CITY OF ANTIOCH

Sanitary Survey Update

FINAL REPORT

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WEST YOST ASSOCIATES

Sanitary Survey Update

Prepared for

City of Antioch

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List of Acronyms and Abbreviations

µg/L	Micrograms Per Liter
AF	Acre-Feet
AFY	Acre-Feet Per Year
AUM	Animal Unit Months
BDCP	Bay Delta Conservation Plan
CAP	Cryptosporidium Action Plan
CBDA	California Bay-Delta Authority
CCL	Contaminant Candidate List
CCR	California Code of Regulations
CCWD	Contra Costa Water District
CDF	California Department of Forestry
CDHS	California Department of Health Services
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CFE	Combined Filter Effluent
City	City of Antioch
CIWQS	California Integrated Water Quality System
DBPs	Disinfection By-Product
DDW	Division of Drinking Water
Delta	Sacramento-San Joaquin Delta
DSC	Delta Stewardship Council
DWP	Drinking Water Program
DWR	Department of Water Resources
EBRPD	East Bay Regional Park District
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
gpd	Gallons Per Day
HAA5	Five Regulated Haloacetic Acids
HPC	Heterotrophic Plate Counts
IESWTR	Interim Enhanced Surface Water Treatment Rule
IFE	Individual Filter's Filtered Effluent
lbs	Pounds
LRAA	Locational Running Annual Average
LT2ESWTR	Long-Term 2 Enhanced Surface Water Treatment Rule
MCL	Maximum Contaminant Level
MG	Million Gallons
mg/L	Milligrams Per Liter
mgd	Million Gallons Per Day
MIB	Methylisoborneol
MRDLs	Maximum Residual Disinfectant Levels

NOI	Notice of Intent
NOM	Natural Organic Matter
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
OHV	Off-highway Vehicle
PHG	Public Health Goal
RAA	Running Annual Average
S1DDBPR	Stage 1 Disinfectants/Disinfection By-Products Final Rule
S2DDBPR	Stage 2 Disinfectants/Disinfection By-Products Final Rule
SB X7-1	Senate Bill X7-1
SB X7-7	Senate Bill X7-7
SCADA	System Control and Data Acquisition
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
SMARTS	Storm Water Multiple Application & Report Tracking System
SSO	Sanitary Sewer Overflows
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
THM	Trihalomethane
TOC	Total Organic Carbon
TT	Treatment Techniques
UCMR1	First Unregulated Contaminant Monitoring Rule
UCMR2	Second Unregulated Contaminant Monitoring Rule
UCMR3	Third Unregulated Contaminant Monitoring Rule
UCMR4	Fourth Unregulated Contaminant Monitoring Rule
USBR	United States Bureau of Reclamation
UST	Underground Storage Tank
WDR	Waste Discharge Requirements
West Yost	West Yost Associates
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

The City of Antioch (City) currently provides water service to approximately 32,000 customers (connections) within Contra Costa County, serving a population of approximately 108,000 people. The City's water supplies include the following:

- Local surface water from the Sacramento-San Joaquin Rivers Delta;
- Treated and untreated surface water purchased from the Contra Costa Water District (CCWD); and
- Recycled water for irrigation purposes purchased from Delta Diablo[1].

The City's local surface water supplies are obtained from the San Joaquin River and the Antioch Municipal Reservoir. The City's surface water supplies purchased from CCWD are diverted at the Middle River (Victoria Canal), Rock Slough and Old River in the Sacramento-San Joaquin Rivers Delta, and also include untreated surface water supplies from Los Vaqueros Reservoir. The untreated surface water supplies are conveyed to the City via the Contra Costa Canal. The City's treated water supplies purchased from CCWD are conveyed to the City via the 21-mile Multi-Purpose Pipeline which parallels the Contra Costa Canal.

As a drinking water supplier that draws from a surface water supply, the City is required by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW)[2] to conduct a sanitary survey for their surface water supply sources per the requirements of the California Surface Water Treatment Rule (SWTR), and then update that survey every five years.

The purpose of this Sanitary Survey Update for the City is to evaluate the source water quality of the Antioch Municipal Reservoir watershed and a segment of the San Joaquin River, specifically evaluating watershed activities and land uses, and specific watershed, water treatment, and/or monitoring recommendations for the City. This report covers the period from January 2012 through December 2016 and provides an update to the City's January 2013 Sanitary Survey Update. CCWD's Watershed Sanitary Survey (last updated in June 2015) addresses the sanitary survey requirements for the Contra Costa Canal.

Based on this Sanitary Survey Update, no major changes to the watershed or risks to the City's raw water supply have been identified, compared to the City's January 2013 Sanitary Survey Update. As described in Section 4 of this Sanitary Survey Update, the City continues to undertake a number of watershed control measures to protect the water quality of the Municipal Reservoir.

This report fulfills the City's requirement under Title 22 of the California Code of Regulation (CCR) to complete a sanitary survey for the Antioch Municipal Reservoir and a segment of the San Joaquin River. The next update of the City's Sanitary Survey will be due in five years (in 2022) and should report on watershed conditions and activities for the period from 2017 through 2021.

[1] Delta Diablo was formerly known as the Delta Diablo Sanitation District.
[2] As of July 1, 2014, the administration of the California Drinking Water Program (DWP) was transferred from the California Department of Public Health (CDPH) to the SWRCB DDW.

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1.0 INTRODUCTION

1.1 Overview

The City of Antioch (City) currently provides water service to approximately 32,000 customers (connections) within Contra Costa County, serving a population of approximately 108,000 people. The City's water supplies include the following:

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The purpose of this Sanitary Survey Update for the City is to evaluate the source water quality of the Antioch Municipal Reservoir watershed and a segment of the San Joaquin River. CCWD's Watershed Sanitary Survey (last updated in June 2015) addresses the sanitary survey requirements for the Contra Costa Canal.

This report covers the period from January 2012 through December 2016 and provides an update to the City's January 2013 Sanitary Survey Update. Four previous sanitary surveys have been prepared for the City of Antioch; these were prepared in February 1996, May 2001, July 2006, and January 2013.

1.2 Regulatory Requirements

A sanitary survey is a review of a public water system for the purpose of evaluating the adequacy of the water source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water. Per Title 22 of the California Code of Regulations (CCR), Division 4 Environmental Health, Chapter 17 Surface Water Treatment, Article 7 Sanitary Surveys, Sections 64665 and 64665.5, all water suppliers are required to have a sanitary survey of their watershed(s) completed as least every five years. A report of the sanitary survey must be submitted to the DDW not later than 60 days following completion of the sanitary survey.

The sanitary survey report shall include the following:

- A physical and hydrogeological description of the watershed;
- A summary of source water quality monitoring data;
- A description of activities and sources of contamination;
- A description of any significant changes that have occurred since the last survey which could affect the quality of the source water;
- A description of watershed control and management practices;
- An evaluation of the system's ability to meet requirements of Title 22; and
- Recommendations for corrective actions.

The focus of a watershed sanitary survey is to determine if the water supplier should implement measures to preserve and improve the quality of its surface water supply. These recommendations are based on the following:

- Evaluation of the information collected on watershed activities to identify existing or potential threats to water quality and the significance of those threats;
- Comparison of watershed protection measures being implemented in the watershed against identified threats to water quality, by identifying discrepancies between watershed protection measures and threats and recommending watershed management practices to be implemented within the watershed to address existing inadequacies; and
- Evaluation of water quality data and existing water treatment to determine if the level of treatment provided is sufficient, and recommending any necessary adjustments to the treatment facility.

The results of the evaluation of watershed activities and land uses, and specific watershed, water treatment, and/or monitoring recommendations for the City, are described in this report.

This report fulfills the City's requirement under Title 22 of the CCR to complete a sanitary survey for the Antioch Municipal Reservoir and a segment of the San Joaquin River.

1.3 Report Organization

The format and content of this report are based on the American Water Works Association, California-Nevada Section "Watershed Sanitary Survey Guidance Manual" dated December 1993. The sanitary survey report organization is summarized in Table 1-1.

Table 1-1. Sanitary Survey Report Organization	
Section Number and Title	Section Contents
Section 1: Introduction	Provides an overview of the Sanitary Survey, regulatory requirements, report organization and report preparation Describes the methods used to conduct the sanitary survey
Section 2: Watershed and Supply System	Provides a description of the Antioch Municipal Reservoir and the City's raw water supply system
Section 3: Potential Contaminant Sources	Identifies and discusses potential contaminant sources within the Antioch Municipal Reservoir watershed and the San Joaquin River segment used by the City of Antioch, and describes projected population growth and changes in activities anticipated within the watershed
Section 4: Watershed Control and Management Practices	Summarizes watershed management activities being implemented within the Antioch Municipal Reservoir watershed by the City and others
Section 5: Water Quality	Presents discussions of drinking water regulations, water quality parameters, and City raw water turbidity and microbiological data
Section 6: Conclusions and Recommendations	Provides a summary of the Sanitary Survey conclusions and recommendations
Section 7: References	Lists reference documents used in the preparation of this Sanitary Survey

1.4 Survey Methods

West Yost Associates (West Yost) obtained data for this Sanitary Survey Update from the following sources:

- Literature survey;
- SWRCB public databases and records, including National Pollutant Discharge Elimination System (NPDES) permits;
- Interviews with facilities staff; and
- Field survey.

The Sanitary Survey Update examined both general land use and specific facilities in the watershed with the potential for adversely affecting surface water quality. This section presents a description of the survey methods and findings.

1.4.1 Literature Survey

A literature survey was conducted as part of this Sanitary Survey Update. Documents that were reviewed included, but were not limited to, the following:

- City's previously prepared Sanitary Surveys (most recent survey dated January 2013);
- City's Water System Master Plan Update dated August 2014;
- City's 2015 Urban Water Management Plan dated May 2016;
- City's Annual Water Quality Reports for 2012 through 2016;
- City's raw water quality data for 2012 through 2016; and
- CCWD's 2015 Watershed Sanitary Survey dated June 2015.

1.4.2 Review of Available SWRCB Databases

Extensive amounts of water system and water quality data are available on-line through the SWRCB website and associated on-line databases. The following websites and databases were accessed for this Sanitary Survey Update:

- Safe Drinking Water Information System (SDWIS) for California Public Drinking Water Supply Systems (https://sdwis.waterboards.ca.gov/pdww/).
- SWRCB California Integrated Water Quality System (CIWQS) (http://www.waterboards.ca.gov/water_issues/programs/ciwqs/publicreports.shtml)
- SWRCB Storm Water Multiple Application & Report Tracking System (SMARTS) Database (https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.xhtml)

1.4.3 Facility Staff Interviews

The following facilities' staff were contacted to obtain information about current operations within the Municipal Reservoir or San Joaquin River watershed:

- City of Antioch, Tim Coley, Water Treatment Supervisor
- Delta Diablo: Dean Eckerson, Resource Recovery Services Director
- Lone Tree Golf Course: Danny Fielder, Golf Course Superintendent
- Black Diamond Mines Regional Preserve: Rex Caufield, Park Supervisor
- Contra Loma Regional Park: Josh Carlson, Park Supervisor

1.4.4 Field Survey

A field survey of the Municipal Reservoir watershed area was conducted on August 9, 2017. During the field survey, Tim Coley, City Water Treatment Supervisor, provided a tour of the reservoir area, including the overall reservoir area and dam and reservoir overflow facilities. During the field survey, current reservoir and water system operations and maintenance practices were discussed, as well as current reservoir security measures.

1.5 Related Studies and Plans

1.5.1 CCWD 2015 Watershed Sanitary Survey

CCWD's Watershed Sanitary Survey (last updated in June 2015) addresses the sanitary survey requirements for CCWD's overall watershed, including the Contra Costa Canal, through which the City obtains surface water supplies purchased from CCWD. Key recommendations related to protecting water quality in the Contra Costa Canal included the following:

- Storm water drainage into the Canal should be minimized per CCWD's 2006 Storm Water Remediation Study recommendations.
- Work with the landowners adjacent to Rock Slough headworks to manage livestock access to the waterway.
- Consider developing handouts for recreational boaters to educate them on proper disposal of sewage and unwanted vessels. These could be distributed at the marinas proximate to the CCWD intakes.
- Continue seeking funding sources to replace the unlined Canal with a pipeline between Rock Slough intake and the Segment 2 extent. Replacing the unlined Canal with a pipeline will minimize the risks associated with the urban development in eastern Contra Costa County adjacent to and near the open canal. Replacing this remaining stretch of unlined canal would also reduce risks of groundwater intrusion into canal waters.

1.5.2 Contra Costa County Local Hazard Mitigation Plan

The Contra Costa County Local Hazard Mitigation Plan was last updated in 2011 and adopted in 2012. The Plan serves as a coordinating document to help more than three dozen local agencies and special purpose districts reduce their risks from a wide range of potential events, including dam failure, drought, earthquakes, floods, landslides, severe weather, wildfires and extreme heat. In the preparation of the Contra Costa County Hazard Mitigation Plan, a Planning Partnership was formed to leverage resources and to meet requirements of the federal Disaster Mitigation Act of 2000 for as many eligible local governments in Contra Costa County as possible. The City of Antioch was one of the municipal planning partners that collaborated with the County on the development of the hazard mitigation plan. Each planning partner developed jurisdiction-specific annexes to the County plan including a hazard risk ranking, capability assessment and identification of recommended hazard mitigation initiatives.

The City's hazard mitigation initiatives included the following:

- Improvements to storm water facilities to mitigate flooding hazards;
- Construction of water reservoir maintenance improvement projects to mitigate earthquake, flood, severe weather and drought hazards;
- Construct water and sewer pipeline projects to strengthen system and ensure safe and reliable provision of public water and sewer systems to mitigate earthquake hazards; and
- Update Emergency Operations Plan to mitigate all hazards.

Contra Costa County is in the process of updating its Local Hazard Mitigation Plan. The update process kicked off in November 2016, and a multi-agency steering committee is in place to provide leadership and guidance, and oversee the update process. The City will participate in the update of the plan.

2.0 WATERSHED AND WATER SUPPLY SYSTEM

The City's water supplies consist of raw water from the Antioch Municipal Reservoir, local surface water withdrawn from the San Joaquin River, and purchased surface water supplies from CCWD conveyed via the Contra Costa Canal.

This section describes the City's Antioch Municipal Reservoir watershed, the San Joaquin River watershed from the Antioch River Bridge (Highway 160) to the eastern end of New York Slough, the City's water supply system, and the Antioch Municipal Water Treatment Plant (WTP).

The sanitary survey requirements for the Contra Costa Canal and for the San Joaquin River further upstream are addressed in CCWD's Watershed Sanitary Survey which was last updated in June 2015.

2.1 Antioch Municipal Reservoir Watershed

2.1.1 Watershed Description

The Municipal Reservoir watershed is located in Contra Costa County. Excluding the portion of the watershed owned by the East Bay Regional Park District (EBRPD), the rest of the watershed is within the Antioch City limits. The Municipal Reservoir watershed and its boundary are shown on Figure 2-1.

The Municipal Reservoir watershed is a natural drainage basin of approximately 1,300 acres; however, the watershed area contributing runoff to the Municipal Reservoir is about 800 acres. The natural watershed has been modified in conjunction with the residential development that has occurred within the watershed. As part of the development, the City installed a storm drainage system which collects nearly all of the residential runoff from the developed areas of the watershed and diverts it out of the watershed. The portion of the watershed that no longer drains into the Municipal Reservoir covers approximately 500 acres.

The City's 240 million gallon (MG) Municipal Reservoir enhances the City' supply reliability and provides equalization storage for the water pumped from the San Joaquin River and the Contra Costa Canal. The use of equalizing volume allows the purchase of raw water at a constant rate for periods of a month or more, depending on the season of the year. Although the raw water is delivered at a constant rate to the Municipal Reservoir and WTP, water is withdrawn from the Municipal Reservoir at varying rates to meet fluctuating demand conditions.

2.1.2 Land Use

The watershed is primarily publicly owned, including portions owned by the City and other portions owned by EBRPD. The City owns the land in the immediate watershed of the Municipal Reservoir where recreational use of the land and the municipal reservoir is not allowed. EBRPD operates two regional parks (Contra Loma Regional Park and the Black Diamond Mines Regional Preserve) which partially drain into the watershed. The various land uses within the Municipal Reservoir watershed boundary are described below.

2.1.2.1 Residential

Recent and future residential growth within the City limits will mainly occur in the hill and valley areas to the south of the Contra Costa Canal where the Municipal Reservoir watershed is located. Runoff from nearly all of the residential area within the watershed is collected in a storm drainage system which transports it out of the watershed. The storm drainage system is designed to carry runoff from a 25-year storm event. Flow in excess of that from a 25-year storm event would overflow into the Municipal Reservoir.

2.1.2.2 Golf Course

The Antioch Municipal Golf Course, also known as the Lone Tree Golf Course, is adjacent to the Municipal Reservoir. Most of the 132-acre golf course drains into the reservoir. The golf course management staff are aware that the golf course could cause potential water quality problems in the reservoir and has been very cooperative in working with the City's water treatment plant staff to assure that the golf course does not impact reservoir water quality. An automated irrigation system was installed at the golf course in 1994. This irrigation system prevents over-watering, thereby reducing the potential for runoff into the reservoir during the summer. Additionally, during the dry season from April 15 through October 15, the reservoir water level is kept high; therefore, if water must be removed from the golf course during this time, it is pumped into the storm drain system, which transports it out of the watershed. The Antioch Municipal Golf Course is irrigated with raw water drawn from the Municipal Reservoir during the winter months and recycled water provided by Delta Diablo during the summer months (generally from April 1 through November 1).

2.1.2.3 Regional Parks

Two parks, the Contra Loma Regional Park and the Black Diamond Mines Regional Preserve, are located within the watershed. However, less than 15 percent of the Regional Park, and only about 7 percent of the Regional Preserve, lie within the watershed. The Regional Park offers hiking, bicycling, horseback riding, and leases rodeo grounds frequently over the summer. The Regional Preserve offers historical, botanical, and geological educational opportunities along with hiking.

2.1.2.4 Cattle Ranching

Cattle ranching occurs in the watershed in the Contra Loma Regional Park northwest of the Municipal Reservoir and in Black Diamond Mines Regional Preserve, as described in more detail in Section 3.

2.1.3 Natural Setting

The Municipal Reservoir is located in Contra Costa County on the east side of the Diablo Mountain Range. The Municipal Reservoir watershed has a range of elevation between 165 and 1,120 feet. The terrain ranges from relatively flat in the lower elevations to rolling foothills as it stretches to its upper reaches.

2.1.3.1 Geology and Soils

The bedrock geology in the Municipal Reservoir area is characterized by a series of northward tilted sedimentary formations. Like most of the area, the watershed is on a sedimentary bedrock formation of the Mount Diablo foothills.

The foothills that span into the watershed are known historically for coal mining, but no coal mine sites are located within the watershed itself. A closed silica mine is located near, but outside, the watershed.

2.1.3.2 Vegetation

The lower elevations of the Municipal Reservoir watershed are naturally grassland, though along the municipal reservoir shoreline cattails and tules have established, and throughout the golf course trees have been planted. The grassland continues up the slopes of the Diablo Foothills and at around 500 feet in elevation oak trees, and some shrubs, can be found. Overall, the vegetative cover in the watershed is sparse due to the low rainfall. Less than 10 percent of the watershed has vegetative cover other than grassland.

2.1.3.3 Wildlife

The grassland vegetation in the area provides habitat for a variety of small animal species, including numerous snakes and lizards. Mammals found in the watershed boundary include deer, kit fox, coyotes, raccoons, rabbits, possums, skunk, badger, gophers, and squirrels. The riparian habitat provided by the Municipal Reservoir and the adjacent Contra Loma Reservoir includes a variety of fish, water birds, and raptors.

Overall, the wildlife population in the watershed is relatively low due to the sparse vegetation during the summers and the encroaching residential growth.

2.1.4 Existing Hydrology

Much of the water supplied to the Municipal Reservoir is pumped from the San Joaquin River. The City also pumps water from the Contra Costa Canal into two pipelines, one 24-inch diameter and one 39-inch diameter, that connect to both the WTP and the Municipal Reservoir. The City pumps San Joaquin River water into the Municipal Reservoir when the river water quality is good (see Section 2.2). The City then draws upon the Municipal Reservoir or the Contra Costa Canal when river water quality is poor due to saltwater intrusion. Typically, only a small amount of the water in the Municipal Reservoir is derived from its watershed. The potential for watershed runoff has decreased substantially by the re-routing of residential storm drainage out of the watershed.

The area receives an average rainfall of approximately 14 inches per year. Runoff is generated when there is significant rainfall, which occurs during the rainy season, typically between October and the end of March.

Due to the low rainfall in the area, no perennial streams drain into the Municipal Reservoir. When there is significant runoff, surface flows originating at the higher elevations in the watershed are routed by the topography into a natural drainage channel, which can be described as a swale or dry creek bed. The drainage channel originates in the southwestern corner of the watershed and heads in a northeasterly direction, under Frederickson Lane, and across the golf course. A sediment pond was built along the creek on the private property south of Frederickson Lane. Where the natural drainage channel terminates at the golf course, a large sump area and catch basin have been constructed. When runoff reaches the sump area, it flows into a culvert which passes under the golf course access road and into the Municipal Reservoir located on the other side of the road. Any water collected in the sump is pumped to the storm drain.

Excluding the residential area, other runoff in the watershed originates in very small areas of either the golf course or land adjacent to the Municipal Reservoir. The runoff from these small areas is minimal.

2.2 San Joaquin River Segment Watershed

The segment of the river covered by this Sanitary Survey stretches from the Antioch River Bridge by Highway 160 to the eastern end of the New York Slough (see Figure 2-1). The raw water intake for the Antioch Municipal Reservoir lies about halfway within the segment. Discharges upstream and downstream could affect the water quality at the intake, as the segment is under tidal influence

and hence water flows in both directions. Five types of potential contamination sources were identified for this segment of the San Joaquin River, including the following:

- Urban storm water runoff,
- Industrial storm water runoff,
- One municipal wastewater discharge,
- Industrial wastewater discharges, and
- Discharges from boating on the river.

These potential contamination sources are discussed in Section 3.2 of this Sanitary Survey Update.

For over 145 years, the Sacramento-San Joaquin Rivers Delta (Delta) has been a primary source of water supply for the City and other local inhabitants. However, as a result of the irrigated rice industry's diversions from the Delta around World War I, flows into the Delta significantly decreased and saline bay waters moved further upstream replacing the fresh water. After the City's diversion point was moved upstream in 1922, the City had typically been able to pump from the Sacramento-San Joaquin Rivers Delta for varying periods up to more than 300 days per year. Exceptions include the drought period of 1976 to 1977 when no pumping occurred, and from 1986 to March 1991 where the City was only able to pump 7 days during the year. This pumping limitation also occurred in the most recent drought, with the City only being able to pump for 16 days in 2014 and 37 days in 2015.

The City does not pump water from the Delta when the mean chloride concentration exceeds 250 milligrams per liter (mg/L). However, if the chloride concentration in the Municipal Reservoir water is particularly low, the City may continue limited pumping to the Municipal Reservoir even when the chloride concentration exceeds 250 mg/L in the river. When river water quality is acceptable, the City continues to pump raw water from the San Joaquin River because the water cost is substantially less than the cost for water purchased from the Contra Costa Canal.

A portion of Sherman Island borders the northern area of City's San Joaquin River segment watershed. A majority of the island is below sea level and approximately 90 percent of the island is owned by the California Department of Water Resources (DWR). Reclamation District 341 oversees the levee maintenance and discharges from the island. Though the island was historically used for agricultural purposes, farming has been phased out of the portion of the island bordering the study area, and it is now primarily wetlands. However, upstream portions of the island that are outside of the study area continue to serve agricultural uses. Although seepage and drainage water is pumped back into the San Joaquin River, there are no agricultural discharge points within the study area (Sanitary Survey Update dated January 2013).

Water quality in the San Joaquin River will continue to be impacted by decisions outside the City's control, including the results of the ongoing Bay-Delta programs (the Delta Plan and the Bay-Delta Conservation Plan [BDCP]). Any decrease in the net flow from east to west in the San Joaquin River at Antioch will tend to reduce the availability of low chloride waters.

In the late 1970s, the California Department of Health Services (CDHS), predecessor to the CDPH, and now the SWRCB DDW, questioned the City's use of San Joaquin River water. The concerns were predominately with regard to the bacteriological and chemical water quality risks. The CDHS believed that local and upstream discharges of treated or partially treated wastewaters and potential spills of organic chemicals made the river a threatened and, therefore, undesirable water source. One CDHS concern, the discharge of primary or poorly treated secondary effluent from local wastewater treatment plants, ended in mid-1981 when the Delta Diablo Wastewater Treatment Plant began operation. This facility has significantly upgraded the treated effluent quality for discharges near the City. DDW has not expressed concerns recently about the City's use of San Joaquin River water.

