

Drinking Water Source Assessment

Patterson Pass Water Treatment Plant Intake on South Bay Aqueduct

**Source Name – Patterson Pass WTP Raw Water Reservoir
Source Number - 0110010-009**

**Zone 7 Water Agency of the
Alameda County Flood Control and Water
Conservation District**

**Prepared by
Archibald & Wallberg Consultants**

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INTRODUCTION

Zone 7 Water Agency of the Alameda County Water Conservation and Flood Control District provides drinking water to about 174,000 customers (approximately 53,000 service connections) mostly through 26 turnouts to four retailer water systems (California Water Service Company, City of Livermore, City of Pleasanton, and Dublin San Ramon Services District) in eastern Alameda County. Zone 7 Water Agency also provides drinking water to 13 direct users, including a local vineyard, hospital, and park. This drinking water source assessment was conducted for Zone 7 Water Agency's Patterson Pass intake on the South Bay Aqueduct (SBA).

The SBA is part of the State Water Project (SWP) system that pumps water from the Sacramento-San Joaquin Delta (Delta) at the Harvey O. Banks Pumping Plant (Banks Pumping Plant). Water flows a short distance down the California Aqueduct to Bethany Reservoir. Bethany Reservoir is essentially a wide spot on the California Aqueduct with a capacity of 5070 acre-feet (AF). Water is pumped into the SBA at the South Bay Pumping Plant on Bethany Reservoir. The first three miles of the SBA are an enclosed pipeline, with a capacity of 330 cubic feet per second (cfs). This is followed by two miles of open canal, a tunnel under Interstate 580, and another two miles of open canal between the tunnel and Patterson Reservoir. Patterson Reservoir is a 100 AF facility adjacent to the SBA. Water is taken by gravity from Patterson Reservoir into the Patterson Pass WTP.

The Department of Water Resources (DWR) conducted a detailed sanitary survey of the watershed of the SWP in 2001. This source water assessment is based largely on the information presented in the sanitary survey. The potential contaminant sources in the watershed that the Patterson Pass WTP is most vulnerable to are identified in this source water assessment. Zone 7 Water Agency is working with the other SBA Contractors to identify potential watershed management practices that could improve water quality and reduce the significance of the potential contaminant sources.

ASSESSMENT PROCEDURES

The source water assessment of the Patterson Pass WTP intake watershed was conducted by Archibald & Wallberg Consultants, under contract to the SBA Contractors. The following sources of information were used:

- California State Water Project Watershed Sanitary Survey Update Report 2001
- Aerial photographs taken by Alameda County Water District in the spring of 2002
- Detailed field survey notes from 1990 Sanitary Survey of the State Water Project
- Interviews with staff from agencies treating SBA water
- Interviews with staff from the Department of Water Resources (DWR) Delta Field Division and Operations and Maintenance Division

In addition, a field survey of Bethany Reservoir and the open canal sections of the SBA, was conducted on March 21, 2002.

DELINEATION OF PROTECTION ZONES

The watershed for the Patterson Pass WTP intake includes the Sacramento River, San Joaquin River, and Delta drainage areas, in addition to the land that drains to the California Aqueduct between the Banks Pumping Plant and Bethany Reservoir, Bethany Reservoir, and the open canal sections of the SBA. Based on the 2001 Sanitary Survey Update, Department of Health Services (DHS) staff worked with the SBA Contractors to determine the appropriate geographic area to be covered by this source water assessment. It was determined that the source water assessments for the SBA water treatment plant intakes should include Bethany Reservoir, the open canal sections of the SBA, and for the intakes downstream of Lake Del Valle, the Lake Del Valle watershed. Based on this guidance, the following protection zones were established for the Patterson Pass WTP intake watershed:

Zone A – This is the zone that has the most potential to impact water quality at the intake of the Patterson Pass WTP. It includes the land draining to the open canal sections of the SBA and to Patterson Pass Reservoir upstream of the intake. It also includes Bethany Reservoir, the land that drains to Bethany Reservoir that is within 400 feet of the reservoir shoreline, and the land within 400 feet of the ephemeral stream that flows into Bethany Reservoir near the South Bay Pumping Plant.

