2.5
Total Dissolved Solids	mg/L	110	110	110	140	150	150	140	130	120	120
MBAS	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
GENERAL PHYSICAL											
Odor	TON	3.5	1.0	***	2.0	6.5	6.5	6.0	***	***	3.5
Odor Type	***	Fishy	Earthy	***	Earthy	Fishy	Fishy	Fishy	***	***	Fishy
Dissolved Oxygen	mg/L	7.01	8.68	6.11	5.85	8.15	8.56	8.34	6.7	3.8	3.5
Specific Conductance	umhos/cm	200	200	200	200	230	270	240	250	210	200
pH (WQL)	***	7.72	8.21	7.67	7.26	8.57	8.51	8.48	8.36	7.53	7.46
pH (Field)	***	7.40	7.99	7.33	7.20	8.58	8.35	8.23	8.37	7.49	7.31
Temperature	° C	10.9	19.6	13.3	11.3	24.8	25.1	25.4	25.9	11.9	12.8
Color (True)	CU	27	***	***	24	7	6	7	***	***	***
Color (Apparent)	CU	45	***	***	33	9	8	9	***	***	***
Color (Field, Apparent)	CU	***	***	***	***	***	***	***	25	76	48
Turbidity (Field)	NTU	20.2	2.08	14.3	13.9	3.00	2.30	2.76	2.0	7.4	8.6
Turbidity (Lab)	NTU	19	***	***	13	1.6	1.5	1.6	***	***	***
METALS											
Aluminum	ug/L	590	***	***	49	49	30	51	***	***	***
Antimony	ug/L	<1	***	***	<1	<1	<1	<1	***	***	***
Arsenic	ug/L	<1	***	***	<1	<1	<1	<1	***	***	***
Barium	ug/L	32	***	***	30	27	31	29	***	***	***
Beryllium	ug/L	<1	***	***	<1	<1	<1	<1	***	***	***
Boron	ug/L	***	***	***	***	***	***	***	***	***	***
Cadmium	ug/L	<0.5	***	***	<0.5	<0.5	<0.5	<0.5	***	***	***
Copper	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	***	***	***
Chromium	ug/L	3.2	***	***	<1	<1	<1	<1	***	***	***
Cyanide	ug/L	<25	***	***	<25	<25	<25	<25	***	***	***
Iron	ug/L	810	110	470	560	63	42	70	***	***	***
Lead	ug/L	<0.5	***	***	<0.5	<0.5	<0.5	<0.5	***	***	***
Manganese	ug/L	25	<5.0	11	15	5.4	7.2	12	***	***	***
Mercury	ug/L	<0.2	***	***	<0.2	***	***	***	***	***	***
Nickel	ug/L	<5	***	***	7.9	<5	<5	<5	***	***	***
Selenium	ug/L	<5	***	***	<5	<5	<5	<5	***	***	***
Silver	ug/L	<0.5	***	***	<0.5	<0.5	<0.5	<0.5	***	***	***
Strontium	ug/L	***	***	***	<1	<1	<1	<1	***	***	***
Thallium	ug/L	<1	***	***	<1	<1	<1	<1	***	***	***
Zinc	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	***	***	***

Handout: Effects of Wildfire and Drinking Water Utilities (EPA 2013)

Effects of Wildfire and Drinking Water Utilities (EPA 2013)

Water Quality Effects of Wildfires

- Water quality effects can include changes in nutrients, turbidity, organic carbon, metals, major ions, and alkalinity.
- Water quality changes are variable and are greatest immediately after a rain event ("first flush").
- Storm intensity affects water quality.
- Greater burn severity can induce greater water quality effects.

Nutrients

- Nutrient exports from a watershed increase post-fire.
- Increases can include both dissolved and particulate nutrients.
- Nutrient pools (vegetation, leaf litter, soil organic matter) are combusted, and nitrification rates increase post-fire.
- Dissolved and sediment-associated phosphorous concentrations can increase.
- Magnitude of nutrient loading increases with burn severity.

Other Chemicals

- Base cations and chloride may leach from ash and affect stream water chemistry until the ash is flushed out of the watershed.
- Sensitivity to effects of wildfire varies with bedrock and pre-fire stream chemistry.
- Iron and manganese associated with particulate matter may increase.
- Other metals such as copper, zinc, and selenium may increase.
- Mercury may be mobilized, and mono-methylmercury may be generated.
- Fire retardant chemicals may reach streams either in runoff or base flow.
- Effects may include increases in ammonia, phosphorous, or cyanide.
- Water quality changes due to fire retardants may be detected, but are usually of short duration.

Hydrologic Effects, Sediment Yields, and Debris Flows

- Erosion and sediment transport increase post-fire, posing threats to downstream reservoirs.
- Greater soil hydrophobicity from severe fires reduces infiltration and leads to greater runoff and erosion.
- Serious erosion may occur during heavy rainfall in steep terrain that has been severely burned and has not yet recovered its vegetation
- Debris flows can occur with little warning under conditions of intense rainfall.
- Risk is greater in areas with steep slopes.
- Areas with thicker sediments and soil can produce multiple debris flows.
- Debris flows are unusual after the second rainy season post-fire.

Water Quality Changes

- Wildfires cause variability and spikes in water quality, for which water treatment facilities may need to compensate.
- Elevated turbidity has been documented at water treatment plants.
- Changes in DOC may necessitate changes in coagulant dosing and affect oxygen demand.
- Pulses of nitrate may exceed the MCL of 10 mg/L.
- Jar testing can be useful for adjusting treatment to respond to fire-related water quality changes.

Watershed and Water Quality Recovery

- Watershed recovery is highly variable. It generally takes 4-8 years, but some areas may take longer.
- Bedrock, soils, vegetation type, and climate affect recovery times.
- Although the worse effects occur within the first year or two post-fire, water quality changes may persist for several years, depending upon the watershed and its rate of recovery.