The City can presently draw no more than 16 million gallons per day (mgd) from the San Joaquin River when river water quality permits withdrawal because of the limited capacity of the river pumping station and the raw water pipeline from the river to the Municipal Reservoir. However, no quantity limitations on the City's appropriation from the San Joaquin River have been identified by the SWRCB's Water Rights Division.

2.3 Contra Costa Canal

CCWD supplies water to the City from diversions at the Middle River (Victoria Canal), Rock Slough, and Old River in the Sacramento-San Joaquin Rivers Delta, as well as from Los Vaqueros Reservoir. Untreated water is then conveyed through the 52-mile Contra Costa Canal (see Figure 2-2). Based on recent studies, the existing Contra Costa Canal does not have sufficient capacity to carry the City's increased future flow together with those required by other customers. CCWD has installed a parallel pipeline to the Canal (referred to as the Multi-Purpose Pipeline) to convey treated water supplies and satisfy such demands.

The quality of the water in the Canal is outside CCWD's direct control. It depends on overall Delta water quality which is affected by a multitude of factors including weather, upstream reservoir releases, tidal changes, discharge of nearby agricultural users, export rates of the pumps for the State Water Project and Central Valley Project, and standards and objectives set by the SWRCB and the United States Environmental Protection Agency (EPA). The Canal was one of the first units in the Central Valley Project. Although the United States Bureau of Reclamation (USBR) has a contract to deliver the water to the Canal, the contract includes no water quality requirements. According to the contract, the USBR is "…to maintain the quality of the raw water to be delivered hereunder at the highest level reasonably attainable and consistent with municipal and industrial use." The USBR is not required to meet any specific water quality level for the Canal. The future water quality depends, primarily, on two factors:

- Operation of the Los Vaqueros Project, and
- Outcome of the Bay-Delta proceedings.

The Los Vaqueros Project, approved by the voters in November 1988, resulted in the construction of the 100,000 acre-foot (AF) Los Vaqueros Reservoir located southwest of Brentwood. This project allows CCWD to draw low salinity (as measured by total dissolved solids [TDS] or chlorides) water from the Delta during high runoff periods. Los Vaqueros Reservoir also serves as emergency storage in the event of a chemical spill in the Delta or other disruption such as a levee failure. To help ensure high-quality water deliveries to customers, reliability during drought, and the protection of Delta fisheries and the environment, the Los Vaqueros Reservoir was expanded from 100,000 acre-feet to 160,000 acre-feet. The expansion was completed in the fall of 2012 and, in January 2013, CCWD began filling the reservoir above its original capacity.

Since the Los Vaqueros Reservoir was built in 1998, CCWD has operated its facilities based on the goal of providing 65 mg/L chlorides or less in the water delivered to its customers, which can be met with diversions at the Rock Slough Intake on the Contra Costa Canal and/or diversions at our other Delta intakes (the Old River, Middle River on Victoria Canal, and Mallard Slough intakes) and/or water released from Los Vaqueros Reservoir.

A complete description of potential contaminant sources for the Contra Costa Canal is provided in CCWD's 2015 Watershed Sanitary Survey.

2.4 Description of the Drinking Water Supply System

The City's local water supply system is composed of essentially all manmade waterways. A schematic of the City's drinking water supply system is shown on Figure 2-3. Descriptions of the water supply system and a discussion of the water treatment plant operations and water quality staff are provided below. Much of the information provided in this section was obtained from the City's 2015 Urban Water Management Plan and the City's 2014 Water System Master Plan Update.

The City has three raw water sources which are treated at the City's water treatment plant:

- The San Joaquin River;
- Surface water purchased from CCWD (conveyed via the Contra Costa Canal); and
- The Antioch Municipal Reservoir.

The Municipal Reservoir usually contains a mixture of water sources, which can originate from the Contra Costa Canal, the San Joaquin River, and watershed runoff. The City's primary sources of supply are from the Contra Costa Canal and the San Joaquin River.

2.4.1 San Joaquin River

The water that the City pumps directly from the San Joaquin River under riparian rights must first go to the Antioch Municipal Reservoir and then, from the Municipal Reservoir, it can flow via a pipeline to the WTP. However, due to the decrease in wastewater discharges to the San Joaquin River near the City's intake, the City is evaluating the option of pumping water directly from the river to the WTP again.

Water from the river is not always an acceptable drinking water supply due to saltwater intrusion. As indicated above, when chloride levels in river water are equal to or greater than 250 mg/L, the City stops using that source until the chloride levels decrease. The 250 mg/L chloride level corresponds to the secondary drinking water limit recommended by the EPA.

DWR and the City have an existing agreement, which specifies that the City will be able to pump water with a chloride content less than 250 mg/L at least 208 days per year. If the long-term average days of river pumping are less than 208 days per year, DWR will pay for one-third of the incremental cost to the City between using river water and Contra Costa Canal water. This contract was initially a 40-year contract that began in 1968. In 2013, the City entered into a 15-year contract extension with DWR.

The chloride requirement has posed a serious constraint during drought years. In 1976 and 1977, no water could be pumped from the river because chloride levels never fell below 250 mg/L. From 1986 through March 1991, the City was only able on average to pump from the river 7 days per year due to high chloride levels. Between 2012 and 2016, the City pumped water from the river an average of 81 days per year. However, as in past drought years, the City's ability to pump from the river was severely limited in the recent drought years (2014 through 2016), ranging from only 16 days in 2014 to 95 days in 2016, averaging only 49 days per year.

2.4.2 Surface Water Purchased from CCWD

The City purchases surface water supplies from CCWD that are conveyed via the Contra Costa Canal. CCWD pumps water out of the San Joaquin River at Rock Slough, Old River, and Middle River (Victoria Canal) to serve as the supply for the Contra Costa Canal. CCWD also stores diverted water in Los Vaqueros Reservoir and releases it as needed. That reservoir also receives local runoff from its watershed. Descriptions of the Contra Costa Canal and Los Vaqueros Reservoir are provided in CCWD's 2015 Watershed Sanitary Survey.

The pipelines from the Contra Costa Canal to the WTP have a capacity of more than 60 mgd, which is well above the maximum predicted future water demand. Water from the Canal can be pumped into the Municipal Reservoir or directly to the WTP. Water that the City withdraws from the Antioch San Joaquin River intake historically first has been pumped to the Municipal Reservoir before going to the WTP; however, the City is exploring relaxing this methodology so that it may pump directly from the river to the WTP. The City's current agreement with CCWD provides for a peak supply of 36 mgd.

To meet high demand during the summer, the City can receive up to an additional 5.94 mgd of treated water from CCWD via the Multi-Purpose Pipeline.

2.4.3 Antioch Municipal Reservoir

The City uses its 240 MG (735 AF) Municipal Reservoir to enhance supply reliability and provide equalization storage for the water pumped from the Sacramento-San Joaquin Rivers and the Contra Costa Canal. The use of equalizing volume allows the purchase of raw water at a constant flow rate for periods of a month or more, depending on the season of the year. Water is withdrawn from the

Municipal Reservoir at varying flow rates to meet fluctuating demand conditions. The ability to purchase water from CCWD at uniform flow rates has been a significant economic value to the City.

To improve reservoir water quality, the City has four SolarBee® mixers in the Municipal Reservoir to help water circulation and minimize potential for algae growth in the reservoir. These are solar-powered mixers which operate 24 hours per day.

2.4.4 Antioch Water Treatment Plant

The City's WTP has a maximum capacity of 36 mgd and serves a population of 108,298 people (2015) and is comprised of two sections designated as Plant A and Plant B.

Plant A is the original facility constructed in 1949 that underwent two expansions in 1956 and 1967. It is a conventional treatment facility with a firm capacity of 16 mgd. Processes include flash mixing, flocculation, upflow/solids contact sedimentation, and dual-media filtration. In 1986, the City replaced anthracite media in the filters with granular activated carbon. Since 1989, the City has made numerous improvements to Plant A, and continues to make additional improvements as needed.

Plant B is a 1989 expansion of the original facility. Plant B also has a conventional filtration treatment process that includes the same water treatment processes and chemical treatment that are used at Plant A. In 2007, the City completed an expansion of Plant B that doubled its capacity to 20 mgd. The Plant B expansion included adding six filters and one sedimentation basin.

The City's Department of Public Works operates the WTP. The WTP staff includes 14 permanent positions, including the superintendent.

2.5 Recycled Water

Delta Diablo is the agency responsible for treating and discharging treated wastewater for the Cities of Antioch and Pittsburg and the unincorporated community of Bay Point that are all located in Contra Costa County. Delta Diablo collected an estimated 4,453 MG of wastewater in 2015. Approximately 43 percent of the wastewater is treated to recycled water quality standards for various landscaping, agricultural and industrial uses for the Cities of Antioch and Pittsburg. The remaining wastewater is discharged through a river outfall into the Delta at New York Slough.

Within the last 5 years, Delta Diablo and its contributing agencies have moved to expand recycled water use within Delta Diablo's service area. Recently, Delta Diablo's recycled water system was expanded to serve parts of Antioch. Currently, recycled water is used within the City to irrigate four City parks and portions of the Lone Tree Golf Course. Delta Diablo recently negotiated an

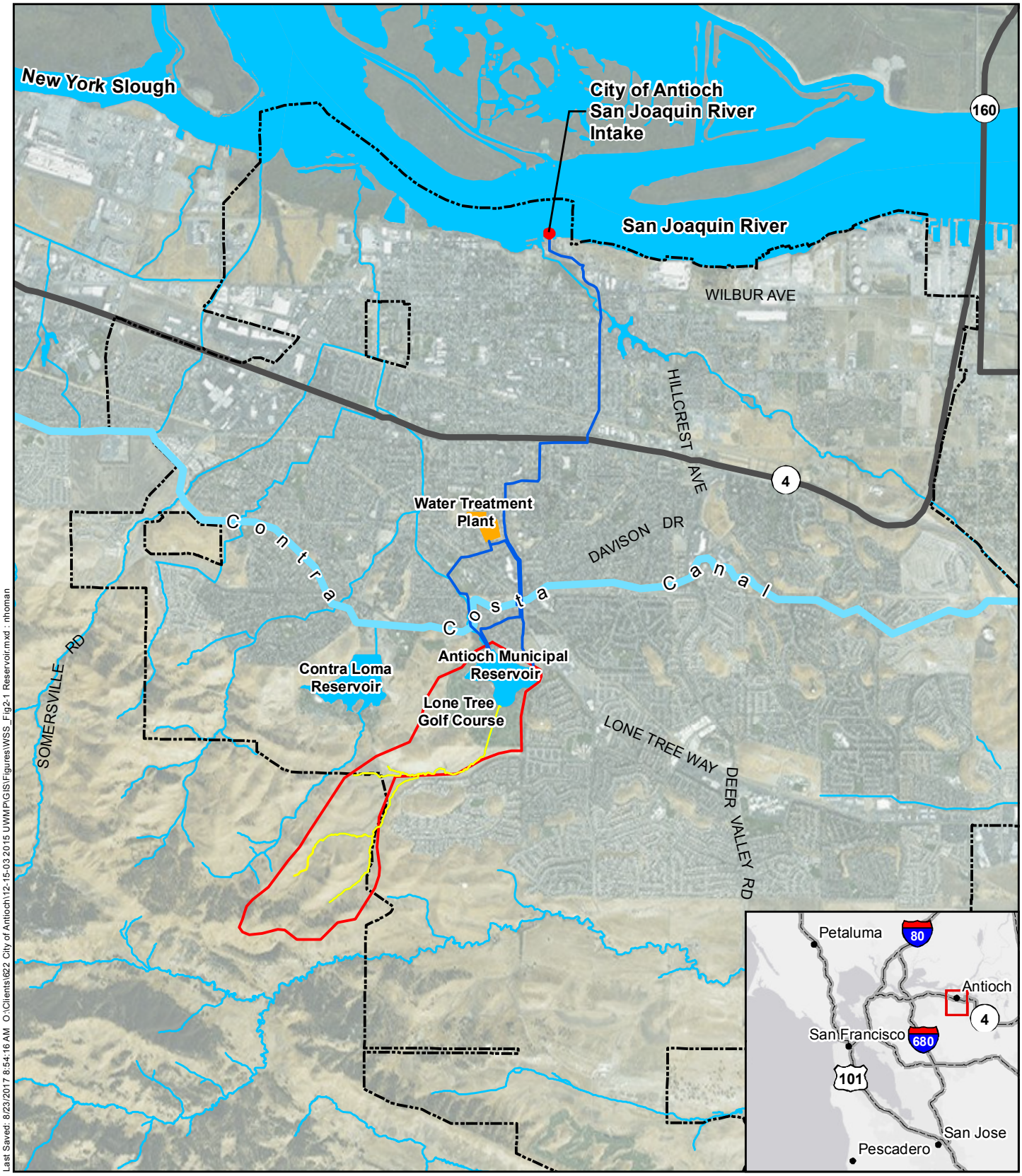
agreement with CCWD to develop an additional 539 MG/yr (1,654 AFY) of recycled water for urban landscape and golf course irrigation projects within the City's service area.

Since 1999, Delta Diablo, in cooperation with Calpine Corporation has been delivering recycled water from the Delta Diablo Wastewater Treatment Plant (WWTP) to two power plants and some park areas within the City of Pittsburg. Delta Diablo has provided approximately 7 mgd of recycled water on average since completing construction of a 12.8 mgd recycled water facility in 2001. This facility is one of the largest industrial recycled projects in California.

In 2007, the City of Antioch and Delta Diablo approved the Antioch Urban Reuse Project to provide recycled water to irrigation water users in Antioch. The Antioch Urban Reuse Project constructed 32,000 feet of recycled water (purple) PVC pipelines for use as landscape irrigation supply for medians, municipal parks, playing fields, the Lone Tree Golf Course, and any other green spaces. Delta Diablo owns, operates and maintains a one million gallon recycled water storage tank located within the City's service area at the Lone Tree Golf Course.

Currently, recycled water is used within the City to irrigate four City parks and the Lone Tree Golf Course. Delta Diablo and its contributing agencies have moved to expand recycled water use within Delta Diablo's service area to achieve the following:

- Reduce Dependence on Delta Supplies: Delta supplies are the primary water source in Delta Diablo's service area. Recycled water would be expected to reduce Delta water diversions by CCWD and the City.
- Improve Water Supply Reliability: Recycled water is not as affected by hydrologic variability as is surface water, and provides additional dry-year reliability.
- Preserve Potable Water Supplies: Recycled water use can offset potable water supply demands by serving non-potable demands such as irrigation that are currently served by potable water.
- Reduce Wastewater Discharges: Recycled water use reduces wastewater discharges, which is beneficial to Delta Diablo, which currently discharges its wastewater effluent into the New York Slough. With increasingly stringent wastewater discharge regulations, reusing wastewater helps Delta Diablo reduce its WWTP's treated effluent volume and mass of trace constituents in its discharge.



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Symbology

- San Joaquin River Intake
- Raw Water Pipeline
- Contra Costa Canal
- Watershed Drainage Channel
- Other Drainage Channel
- Watershed Boundary
- City Limit

N

0 2,375 4,750

Scale in Feet

WEST YOST ASSOCIATES

Figure 2-1

Antioch Municipal Reservoir Watershed

City of Antioch
Watershed Sanitary Survey
2016 Update

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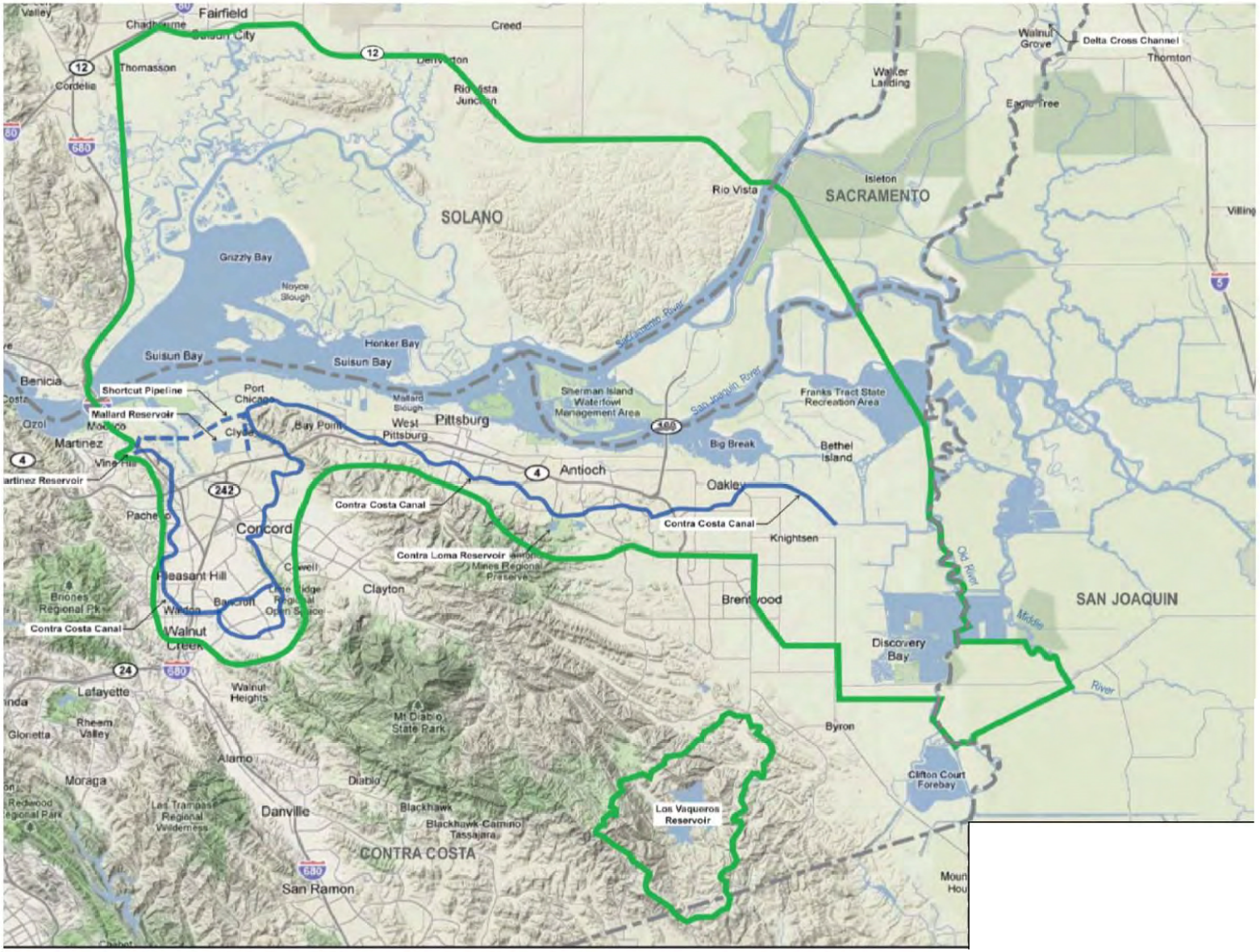

Source: Contra Costa Water District 2015 Watershed Sanitary Survey

WEST YOST ASSOCIATES

Figure 2-2

Contra Costa Canal

City of Antioch
Watershed Sanitary Survey
2016 Update

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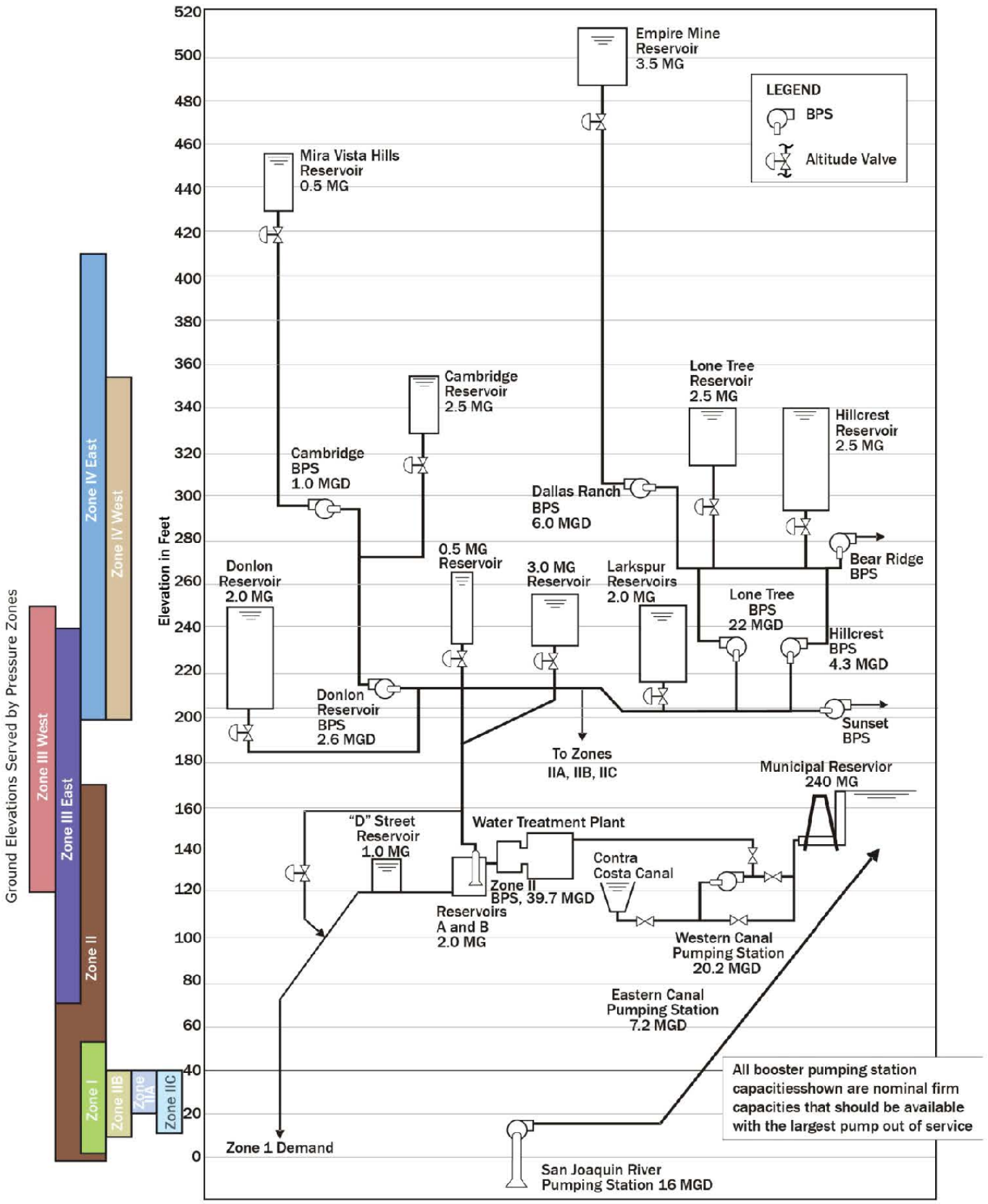

Source: City of Antioch Water System Master Plan Update, Brown and Caldwell (2014)

Figure 2-3

Existing Water System Schematic

City of Antioch
Watershed Sanitary Survey
2016 Update

WEST YOST ASSOCIATES

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3.0 POTENTIAL CONTAMINANT SOURCES

3.1 Potential Contaminant Sources to the Municipal Reservoir Watershed

The objective of this Sanitary Survey Update was to document the present and future potential sources of contamination to the Municipal Reservoir watershed. This section discusses the following existing sources of potential contamination:

- Wastewater Systems;
- Recycled Water Systems and Usage;
- Urban Runoff;
- Grazing Animals;
- Pesticides, Herbicides and Fertilizers;
- Wild and Domestic Animals;
- Recreational Use;
- Unauthorized Activity;
- Traffic Accidents;
- Hazardous Materials Storage;
- Geologic Hazards; and
- Fires.

The watershed has no point sources that discharge into the Municipal Reservoir. Point sources have a single, identifiable source of pollution. Non-point sources of contamination are less confined in the generation and release of contaminants, but can have a significant cumulative impact on surface water quality (e.g., cattle grazing).

3.1.1 Wastewater Systems

Wastewater generated within the watershed boundary is conveyed outside of the watershed to the Delta Diablo WWTP. Therefore, the only risk of contamination is from a sewer pipeline failure and leakage that bypasses the storm water collection system.

3.1.1.1 Contaminants of Concern

The potential public health risks to the City's source water supplies resulting from a sewer pipeline failure includes pathogenic microorganisms, chemicals of concern that include heavy metals, synthetic organic compounds, and high or low pH.

3.1.1.2 Existing Conditions

There are no wastewater discharges to the Municipal Reservoir or the intermittent creek in the watershed. The Lone Tree Golf Course formerly used a septic tank, but was connected to a sewer system in 1984. Because the sewer pipeline was installed relatively recently, construction standards should limit risk of leaks as long as the collection system is properly maintained.

The Contra Loma Regional Park is served by self-contained toilets located outside of the watershed. The Black Diamond Mine Regional Preserve has no wastewater facilities (including pit toilets) in the Municipal Reservoir portion of the Preserve. When the Contra Loma Regional Park leases the rodeo grounds, temporary self-contained toilets are rented for the attendees.