Zone B – This zone includes the remainder of the watershed of Bethany Reservoir.

Zone C – The remainder of the SWP watershed is included in this zone. The Delta watershed is treated as a point source input to Bethany Reservoir in Zone A.

POSSIBLE CONTAMINATING ACTIVITIES

The possible contaminating activities (PCAs) in the watershed of the Patterson Pass WTP were identified in the 2001 Sanitary Survey Update and were further investigated for this source water assessment. Table 1 lists the PCAs that have been identified in Zones A and B of the watershed. The Delta is treated as a point source discharge to Bethany Reservoir in this assessment. The water quality challenges faced at the WTP are described in Table 2. Each of the contaminant sources is qualitatively ranked as being of high, medium, or low significance based on the potential for that contaminant source to contribute to the water quality challenges identified in Table 2. Factors considered in assigning the ranking include the volume of discharge, timing of discharge relative to the timing of water quality problems, proximity of the contaminant source to the WTP intake, and the types of contaminants present in the discharge. Although there are a number of PCAs in the watershed, the Delta is the primary source of contaminants to the Patterson Pass WTP. The Delta supplies all of the water to the

Patterson Pass WTP, with the exception of a minor amount of drainage that enters Bethany Reservoir and the open canal sections of the SBA during storm events.

VULNERABILITY ANALYSIS

The SBA source water for the Patterson Pass WTP is most vulnerable to contaminants entering the SBA from the Delta. As shown in Table 2, many of the contaminants, such as pathogens, organic carbon, and nutrients, detected in the Patterson Pass WTP intake water originate in the Sacramento and San Joaquin watersheds and the Delta. There are numerous contaminant sources including agricultural drainage, wastewater treatment plant discharges, and urban runoff. Recreational usage of the water also contributes contaminants to the Delta. In addition seawater intrusion contributes salt and bromide to the water supply.

The source water is also vulnerable to cattle grazing in the watersheds of Bethany Reservoir and along the open canal sections of the aqueduct. There are several areas along the aqueduct where drainage from cattle grazing land is discharged directly into the aqueduct in drainage pipes. Cattle have direct access to the western shore of Bethany Reservoir and may be a source of pathogens and other contaminants. The relative amounts or loads of pathogens and other contaminants coming from cattle and runoff from cattle grazing land compared to the amounts coming from the Delta are unknown. The Delta likely supplies the majority of the contaminant loads because it is the primary source of water to the SBA. During storm events runoff from cattle grazing land that enters the SBA near the Patterson Pass WTP or enters Bethany Reservoir near the South Bay Pumping Plant may also be a significant source of contaminants for short periods of time.

Table 1. Possible Contaminating Activities in Bethany Reservoir and the South Bay Aqueduct Watershed