3.1.1.3 Conclusions

Since only a sewer collection system is present in the watershed, the potential impact on the surface water quality is expected to be relatively low.

3.1.2 Recycled Water System

As part of its recycled water system, Delta Diablo has recycled water pipelines and a 1 million gallon recycled water storage tank at the Lone Tree Golf Course (as mentioned above) that are located in the Municipal Reservoir's watershed. The golf course irrigation system pipelines distribute the recycled water throughout the golf course.

3.1.2.1 Contaminants of Concern

If the recycled water pipelines or storage tank in the Municipal Reservoir watershed leak, a potential concern exists related to contamination of the Municipal Reservoir water quality. Primary contaminants of concern include microbial pathogens, heavy metals, synthetic and other organic compounds, and pharmaceutical and personal care products that were not removed during treatment of the reclaimed water.

3.1.2.2 Existing Conditions

The recycled water pipelines and storage tank located at the golf course do present a risk of leaking. Delta Diablo and golf course maintenance staff inspect the recycled water infrastructure regularly to verify the integrity and to take action as needed to maintain it. Delta Diablo, City and golf course staff participate in annual training on the use of recycled water.

In June 2013, a recycled water leak occurred at the Lone Tree Golf Course. Upon discovery of the leak by the golf course maintenance crew, the main irrigation pump was shut down and the leak was repaired. Runoff from the recycled water the irrigation system leak reached the Municipal Reservoir. Based on the irrigation system's System Control and Data Acquisition (SCADA) data and when the leak was discovered, the leak volume was estimated to be between 35,000 and 82,500 gallons. Approximately 10,000 gallons of the leaked recycled water was captured on the golf course and returned to the system. This equates to a net leakage between 25,000 and 72,500 gallons that could have entered the Municipal Reservoir.

The City and golf course staff notified, consulted and coordinated with the Central Valley RWQCB and CDPH in response to the leak. Water quality samples were collected from several points in the Municipal Reservoir and at/near the spill site and analyzed by the City to assess possible impacts on the Municipal Reservoir water supply; no adverse water quality impacts were identified. Measured pH, Total Organic Carbon (TOC), and coliform counts were all consistent with historical levels typical of the Municipal Reservoir in the month of June. As a precautionary measure, the golf course temporarily stopped using reclaimed water and resumed irrigation with raw water from the Municipal Reservoir, until the irrigation system was repaired and inspected by Delta Diablo. At the time of the incident, the Municipal Reservoir had already been isolated from the WTP to prevent taste and odor complaints in the distribution system due to algal growth in the Municipal Reservoir.

In response to the 2013 incident, Delta Diablo has made adjustments to the SCADA system at the golf course to trigger a shutdown of the irrigation pumps, and a call to the Delta Diablo operator on duty, if there is a loss in pressure or an increase in flow outside of established set points. A "Recycled Water Leak Response Plan" was also developed by Delta Diablo, Lone Tree Golf Course and the City which addresses responsibilities in the event of a leak or spill.

Since the 2013 incident, no other issues or leaks have occurred with the recycled water system at the Lone Tree Golf Course (personal communication, Danny Fielder, Lone Tree Golf Course, July 2017).

3.1.2.3 Conclusions

As indicated by the June 2013 recycled water system leak at the Lone Tree Golf Course, the recycled water system could have a potentially negative impact on water quality in the Municipal Reservoir. However, as discussed above, no water quality impacts resulted from the June 2013 incident and the golf course irrigation system facilities and operations are closely monitored by Delta Diablo and golf course staff to minimize the risk for such an event to occur again in the future.

3.1.3 Urban Runoff

Urban runoff is that portion of rainfall and irrigation water use which drains from developed, urban areas and flows via natural or manmade drainage systems into surface waters.

3.1.3.1 Contaminants of Concern

Runoff from industrial land uses differs from residential or commercial runoff, and, depending on the types of industry involved, generally has higher concentrations of many constituents of concern. The principal short-term impacts of urban runoff on drinking water supply's sources are temporarily elevated levels of turbidity and pathogens in receiving waters during and immediately after a storm, especially following the first storm during each water year. This situation could result in temporary increases in the amount of chlorine used to oxidize and disinfect the water and reduction in filter run times for water utilities immediately downstream of urban runoff discharges.

3.1.3.2 Existing Conditions

The golf course is the only facility in the watershed that generates urban runoff, aside from the few roadways. The golf course improved its storm water quality by collecting runoff from garage areas and installing more drains that connect to the storm drainage system that was installed in 1991.

A significant portion of the watershed has been converted to residential developments during recent years, and storm water from these newly-urbanized areas is diverted out of the watershed via a storm drain system. New residential developments will be required to connect their storm drains to the existing storm drainage system. This storm drain system is sized for a 25-year storm event. Some of the storm water from events greater than a 25-year storm event interval could drain into the Municipal Reservoir. With a 25-year storm event, the first flush of storm water flows will likely carry a higher concentration of the majority of pollutants of concern that could enter the Municipal Reservoir.

3.1.3.3 Conclusions

The watershed receives minimal urban runoff. The golf course generates some runoff and low recurrence 25-year storm events may be a source of runoff to the Municipal Reservoir. City staff can increase the frequency that it monitors runoff into the Municipal Reservoir during and after major storm events, and can also increase both the frequency and constituents that are analyzed in water samples collected from the Municipal Reservoir following storms that result in runoff entering the Municipal Reservoir. Overall, the potential impact on the surface water quality from urban runoff is low.

3.1.4 Grazing Animals

Cattle grazing occurs within the watershed.

3.1.4.1 Contaminants of Concern

Water quality concerns related to grazing are predominantly due to sediment input and turbidity as a result of erosion from overgrazed lands. Livestock can also cause increased nutrients and pathogenic organisms (*Cryptosporidium* and *Giardia*) in runoff and nearby water bodies.

3.1.4.2 Existing Conditions

Cattle grazing occurs in the portions of the watershed owned by the EBRPD. EBRPD has one lease with a private party for cattle grazing on the land within Contra Loma Regional Park. Less than 50 cattle graze in the watershed in the Contra Loma Regional Park northwest of the Municipal Reservoir (personal communication, Josh Carlson, Contra Loma Regional Park, 2017).

There are cattle grazing in the portion of the watershed within the Black Diamond Mines Regional Preserve. EBRPD has two leases with private parties for cattle grazing on the Preserve. The two grazing leases on the Preserve cover 4,283 acres combined. The amount of grazing is measured by animal unit months (AUM), which is equivalent to one animal grazing for one month, and the maximum allowable AUM for the Preserve is 2,532. However, only a small portion of this area is included in the Municipal Reservoir watershed. The lease areas are divided into grazing units with

barbed wire fencing, but they do not correspond to the watershed area. While EBRPD does track the number of cows in a grazing unit, it would be impossible to determine how many cows are within that watershed area at any given time without physically counting them. However, it is estimated that approximately 600 cow-calf pairs graze the Preserve area (personal communication, Rex Caufield, Black Diamond Mines Regional Preserve, 2017). EBRPD has a seasonal grazing rotation; cows typically graze in the Preserve approximately between November and May. EBRPD runs cow/calves and counts a pair as 1 AUM in a month.

The Preserve is trying to maintain 750 pounds (lbs) to 1,000 lbs dry matter (i.e., forage) per acre, which is approximately twice the historical level. This means that there will be significantly less cattle on the land than before. By increasing the amount of dry matter, natural filtration should increase and the amount of sediment runoff should decrease. The average residual dry matter measured at one monitoring site in the watershed is 1,075 lbs/acre over the last 5 years. The number of cattle in any area varies throughout the year because they move around for forage. Generally, the cattle do not graze near the creeks because of the lack of water in the creek beds, and because there are a number of springs and plenty of forage on higher ground. The cattle cause very minor amounts of erosion where they graze, including on trails. The trails are re-graded every June, at the end of the rainy season, to smooth out cattle and other tracks.

3.1.4.3 Conclusions

Cattle grazing is relatively distant from the Municipal Reservoir, which lessens its potential impact to water quality. Cattle grazing is not likely to be a significant contributor of organic carbon, nutrients, sediment, and pathogen contamination to the Municipal Reservoir or WTP. Livestock, in general, are less likely to be carriers of pathogens when they are not kept in concentrated facilities. Cattle grazing intensity has decreased substantially since the City's original Watershed Sanitary Survey was prepared; however, in the last five years, cattle grazing has been relatively unchanged (personal communication, Rex Caufield, Black Diamond Mines Regional Preserve, 2017). At its existing level, this type of activity presents a low threat to water quality.

3.1.5 Pesticides, Herbicides, and Fertilizers

Pesticides, herbicides and fertilizers used in golf courses, parks, and along roadways can drain into surface water.

3.1.5.1 Contaminants of Concern

The City has not detected any pesticides or herbicides in samples collected from the Municipal Reservoir during annual monitoring.

3.1.5.2 Existing Conditions

Pesticides, herbicides and fertilizers are used at the Lone Tree Golf Course; however, the golf course undertakes measures to minimize the use and mitigate the impact of pesticide, herbicide and fertilizer use. For example, although the greens are fertilized every month of the year, the entire course is fertilized only in the dry months when runoff is less likely to drain into the reservoir. The impacts to the reservoir are also mitigated by a computer-controlled watering system that was installed in early 1994 to prevent under- and overwatering. All pesticide, herbicide and fertilizer use at the golf course is logged (including product name, application type and rate, and total usage), and pesticide use is reported to Contra Costa County on a monthly basis. The pesticides, herbicides and fertilizers used in 2016 at the golf course are presented in Table 3-1.

The Contra Loma Regional Park uses pesticides within the park on a very limited basis. All pesticides used in the park must be cleared for use through CCWD.

The Black Diamond Mines Regional Preserve does not use fertilizers or pesticides on its property; however, the Contra Costa County Agriculture Department performs spot applications of herbicides as needed to control specific weeds. These herbicide applications are very limited.

3.1.5.3 Conclusions

Due to limited application and the ease of identifying the potential users, pesticides and herbicides are a low threat to surface water quality in the Municipal Reservoir watershed. The golf course staff coordinates with the WTP staff to minimize adverse water quality impacts in the Municipal Reservoir.

3.1.6 Wild/Domestic Animals

Wild animal populations and domestic animals pose a potential threat to water quality because they may release/discharge pathogenic microorganisms into the water supply. The large amount of parkland in the watershed and ease of aerial access to the Municipal Reservoir makes this potential source of contamination a concern.

3.1.6.1 Contaminants of Concern

Wild animals congregate near bodies of water and even dry creek beds where vegetation tends to grow. Domestic animals (dogs) are also permitted in the Contra Loma Regional Park and the Black Diamond Mines Regional Preserve. They can contribute to increased nutrients, pathogenic microorganisms, and sediment levels in the water.

Table 3-1. Pesticide, Herbicide and Fertilizer Usage at Lone Tree Golf Course, 2016	
Chemical Type	Quantity
Granular Fertilizers	
10-4-16	2,575 lbs
11-55-0	300 lbs
46-0-0[(a)]	1,775 lbs
Black Gypsum	600 lbs
Cal-CM	800 lbs
Crystal Green	725 lbs
Liquid Fertilizers	
0-0-25	55 gallons
20-20-20	310 lbs
25-0-0	2.5 gallons
Deep Green 16	25 lbs
Ferrous Sulfate	580 lbs
Hi-Mg Combo	40 gallons
Micro King	15 gallons
Micro Mix	30 gallons
Per "4" Max	18 gallons
Sprint	184 lbs
U-Flexx	99.5 lbs
Urea	852 lbs
Herbicides	
Barricade	56 oz
Drive	23 oz
Glyphosate	21oz
Lontrel	46 oz
Pendalum Aquacap	8 oz
Prosecutor	175 oz
Speed Zone	8 oz
Surflan	176 oz
Fungicides	
4 Flowable Mancozeb	2.5 gallons
CHIPCO 26019	2.5 gallons
Insignia	125 oz
Instrata	18.25 gallons
Lexicon	84 oz
Manicure	2.5 gallons
Strider	2.5 gallons
T-Methyl SPC 4.5 F	12.5 gallons
T-Storm	2.5 gallons
Sync	160 oz
Other[(b)]	
Acelepryn	20 oz
Apex-10	5 gallons
APSA 80	1,168 oz
Primo Maxx	340 oz
Proxy	4 gallons
R.E.V	7.5 gallons
FP-747	287 oz
Spray-Rite	16 lbs
T-Nex	1735 oz
Tri-Cure	2 gallons
Turf Screen	544 oz
Unknown Wetting Agent	64 oz

Source: 2016 Daily Application Reports provided by Danny Fielder, Superintendent, Long Tree Golf Course, August 2017.

(a) Includes 43-0-0, 44-0-0, and 46-0-0 fertilizer formula.
(b) Includes insecticides, plant growth regulators, soil amendments, spray adjuvants, UV protectors, and wetting agents.

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3.1.6.2 Existing Conditions

Mammals that are present in the watershed include: deer, kit fox, coyotes, raccoons, rabbits, possums, skunk, badger, gophers, squirrels, wild turkeys, and feral pigs. Other small animal species include numerous snakes and lizards. In addition, the riparian habitat provided by the Municipal Reservoir and the adjacent Contra Loma Reservoir includes a variety of fish, water birds, and raptors. Although the Municipal Reservoir is completely fenced, wild animal access is not precluded.

Dogs are allowed in the Contra Loma Regional Park and the Black Diamond Mines Regional Preserve, and owners are required to be with their dogs at all times and to pick up dog waste and dispose of it properly.

3.1.6.3 Conclusions

There are no data indicating that wild animal populations in the watershed have contributed to pathogenic microorganisms entering the watershed or the Municipal Reservoir. Although a significant portion of the watershed is open space, the level of human activity in the area probably keeps wild animal populations down. Also, although dogs are allowed in the Regional Park and Regional Preserve, owners are required to pick up any dog waste and dispose of it properly. Therefore, wild animal populations and domestic animals are likely a relatively low risk as a contaminant source.

3.1.7 Recreational Use

Authorized recreational activities in the Municipal Reservoir watershed include golfing, visiting the park sites, and occasional rodeos. Unauthorized off-highway vehicle (OHV) driving and associated activities reportedly occurs occasionally in the watershed.

3.1.7.1 Contaminants of Concern

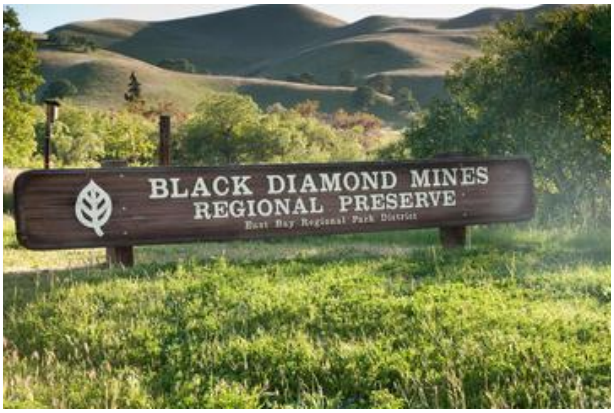
Recreational visitors, rodeos, and unauthorized OHV use may contribute to sediment and petroleum hydrocarbon runoff, which may be transported into the Municipal Reservoir. Unauthorized (as well as authorized) OHV use can cause erosion directly from the vehicles, and also from rainwater moving the resultant loose soil.

3.1.7.2 Existing Conditions

Recreational use of the Municipal Reservoir is not allowed, and it is off-limits to the public. The Municipal Reservoir is completely fenced and posted. Unauthorized swimming and fishing rarely occur in the Municipal Reservoir because these activities would be visible from most vantage points.

Most of the area within the watershed is relatively inaccessible to motor vehicles due to few roads and rough terrain. There is occasionally unauthorized OHV use in the Contra Loma Regional Park and the Black Diamond Mines Regional Preserve.

The Contra Loma Regional Park is 780 acres, of which less than 15 percent is in the Municipal Reservoir watershed. Activities occurring in the park include hiking, horseback riding (horses are not provided), bicycling, dog walking and sightseeing. Horseback riding does not occur at an intensity to require trail cleanup. A model airplane club and a rodeo group make regular use of the park. The park received approximately 230,000 visitors in 2016, with visitation increasing by 15 percent from 2012 (personal communication, Josh Carlson, Contra Loma Regional Park, 2017).



The 6,096-acre Black Diamond Mines Regional Preserve, of which about 7 percent is in the Municipal Reservoir watershed, is a botanical, geological, and historical preserve. It is the site of the largest historical coal mine in California. Typical visitors include scout groups, school groups, and university students. There is a group camp for these visitors, but it is outside of the watershed. The Black Diamond Mines Regional Preserve currently receives approximately 250,000 visitors per year, which has increased by about 50 percent since 2011 (personal communication, Rex Caufield, Black Diamond Mines Regional Preserve, 2017).

3.1.7.3 Future Land Use Plans

In 2013, EBRPD staff initiated preparation of a land use plan amendment and environmental review in compliance with the California Environmental Quality Act (CEQA) for the Preserve. Implementation of the land use plan amendment would open to the public close to 5,000 additional acres of land, bringing the total land in the Preserve to just under 10,000 acres. The planning area affords opportunities to open several local trailheads to the public and two new staging areas: the Arata Ranch Recreation/Staging Unit at the northern boundary and the proposed Clayton Ranch Recreation/Staging Unit that will provide vehicle access to the southern edge of the Preserve at Marsh Creek Road. The project also includes a major section of the proposed Black Diamond Mines to Round Valley Regional Trail that would be located outside of the Preserve; approximately one mile of this proposed six-mile trail segment would be located on existing dirt roads.

The EBRPD proposes to develop a balanced amendment to the land use plan to protect and enhance scenic, natural and cultural resources, while providing the public with opportunities for trail use, camping, environmental education and outdoor enjoyment. The land use plan amendment will establish a long-range vision that integrates resource management with public access, use and interpretation.

The EBRPD held two public meetings to solicit input for this project: one in 2013 in Antioch and another in 2015 in Clayton. In June 2017, the EBRPD released a Notice of Preparation (NOP) to conduct an Environmental Impact Report (EIR) for the land use plan amendment project. On June 14, 2017, the EBRPD hosted a Scoping Meeting to receive public comments on the proposed project and EIR.

3.1.7.4 Conclusions

The recreational activities that occur in the watershed are in limited, confined areas such as the golf course, rodeo, and parks. The recreational and visitor activities in the two regional parks are of low intensity and, therefore, pose a relatively low threat to surface water quality. The water quality concern associated with the rodeo grounds is sediment loading. Since the rodeo is used during the summer when normally there is little or no runoff in the watershed, the threat of microbial contamination from rodeo animals is low.

The sediment loading potentially contributed to the Municipal Reservoir from the rodeo grounds is small in comparison to that contributed by the Municipal Reservoir's other water supplies. Therefore, overall the rodeo poses a low threat to Municipal Reservoir water quality.

3.1.8 Unauthorized Activity

Examples of unauthorized activities include dumping of chemicals, paints, or any other toxic material in surface water, or disposal of municipal or industrial refuse into conveyance channels and driving unauthorized OHV in the watershed (as discussed in Section 3.1.7). Illegal dump sites are a common type of unauthorized activity.

3.1.8.1 Contaminants of Concern

Illegal dump sites range from disposing relatively innocuous household goods to the dumping of refuse chemicals from illegal drug laboratory operations. Illegal dump sites have the potential to be of concern depending on their proximity to the Municipal Reservoir and the specific nature of the material disposed of at the dump site. Although they involve land disposal, illegal dump sites may create leachate similar to that from permitted solid waste disposal sites.

3.1.8.2 Existing Conditions

Typical hazardous materials incidents include oil spills and dumping, although this rarely occurs in the undeveloped portions of the watershed. EBRPD staff has observed occasional dumping on Frederickson Lane, but they have not noticed that hazardous materials, oils, or illegal drugs lab materials have been dumped.

The parks and golf course managers patrol their lands on a daily basis; so, there is little potential for unauthorized activity within these large portions of the watershed.

3.1.8.3 Conclusions

Unauthorized activities pose a low threat to water quality due to their infrequent occurrence and regular patrolling.

3.1.9 Traffic Accidents

Traffic accidents are potential sources of contamination to surface waters through their potential to involve fuel spills and spills of transported items.

3.1.9.1 Contaminants of Concern

Motor vehicle accidents can result in spills of petroleum products and battery acids and lead. Traffic accidents involving tankers or trucks carrying chemicals or hazardous materials are of particular concern. The contaminant of concern in a traffic accident spill is specific to each accident.

3.1.9.2 Existing Conditions

The only roads in the watershed that receive a moderate amount of traffic are Lone Tree Way and Golf Course Road, which lead to the golf course. Frederickson Lane and Contra Loma Road are secondary routes to the Contra Loma Reservoir. There are no commercial destinations in the watershed. The occasional public events held at the rodeo grounds are a minor exception to the low traffic levels on Frederickson Lane.

The Contra Costa County Department of Health Services Hazardous Materials Incident Response Team has responsibility for hazardous materials spills within the watershed; however, the Contra Costa County Fire Protection District generally is the first responder to an incident. EBRPD and the City also respond to incidents.

3.1.9.3 Conclusions

The region of the watershed that could contribute runoff to the Municipal Reservoir is sparsely populated and contains no major transportation corridors. There is low likelihood for motor vehicle accidents, and hazardous material transport in the watershed is even less likely. Traffic accidents and resultant spills pose a low threat to surface water quality.

3.1.10 Hazardous Materials Storage

Hazardous materials storage is a potential source of contamination to surface waters through possible spills and leakages.

3.1.10.1 Contaminants of Concern

The contaminant of concern with hazardous materials storage is specific to each material.

3.1.10.2 Existing Conditions

The golf course stores unleaded gasoline and diesel in two double-walled (500 gallons each) above-ground tanks. The tanks have concrete berms to contain spills. The tanks are located 1,000 yards west of the barn, which is west of the clubhouse.

The above-ground tanks were installed in 1991 to replace a 300-gallon underground storage tank (UST) that stored gasoline. The UST was removed because it was in the path of the new storm drain system. After removal, the tank was inspected and tested and found to be sound. Soil samples were taken, and no contamination was detected.

3.1.10.3 Conclusions

The threat to the watershed from either the older tank site or the new tank site is minimal because of the lack of contamination detected at the old site and the spill containment at the new site.

3.1.11 Geologic Hazards

Geologic hazards such as earthquakes, landslides, and mudslides have the potential to destroy portions of the water supply system, and may contribute large quantities of suspended solids to the source of supply in a short period of time.

3.1.11.1 Contaminants of Concern

Erosion and sediment dumps may result from earthquakes, landslides, and mudslides. Increased sediment in runoff is a significant treatment concern.

3.1.11.2 Existing Conditions

The watershed lies near several fault lines, but none are considered active. The Antioch Fault was removed from the Alquist-Priolo Special Studies Zone in 1993. The Special Studies Zone runs southeasterly through the north central part of the City and is established by state law to govern land use activities in areas of likely geologic activity.

The slope of the Municipal Reservoir banks is grassy, flat, and receives little use because of the limited access. Therefore, there is little erosion on the Municipal Reservoir banks. Only minor landslides have occurred elsewhere in the watershed. Park usage by visitors or cattle has not resulted in significant erosion.

3.1.11.3 Conclusions

Based on the extent of landslides and erosion in the watershed, sediment from these sources poses a low threat of contamination.

3.1.12 Fires

Fires in the watershed can contribute large loads of suspended solids and organic matter to the water supply system during and immediately after a fire, and for some period of time until a fire area is stabilized.

3.1.12.1 Contaminants of Concern

Erosion resulting from wildfires increases sediment transportation in runoff, which is a significant treatment concern. Increased levels of carbon, suspended solids, and nutrients may also result from a fire.

3.1.12.2 Existing Conditions

Much of the land in the Antioch watershed is undeveloped and covered with dry grasses, making it very susceptible to wildfires, particularly during the dry months. The climate of the East Bay Hills is classed as Mediterranean with cool, winter rainfall and warm, dry summers. The East Bay's worst fire weather is created by the seasonal "Diablo Winds". These strong, hot, and dry winds coming from the East increase the likelihood of a fire by drying out the local vegetation. They also lead to unpredictable fire behavior and make it harder to suppress fire once it has been ignited.

In June 2015, in the midst of the recent drought, there was a 533-acre brush fire in the Contra Loma Regional Park. The fire prompted evacuations at the Contra Loma Reservoir and neighboring homes; however, no structures were damaged.

The Contra Costa County Fire Protection District is the primary responder for fires within the City limits portion of the watershed. The EBRPD Fire Department has responsibility for fires that occur within the Black Diamond Mine Regional Preserve portion of the watershed; however, the Contra Costa County Fire Protection District generally is the first responder to the scene. The California Department of Forestry (CDF) also responds to wildfires in the watershed.

The EBRPD has a Wildfire Hazard Reduction and Resource Management Plan which contains strategies for reducing fuel loads and managing vegetation within the EBRPD park to minimize the risk of wildfire along the wildland-urban interface while ensuring the protection and enhancement of ecological values and resources within EBRPD's jurisdiction.

3.1.12.3 Conclusions

The size and grassy nature of the undeveloped land area suggests that a large fire is not unlikely; however, the increasing urbanization surrounding the watershed is reducing this risk.

3.1.13 Significance of Potential Contaminant Sources to the Municipal Reservoir Watershed

Table 3-2 presents a summary of the significance of the various potential contaminant sources to the Municipal Reservoir watershed. The table shows the contaminant source, an assessment of its significance to the water quality of the Municipal Reservoir, and comments relating to that assessment. Except for fires, the activities in the watershed generally have a low potential to affect water quality.

Table 3-2. Significance of Potential Contaminant Sources to Municipal Reservoir Watershed

Source	Potential to Affect Water Quality	Comments
Wastewater Systems	Low	Previous septic tank at golf course was removed; only a sewer collection system is present in the watershed
Recycled Water System	Low	Additional system monitoring and inspections have been implemented since 2013 spill; 2013 spill did not impact reservoir water quality
Urban Runoff	Low	There is minimal urban runoff in the watershed
Grazing Animals	Low	Cattle grazing is relatively distant from the reservoir, which lessens the potential impact to water quality
Pesticides / Herbicides / Fertilizers	Low	Very limited use in parks; use at golf course is monitored
Wild / Domestic animals	Low	Not a significant source of microbial pathogenic organisms; wild animals in watershed area, but level of human activity in the area probably keeps wild animal populations down; dogs allowed in parks, but must be under control by owners
Recreation	Low	Low-intensity recreation and none allowed in or on reservoir
Off-highway Vehicle Recreation	Low	Only occasional unauthorized OHV use
Traffic Accidents / Chemical Spills	Low	Few roads with minimal use; response systems in place
Hazardous Materials Storage	Low	Golf course fuel tanks are above-ground; any leaks would be readily evident
Geologic Hazards / Erosion	Low	Few landslides in watershed; grazing cattle contribute only minor erosion
Fires	Low-Medium	Size and grassy nature of much of watershed poses a potential fire threat

3.2 Potential Contamination in the San Joaquin River Segment

This section provides the findings of an investigation focused on the watershed for a 7.5-mile segment of the San Joaquin River in the City of Antioch. Other drinking water suppliers have prepared sanitary surveys for the remainder of the San Joaquin River watershed and CCWD's 2015 Watershed Sanitary Survey describes the Contra Costa Canal.

The segment of the river covered by this Sanitary Survey Update stretches from approximately the Antioch Bridge (Highway 160) westward to the Delta Diablo WWTP discharge. The intake for the raw water diversion to the Municipal Reservoir lies approximately halfway between the Antioch Bridge and the WWTP. Discharges along this segment of the river could impact the City's intake since the river flows in both directions owing to the tidal influences.

The potential sources of contamination are:

- Urban storm water runoff;
- Industrial storm water runoff;
- Municipal wastewater discharges;
- Industrial wastewater discharges; and
- Boating discharges.

The only existing significant point source discharges to the project area that require NPDES permits is the Delta Diablo WWTP. The Contra Costa Power Plant, built in 1953, had previously discharged process water directly to the San Joaquin River. However, in 2013, the Contra Costa Power Plant was closed and was replaced with a newer and more environmentally friendly Marsh Landing Generating Station located just northeast of Antioch. The only remaining contamination source is storm water runoff that either flows directly into the San Joaquin River or into its tributaries. Incidental non-point source contamination likely occurs from the marinas located along the river.

3.2.1 Urban Storm Water Runoff

Several water bodies that carry urban storm water discharges, including municipal and industrial runoff, flow into the San Joaquin River within the study segment. The upper watershed is a sparsely developed rural/ranch area. Kirker Creek has its source waters near Kirker Pass in unincorporated Contra Costa County. Kirker Creek flows into Dowest Slough, which is on the east side of the City of Pittsburg and receives storm water from the City of Pittsburg. The Dowest Slough flows into the New York Slough less than 1/8 mile east of the Delta Diablo WWTP discharge. The lower watershed receives runoff from residential and urban areas from both unincorporated Contra Costa County and the City of Pittsburg.

West Antioch Creek receives storm water only from Antioch, along with infrequent overflows from the Municipal Reservoir. Markley Creek, which receives storm water from Antioch and unincorporated areas of Contra Costa County, joins West Antioch Creek near the county fairgrounds; at this confluence, this water body becomes known as Antioch Creek. Antioch Creek flows into the San Joaquin River one mile east of Dowest Slough.

One and one-half miles east of Antioch Creek, East Antioch Creek discharges into the San Joaquin River. East Antioch Creek receives storm water from Antioch, including the area as far south as Lone Tree Way.

In 1990, the EPA issued final regulations that established NPDES permit application requirements for specified categories of industries, including construction projects that encompass five or more acres of soil disturbance. In 1999, the regulations were revised further to lower the permitting threshold to one acre of disturbed soil. The RWQCBs administer the NPDES program for the EPA in California.

The SWRCB maintains the SMARTS database with information on facilities that file a Notice of Intent (NOI) to comply with the State General Construction Permit. The construction sites with active NOIs within the study area are summarized in Table 3-3.

Table 3-3. Construction Sites in Antioch with Active Storm Water NOIs

No.	Status Date	Facility Name	Receiving Waterbody
1	10/26/2010	Development of a Bank & Autospa	San Joaquin River
2	04/17/2013	Upper Sand Creek Basin Expansion	Sand Creek
3	03/26/2015	eBART 04SF130	Unknown
4	06/17/2015	1200 W 4th Street	San Joaquin River
5	03/28/2016	Aviano	Marsh Creek
6	06/20/2016	The Learning Experience	East Antioch Creek (discharges into the San Joaquin River)
7	09/15/2016	Sutter Delta Medical Center	Unknown
8	09/02/2016	Park Ridge Phase 1	East Antioch Creek (discharges into the San Joaquin River)
9	06/28/2017	Heidorn Village	Marsh Creek

Source: State Water Resources Control Board, Storm Water Multiple Application & Report Tracking System Database. Accessed on November 20, 2017.

3.2.2 Industrial Storm Water Runoff

The EPA's regulations for NPDES permits also include industrial storm water runoff discharges, and require permits for certain types of industrial facilities. These facilities are required to manage their storm water runoff. Thirteen industrial facilities within the study area have active NOIs to comply with the State General Industrial Permit, which applies to industrial storm water discharges. These facilities are listed in Table 3-4.

Table 3-4. Industrial Facilities in Antioch with Active Storm Water NOIs

No.	Status Date	Facility Name	Type of Business	Receiving Waterbody
1	03/02/1992	Eastern Contra Costa Transit Authority	Public bus company	San Joaquin River
2	05/11/1992	Antioch Unified School District	Maintenance/transportation	San Joaquin River
3	10/23/2002	CEMEX Construction Materials Pacific LLC	Concrete construction products	San Joaquin River
4	08/23/2005	A1 Auto Dismantlers Inc	Automobile dismantler	San Joaquin River
5	10/15/2006	Verco Decking Inc	Manufacture corrugated sheet steel	San Joaquin River
6	02/13/2007	Georgia Pacific Gypsum LLC	Gypsum product manufacturing	San Joaquin River
7	12/05/2008	Gateway Generating Station	Natural gas-fired energy facility	San Joaquin River
8	09/14/2010	KieCon Inc	Precast concrete	San Joaquin River
9	07/14/2015	Silgan Containers Manufacturing Company	Metal cans	San Joaquin River
10	02/02/2016	Concord Ready Mix Inc	Concrete construction products	San Joaquin River
11	04/22/2016	FTG Construction Materials Inc	Concrete and asphalt products	San Joaquin River
12	01/09/2017	Bridgehead Marine Sciences	Boat building and repairing	San Joaquin River
13	03/22/2017	CHEP Recycled Pallet Solutions	Wood pallets and skids	Delta waterways (western portion)

Source: State Water Resources Control Board, Storm Water Multiple Application & Report Tracking System Database. Accessed on November 20, 2017.

3.2.3 Municipal Wastewater Discharges

Potential sources of municipal wastewater discharges include the WWTP and sanitary sewer overflows.

3.2.3.1 Wastewater Treatment Plant

Built in 1981, the Delta Diablo WWTP is the only source of domestic wastewater discharge in the study segment of the San Joaquin River. The WWTP has a dry weather permitted capacity of 16.5 mgd with an ultimate capacity of 22.7 mgd. The average dry weather flow to the treatment plant, which includes the wastewater from the cities of Antioch and Pittsburg and Bay Point, is 13.2 mgd. Delta Diablo's WWTP has primary, secondary, and partial tertiary treatment capabilities. The major treatment processes include screening and grit removal, primary clarification, tower trickling filters, aeration in an activated sludge system, secondary clarification, and disinfection/chlorination. Treated and disinfected secondary effluent discharges to New York Slough which forms a portion of the northern boundary of the City of Pittsburg, west of Winter Island.

New York Slough is a fork of the San Joaquin River flowing west, as the river briefly turns northward, and connects the San Joaquin River to the Sacramento River. The WWTP discharge point is located downstream of the Antioch WTP intake location but may affect the water quality arriving at the WTP intake when reverse flows occur in the San Joaquin River. The Delta Diablo WWTP operates under a Waste Discharge Requirements (WDR) and a NPDES Permit issued by the RWQCB.

In the past five years, there have been no violations at the WWTP (personal communication, Dean Eckerson, Resource Recovery Services Director, Delta Diablo, June 2017).

3.2.3.2 Sanitary Sewer Overflows

A record of Sanitary Sewer Overflows (SSOs) is maintained by the SWRCB. Overflows listed in each individual SSO report contain data related on each specific incident where sewage is discharged from the sanitary sewer system due to a failure (e.g., sewer pipe blockage or pump failure). Table 3-5 provides a summary of SSOs from 2012 to 2016 within the City within the Delta Diablo Collection System; as noted, only Category 1 spills are included.

Table 3-5. Sanitary System Overflows in Delta Diablo Collection System in City of Antioch (2012-2016)[(a)]

Event ID	Date	Address	SSO Location	Estimated Total Spill Volume, gallons	Estimated Total Spill Volume Recovered, gallons	Estimated Total Spill Volume Reaching Surface Water, gallons
785075	08/10/2012	115 Wilbur Avenue, Antioch	Force main air relief valve	200	200	50
797740	08/10/2013	Antioch	Main	45,100	42,845	45,100
798137	08/21/2013	14 8th Street, Antioch	Draining of force main for CCTV	1,250	1,250	1,250

Source: CIWQS SSO Public Reports. Accessed in August 2017.

(a) Includes only Category 1 SSOs. Category 1 spills are defined as those with discharges of untreated or partially treated wastewater of any volume resulting from an enrollee's sanitary sewer system failure or flow condition that reach surface water and/or reach a drainage channel tributary to a surface water, or reach a municipal separate storm sewer system and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly.

3.2.4 Industrial Wastewater Discharges

Numerous industries previously discharged wastewater directly into the study segment of the river, however, currently, all industrial dischargers have ceased their discharge. Since the 2012 WSS Update, the Contra Costa Power Plant ceased its discharge and was the last industrial discharger to cease.

Southern Energy Delta, LLC operated the Contra Costa Power Plant, which was a fossil-fuel power plant that used up to about 500 gallons per day (gpd) of non-contact once-through cooling water for its power production processes, and some process cleaning waters. In 2013, the Contra Costa Power Plant was closed and replaced with a newer and more environmentally friendly Marsh Landing Generating Station, located northeast of Antioch. Instead of drawing water from the San Joaquin River for cooling and delivering it back to the river at higher temperatures, the Marsh Landing Generating Station uses water and wastewater hookups provided by the City and Delta Diablo. Therefore, the Marsh Landing Generating Station does not contribute significant point source discharges to the San Joaquin River. The Marsh Landing's planned maximum water use of 50 acre-feet per year (averaging 50,000 gpd) is a 99.99 percent reduction from the Contra Costa Power Plant's previous water use.

3.2.5 Boating Discharges

The San Joaquin River is used for recreational boating. The main concern coming from this use is the potential release of hydrocarbons. The City's monitoring program results have shown that these compounds have not been a problem in the past.

3.2.6 Significance of Potential Contaminant Sources to the San Joaquin River Watershed within the City of Antioch

Table 3-6 presents a summary of the significance of the various potential contaminant sources to the segment of the San Joaquin River located within the City. The table shows the contaminant source, an assessment of its significance to the water quality of the San Joaquin River, and comments relating to that assessment. Both storm water runoff and wastewater discharges have the potential to affect water quality within the river.

Table 3-6. Significance of Potential Contaminant Sources to Municipal Reservoir Watershed

Source	Potential to Affect Water Quality	Comments
Urban storm water runoff	Medium	Several water bodies that carry urban storm water discharges, including municipal and industrial runoff, flow into the San Joaquin River within the study segment
Industrial storm water runoff	Low	Industrial facilities are required to manage their storm water runoff
Municipal wastewater discharges	Medium	In the past five years, there have been no violations at the WWTP, and only isolated SSOs
Industrial wastewater discharges	Low	No current industrial discharges
Boating discharges	Low	The City's monitoring program results have shown that these compounds have not been a problem in the past

3.3 Anticipated Growth within the Study Area

The population in the City of Antioch has grown from 75,805 in 1995 to 108,298 in 2015, an average annual growth rate of 2.1 percent. From 2000 to 2010, the City population increased 13 percent, which is a growth rate of approximately 1.3 percent per year. From 2010 to 2015, the City population increased 6 percent (growth rate of approximately 1.2 percent per year). Growth within the study area has included residential development in the natural watershed of the Municipal Reservoir. However, the only remaining pocket of undeveloped land is located southeast of Frederickson Lane and is not planned for development. This land was formerly owned by Richland Development Company and has since been dedicated to the City. Therefore, no additional lands within the watershed are planned for residential development.

3.4 Projected Changes in Sources of Contaminants

This section describes projected changes in sources of contaminants as a result of population increases and land use changes in the watersheds. The ownership of large tracts of land by EBRPD and the City's intentions for the watershed will prevent further residential development. The Black Diamond Mines Regional Preserve plans no significant changes in the next five years or more.

Despite the constancy of land uses expected within the watershed, the population increases outside the watershed can be expected eventually to impact the level of park usage within the watershed. The Black Diamond Mines Regional Preserve has been experiencing steady increases in the number of visitors over the last decade as the local and regional populations have grown, and this trend can be expected to continue as more growth is planned. Because of the non-intensive uses of the Preserve grounds, these increases will have only a minimal impact on the watershed. Although Contra Loma Regional Park has experienced an increase in visitor counts in recent years, no significant increases are anticipated in the near future for the park lands.

Because land use in the watershed is not expected to change very much in the near future, there is not expected to be much change in the type of contaminants that may affect the water quality of the Municipal Reservoir or the San Joaquin River.

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4.0 WATERSHED CONTROL AND MANAGEMENT PRACTICES

This section summarizes existing watershed management practices used by the City and by other agencies within the watershed. Watershed management measures discussed in this section may improve the water quality of the Municipal Reservoir. Additional watershed control measures are recommended in Section 4.3 to enhance the microbiological quality of the Municipal Reservoir and prevent future degradation. Consistent with the remainder of this report, the developed and proposed developed portion of the watershed that drains outside of the watershed is excluded from this discussion.

The City owns approximately 25 percent of the 800 acres of the watershed area that contributes runoff to the Municipal Reservoir, including the land around the periphery of the Municipal Reservoir. Therefore, the City has some ownership of and involvement in protection and management of the watershed. The remainder of the land within the Municipal Reservoir watershed is owned and operated by EBRPD.

4.1 Current City Management Practices

The City continues to undertake a number of watershed control measures to protect the water quality of the Municipal Reservoir. These activities are described below:

- The City does not allow public access to the Municipal Reservoir. City land surrounding the Municipal Reservoir is entirely fenced to keep trespassers out of the immediate watershed. There are "No Trespassing" signs on the City's land that is adjacent to the Municipal Reservoir.
- The Antioch WTP staff visit the dam location at least once per day (7 days a week) to check and record information. As they perform this task, the staff scans the Municipal Reservoir and adjacent area for unusual or illicit activity.
- The City required that runoff from residential developments within the watershed be removed from the watershed through a storm drainage system.
- The Antioch WTP works closely with the golf course staff to prevent and improve activities in the watershed that may lead to treatment problems at the WTP (these were described in Section 3).
- The municipal Lone Tree Golf Course, which is immediately adjacent to the Municipal Reservoir, is patrolled throughout the day. The maintenance staff prepares and checks the course at dawn and dusk each day and a golf course marshal drives the course continuously during daylight hours to monitor the golfer’s activities.

4.2 Other Agencies with Watershed Management Authority

The primary governmental agencies that have authority over watershed management are Contra Costa County and EBRPD. The Municipal Reservoir and San Joaquin River watersheds are situated in Contra Costa County and are, therefore, subject to environmental enforcement policies implemented by county departments. EBRPD manages a portion of the Municipal Reservoir watershed through its operation of the two regional parks. Therefore, EBRPD has considerable

influence toward the effective protection of the Municipal Reservoir watershed. Programs for these two agencies that are relevant to watershed management are described below.

Septic systems in the San Joaquin River watershed are under the jurisdiction of the Contra Costa County Department of Health Services, Environmental Health Division. If septic systems are poorly sited, constructed, or maintained, they can pose threats to the water quality of both surface and groundwater supplies. Generally, conventional septic systems should not be allowed in areas where soil type, subsurface conditions, groundwater conditions, or proximity to surface water could cause contamination of water supplies. Minimum requirements for the design, installation, operation, and maintenance of septic tanks and other on-site sewage disposal systems are established by state and local public health codes.

The County Environmental Health Division is also responsible for the investigation and remediation of above-ground petroleum product storage tanks (e.g., the fuel tanks at the Lone Tree Golf Course are under its purview).

Contra Loma Regional Park staff patrol the park throughout the year. During bad weather, staff drive throughout the park two to three times during each day, and during good weather, staff drive throughout the park as many as 20 or more times during a day.

Black Diamond Mines Regional Preserve staff patrol the preserve several times a week for a variety of purposes including the following: to control unauthorized access; to check fences, gates, and trails; to prevent poaching; to conduct maintenance; and to assist park users as necessary.

4.3 Recommended Management Measures

The City should develop an overall Watershed Emergency Response Plan. This plan would include communication protocols with the park supervisors of the Contra Loma Regional Park, the Black Diamond Mines Regional Preserve, and the Lone Tree Golf Course, so that the WTP is promptly advised of any activities (authorized or unauthorized) occurring in the parks that may impact the watershed. All three parks patrol their portions of the watershed frequently; however, there is no formal mechanism (except as described below with the golf course) for them to report incidents to the City. Roadway signs which identify watershed areas and include City contact numbers could also improve notification procedures.

As described in Section 3.1.2, in response to the 2013 recycled water spill on the Lone Tree Golf Course, a "Recycled Water Leak Response Plan" was developed by Delta Diablo, Lone Tree Golf Course and the City which addresses responsibilities in the event of a recycled water leak or spill.

5.0 SOURCE WATER QUALITY

Since completion of the City's January 2013 Sanitary Survey Update, a number of water quality monitoring programs have been implemented by the City. They include the following:

- In 2013 and 2014, the City completed monitoring under the third federal Unregulated Contaminant Monitoring Rule; and
- In 2015 and 2016, the City conducted the Round Two source water monitoring required under the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

This section presents a review of water quality data for the study period of January 2012 through December 2016. Section 5 is organized as follows:

- Review of drinking water regulations with a focus on the Surface Water Treatment Rule (SWTR), the Interim Enhanced Surface Water Treatment Rule (IESWTR), and the LT2ESWTR;
- Potential impacts of Bay-Delta Programs;
- Overview of the City's water quality monitoring programs; and
- Water quality data for the study period 2012 through 2016.

5.1 Review of Drinking Water Regulations

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

DDW establishes Maximum Contaminant Levels (MCL) for a wide variety of physical, chemical, biological, and radiological constituents to ensure that water is safe for public consumption. These MCLs are at least as stringent as the federal MCLs established by the EPA.

5.1.1 Surface Water Treatment Requirements

The SWTR was promulgated in 1989 to control the levels of turbidity, *Giardia lamblia* cysts, enteric viruses, *Legionella*, and heterotrophic bacteria. Compliance with the SWTR is demonstrated by meeting specific turbidity and disinfection performance requirements. Surface water treatment plants are required to provide 3-log (99.9 percent) reduction of *Giardia* cysts and 4-log (99.99 percent) reduction of viruses when treating high-quality surface water supplies.

Table 5-1 provides a summary of currently regulated microorganisms.

Table 5-1. Currently Regulated Microorganisms

Microorganisms	MCLG	MCL[(a)]
Cryptosporidium parvum	0	TT-2 log removal
Giardia lamblia	0	TT-3 log removal
Heterotrophic bacteria (plate count (HPC))	0	TT-<500/ml
Legionella	0	TT-No MCL
Total Coliform (including fecal coliform and *E. coli*)	0	TT-<5% distribution system samples positive
Viruses (enteric)	0	TT-4 log removal

Source: Table 4-2 City of Antioch Water System Master Plan Update, August 2014.

(a) Constituents regulated through Treatment Techniques (TT) require a treatment process to reduce the level of a contaminant in drinking water.

A WTP with a conventional filtration treatment process that complies with the turbidity performance standards receives physical removal credit of 2.5 logs for *Giardia*, 2.0 log for virus, and 2-log for *Cryptosporidium*. The additional 0.5-log *Giardia* reduction and 2-log virus reduction must be achieved through inactivation (disinfection) credits. Compliance with the disinfection requirements is demonstrated by monitoring CT where C is the disinfectant's concentration in the water leaving the disinfection contactor, T is the time that at least 90 percent of the water requires to pass through the disinfection contactor, and CT is the product of the two. Beyond the minimum SWTR requirements described above, DDW staff can impose additional treatment requirements (via the permit process) when the quality of the raw water poses higher microbial risk according to the criteria presented in Table 5-2.

Table 5-2. California SWTR Raw Water Median Monthly Total Coliform MPN that Require Higher *Giardia* and Virus Reduction

Median Monthly Total Coliform MPN/100 ml	*Giardia* Cyst Treatment Requirement	Virus Treatment Requirement
<1,000	3	4
>1,000-10,000	4	5
>10,000-100,000	5	6

Source: Table 4.1 CCWD 2015 Watershed Sanitary Survey, June 2015.

EPA promulgated the IESWTR in 1998. The IESWTR lowered the filtered water turbidity performance requirement from the 1989 SWTR for the combined filter effluent (water) (CFE) from 0.5 NTU to 0.3 NTU for conventional and direct filtration plants, and required that utilities monitor and record the individual filters' filtered effluent (water) (IFE) turbidity. In addition, the IESWTR added the following: (1) a requirement that utilities achieve 2-log removal of *Cryptosporidium*, with compliance demonstrated by achieving the IESWTR CFE and IFE turbidity performance requirement in at least 95 percent of data recorded at 15 minute intervals during each month; (2) requirements for disinfection profiling and benchmarking; (3) a requirement that

all new finished water storage facilities be covered; and (4) a requirement for sanitary surveys for all surface water systems regardless of size. The IESWTR applies to all public water systems that use surface water or groundwater under the influence of surface water and serve 10,000 or more people.

The LT2ESWTR was promulgated by the EPA in 2006. The LT2ESWTR required 24 months of monthly source water monitoring for *Cryptosporidium*. Depending upon the concentration of *Cryptosporidium*, utilities were placed into one of four "bins" that identify the source water's levels of risk. Table 5-3 presents the four bin classifications in the LT2ESWTR.

If the monitoring data place a source in Bin 1, no additional treatment is required for *Cryptosporidium* removal beyond the 2-log removal credit given to WTPs that meet the IESWTR turbidity performance criteria. Placement in Bins 2 through 4 required that the WTP provide higher levels of *Cryptosporidium* reduction.

EPA developed a microbial toolbox that identifies methods of providing additional reduction credit for *Cryptosporidium* for various treatment options. Based on the City's initial round of source water monitoring data collected beginning in October 2006 and continuing through September 2008, the City's two surface water sources were classified as Bin 1 sources.

Table 5-3. LT2ESWTR Bin Classification for Cryptosporidium Reduction Requirements

Cryptosporidium Concentration (oocysts/L)	Bin Classification	Additional Treatment Required for WTPs with a Conventional Filtration Process
<0.075	1	No additional treatment
≥0.075 and <1.0	2	1 log treatment[(a)]
≥1.0 and <3.0	3	2 log treatment[(b)]
≥3.0	4	2.5 log treatment[(b)]

Source: Table 4-3 City of Antioch Water System Master Plan Update, August 2014.