Contaminating Activity	Location	Contaminants of Concern	Comments	Significance of Source
Delta	Zone A – Input to Bethany Reservoir & SBA	TOC Bromide Pathogens Nutrients Sediment Algae Pharmaceuticals Personal care products	The Delta is the major source of water to the WTP. The volume of drainage from Bethany Reservoir and open canal watersheds is minor compared to the Delta.	High
Runoff from grazing land	Zones A & B - Bethany Reservoir & open canal sections of SBA	Pathogens TOC Nutrients Sediment	Due to proximity to intake, runoff from grazing land may contribute pathogens and other contaminants during storm events.	Medium
Grazing animals with access to water	Zone A - Bethany Reservoir	Pathogens TOC Nutrients Sediment	Cattle have access to western shore of Bethany Reservoir and have been observed in the water. This allows direct input of animal droppings to the reservoir.	Medium
Roadside drainage from public and farm bridges	Zone A – Open canal sections of SBA	Hazardous materials Pathogens TOC Nutrients	No history of spills from vehicle accidents on bridges. Farm bridges have been improved to eliminate direct inputs from cattle. Runoff during storm events still enters SBA and may affect water quality.	Medium
Body contact recreation	Zone A - Bethany Reservoir	Pathogens	Relative contribution of recreation and other sources is unknown but the Delta is likely the major source.	Low
Non-body contact recreation	Zone A – Bethany Reservoir	Sediment MTBE & other petroleum products	No evidence that minor amount of boating in Bethany Reservoir is problematic. Impacts of potential trail along SBA unknown and warrant further investigation.	Low
Wild animals	Zones A & B - Watershed	Pathogens	Contribution of wild animals relative to other sources is unknown.	Low
Right-of-Way road drainage	Zone A – Open canal sections of SBA	Sediment	Right-of-way is traveled only by DWR and is well maintained.	Low
Pipelines	Zone A – Open canal sections of SBA	Petroleum products	No history of spills from pipelines crossing SBA	Low
Aquatic herbicide use	Zone A - Bethany Reservoir & open canal sections	Copper sulfate Komeen	Copper sulfate is used for algal control in SBA. Komeen is used to control aquatic weeds in Bethany Reservoir.	Low
Fires	Zones A & B – Watershed of Bethany Reservoir and open canal sections of SBA	Sediment	No history of fires. Watershed is accessible for fire suppression if a fire started.	Low

Table 2. Water Quality Challenges at Patterson Pass WTP

Water Quality Challenge	Problem Statement	Major Sources	Other Minor Sources
Excessive algal growth	The high concentrations of nutrients, combined with abundant sunshine and warm water temperatures during the spring, summer, and fall months leads to excessive algal growth in the Delta and SBA. This results in taste and odor problems due to the formation of MIB, geosmin, and other byproducts of algal growth. It also results in daily fluctuations in pH, which can reduce the effectiveness of coagulants and other chemicals. Algae also result in shortened filter run times which can substantially decrease plant production and create difficulties meeting customer demands.	Delta is source of nutrients and algae. Additional algal growth likely occurs in Bethany and SBA. Copper sulfate is used to control algal growth in the SBA	Algal growth is problematic during spring, summer, and fall months when there is minimal runoff from watersheds of Bethany Reservoir and the open canal sections of SBA so the watersheds are not a source of algal stimulating nutrients.
Variable and high turbidity	Turbidity is variable and at times increases quickly from about 20 NTU to 50 NTU, and may go over 100 NTU, although the Patterson Pass Reservoir provides some buffering from the rapid water quality changes in the Delta. This creates treatment challenges because operators have to quickly adjust chemical dosages without adequate time to conduct jar tests to accurately determine the correct dosage. It also results in lower plant production and creates difficulties meeting customer demands.	Possibly wind induced turbidity from Clifton Court during dry season Storm runoff from the Delta and Bethany watersheds during wet season	Cattle in water at Bethany Reservoir Storm runoff from cattle grazing land and vineyards along SBA Storm runoff from canal roadside drainage
Formation of TTHMs and HAA5s	The relatively high concentrations of TOC and bromide in the SBA water make it difficult to meet TTHM and HAA5 MCLs at the Patterson Pass WTP. Recent usage of ferric chloride as the primary coagulant coupled with more proactive monitoring has reduced formation of TTHM and HAA5 significantly.	Delta	Storm runoff from Bethany Reservoir watershed Storm runoff from cattle grazing land along SBA
Temperature fluctuations	Daily variability in temperature creates difficulties maintaining the sludge blanket in the upflow clarifiers at the WTP.	Delta water heats up as it flows through Clifton Court and the shallow open canal sections of SBA	None
Pathogens	The coliform and pathogen data indicate that pathogens are not problematic based on the relatively low levels found in SBA water during routine monitoring with current analytical methods. Levels may be higher during storm events. Improved analytical methods may result in higher levels being detected in the future.	Delta	Storm runoff from Bethany Reservoir watershed Storm runoff from cattle grazing land along SBA Wild animals
High TDS concentrations	High TDS concentrations lead to aesthetic problems in finished water. The 1998 Bay-Delta Accord restricted pumping of Delta water during the spring months when TDS concentrations are lowest and shifted pumping to the fall months when TDS concentrations are highest. During droughts TDS concentrations increase substantially,	Delta	Storm runoff from Bethany Reservoir watershed Storm runoff from areas that drain to open canal sections.
Personal care products and pharmaceuticals	This is an emerging area of concern but there are no data on the concentrations of these chemicals in SBA water	Wastewater treatment plant discharges in the Delta watershed	