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

The LT2ESWTR requires that utilities conduct a second round of source water monitoring 6 years after completing the initial monitoring. The City's initial round of *Cryptosporidium* monitoring was conducted from October 2006 through September 2008. The City's second round of *Cryptosporidium* and *Giardia* monitoring was conducted from January 2015 through December 2016.

5.1.2 Regulation of Disinfection By-Products (DBPs)

Disinfection by-product (DBPs) have been regulated since the adoption of the 1979 Trihalomethane (THM) standard. In 1998, EPA published its Stage 1 Disinfectants/Disinfection By-Products Final Rule (S1DDBPR) in the Federal Register. The S1DDBPR lowered the THM MCL from 0.10 mg/L to 0.080 mg/L, established a new MCL for five regulated haloacetic acids

(HAA5) at 0.060 mg/L, bromate at 0.010 mg/L (for systems using ozone), and chlorite at 1.0 mg/L (for systems using chlorine dioxide).

The S1DDBPR also established Maximum Residual Disinfectant Levels (MRDLs) for disinfectants including chlorine, chloramines, and chlorine dioxide, and included requirements for "enhanced coagulation" for the removal of natural organic matter (NOM) from surface water sources at WTPs that have a conventional filtration treatment process. Table 5-4 summarizes the water quality standards for disinfectants and disinfectant by-products. Compliance with the enhanced coagulation requirement is met by achieving specific levels of TOC removal for a raw water with nine combinations of alkalinity and TOC.

Table 5-4. Water Quality Standards for Disinfectants and Disinfectant By-Products

	MCL, mg/L	MCLG, mg/L	MRDL, mg/L	MRDLG, mg/L
Bromate	0.010	0	-	-
Chlorite	1.0	N/A	-	-
Haloacetic acids (HAA5)[a,c]	0.060	N/A	-	-
Total Trihalomethanes[b,c]	0.080	N/A	-	-
Chloramines (as Cl_2)	-	-	4.0	4.0
Chlorine (as Cl_2)	-	-	4.0	4.0
Chlorine dioxide (as ClO_2)	-	-	0.8	0.8

Source: Table 4-4, City of Antioch Water System Master Plan Update, August 2014.

(a) HAA5 MCL is the total concentration of the five regulated haloacetic acids: monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.
(b) Total THM (TTHM) represent the total concentration of bromochloromethane, bromoform, chlorodibromethane, and chloroform.
(c) HAAs and TTHMs compliance based on Locational Running Annual Average (LRAA) under S2DDBPR.

On January 4, 2006, EPA published its Stage 2 DDBPR (S2DDBPR). The S2DDBPR did not change the THM or HAA5 MCLs, the MRDLs, or the enhanced coagulation requirements from the S1DDBPR. However, the method of determining compliance with the MCLs for THMs and HAA5 is based on each sample's Locational Running Annual Average (LRAA) rather than on a system-wide Running Annual Average (RAA). The S2DDPBR also included a requirement that each water system conduct an Initial Distribution System Evaluation that was used to identify sample locations that would have higher DBP concentrations.

5.1.3 Radionuclides

Radionuclides are not commonly present in most drinking waters; however, they have been found to be present in a number of groundwater sources and are highly carcinogenic in drinking water. Since December 2003 new rules for radionuclides have been in effect. Monitoring requirements have increased to be more consistent with the other drinking water treatment standards and to ensure adequate protection of public health. Table 5-5 lists the MCLs for regulated radionuclides set to limit associated cancers caused by exposure.

Table 5-5. Regulated Radionuclides[a]		
	MCL	MCLG
Alpha particles	15 pCi/L	None[b]
Beta particles and photon emitters	4 mrem/year	None[b]
Radium 226 and 228	5 pCi/L	None[b]
Uranium	30 µg/L	None[b]

Source: Table 4-8 City of Antioch Water System Master Plan Update, August 2014.

(a) Rule effective December 30, 2003.
(b) MCLG for radionuclides when the SDWA was established in 1974, amended in 1986.

5.1.4 Chloride Concentrations

DWR and the City have an existing agreement that permits the City to pump water from the San Joaquin River with a chloride concentration below 250 mg/L at least 208 days per year. If the long-term average days of river pumping are less than 208 days per year, DWR will pay for one-third of the incremental cost to the City between using river water and Canal water. This contract was initially a 40-year contract that began in 1968; a 15-year contract extension was entered into in 2013.

SWRCB has also established water quality standards for the Delta, including a provision of 150 mg/L maximum concentration of chloride at Antioch's River pumping station for a minimum duration depending on net Delta outflow[3]. If these standards are maintained, the river can continue as an intermittent, but important, water source for the City. Table 5-6 summarizes the chloride standards for the river.

Table 5-6. Water Quality Standards for Chloride			
	Maximum Concentration, mg/L	Frequency, days/year[a]	Water Year Classification
Contra Costa Canal intake at Rock Slough	250 [b]	All	-
Contra Costa Canal intake at Rock Slough or Antioch intake on San Joaquin River	150 [c]	240 190 175 165 155	Wet Above Normal Normal Dry Critically Dry

Source: Table 4-14, City of Antioch Water System Master Plan Update, August 2014

(a) Number of days that chloride level has been less than 150 mg/L.
(b) Maximum mean daily concentration.
(c) Maximum mean daily concentration at intervals of not less than 2 weeks' duration

[3] Per SWRCB Amended Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan), adopted December 13, 2006.

In coming years, decisions and actions outside the City's control will continue to impact river water quality. Any decrease in the net flow from east to west in the San Joaquin River at Antioch will tend to reduce the availability of low chloride waters.

5.1.5 Filter Backwash Recycling

The Safe Drinking Water Act stipulates that the EPA should develop a regulation that governs filter backwash recycling in public water treatment systems. The EPA published its final Filter Backwash Recycling Rule in June 2001. The State of California published its Cryptosporidium Action Plan (CAP) in April 1995. The CAP includes guidance about recycling spent filter backwash water.

Filters must be backwashed periodically to remove accumulated solids, and the spent backwash water normally will be returned to the head of the water treatment process and blended with source water. If the recycle rate is high, it may significantly increase the concentration of contaminants in the inflow and decrease the plant's ability to produce high quality drinking water. The City constructed facilities in 2006 at its WTP that permit managing and treating spent filter backwash water prior to returning the reclaimed water to the head of the water treatment process. The City's system recycles spent filter backwash water after treatment to remove solids, at a flow rate no greater than 10 percent of the WTP's flow rate, and the recycled water turbidity is normally less than 2.0 NTU.

5.1.6 Additional Drinking Water Regulations

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

5.1.7 Future Drinking Water Regulations

5.1.7.1 Contaminant Candidate List

Every five years, EPA is required to publish a list of currently unregulated contaminants that "are not subject to any proposed or promulgated National Primary Drinking Water Regulation, are known or anticipated to occur in public water systems, and may require regulation under the SDWA" (referred to as the Contaminant Candidate List or CCL). EPA uses the CCL to identify priority contaminants for regulatory decision making and information collection needs. Every five years, EPA is required to determine whether to regulate at least five contaminants from the CCL.

The third CCL (CCL3) was published in 2009. The final CCL3 included 104 chemicals or chemical groups and 12 microbiological contaminants. On January 4, 2016, EPA announced the final determinations for CCL3. The final determinations were to not regulate four of the 116 CCL3 contaminants (dimethoate, 1,3-dinitrobenzene, terbufos, and terbufos sulfone). The EPA delayed its final regulatory determination on strontium to consider additional data and decide whether there is a meaningful opportunity for health risk reduction by regulating strontium in drinking water.

EPA announced the Final CCL4 on November 17, 2016. The Final CCL4 includes 97 chemicals or chemical groups and 12 microbial contaminants. The list includes, among others, chemicals used in commerce, pesticides, biological toxins, disinfection byproducts, pharmaceuticals and waterborne pathogens.

5.1.7.2 Unregulated Contaminant Monitoring Rules

The EPA uses the Unregulated Contaminant Monitoring Rules to collect data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the SDWA.

- The first Unregulated Contaminant Monitoring Rule (UCMR1) was published on September 17, 1999, and through supplemental actions on March 2, 2000, and January 11, 2001. UCMR1 required monitoring for 26 contaminants between January 2001 and December 2003 using analytical methods developed by EPA, consensus organizations, or both.
- The second Unregulated Contaminant Monitoring Rule (UCMR2) was published on January 4, 2007. UCMR2 required monitoring for 25 contaminants between January 2008 and December 2010 using analytical methods developed by EPA, consensus organizations, or both.
- The third Unregulated Contaminant Monitoring Rule (UCMR3) was published on May 2, 2012. UCMR3 required monitoring for 30 contaminants (28 chemicals and two viruses) between January 2013 and December 2015 using analytical methods developed by EPA, consensus organizations or both.
- The fourth Unregulated Contaminant Monitoring Rule (UCMR4) was published in the Federal Register on December 20, 2016. UCMR4 requires monitoring for 30 chemical contaminants between 2018 and 2020 using analytical methods developed by EPA and consensus organizations. The 30 chemical contaminants include: 10 cyanotoxins (nine cyanotoxins and one cyanotoxin group) and 20 additional contaminants (two metals, eight pesticides plus one pesticide manufacturing byproduct, three brominated haloacetic acid [HAA] disinfection byproducts groups, three alcohols, and three semivolatile organic chemicals).

The UCMR monitoring program develops occurrence information for unregulated contaminants (from the CCLs) that may require regulation in the future.

5.2 Potential Impacts of Bay-Delta Programs

5.2.1 Sacramento-San Joaquin Delta

The Delta is an important natural resource for California and its agriculture. The Delta is currently considered to be in ecological crisis. In 2009, the State passed legislation to define a planning and implementation process to improve the Delta. The legislation is part of a comprehensive package of four policy bills and a bond measure. One of the bills is the Delta Protection Act of 2009, Senate Bill X7-1 (SB X7-1).

A summary of SB X7-1 includes the following:

- Formation of the Delta Investment Fund in the State Treasury to fund implementation of the regional economic sustainability plan and ecosystem restoration projects.
- Formation of the Sacramento-San Joaquin Delta Conservancy. The conservancy acts as the primary state agency to implement ecosystem restoration in the Delta and supports environmental protection and economic well-being of Delta residents.
- Formation of a committee convened by the Secretary of the Natural Resources Agency to develop and submit recommendations for a strategic plan related to sustainable management of the Delta.
- Enactment of the Delta Reform Act of 2009 and establishment of the Delta Stewardship Council (DSC). The DSC was required to develop, adopt, and commence implementation of a comprehensive resources management plan (the Delta Plan) for the Delta. The DSC is required to develop the Delta Plan by January 1, 2012. Development of the Delta Plan is a significant effort that requires integration with other planning efforts, such as the BDCP.
- The DSC efforts are built upon other related planning agencies that were formed historically. The Delta Protection Commission, which was formed by the Delta Protection Act of 1992, was formed to prepare and adopt a comprehensive long-term resource management plan for specified lands within the Delta. SB X7-1 revised and recasted the provisions of the Delta Protection Act, including a reduction in the number of commission members and a requirement for the commission to recommend redefining the primary zone of the Delta.
- Requirements of DWR in connection with the BDCP.
- Formation of the Delta Independent Science Board to develop a scientific program related to management of the Delta.
- Requirement of the SWRCB to establish an effective system of Delta watershed diversion data collection and public reporting. The SWRCB is required to develop new flow criteria for the Delta ecosystem and to submit the flow criteria to the council.
- Repeal of the California Bay-Delta Authority Act that established the California Bay-Delta Authority (CBDA). CBDA was responsible for acting as the authority and implementing agency to conduct programs, projects, and activities to address CALFED goals and objectives.
- Appropriation of $28,000,000 in bond money from the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006.

The basic goals for the Delta planning process as defined by State Legislature are as follows:

- Achieve the two coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.
- Protect, maintain, and, where possible, enhance and restore the overall quality of the Delta environment, including, but not limited to, agriculture, wildlife habitat, and recreational activities.
- Ensure orderly, balanced conservation and development of Delta land resources.
- Improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety.

The component of the Delta Protection Act that most significantly affects the City and its wholesaler, CCWD, is the adoption of Delta flow criteria. In August 2003, the SWRCB adopted new flow criteria recommendations for the Delta that call for significantly increased flows into and through the Delta, particularly during the winter and spring.

Until planning efforts result in implementation, Delta water quality is currently dependent on past actions. In August 1978, the SWRCB issued Water Right Decision 1485, setting water quality standards in the Delta to be maintained by the State Water Project and Central Valley Project as a condition of their permit to store above and divert from the Delta. Review of historical water quality data indicate that if the maximum daily mean for chloride is kept below 250 mg/L, the other drinking water standards should not be exceeded, with the possible exception of THMs.

During disinfection, NOM can react with chlorine to form carcinogenic compounds including THMs and HAA5. The City is currently meeting the regulatory standards including the DBPs' MCLs. Currently anticipated drinking water regulations should continue to permit the City's WTP to meet current and future regulatory requirements. However, the City may need to modify its existing facilities to respond to currently unanticipated future regulations.

5.2.2 San Joaquin River

DWR and the City have an existing agreement, which specifies that the City will be able to pump water from the San Joaquin River with the chloride content less than 250 mg/L at least 208 days per year. If the long-term average days of river pumping are less than 208 days per year, DWR will pay for one-third of the incremental cost to the City between using river water and Canal water. This contract was initially a 40-year contract that began in 1968. In 2013, the City entered into a 15-year contract extension with DWR.

In coming years, river water quality will continue to be impacted by decisions outside the City's control. Any decrease in the net flow from east to west in the San Joaquin River at Antioch will tend to reduce the availability of low chloride waters. As indicated previously, the SWRCB has established water quality standards for the Delta, including a provision of 150 mg/L maximum concentration of chloride at Antioch's River pumping station for a minimum duration depending on net Delta outflow. If these standards are maintained, the river can continue as an intermittent, but important, water source for the City.

The DDW has no concerns over the City's use of San Joaquin River water when it is available. The City can presently draw no more than 16 mgd from the San Joaquin River when water quality permits any withdrawal because of the limited capacity of the river pumping station and the raw water pipeline from the river to the Municipal Reservoir.

5.3 Water Quality Monitoring Programs

Nearly all the raw water monitoring performed by the City is on the WTP influent. The San Joaquin River is the single raw water source regularly sampled. When in use, City staff samples the river daily for total coliform, E. coli, turbidity, temperature, pH, alkalinity, chlorides and hardness. Other than this monitoring, the City's raw water sources (including the Municipal Reservoir) are monitored for Title 22 constituents as required.

The City prepares an Annual Water Quality (Consumer Confidence) Report for its customers to document the City's water quality protection measures and sampling results. The City's Annual Water Quality Reports are prepared jointly with a number of neighboring water providers, including CCWD, City of Martinez, City of Pittsburg, Diablo Water District (Oakley), Golden State Water Company (Bay Point) and City of Brentwood. A copy of the City's 2016 Annual Water Quality Report is posted on the City's website (http://www.ci.antioch.ca.us/CityGov/Finance/Water/AWQR.pdf) and is provided in Appendix A.

Water quality monitoring locations pertinent to this Sanitary Survey Update include the following:

- Antioch Water Treatment Plant (WTP):
  - WTP Intake
  - WTP Treated Water
- Raw Water Sources
  - San Joaquin River Intake
  - Municipal Reservoir
- Distribution System
  - Eight locations within the City's Distribution System

In addition to sampling the raw water at the inlets of the WTP's two treatment trains, each train is sampled independently at three additional locations: clarified water from above the filters, CFE water as it enters the clearwells, and treated water between the clearwells and where it leaves the WTP.

The following section describes applicable water quality monitoring results for the period from January 2012 through December 2016.

5.4 Evaluation of Source Water Quality

The Antioch WTP produces high-quality drinking water, which meets all existing federal and state primary and secondary standards. Given the consistently careful operation of existing facilities, such performance is expected into the future. More stringent regulations that may require modification of the existing WTP facilities are currently not anticipated for the next decade. The City likely will need to increase sampling and analyses in response to federal and state concerns about currently unregulated constituents.

This section includes raw water data summaries, discussions, and conclusions for water quality constituents of concern for the period from January 2012 through December 2016.

A copy of the City's 2016 Annual Water Quality Report is posted on the City's website (http://www.ci.antioch.ca.us/CityGov/Finance/Water/AWQR.pdf) and is provided in Appendix A.

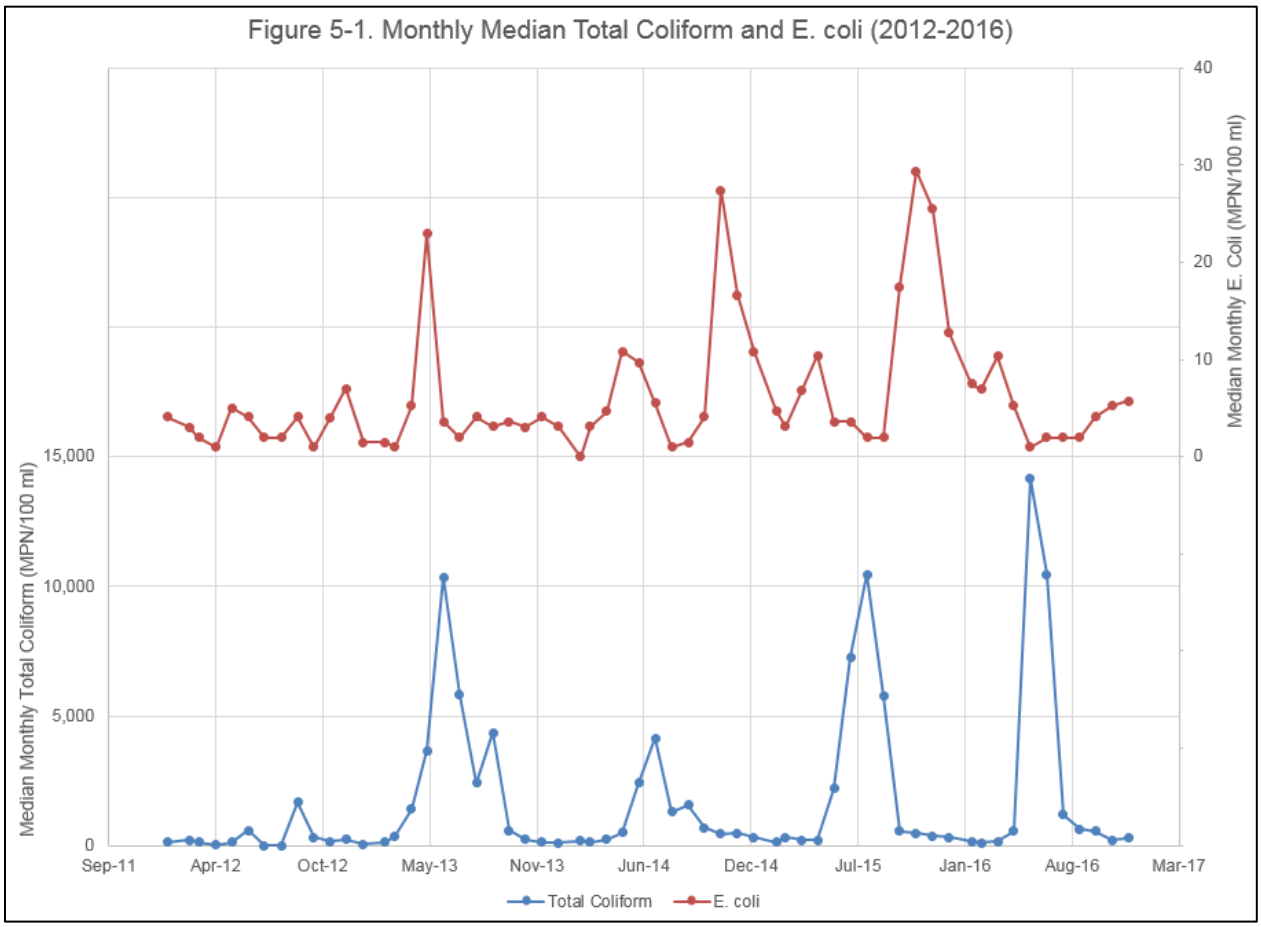
5.4.1 Total Coliform and *E. coli*

A graph of monthly median total coliform and *E. coli* data for the WTP raw water from January 2012 through December 2016 is presented on Figure 5-1. Overall, the source water to the WTP appears to be high quality with respect to bacteriological water quality. The raw data, including minimum, maximum and median monthly values, is provided in Appendix B.

The monthly median total coliform level ranged from 32 MPN/100 ml to 14,136 MPN/100 ml, averaging about 1,790 MPN/100 ml in the 5-year period of record. The monthly median total coliform level was below 500 MPN/100 ml in most months, with some seasonal peaks each year. There does not appear to be any significant trends, as coliform values tend to peak seasonally each year.

The monthly median *E. coli* level ranged from less than 1 MPN/100 ml to 29.35 MPN/100 ml, averaging about 6.2 MPN/100 ml in the 5-year period of record. As with total coliform, there does not appear to be any significant trends.

These data represent the untreated water delivered to the water treatment plant, which can be from the Municipal Reservoir, the Canal or a blend of both. DDW has not expressed any concern regarding these levels; the levels are typical of Delta sources.



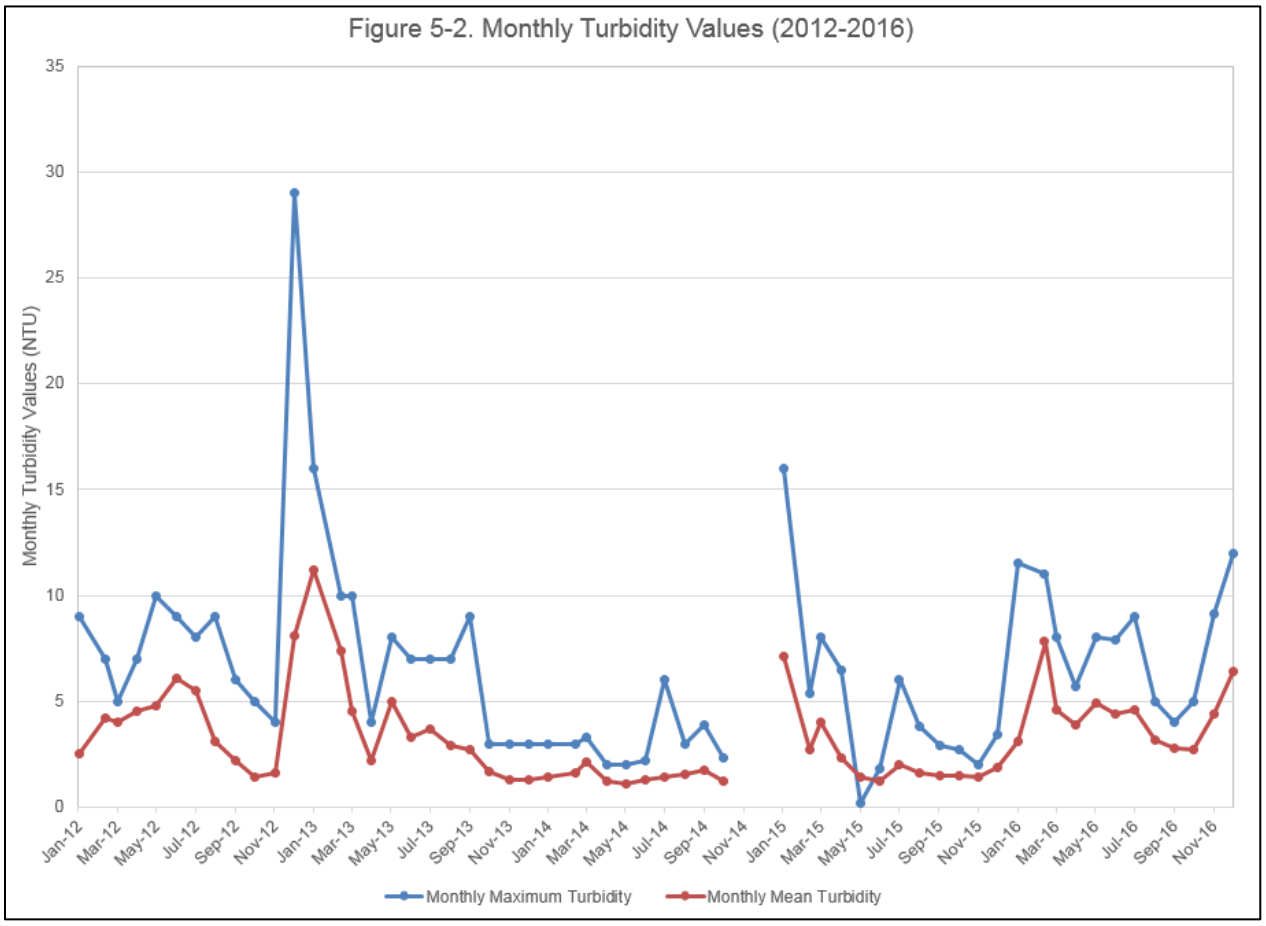
5.4.2 Turbidity

Monthly mean and maximum raw water turbidity values collected from January 2012 through December 2016 from the WTP are presented on Figure 5-2. The raw data, including minimum, maximum and mean monthly values, can be found in Appendix B. Note that the turbidity data is for all raw water received at the WTP, not just that from the Municipal Reservoir.

Monthly mean turbidity values range from 1 to 11 NTU with an average value of 3 NTU. Monthly maximum turbidity values for the same period peaked at 29 NTU. Peak turbidity values tend to occur between the months of January and March and are associated with winter runoff.

When comparing raw water to treated water turbidity values, for both treatment trains (Plants A and B), it appears that both plants reduce turbidity very effectively. The average filtered water turbidity during 2012 through 2016 was approximately 0.05 NTU[4]. The IESWTR requires that WTPs with a conventional filtration treatment process produce both CFE and IFE filtered water turbidity equal to or less than 0.3 NTU in 95 percent of the measurements collected at 15 minute intervals during each month and shall not exceed 1.0 NTU at any time[5].

Figure 5-2. Monthly Turbidity Values (2012-2016)



5.4.3 *Giardia* and *Cryptosporidium*

In accordance with the LT2ESWTR, the City's initial round of *Cryptosporidium* and *Giardia* monitoring was conducted from October 2006 through September 2008 at the Water Treatment Plant influent. A one-time detection of *Cryptosporidium* occurred in May 2008, while there were no detections of *Giardia*. The City's second round of *Cryptosporidium* and *Giardia* monitoring,

[4] Based on data for the treated water effluent as reported to the SWRCB DDW as part of the City's monthly SWTR Compliance Report.

[5] As specified in Title 22 Sections 64653, 64655 and 65660.

conducted from January 2015 through December 2016, indicated non-detect (ND) for both *Cryptosporidium* and *Giardia* in all samples.

The City is in compliance with the LT2ESWTR requirements.

5.4.4 Trihalomethanes and Haloacetic Acids

The City staff collects treated water samples quarterly for TTHM and HAA5 testing at eight locations in the City's distribution system. Table 5-7 presents the results of the monitoring data between the second quarter in 2012 through the fourth quarter in 2016.

The City's quarterly LRAA TTHM values, from the second quarter of 2012 to the fourth quarter of 2016, ranged between 46.0 micrograms per liter (µg/L) and 79.3 µg/L. Quarterly LRAA HAA5 values, from the second quarter of 2012 to the fourth quarter of 2016, ranged between 3.5 µg/L to 7.4 µg/L. The City's reporting of its quarterly disinfection byproducts rule monitoring is provided in Appendix B.

Based on the City's TTHM and HAA5 sampling, the City is in compliance with the Stage 1 and Stage 2 DDBPR.

5.4.5 Organic Chemicals

Despite the level of agricultural activity and pesticide and herbicide applications that occur upstream of the watershed, source water monitoring by the City has resulted in non-detectable values for both the San Joaquin River and the Municipal Reservoir.

5.4.6 Taste and Odor

The City has not had any serious problems with customer complaints due to taste and odors; all complaints are reviewed by the City staff to determine the source of the taste-and-odor problems. Most of the taste and odor problems that occur at the WTP are associated with tastes and odors occurring during the spring and fall and are aggravated by elevated temperatures.

Source-water-related taste-and odor-problems are usually related to algal blooms and typically occur in the late summer. Algal blooms occur in both the Municipal Reservoir and the Contra Costa Canal. Blue-green algae species excrete metabolites such as geosmin and methylisoborneol (MIB) that can be detected by smell or taste at about 5 parts per trillion. These metabolites are produced within one to two weeks after the onset of a blue-green algal bloom at concentrations high enough to produce customer complaints. The City monitors the Municipal Reservoir throughout the warm months for total algae counts and identification, as well as the taste and odor compounds MIB and geosmin. The City uses this information to help determine if and when to treat the reservoir. The City also has four SolarBee® mixers in the reservoir to minimize the potential for algal blooms. The City has tested the Municipal Reservoir source for cyanotoxins in the past and has measured low, though detectable, levels of anatoxin and microcystins.

UCMR4 (described above in Section 5.1.7.2) includes several cyanotoxins, which will be monitored in the treated water effluent from the WTP.

Table 5-7. Antioch Quarterly Disinfection Byproducts Rule Monitoring

	Calculated TTHM LRAAs (in µg/L)															
	2013				2014				2015				2016			
Sample Location	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Canal Park	46.8	50.8	52.0	49.8	53.8	52.0	51.3	52.8	65.5	67.8	70.5	73.0	71.5	69.5	66.8	62.3
Silverado Dr	47.0	50.0	50.8	49.0	52.8	51.5	52.0	54.5	67.0	69.5	69.0	70.8	67.8	64.5	64.5	60.3
Service Rd	46.8	49.8	49.5	46.5	56.8	57.8	60.0	63.3	69.0	70.5	71.3	74.0	72.0	69.5	65.5	61.0
Fairview Park	48.8	51.3	52.8	50.5	53.3	53.0	52.8	55.8	71.5	74.5	77.3	79.3	75.5	72.0	67.5	62.3
Marchetti Park	48.5	51.8	52.3	49.8	52.0	51.8	52.3	55.5	71.8	73.5	76.0	77.8	73.8	71.8	66.8	60.5
Mira Vista Hills	46.0	48.5	47.8	46.0	50.0	49.8	51.3	52.5	66.0	68.0	67.3	69.0	64.3	61.5	62.0	58.0
Wolverine Way	49.3	50.5	49.8	47.5	58.0	60.5	62.3	65.5	72.0	72.8	71.8	73.8	70.3	67.5	65.3	59.0
Sanger Peak Way	49.0	50.8	49.5	47.8	58.5	61.0	62.8	65.8	73.5	73.3	72.3	73.3	66.3	63.5	61.8	56.8
	Calculated HAA5 LRAAs (in µg/L)															
	2013				2014				2015				2016			
Sample Location	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Canal Park	4.7	4.5	4.5	4.9	4.5	5.3	5.8	5.6	7.4	6.6	6.9	7.2	5.3	5.6	5.0	4.7
Silverado Dr	4.5	4.6	4.4	4.6	4.5	5.1	5.2	5.2	6.9	6.1	6.8	7.2	5.3	5.8	4.8	4.3
Service Rd	4.3	4.5	4.2	4.2	4.2	4.6	4.9	5.1	6.2	5.9	5.8	6.2	4.5	4.6	3.7	3.5
Fairview Park	4.4	4.4	4.5	4.5	4.1	4.8	4.8	4.8	6.6	5.8	5.8	6.3	4.3	4.5	4.4	4.1
Marchetti Park	3.7	3.8	4.0	3.8	3.8	4.2	4.4	4.6	7.1	6.7	6.9	7.4	4.7	4.9	4.8	4.4
Mira Vista Hills	4.3	4.9	4.5	4.8	4.7	4.8	5.1	5.0	6.4	6.1	6.5	6.8	5.2	5.4	5.0	4.6
Wolverine Way	3.7	3.6	3.6	3.6	3.6	3.9	4.7	4.7	5.4	5.0	5.1	5.6	4.1	4.5	4.4	4.2
Sanger Peak Way	4.5	4.3	4.2	4.2	4.3	4.6	4.8	4.9	6.2	6.0	6.2	6.8	5.1	5.2	4.8	4.4

Source: City of Antioch 2014 and 2016 Reports for Quarterly Disinfection Byproducts Rule Monitoring at 8 Locations

TTHM: Total Trihalomethane, MCL = 0.08 mg/L = 80 µg/L
LRAA: Locational Running Annual Average
HAA5: Five Regulated Haloacetic Acids, MCL = 0.060 mg/L = 60 µg/L

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5.4.7 General Physical and Inorganic Parameters

General physical and inorganic water quality parameters for Municipal Reservoir and for the San Joaquin River are presented in Tables 5-8 and 5-9, respectively. As shown in Table 5-9, values vary significantly for the San Joaquin River due to salt water intrusion in the Delta. This variance is particularly evident when evaluating the wide range of values for total hardness, TDS, sodium, chloride, and iron. These variations are less evident in the Municipal Reservoir, though the CCWD Canal water pumped into the Municipal Reservoir is also affected by salt water intrusion.

The reason for the wide range of water quality is that the San Joaquin River essentially has two significantly different waters, tidal-influenced water with elevated TDS (including "salt", NaCl) or true river water derived mainly from runoff. When the amount of salt in the river water increases, TDS, sodium, chloride, and total hardness levels increase dramatically while iron concentrations drop. When the water in the river is mostly Sacramento or San Joaquin River water, the reverse occurs with TDS, sodium, chloride, and total hardness levels falling and iron concentrations increasing.

Other than the wide range in San Joaquin River total hardness, TDS, sodium, chloride, and iron, the values for the remaining parameters presented in Tables 5-8 and 5-9 occur within normal ranges and do not pose any unusual problems for the WTP. Metal concentrations are mostly low or undetectable.

5.4.8 Asbestos and Radionuclides

Asbestos fiber counts have always been very low and were non-detectable from 2007 to 2011 (last sample taken in October 2011)[6].

Radionuclides have been low and usually within the counting error and were non-detectable from 2007 to 2011. Similarly, radionuclides were below detection levels based on 2016 sampling.

[6] All community and non-transient-noncommunity water systems are required to monitor to determine compliance with the MCL for asbestos during the year designated by the State Board of the first compliance period of each nine-year compliance cycle, beginning in the compliance period starting January 1, 1993. The City's last sampling for asbestos was in 2011, and the next sampling is scheduled to occur in 2020.

Table 5-8. Antioch Municipal Reservoir General Physical and Inorganic Water Quality						
Parameter	MCL (or Action Level)	3/8/2012	2/25/2013	3/6/2014	3/12/2015	3/8/2016
Total Hardness, mg/L as $CaCO_3$	n/a	110	95	130	120	95
Total Alkalinity, mg/L as $CaCO_3$	n/a	76	76	84	88	68
pH	n/a	8.1	8.7	8.5	8.6	8
Nitrate as NO_3, mg/L	45	2	2	2	2	NA
Total Dissolved Solids, mg/L	1,000	320	200	330	360	250
Arsenic, mg/L	0.01	0.0025	0.0044	0.0022	0.0022	0.0024
Sodium, mg/L	n/a	72	33	72	72	49
Chloride, mg/L	500	110	42	110	120	82
Cadmium, mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Total), mg/L	0.05	<0.010	<0.010	<0.010	<0.010	<0.010
Copper, mg/L	(1.3)	<0.05	<0.05	<0.05	<0.05	<0.05
Iron, mg/L	0.3	0.29	0.44	0.17	1.7	0.33
Lead, mg/L	(0.015)	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium, mg/L	n/a	16	13	17	17	13
Mercury, mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium, mg/L	0.05	<0.005	<0.005	<0.005	<0.005	<0.005
Silver, mg/L	0.1	<0.01	<0.01	<0.01	<0.01	<0.01

Source: https://sdwis.waterboards.ca.gov/PDWW/

NA = Not Available; ND = Non-Detectable

Table 5-9. San Joaquin River General Physical and Inorganic Water Quality						
Parameter	MCL (or Action Level)	3/8/2012	2/25/2013	3/6/2014	3/2/2015	3/10/2016
Total Hardness, mg/L as $CaCO_3$	n/a	100	93	210	130	89
Total Alkalinity, mg/L as $CaCO_3$	n/a	78	76	88	86	68
pH	n/a	7.8	8	7.9	8	7.9
Nitrate as NO_3, mg/L	45	2.7	2.4	3.4	2.8	NA
Total Dissolved Solids, mg/L	1,000	250	170	810	380	210
Arsenic, mg/L	0.01	0.0027	0.004	0.0041	0.002	0.002
Sodium, mg/L	n/a	47	26	210	82	34
Chloride, mg/L	500	69	30	360	130	55
Cadmium, mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Total), mg/L	0.05	<0.010	<0.010	<0.010	<0.010	<0.010
Copper, mg/L	(1.3)	<0.05	<0.05	<0.05	<0.05	<0.05
Iron, mg/L	0.3	1.5	0.83	1.7	2.2	1.2
Lead, mg/L	(0.015)	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium, mg/L	n/a	14	12	36	20	12
Mercury, mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium, mg/L	0.05	<0.005	<0.005	<0.005	<0.005	<0.005
Silver, mg/L	0.1	<0.01	<0.01	<0.01	<0.01	<0.01

Source: https://sdwis.waterboards.ca.gov/PDWW/

NA = Not Available; ND = Non-Detectable

5.4.9 Unregulated Contaminant Monitoring Rule Sampling

The City conducted UCMR3 Assessment monitoring in 2013 and 2014. Selected sampling results, as reported in the City's 2015 Annual Water Quality Report, are summarized in Table 5-10.

Table 5-10. City of Antioch Unregulated Contaminant Monitoring Rule Sampling (2013-2014)

	Public Health Goal (PHG) or Notification Level	MCL	Range	Average
Bromochloromethane, µg/L	n/a	n/a	ND-0.15	0.09
Chlorate, µg/L	n/a	n/a	ND-44	ND
Chromium, µg/L	n/a	50	ND-0.52	ND
Hexavalent Chromium, µg/L	0.02	10	0.056-0.1	0.08
Molybdenum, µg/L	n/a	n/a	ND-1.2	ND
Strontium, µg/L	n/a	n/a	110-190	153
Vanadium, µg/L	n/a	n/a	1.4-3.4	2.6

Source: City of Antioch 2015 Annual Water Quality Report

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this Sanitary Survey Update, no major changes to the watershed or risks to the City's raw water supply have been identified, compared to the City's January 2013 Sanitary Survey Update.

As described in Section 4 of this Sanitary Survey Update, the City continues to undertake a number of watershed control measures to protect the water quality of the Municipal Reservoir. Specifically, as described in Section 3.2.2, in response to the 2013 recycled water spill on the Lone Tree Golf Course, a "Recycled Water Leak Response Plan" was developed by Delta Diablo, Lone Tree Golf Course and the City which addresses responsibilities in the event of a recycled water leak or spill. The City also plans to develop an overall Watershed Emergency Response Plan which would include communication protocols with the park supervisors of the Contra Loma Regional Park, the Black Diamond Mines Regional Preserve, and the Lone Tree Golf Course, so that the water treatment plant is promptly advised of any activities (authorized or unauthorized) occurring in the parks that may impact the watershed.

The next update of the City's Sanitary Survey will be due in five years (in 2022) and should report on watershed conditions and activities for the period from 2017 through 2021.

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7.0 REFERENCES

Black Diamond Mines Regional Preserve, Personal Communication with Rex Caufield, Park Supervisor, June 2017.

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City of Antioch Annual Water Quality Report, 2016.

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APPENDIX A

2016 City of Antioch Annual Water Quality Report

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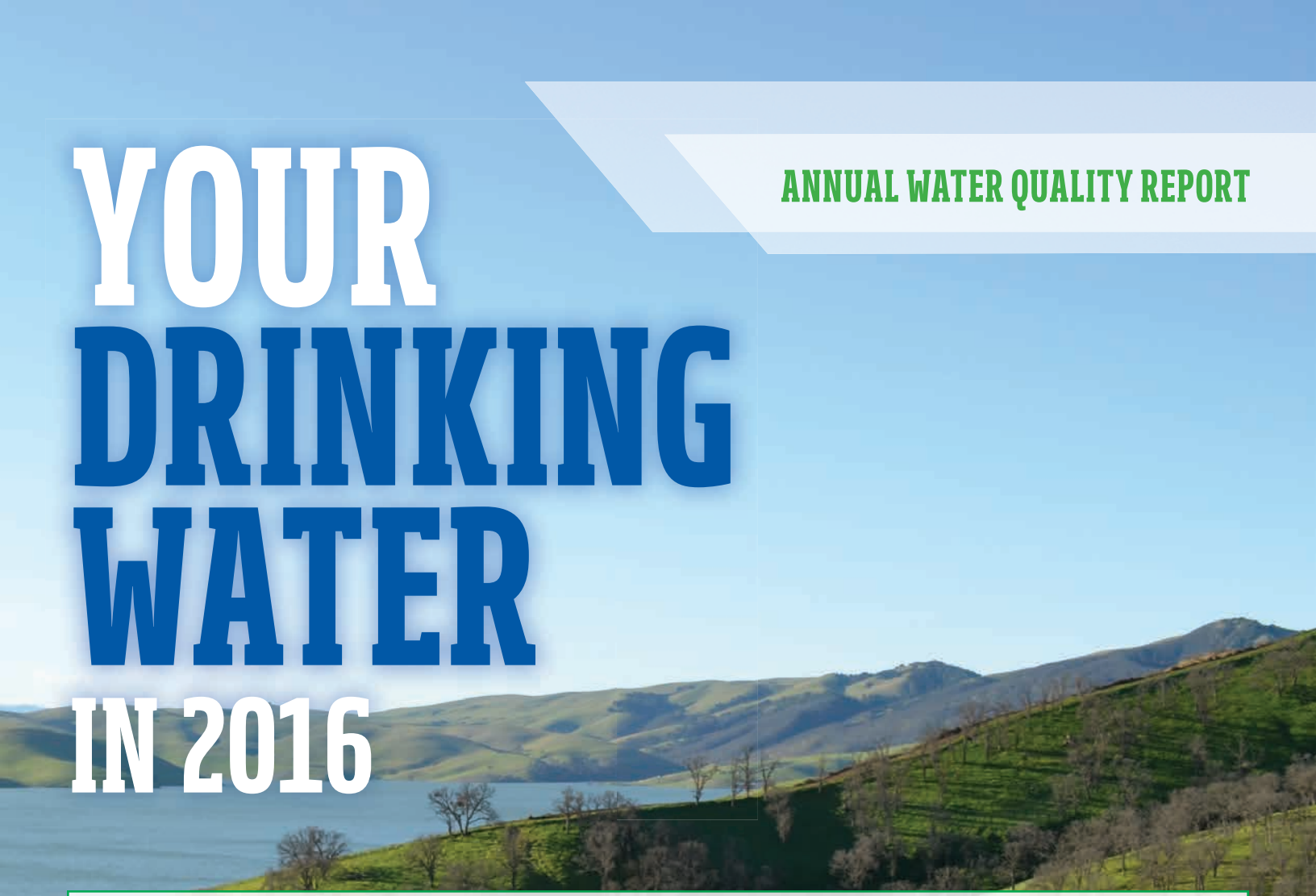
YOUR DRINKING WATER IN 2016

ANNUAL WATER QUALITY REPORT



Contra Costa Water District
Calvin Liu
925-688-8091

City of Antioch
Lori Sarti
925-779-7024

City of Martinez
925-372-3588

City of Pittsburg
Ana Corti
925-252-6916

Diablo Water District (Oakley)
Nacho Mendoza
925-625-2112

Golden State Water Company
(Bay Point)
925-458-3112

City of Brentwood
Eric Brennan
925-516-6000

To Our Customers:

We are pleased to present the 2016 Annual Water Quality Report that shows the high quality of your drinking water. Your water providers are investing in the infrastructure and technology that will ensure all of our customers will enjoy safe, reliable drinking water for generations. Every year, we provide a report full of water quality data so you can get a better understanding of your drinking water.

In 2016, the treated drinking water we delivered was better than all drinking water standards set by the state and federal governments. For test results, see Pages 7-11.

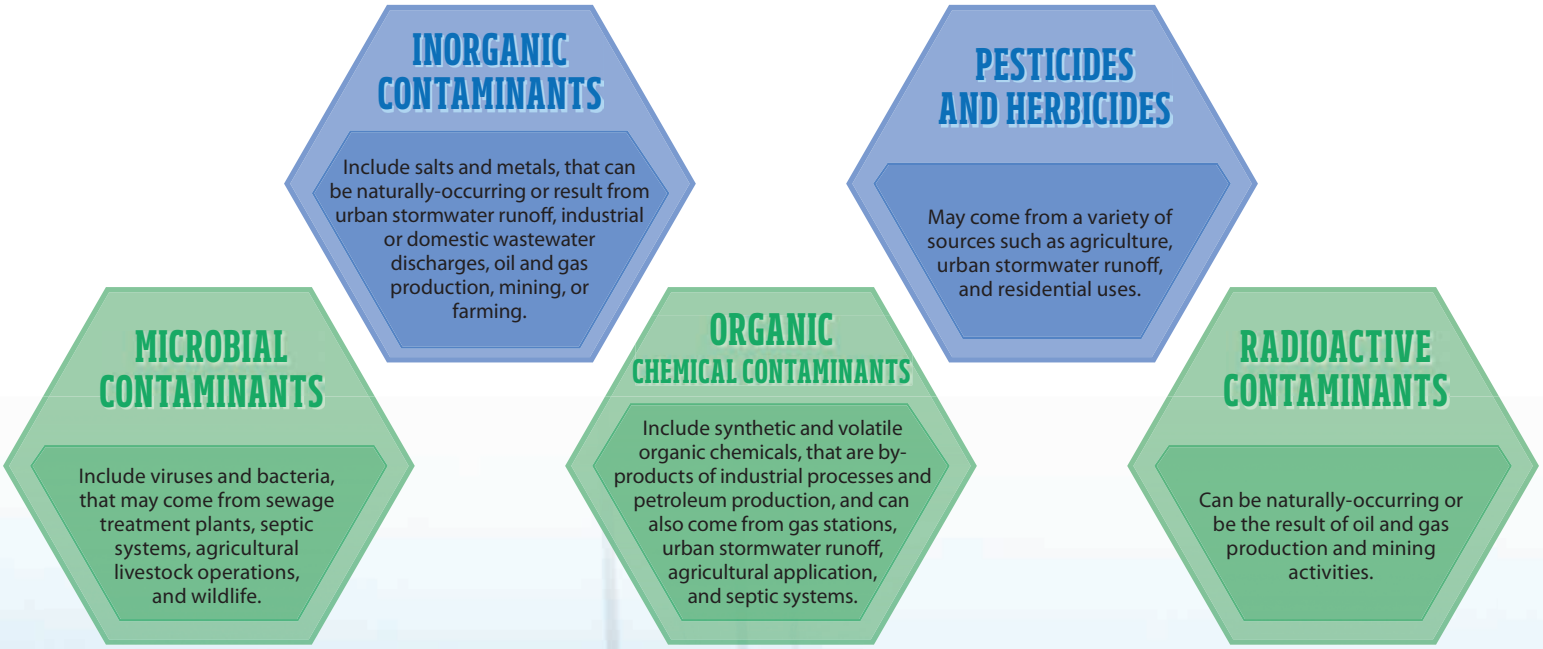
This report includes water quality data collected throughout 2016 and answers questions you might have about your tap water. You can be confident your tap water is of a high quality. Frequent testing for water quality and regular improvements in the treatment process keeps your drinking water among the best in the country. Recent reports about lead in the water systems of communities like Flint, Michigan, have people understandably concerned. Your water provider takes steps to reduce the potential for lead to leach from your home's water pipes. We do this through proactive monitoring and corrosion control. The results from more than 270 water samples collected from our five agencies in 2015 and 2016 are included in the tables of this report and show that lead was not detected. Read more about lead on Page 3.

We hope you find this report useful in illustrating the high-quality of your water service. If you have questions about the tap water in your community, please call the contact on the left.

SAFETY STANDARDS ENSURE QUALITY

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water:



In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Water Resources Control Board (State Board) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. State Board regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Notice for Vulnerable Populations

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Lead

No water provider included in this report detected lead above the regulatory action level in their water supply. If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and plumbing in buildings and homes. Your drinking water supplier is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you do so, you may wish to collect the flushed water and reuse it for another beneficial purpose, such as watering plants. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at **http://www.epa.gov/lead**. A recent California directive allows schools to receive lead-in-water testing from their water provider. To find out more about the Lead Sampling of Drinking Water in Schools initiative, please visit **http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/leadsamplinginschools.shtml**

Fluoride

To prevent tooth decay, fluoride is added to your drinking water. This is a long-standing practice that has improved public health over many years. To read about fluoridation, visit **www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Fluoridation.shtml**

Cryptosporidium

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes *Cryptosporidium*, the most commonly-used filtration methods cannot guarantee 100 percent removal. Our monitoring indicates the presence of these organisms in our source water and/or finished water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of *Cryptosporidium* may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people, infants and small children, and the elderly are at greater risk of developing life-threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. *Cryptosporidium* must be ingested to cause disease, and it may be spread through means other than drinking water.

THE SOURCE OF YOUR WATER

Contra Costa Water District

CCWD provides treated drinking water to homes and businesses in Clayton, Clyde, Concord, Pacheco, Port Costa, and parts of Martinez, Pleasant Hill and Walnut Creek. Water is pumped from the Delta, treated and then delivered to customers through a network of distribution pipes.

In June 2002 and May 2003, source water assessments were conducted at the Old River, Rock Slough and Mallard Slough intakes, the Los Vaqueros, Contra Loma, Mallard and Martinez reservoirs, and the Contra Costa Canal at Clyde. A source water assessment was conducted for the Middle River Intake in 2012. The assessments were based on a review of data collected from 1996 through 2001, as well as a review of the activities and facilities located at or near each source. In summary:

- **Intakes** were found to be most vulnerable to the effects of saltwater intrusion, agricultural drainage, recreational boating and regulated point discharges.
- **Reservoirs** were found to be most vulnerable to the effects of associated recreation, roads and parking lots, and watershed runoff.
- **Contra Costa Canal** was found to be most vulnerable to gas stations, chemical/petroleum processing/storage, septic systems, historic landfills and military institutions.

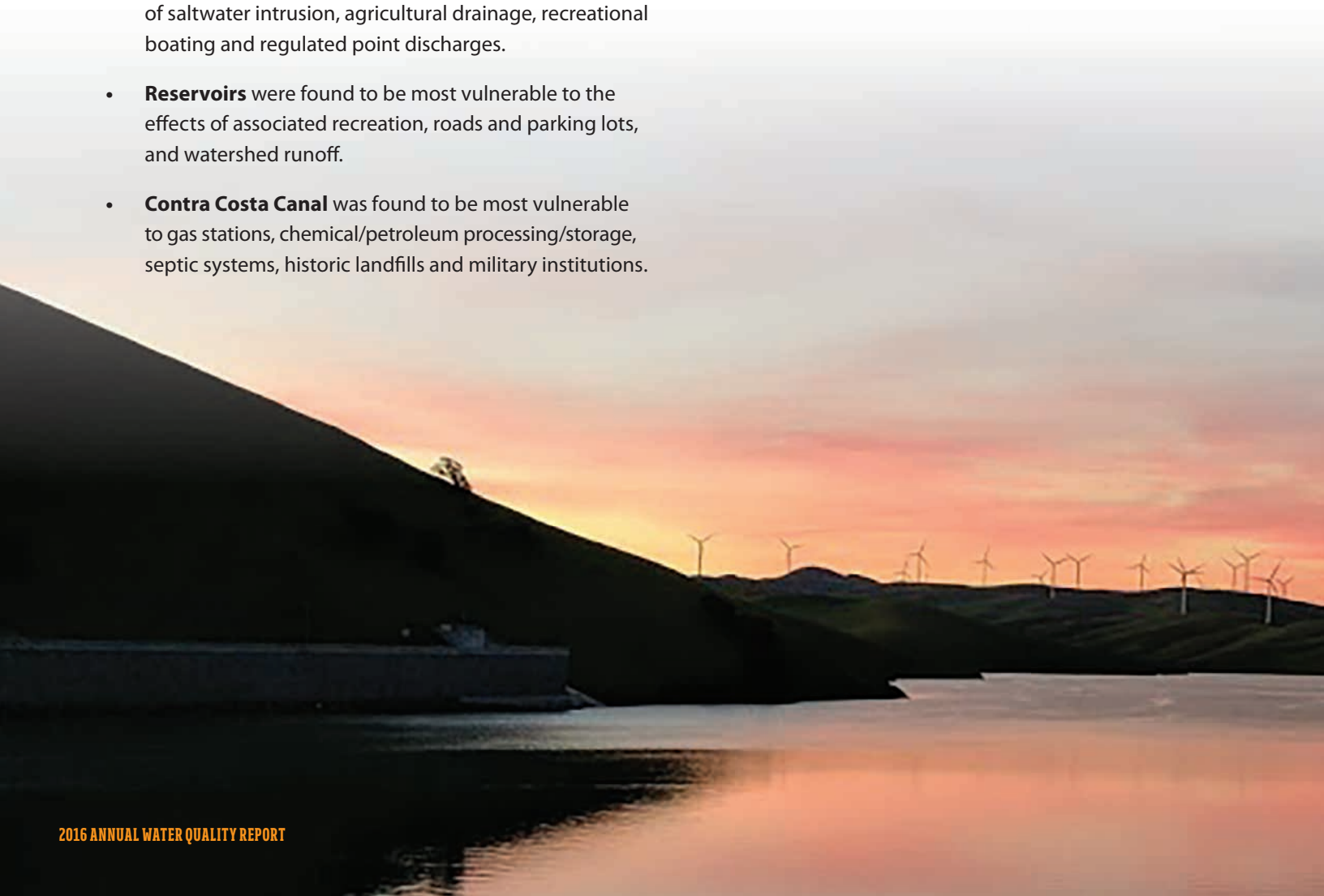
CCWD completes watershed sanitary surveys every five years and the last one was completed in 2015. The surveys concluded that potential contamination is regularly mitigated by the natural flushing of the Delta, controls at contamination sources and existing water treatment practices.

Bay Point

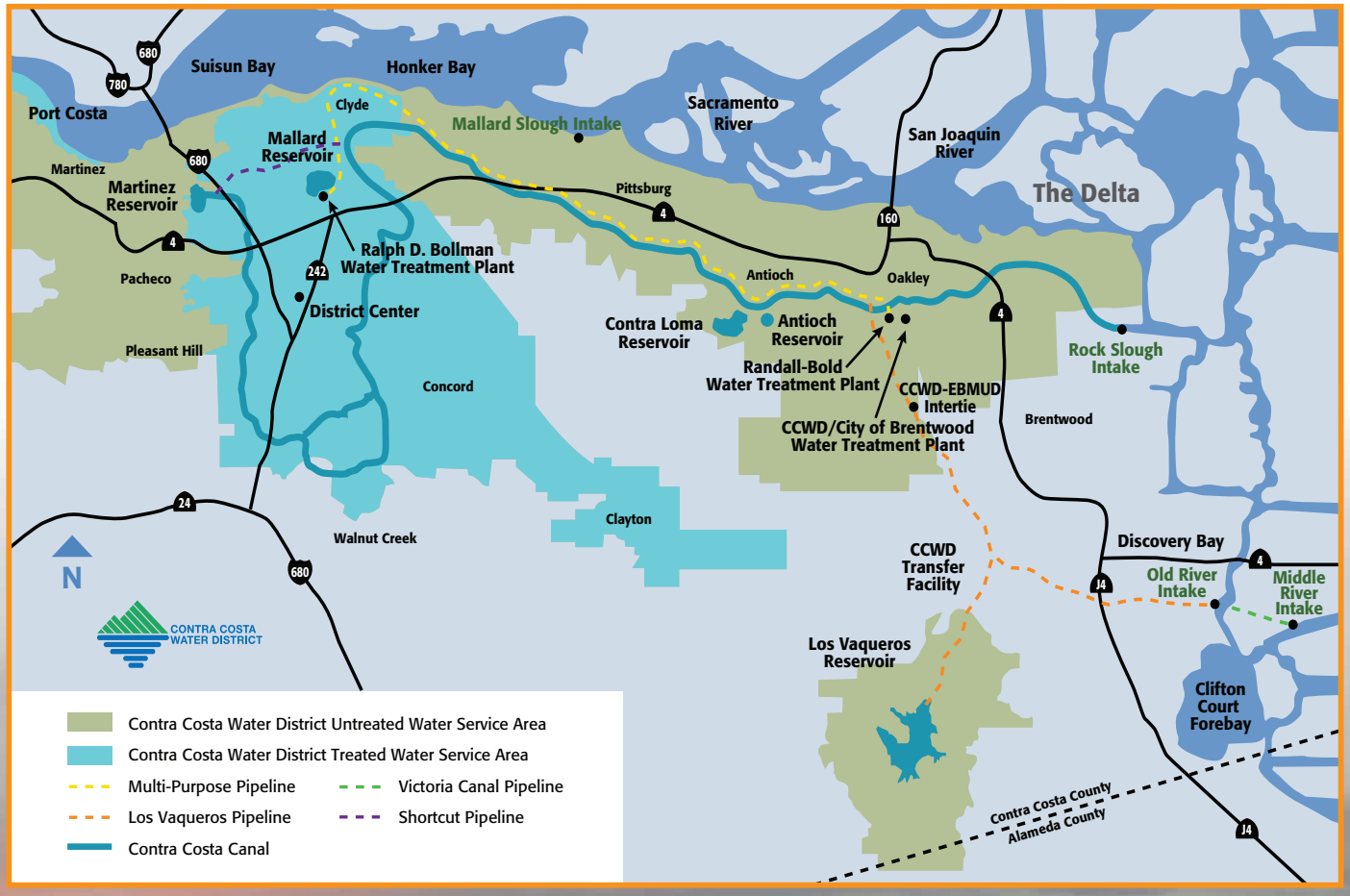
The Golden State Water Company purchases treated water from CCWD and delivers it to customers through its distribution pipes.

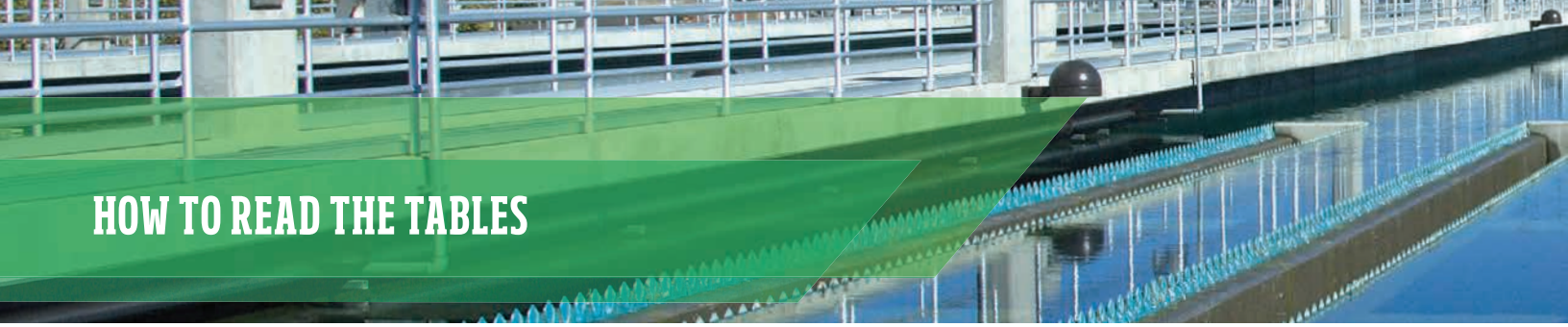
Brentwood

CCWD operates the City of Brentwood's treatment plant to treat water for the City. For complete information about the City's drinking water, visit **www.brentwoodca.gov/gov/pw/water/reports.asp**



Your primary water source is surface water from the Sacramento-San Joaquin River Delta. Though Delta water quality fluctuates throughout the year, investments made by your water provider ensures the water delivered to your tap is of a consistent high-quality. Contra Costa Water District diverts water from four locations in the Delta: Rock Slough near Oakley, Old River near Discovery Bay, Middle River on Victoria Island, and Mallard Slough in Bay Point. CCWD's major conveyance facilities are the Contra Costa Canal, the Los Vaqueros Pipeline and the Multi-Purpose Pipeline.





HOW TO READ THE TABLES

The following tables contain detailed information about the water that is delivered to your home or business. Your water is regularly tested for more than 120 chemicals and substances, as well as radioactivity. Only those constituents that were detected in 2016 are listed in the tables. Constituents may vary from provider to provider depending on water source and treatment techniques.

STATE OR FEDERAL GOAL
The level of a contaminant in drinking water below which there is no known or expected risk to health.

AVERAGE
The average level of a detected contaminant in drinking water.

	STATE OR FEDERAL GOAL (PHG, MCLG OR MRDLG)	HIGHEST AMOUNT ALLOWED (MCL OR MRDL)	Water Provider: RANGE DETECTED	Water Provider: AVERAGE	MAJOR SOURCE IN DRINKING WATER
Primary Drinking Water Standards	Contaminants that may affect health				
INORGANIC					
Fluoride (mg/L)	1	2.0	0.6-0.8	0.7	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories

HIGHEST AMOUNT ALLOWED
The highest level of a contaminant that is allowed in drinking water.

MAJOR SOURCE IN DRINKING WATER
The most likely way a contaminant enters drinking water.

Definitions & Abbreviations

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

mg/L: Milligrams per liter

NA: Not analyzed or not applicable (when used in average column, only one data point is available)

ND: Not detected at or above the reporting level

ng/L: Nanograms per liter

NTU: Nephelometric turbidity units

Primary Drinking Water Standard: MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

RAA: Running Annual Average

Secondary Drinking Water Standard: MCLs for contaminants that affect the odor, taste or appearance of water.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

µg/L: Micrograms per liter

µmhos/cm: Micromhos per centimeter

Table of Chemicals or Constituents Detected in Water in 2016

			Contra Costa Water District		Randall-Bold WTP		CCWD-Brentwood WTP		
	STATE OR FEDERAL GOAL (PHG, MCLG OR MRDLG)	HIGHEST AMOUNT ALLOWED (MCL OR MRDL)	RANGE DETECTED	AVERAGE	RANGE DETECTED	AVERAGE	RANGE DETECTED	AVERAGE	MAJOR SOURCE IN DRINKING WATER
Primary Drinking Water Standards	Contaminants that may affect health								
INORGANIC									
Fluoride (mg/L)	1	2.0	0.6-0.8	0.7	0.6-0.7	0.7	ND	ND	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate as N (mg/L)	10	10	ND	ND	ND-1.1	ND	ND	ND	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
LEAD AND COPPER	PHG	ACTION LIMIT	# OF SITES TESTED / # EXCEEDING ACTION LEVEL	90% PERCENTILE	# OF SITES TESTED / # EXCEEDING ACTION LEVE	90% PERCENTILE	# OF SITES TESTED / # EXCEEDING ACTION LEVE	90% PERCENTILE	
Lead (µg/L)	0.2	15	64/0	ND	n/a	n/a	n/a	n/a	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits
Copper (mg/L)	0.3	1.3	64/0	0.17	n/a	n/a	n/a	n/a	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Date of sampling			Jun-16		n/a		n/a		
MICROBIOLOGICAL STANDARDS									
Total coliform	n/a	>5% of monthly samples	0%-1.1%	0.22%	n/a	n/a	n/a	n/a	
			MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	
Turbidity (NTU) (treatment plant)	n/a	TT	0.14	100%	0.13	100%	0.14	100%	Soil runoff
DISINFECTANT/DISINFECTION BYPRODUCTS			RANGE DETECTED	HIGHEST RAA	RANGE DETECTED	HIGHEST RAA	RANGE DETECTED	HIGHEST RAA	
Chloramines as Cl_2 (mg/L)	n/a	4	ND-3.8	1.5	n/a	n/a	n/a	n/a	Drinking water disinfectant added for treatment
Haloacetic acids (µg/L)	n/a	60	ND-15	9	n/a	n/a	n/a	n/a	Byproduct of drinking water disinfection
Total trihalomethanes (µg/L)	n/a	80	4.3-53	39	n/a	n/a	n/a	n/a	Byproduct of drinking water disinfection
Secondary Drinking Water Standards	Contaminants that may affect the odor, taste or appearance of water								
Chloride (mg/L)	n/a	500	68-100	84	29-100	63	30-190	99	Runoff/leaching from natural deposits; seawater influence
Odor-threshold (units)	n/a	3	1	n/a	1-4	2	1	n/a	Naturally-occurring organic materials
Specific conductivity (µmhos/cm)	n/a	1,600	470-670	520	310-670	460	300-850	550	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	n/a	500	43-86	60	38-81	54	37-68	54	Runoff/leaching from natural deposits; industrial wastes
Total dissolved solids (mg/L)	n/a	1,000	240-360	280	180-310	240	170-440	300	Runoff/leaching from natural deposits
Turbidity (NTU) (distribution system)	n/a	5	0.01-2.5	0.15	n/a	n/a	n/a	n/a	Soil runoff
General Water Quality Parameters	Non-regulated parameters of general interest to consumers								
Alkalinity (mg/L)	n/a	n/a	55-73	62	46-110	61	41-60	54	
Ammonia (mg/L)	n/a	n/a	0.5	n/a	0.4	n/a	0.5	n/a	
Bromide (mg/L)	n/a	n/a	ND-0.19	0.1	ND-0.22	0.12	ND-0.32	0.18	
Calcium (mg/L)	n/a	n/a	16-26	19	11-35	17	12-18	14	
Hardness (mg/L)	n/a	n/a	76-120	95	58-140	90	64-120	89	
Magnesium (mg/L)	n/a	n/a	11-15	12	8-15	11	8.2-18	12	
pH	n/a	n/a	8.2-8.7	8.4	7.7-8.8	8.6	7.9-8.8	8.4	
Potassium (mg/L)	n/a	n/a	2.6-3.5	2.9	1.8-3.8	2.6	2.0-4.5	3.0	
Sodium (mg/L)	n/a	n/a	56-83	65	39-75	56	36-120	72	

CITY OF ANTIOCH

Source of Water

The City of Antioch purchases untreated water from CCWD, treats it in a City-owned treatment plant and delivers it to customers through the City's distribution pipes. The City is also able to pump directly from the San Joaquin River or purchase treated water from CCWD.

In April 2003, Antioch conducted a source water assessment. In summary:

- **Antioch Municipal Reservoir** was found to be most vulnerable to sewer collection systems; this activity is not associated with contaminants in the water supply.
- **San Joaquin River** was found to be most vulnerable to the effects of saltwater intrusion, chemical/petroleum processing or storage, and regulated point discharges.

Water from the San Joaquin River is not always acceptable due to saltwater intrusion. When chloride levels in the river exceed 250 milligrams per liter, the City stops pumping until chloride levels decrease.

The City completes watershed sanitary surveys every five years. The last survey, completed in 2012, concluded that potential contamination is regularly mitigated by the natural flushing of the Delta, controls at contamination sources and existing water treatment practices.

Table of Chemicals or Constituents Detected in Water in 2016

SUBSTANCE (PARAMETER)	STATE OR FEDERAL GOAL (PHG, MCLG OR MRDLG)	HIGHEST AMOUNT ALLOWED (MCL OR MRDL)	City of Antioch: RANGE DETECTED	City of Antioch: AVERAGE	MAJOR SOURCE IN DRINKING WATER
Primary Drinking Water Standards	Contaminants that may affect health				
INORGANIC					
Fluoride (mg/L)	1	2.0	0.6-1.1	0.7	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate as N (mg/L)	10	10	ND-0.5	ND	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
LEAD AND COPPER	PHG	ACTION LIMIT	# OF SITES TESTED / # EXCEEDING ACTION LEVEL	90% PERCENTILE	
Lead (µg/L)	0.2	15	65/0	ND	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits
Copper (mg/L)	0.3	1.3	65/0	0.098	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Date of sampling		August 2015			
MICROBIOLOGICAL STANDARDS			MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ. .	
Turbidity (NTU) (treatment plant)	n/a	TT	0.19	100%	Soil runoff
DISINFECTANT/DISINFECTION BYPRODUCTS			RANGE DETECTED	HIGHEST RAA	
Chloramines as Cl_2 (mg/L)	n/a	4	0.15-3.5	2.1	Drinking water disinfectant added for treatment
Haloacetic acids (µg/L)	n/a	60	0-5.8	6	Byproduct of drinking water disinfection
Total trihalomethanes (µg/L)	n/a	80	48-74	76	Byproduct of drinking water disinfection
Secondary Drinking Water Standards	Contaminants that may affect the odor, taste or appearance of water				
Chloride (mg/L)	n/a	500	32-120	79	Runoff/leaching from natural deposits; seawater influence
Odor-threshold (units)	n/a	3 units	1-4	2	Naturally-occurring organic materials
Specific conductivity (µmhos/cm)	n/a	1600	330-720	510	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	n/a	500	46-50	48	Runoff/leaching from natural deposits; industrial wastes
Total dissolved solids (mg/L)	n/a	1000	320-330	320	Runoff/leaching from natural deposits
Turbidity (NTU) (distribution system)	n/a	5	0.05-0.14	0.08	Soil runoff
General Water Quality Parameters	Non-regulated parameters of general interest to consumers				
Alkalinity (mg/L)	n/a	n/a	48-110	69	
Ammonia (mg/L)	n/a	n/a	0.7	n/a	
Bromide (mg/L)	n/a	n/a	0.17	n/a	
Calcium (mg/L)	n/a	n/a	12-32	17	
Hardness (mg/L)	n/a	n/a	58-140	84	
Magnesium (mg/L)	n/a	n/a	13	n/a	
pH	n/a	n/a	8.0-9.0	8.6	
Potassium (mg/L)	n/a	n/a	3.2	n/a	
Sodium (mg/L)	n/a	n/a	21-84	53	

Table of Chemicals or Constituents Detected in Water in 2016

SUBSTANCE (PARAMETER)	STATE OR FEDERAL GOAL (PHG, MCLG OR MRDLG)	HIGHEST AMOUNT ALLOWED (MCL OR MRDL)	Diablo Water District: RANGE DETECTED	Diablo Water District: AVERAGE	Randall-Bold WTP: RANGE DETECTED	Randall-Bold WTP: AVERAGE	MAJOR SOURCE IN DRINKING WATER
Primary Drinking Water Standards	Contaminants that may affect health						
INORGANIC							
Cadmium (µg/L)	0.04	5	1.4	n/a	ND	n/a	Internal corrosion of galvanized pipes; erosion of natural deposits; discharge from electroplating and industrial chemical factories, and metal refineries; runoff from waste batteries and paints
Fluoride (mg/L)	1	2.0	0.6-0.7	0.6	0.6-0.7	0.7	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate as N (mg/L)	10	10	ND-1.1	ND	ND-1.1	ND	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
LEAD AND COPPER		ACTION LIMIT	# OF SITES TESTED / # EXCEEDING ACTION LEVEL	90% PERCENTILE	# OF SITES TESTED / # EXCEEDING ACTION LEVEL	90% PERCENTILE	
Lead (µg/L)	0.2	15	31/0	ND	n/a	n/a	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits
Copper (mg/L)	0.3	1.3	31/0	0.17	n/a	n/a	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Date of sampling			Jun-16		n/a		
MICROBIOLOGICAL STANDARDS			MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	
Turbidity (NTU) (treatment plant)	n/a	TT	n/a	n/a	0.13	100%	Soil runoff
DISINFECTANT/DISINFECTION BYPRODUCTS			RANGE DETECTED	HIGHEST RAA	RANGE DETECTED	HIGHEST RAA	
Chloramines as Cl_2 (mg/L)	n/a	4	ND-4.5	2.4	n/a	n/a	Drinking water disinfectant added for treatment
Haloacetic acids (µg/L)	n/a	60	ND-13	4	n/a	n/a	Byproduct of drinking water disinfection
Total trihalomethanes (µg/L)	n/a	80	4.5-40	22	n/a	n/a	Byproduct of drinking water disinfection
Secondary Drinking Water Standards	Contaminants that may affect the odor, taste or appearance of water						
Chloride (mg/L)	n/a	500	38-100	70	29-100	63	Runoff/leaching from natural deposits; seawater influence
Manganese (µg/L)	n/a	50	ND-250	ND	ND	n/a	Leaching from natural deposits
Odor-threshold (units)	n/a	3 units	3	n/a	1-4	2	Naturally-occurring organic materials
Specific conductivity (µmhos/cm)	n/a	1600	390-680	540	310-670	460	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	n/a	500	48-88	70	38-81	54	Runoff/leaching from natural deposits; industrial wastes
Total dissolved solids (mg/L)	n/a	1000	220-360	300	180-310	240	Runoff/leaching from natural deposits
Turbidity (NTU) (distribution system)	n/a	5	0.01-0.85	0.26	n/a	n/a	Soil runoff
General Water Quality Parameters	Non-regulated parameters of general interest to consumers						
Alkalinity (mg/L)	n/a	n/a	62-120	80	46-110	61	
Ammonia (mg/L)	n/a	n/a	0.4	n/a	0.4	n/a	
Bromide (mg/L)	n/a	n/a	0.07-0.23	0.14	ND-0.22	0.12	
Calcium (mg/L)	n/a	n/a	18-38	24	11-35	17	
Hardness (mg/L)	n/a	n/a	82-160	120	58-140	90	
Magnesium (mg/L)	n/a	n/a	10-17	14	8-15	11	
pH	n/a	n/a	7.8-8.5	8.3	7.7-8.8	8.6	
Potassium (mg/L)	n/a	n/a	1.9-3.6	2.6	1.8-3.8	2.6	
Sodium (mg/L)	n/a	n/a	45-82	63	39-75	56	

Source of Water

Diablo Water District purchases untreated water from CCWD. Water is treated and blended with groundwater pumped from two wells. The treated water is then delivered to customers through its distributions pipes.

A source water assessment was conducted for Glen Park well in April 2005 and for Stonecreek well in March 2011. In summary:

- **Both wells** were found to be most vulnerable to historic waste dumps/landfills and septic systems (high density, >1/acre). These activities are not associated with contaminants in the water supply.

CITY OF MARTINEZ

Source of Water

The City of Martinez purchases untreated water from CCWD, treats it in a City-owned treatment plant and delivers it through the City's distribution pipes to customers who are not served treated water directly from CCWD.

Table of Chemicals or Constituents Detected in Water in 2016

SUBSTANCE (PARAMETER)	STATE OR FEDERAL GOAL (PHG, MCLG OR MRDLG)	HIGHEST AMOUNT ALLOWED (MCL OR MRDL)	City of Martinez: RANGE DETECTED	City of Martinez: AVERAGE	MAJOR SOURCE IN DRINKING WATER
Primary Drinking Water Standards	Contaminants that may affect health				
INORGANIC					
Fluoride (mg/L)	1	2.0	0.6-1	0.8	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
LEAD AND COPPER	PHG	ACTION LIMIT	# OF SITES TESTED / # EXCEEDING ACTION LEVEL	90% PERCENTILE	
Lead (µg/L)	0.2	15	63/0	ND	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits
Copper (mg/L)	0.3	1.3	63/0	0.12	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Date of sampling			Jun-16		
MICROBIOLOGICAL STANDARDS			MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	
Turbidity (NTU) (treatment plant)	n/a	TT	0.14	100%	Soil runoff
DISINFECTANT/DISINFECTION BYPRODUCTS			RANGE DETECTED	HIGHEST RAA	
Chloramines as Cl_2 (mg/L)	n/a	4	0.1-3.0	1.2	Drinking water disinfectant added for treatment
Bromate (µg/L)	0.1	10	ND-9	3	Byproduct of drinking water disinfection
Haloacetic acids (µg/L)	n/a	60	ND-3.2	2	Byproduct of drinking water disinfection
Total trihalomethanes (µg/L)	n/a	80	3.6-22	12	Byproduct of drinking water disinfection
Secondary Drinking Water Standards	Contaminants that may affect the odor, taste or appearance of water				
Chloride (mg/L)	n/a	500	37-130	74	Runoff/leaching from natural deposits; seawater influence
Odor-threshold (units)	n/a	3 units	1-2	1	Naturally-occurring organic materials
Specific conductivity (µmhos/cm)	n/a	1600	350-600	480	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	n/a	500	43-61	52	Runoff/leaching from natural deposits; industrial wastes
Total dissolved solids (mg/L)	n/a	1000	180-350	260	Runoff/leaching from natural deposits
Turbidity (NTU) (distribution system)	n/a	5	0.07-0.3	0.13	Soil runoff
General Water Quality Parameters					
Alkalinity (mg/L)	n/a	n/a	56-100	78	
Bromide (mg/L)	n/a	n/a	0.10-0.36	0.2	
Calcium (mg/L)	n/a	n/a	13-31	22	
Hardness (mg/L)	n/a	n/a	68-140	100	
Magnesium (mg/L)	n/a	n/a	8.6-14	11	
pH	n/a	n/a	7.3-9.2	8.8	
Potassium (mg/L)	n/a	n/a	2.2-3.4	2.8	
Sodium (mg/L)	n/a	n/a	42-64	53	

CITY OF PITTSBURG

Table of Chemicals or Constituents Detected in Water in 2016

SUBSTANCE (PARAMETER)	STATE OR FEDERAL GOAL (PHG, MCLG OR MRDLG)	HIGHEST AMOUNT ALLOWED (MCL OR MRDL)	City of Pittsburg: RANGE DETECTED	City of Pittsburg: AVERAGE	MAJOR SOURCE IN DRINKING WATER
Primary Drinking Water Standards	Contaminants that may affect health				
INORGANIC					
Fluoride (mg/L)	1	2.0	0.5-0.9	0.7	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate as N (mg/L)	10	10	0.69	n/a	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
LEAD AND COPPER	PHG	ACTION LIMIT	# OF SITES TESTED / # EXCEEDING ACTION LEVEL	90% PERCENTILE	
Lead (µg/L)	0.2	15	47/0	ND	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits
Copper (mg/L)	0.3	1.3	47/0	ND	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Date of sampling			Aug-15		
MICROBIOLOGICAL STANDARDS			MAXIMUM VALUE	LOWEST MONTHLY % OF SAMPLES THAT MEETS REQ.	
Turbidity (NTU) (treatment plant)	n/a	TT	0.12	100%	Soil runoff
DISINFECTANT/DISINFECTION BYPRODUCTS			RANGE DETECTED	HIGHEST RAA	
Chloramines as Cl_2 (mg/L)	n/a	4	0.1-3.4	1.2	Drinking water disinfectant added for treatment
Haloacetic acids (µg/L)	n/a	60	ND-16	8	Byproduct of drinking water disinfection
Total trihalomethanes (µg/L)	n/a	80	8.5-36	24	Byproduct of drinking water disinfection
Secondary Drinking Water Standards	Contaminants that may affect the odor, taste or appearance of water				
Chloride (mg/L)	n/a	500	53-140	94	Runoff/leaching from natural deposits; seawater influence
Color	n/a	15 units	ND-9	3.5	Naturally-occurring organic materials
Odor-threshold (units)	n/a	3 units	1.3-1.6	1.3	Naturally-occurring organic materials
Specific conductivity (µmhos/cm)	n/a	1600	370-840	670	Substances that form ions when in water; seawater influence
Sulfate (mg/L)	n/a	500	76-110	90	Runoff/leaching from natural deposits; industrial wastes
Total dissolved solids (mg/L)	n/a	1000	280-470	390	Runoff/leaching from natural deposits
Turbidity (NTU) (distribution system)	n/a	5	0.05-0.3	0.12	Soil runoff
General Water Quality Parameters	Non-regulated parameters of general interest to consumers				
Alkalinity (mg/L)	n/a	n/a	46-120	68	
Ammonia (mg/L)	n/a	n/a	ND-0.58	0.29	
Calcium (mg/L)	n/a	n/a	30	n/a	
Hardness (mg/L)	n/a	n/a	110-210	160	
Magnesium (mg/L)	n/a	n/a	16	n/a	
pH	n/a	n/a	7.2-8.8	8.5	
Potassium (mg/L)	n/a	n/a	3.2	n/a	
Sodium (mg/L)	n/a	n/a	34-110	62	

Source of Water

The City of Pittsburg purchases untreated water from CCWD, treats it in a City-owned treatment plant and delivers it to customers through the City's distribution pipes. In addition to the water it buys from CCWD, the City is able to pump water from two wells.

A source water assessment was conducted for the Rossmoor well in November 2001, and for the Bodega well in July 2009. In summary:

- **Bodega well** was found to be most vulnerable to residential sewer collection systems, abandoned military installation (Camp Stoneman) and illegal activities (drug labs).
- **Rossmoor well** was found to be most vulnerable to grazing, sewer collection systems, utility stations and maintenance areas.

How to Get Involved in the Quality of Your Water

CONTRA COSTA WATER DISTRICT
The Board of Directors meets in regular session at 6:30 p.m. on the first and third Wednesday of each month. Meetings are held in the Board Room at the Contra Costa Water District Center, 1331 Concord Ave., Concord. For meeting agendas, contact the District Secretary at 925-688-8000 or visit **www.ccwater.com.**

CITY OF MARTINEZ
The Martinez City Council meets in regular session at 7 p.m. on the first and third Wednesday of each month. Meetings are held in Council Chambers at 525 Henrietta Street, Martinez. For meeting agendas, contact the Deputy City Clerk at 925-372-3512 or visit **www.cityofmartinez.org.**

CITY OF PITTSBURG
The Pittsburg City Council meets in regular session at 7 p.m. on the first and third Monday of each month. Meetings are held in Council Chambers at 65 Civic Drive, Pittsburg. For meeting agendas, call 925-252-4850 or visit **www.ci.pittsburg.ca.us.**

CITY OF ANTIOCH
The Antioch City Council meets in regular session at 7 p.m. on the second and fourth Tuesday of each month. Meetings are held in Council Chambers at Third and H streets, Antioch. For meeting agendas, contact the City Clerk at 925-779-7009 or visit **www.ci.antioch.ca.us.**

DIABLO WATER DISTRICT (OAKLEY)
The Board of Directors meets in regular session at 7:30 p.m. on the fourth Wednesday of each month. Meetings are held at 87 Carol Lane, Oakley. For meeting agendas, contact DWD at 925-625-3798 or visit **www.diablowater.org.**

Want more information?

Contra Costa Water District's website contains valuable information about water issues. Visit **www.ccwater.com** to begin your research.

CONTRA COSTA WATER DISTRICT

This report contains important information about your drinking water. Have someone translate it for you, or speak with someone who understands it.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo o hable con alguien que lo entienda bien.

此报告包含有关您的饮用水的重要信息。请人帮您翻译出来，或请看懂此报告的人将内容说给您听。

این گزارش شامل اطلاعات مهمي درمورد اب اشاميدني شما ميباشد. از شخصي بخواهيد که به شما ترجمه کنند و يا با شخصي که اين موضوع را ميفهمند صحبت بکنيد.

Mahalaga ang impormasyong ito. Mangyaring ipasalin ito.

APPENDIX B

2012-2016 City of Antioch Water Quality Results

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City of Antioch
Raw Water Total Coliform and E. Coli Data (January 2012 through December 2016)

Raw Water Total Coliform (MPN/100 ml)						Raw Water E. Coli Data (MPN/100 ml)		
Year	Month	Min	Max	Median		Min	Max	Median
2012	January	55	461	144		<1	5.2	4.1
	February	81	326	205		<1	3.1	3
	March	66	219	123		1	4.1	2
	April	20	58	32		<1	2	1
	May	25.6	727	127		2	10.8	5
	June	365	>2420	591		<1	5.2	4.1
	July	>2420	>2420	>2420		1	5	2
	August	>2420	>2420	>2420		<1	2	2
	September	613	8164	1684		1	6.3	4.1
	October	225	1046	326		1	9.6	1
	November	143	517	166		3	17	4
	December	88	387	249		2	15.8	7
2013	January	40.4	108.6	59.25		1	5.2	1.5
	February	90.8	435.2	121		1	2	1.5
	March	40	1198	380		<1	<10	1
	April	149.7	2419.6	1413.6		1	11	5.2
	May	920.8	24196	3651.8		10	58.3	22.9
	June	5300	16070	10360		1	6.3	3.6
	July	648.8	9208	5811		1	5.2	2
	August	1986.3	3448	2419.6		<1	9.8	4.1
	September	2046	4884	4352		3.1	<1	3.1
	October	435.2	1732.9	580.36		2	5.2	3.6
	November	129.6	344.8	231.6		1	4.1	3.05
	December	39.3	285.1	127.4		2	5.2	4.1
2014	January	39.9	184.2	103.95		1	6.3	3.1
	February	123.6	328.2	193.2		<	1	<1
	March	95.9	488.4	146.7		1	14.2	3.1
	April	157.6	248.9	238.2		3	8.4	4.65
	May	275.5	1986.3	502.8		8.4	18.9	10.85
	June	1553.1	2481	2419.6		1	10	9.7
	July	2419.6	6131	4137.5		1	10	5.5
	August	165.8	2419.6	1299.7		1	4.1	1
	September	313.1	1986.3	1553.1		<1	2	1.5
	October	488.4	920.8	697.9		1	7.5	4.1
	November	344.8	770.1	461.1		17.5	66.3	27.35
	December	344.8	613.1	476.2		2	55.6	16.65
2015	January	110.6	410.6	317.85		10.5	16	10.8
	February	40.8	228.2	145.95		2	13.4	4.7
	March	145	727	307.6		1	4.1	3.1
	April	155.3	579.4	217.25		4.1	10.5	6.85
	May	111.9	238.2	224.7		3.1	17.5	10.4
	June	727	15531	2202.95		3.1	16	3.6
	July	275.5	72700	7270		1	10	3.6
	August	4140	51720	10462		1	3.1	2
	September	4884	6867	5794		1	2	2
	October	261.3	2187	549.35		7.5	22.1	17.5
	November	435.2	920.8	489.15		7.5	56.3	29.35
	December	238.2	686.7	371.4		14.4	37.3	25.5
2016	January	291	727	317		9.8	36.4	12.7
	February	90.8	435.2	155.3		2	21.8	7.5
	March	13.7	2419.6	97.45		4	16	6.95
	April	98.8	1986.3	158.15		4.1	13.4	10.35
	May	101.4	1046.2	554.95		4.1	7.4	5.2
	June	2282	17329	14136		1	6.3	1
	July	4352	17329	10462		1	5.2	2
	August	866.4	2419.6	1203.3		2	2	2
	September	410.6	770.1	648.8		1	3	2
	October	178.5	980.4	557.65		1	10.9	4.1
	November	135.4	344.1	210.05		1	1	5.2
	December	248.1	387.3	290.9		4.1	11	5.75

Source: https://sdwis.waterboards.ca.gov/PDWW/

City of Antioch
Raw Water Turbidity (January 2012 through December 2016)

Year	Month	Range (NTU)		
		Minimum	Maximum	Average
2012	January	2	9	2.5
	February	2	7	4.2
	March	2	5	4
	April	3	7	4.5
	May	4	10	4.8
	June	3	9	6.1
	July	3	8	5.5
	August	2	9	3.1
	September	1	6	2.2
	October	0.6	5	1.4
	November	0.7	4	1.6
	December	1.3	29	8.1
2013	January	8	16	11.2
	February	6	10	7.4
	March	1.9	10	4.5
	April	1	4	2.2
	May	3	8	5
	June	2	7	3.3
	July	2	7	3.7
	August	1.5	7	2.9
	September	0.9	9	2.7
	October	0.7	3	1.7
	November	0.8	3	1.3
	December	0.9	3	1.3
2014	January	1	3	1.44
	February	1	3	1.61
	March	1	3.3	2.11
	April	0.7	2	1.2
	May	0.7	2	1.1
	June	0.8	2.2	1.27
	July	0.61	6	1.42
	August	0.75	3	1.53
	September	0.74	3.9	1.77
	October	0.6	2.3	1.2
	November			
	December			
2015	January	2	16	7.1
	February	1.3	5.4	2.7
	March	2	8	4
	April	0.8	6.5	2.3
	May	0.9	0.2	1.4
	June	0.8	1.8	1.2
	July	1	6	2
	August	1	3.8	1.6
	September	0.6	2.9	1.5
	October	1	2.7	1.5
	November	0.9	2	1.4
	December	1.1	3.4	1.9
2016	January	1.3	11.5	3.1
	February	5	11	7.8
	March	3	8	4.6
	April	2.6	5.7	3.9
	May	3	8	4.9
	June	3	7.9	4.4
	July	2.9	9	4.6
	August	1.7	5	3.2
	September	1.4	4	2.8
	October	1	5	2.7
	November	0.7	9.1	4.4
	December	2	12	6.4

California Department of Public Health - Drinking Water Program

Schedule 1 Report for Quarterly Stage 2 Disinfection Byproducts Rule Monitoring at 8 Locations

System no: 0710001 System Name: City of Antioch Year: 2014 Quarter: 4

TTHM Individual Site Results in µg/L

Site no.	Sample Location Name	Current Quarter Sample Date(s)	2012				2013				2014			
			1st Qtr.	2nd Qtr. 6/4	3rd Qtr. 9/11	4th Qtr. 12/10	1st Qtr.	2nd Qtr.	9/9 3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
0710001-801	Canal Park	12/9/2014		54.0	58.0	62.0	13.0	70.0	63.0	53.0	29.0	63.0	60.0	59.0
0710001-802	Silverado Dr	12/9/2014		55.0	60.0	60.0	13.0	67.0	63.0	53.0	28.0	62.0	65.0	63.0
0710001-803	Service Rd	12/9/2014		52.0	60.0	61.0	14.0	64.0	59.0	49.0	55.0	68.0	68.0	62.0
0710001-804	Fairview Park	12/9/2014		57.0	61.0	62.0	15.0	67.0	67.0	53.0	26.0	66.0	66.0	65.0
0710001-805	Marchetti Park	12/9/2014		54.0	62.0	63.0	15.0	67.0	64.0	53.0	24.0	66.0	66.0	66.0
0710001-806	Mira Vista Hills	12/9/2014		52.0	58.0	62.0	12.0	62.0	55.0	55.0	28.0	61.0	61.0	60.0
0710001-807	Wolverine Way	12/9/2014		58.0	64.0	61.0	14.0	63.0	61.0	52.0	56.0	73.0	68.0	65.0
0710001-808	Sanger Peak Way	12/9/2014		58.0	65.0	59.0	14.0	65.0	60.0	52.0	57.0	75.0	67.0	64.0

Calculated TTHM LRAAs in µg/L

Site no.	Sample Location Name	2013				2014			
		1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
0710001-801	Canal Park	46.8	50.8	52.0	49.8	53.8	52.0	51.3	52.8
0710001-802	Silverado Dr	47.0	50.0	50.8	49.0	52.8	51.5	52.0	54.5
0710001-803	Service Rd	46.8	49.8	49.5	46.5	56.8	57.8	60.0	63.3
0710001-804	Fairview Park	48.8	51.3	52.8	50.5	53.3	53.0	52.8	55.8
0710001-805	Marchetti Park	48.5	51.8	52.3	49.8	52.0	51.8	52.3	55.5
0710001-806	Mira Vista Hills	46.0	48.5	47.8	46.0	50.0	49.8	51.3	52.5
0710001-807	Wolverine Way	49.3	50.5	49.8	47.5	58.0	60.5	62.3	65.5
0710001-808	Sanger Peak Way	49.0	50.8	49.5	47.8	58.5	61.0	62.8	65.8

HAA5 Individual Site Results in µg/L

Site no.	Sample Location Name	Current Quarter Sample Date(s)	2012				2013				2014			
			1st Qtr.	2nd Qtr. 6/4	3rd Qtr. 9/11	4th Qtr. 12/10	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
0710001-801	Canal Park	12/9/2014		4.8	3.4	4.1	6.5	3.9	3.3	5.7	5.0	7.0	5.3	5.2
0710001-802	Silverado Dr	12/9/2014		3.6	4.4	4.3	5.6	4.2	3.5	5.1	5.1	6.7	3.8	5.2
0710001-803	Service Rd	12/9/2014		3.0	3.5	4.3	6.4	3.6	2.6	4.1	6.5	5.1	4.0	4.8
0710001-804	Fairview Park	12/9/2014		3.5	3.2	4.1	6.7	3.6	3.6	4.1	5.0	6.5	3.7	4.1
0710001-805	Marchetti Park	12/9/2014		3.6	2.0	4.4	4.9	3.7	2.8	3.9	4.8	5.3	3.7	4.5
0710001-806	Mira Vista Hills	12/9/2014		2.9	4.1	4.6	5.7	5.1	2.4	5.8	5.3	5.5	3.6	5.4
0710001-807	Wolverine Way	12/9/2014		3.7	0.0	4.2	7.0	3.3	0.0	4.2	6.7	4.6	3.3	4.3
0710001-808	Sanger Peak Way	12/9/2014		4.2	3.7	4.3	5.6	3.7	3.1	4.4	5.9	5.0	4.0	4.8

Calculated HAA5 LRAAs in µg/L

Site no.	Sample Location Name	2013				2014			
		1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
0710001-801	Canal Park	4.7	4.5	4.5	4.9	4.5	5.3	5.8	5.6
0710001-802	Silverado Dr	4.5	4.6	4.4	4.6	4.5	5.1	5.2	5.2
0710001-803	Service Rd	4.3	4.5	4.2	4.2	4.2	4.6	4.9	5.1
0710001-804	Fairview Park	4.4	4.4	4.5	4.5	4.1	4.8	4.8	4.8
0710001-805	Marchetti Park	3.7	3.8	4.0	3.8	3.8	4.2	4.4	4.6
0710001-806	Mira Vista Hills	4.3	4.9	4.5	4.8	4.7	4.8	5.1	5.0
0710001-807	Wolverine Way	3.7	3.6	3.6	3.6	3.6	3.9	4.7	4.7
0710001-808	Sanger Peak Way	4.5	4.3	4.2	4.2	4.3	4.6	4.8	4.9

Does any current quarter TTHM LRAA exceed the 80 µg/L MCL? **No**

Is an operational evaluation required? **No**

Does any current quarter HAA5 LRAA exceed the 60 µg/L MCL? **No**

Completed by:

Name:

Title: Water Quality Analyst

Date: Monday, December 29, 2014

If the current-quarter LRAA at any location exceeds an MCL for TTHM or HAA5, you must provide public notice within 30 days. Send CDPH a copy of your proposed public notice for review before delivering the notice to customers.

If an operational evaluation is required, you must send the completed evaluation report to CDPH within 90 days. Contact your CDPH Drinking Water Program district office for more information about the scope of the evaluation.

Rev. 2012Mar20

State Water Resources Control Board - Division of Drinking Water

Rev. 2015Feb13

Report for Quarterly Disinfection Byproducts Rule Monitoring at 8 Locations

System №: 0710001 System Name: City of Antioch Year: 2016 Quarter: 4

TTHM Individual Site Results in µg/L

Site no.	Sample Location Name	Current Quarter Sample Date(s)	2014				2015				2016			
			1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
0710001-801	Canal Park	12/6/2016	29.0	63.0	60.0	59.0	80.0	72.0	71.0	69.0	74.0	64.0	60.0	51.0
0710001-802	Silverado Dr	12/6/2016	28.0	62.0	65.0	63.0	78.0	72.0	63.0	70.0	66.0	59.0	63.0	53.0
0710001-803	Service Rd.	12/6/2016	55.0	68.0	68.0	62.0	78.0	74.0	71.0	73.0	70.0	64.0	55.0	55.0
0710001-804	Fairview Park	12/6/2016	26.0	66.0	66.0	65.0	89.0	78.0	77.0	73.0	74.0	64.0	59.0	52.0
0710001-805	Marchetti Park	12/6/2016	24.0	66.0	66.0	66.0	89.0	73.0	76.0	73.0	73.0	65.0	56.0	48.0
0710001-806	Mira Vista Hills	12/7/2016	28.0	61.0	61.0	60.0	82.0	69.0	58.0	67.0	63.0	58.0	60.0	51.0
0710001-807	Wolverine Way	12/6/2016	56.0	73.0	68.0	65.0	82.0	76.0	64.0	73.0	68.0	65.0	55.0	48.0
0710001-808	Sanger Peak Way	12/6/2016	57.0	75.0	67.0	64.0	88.0	74.0	63.0	68.0	60.0	63.0	56.0	48.0

Calculated TTHM LRAAs in µg/L

2015				2016			
1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
66	68	71	73	72	70	67	62
67	70	69	71	68	65	65	60
69	71	71	74	72	70	66	61
72	75	77	79	76	72	68	62
72	74	76	78	74	72	67	61
66	68	67	69	64	62	62	58
72	73	72	74	70	68	65	59
74	73	72	73	66	64	62	57

HAA5 Individual Site Results in µg/L

Site no.	Sample Location Name	Current Quarter Sample Date(s)	2014				2015				2016			
			1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
0710001-801	Canal Park	12/6/2016	5.0	7.0	5.3	5.2	12.0	3.9	6.3	6.4	4.4	5.1	3.9	5.5
0710001-802	Silverado Dr	12/6/2016	5.1	6.7	3.8	5.2	12.0	3.4	6.4	6.8	4.7	5.2	2.5	4.9
0710001-803	Service Rd.	12/6/2016	6.5	5.1	4.0	4.8	11.0	3.8	3.5	6.3	4.4	4.1	0.0	5.5
0710001-804	Fairview Park	12/6/2016	5.0	6.5	3.7	4.1	12.0	3.2	4.0	6.1	3.7	4.3	3.5	4.7
0710001-805	Marchetti Park	12/6/2016	4.8	5.3	3.7	4.5	15.0	3.5	4.5	6.7	3.9	4.6	3.8	5.3
0710001-806	Mira Vista Hills	12/7/2016	5.3	5.5	3.6	5.4	11.0	4.5	5.1	6.7	4.4	5.5	3.3	5.1
0710001-807	Wolverine Way	12/6/2016	6.7	4.6	3.3	4.3	9.3	3.2	3.6	6.4	3.1	4.9	3.3	5.3
0710001-808	Sanger Peak Way	12/6/2016	5.9	5.0	4.0	4.8	11.0	4.0	4.8	7.2	4.5	4.4	2.9	5.8

Calculated HAA5 LRAAs in µg/L

2015				2016			
1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
7	7	7	7	5	6	5	5
7	6	7	7	5	6	5	4
6	6	6	6	5	5	4	4
7	6	6	6	4	5	4	4
7	7	7	7	5	5	5	4
6	6	7	7	5	5	5	5
5	5	5	6	4	5	4	4
6	6	6	7	5	5	5	4

Does any current quarter TTHM LRAA exceed the 80 µg/L MCL? **No**

Is an operational evaluation required? **No**

Does any current quarter HAA5 LRAA exceed the 60 µg/L MCL? **No**

Completed by:

Name: Lori Sarti

Title: Water Quality Analyst

Date: 1/03/2017

If the current-quarter LRAA at any location exceeds an MCL for TTHM or HAA5, you must provide public notice within 30 days. Send the Division of Drinking Water a copy of your proposed public notice for review before delivering the notice to customers.

If an operational evaluation is required, you must send the completed evaluation report to the Division of Drinking Water within 90 days. Contact your Division of Drinking Water district office for more information about the scope of the evaluation.

WEST YOST ASSOCIATES