VULNERABILITY SUMMARY

A sample of the vulnerability summary to be included in the annual consumer confidence report, as required by DHS, is as follows:

An assessment of the South Bay Aqueduct drinking water source was completed in 2002 for Zone 7 Water Agency of the Alameda County Water Conservation and Flood Control District, (Zone 7 Water Agency). A copy of the complete assessment may be reviewed at the Zone 7 Water Agency office located at 5997 Parkside Drive in Pleasanton. You may request a summary of the assessment be sent to you by contacting Ms. Angela O'Brien at (925) 447-6704 ext. 118.

Many of the contaminants, such as pathogens, organic carbon, and nutrients detected in the SBA water supply originate in the Sacramento and San Joaquin watersheds and the Delta. There are numerous contaminant sources including agricultural drainage, wastewater treatment plant discharges, and urban runoff. Recreational usage of the water also contributes contaminants to the Delta. In addition seawater intrusion contributes salt and bromide to the water supply. The SBA water is also vulnerable to cattle grazing in the watersheds of Bethany Reservoir and along the open canal sections of the aqueduct.

Although the SBA water source is considered vulnerable to various possibly contaminating activities, it is important to note that there are multiple barriers for physical removal of contaminants and disinfection of the source water at the WTPs. All drinking water standards are met in the treated water that is delivered to customers in the Zone 7 Water Agency service area.

ATTACHMENT A – ASSESSMENT SUMMARY

The Patterson Pass Water Treatment Plant (WTP), operated by the Zone 7 Water Agency of the Alameda County Flood Control and Water Conservation District, is located in Alameda County and serves the City of Livermore. The drinking water source for the Patterson Pass WTP is the South Bay Aqueduct, a component of the State Water Project. Sacramento-San Joaquin Delta water is pumped into the South Bay Aqueduct at the South Bay Pumping Plant on Bethany Reservoir, near Byron. The land uses in the watershed of Bethany Reservoir are cattle grazing and recreation. Cattle grazing is the primary activity on land that drains to the open canal sections of the South Bay Aqueduct upstream of the WTP intake.

An assessment of the Patterson Pass WTP drinking water source was conducted by Archibald and Wallberg Consultants. Information used in the assessment includes aerial photographs and sanitary surveys of the State Water Project. In addition, a field survey of the area draining to Bethany Reservoir and the South Bay Aqueduct was conducted in March 2002 and Department of Water Resources staff responsible for maintaining the South Bay Aqueduct were interviewed. A copy of the complete assessment is available for review at Zone 7 Water Agency's office located at 5997 Parkside Drive in Pleasanton.

Many of the contaminants, such as pathogens, organic carbon, and nutrients, detected in the Patterson Pass WTP water supply originate in the Sacramento and San Joaquin watersheds and the Delta. There are numerous contaminant sources such as agricultural drainage, wastewater treatment plant discharges, and urban runoff. Recreational usage of the water also contributes contaminants to the Delta. Seawater intrusion contributes salt and bromide to the water supply.

The source water is also vulnerable to cattle grazing in the watersheds of Bethany Reservoir and along the open canal sections of the aqueduct. Cattle have direct access to the western shore of Bethany Reservoir and may be a source of pathogens and other contaminants.

Although the South Bay Aqueduct water source is considered vulnerable to these activities, it is important to note that there are multiple barriers for physical removal of contaminants and disinfection of the source water at the Patterson Pass WTP. All drinking water standards are met in the treated water that is delivered to customers in the Zone 7 Water Agency service area. Zone 7 Water Agency is working with the other South Bay Aqueduct Contractors to identify potential watershed management practices that could improve water quality and reduce the significance of the potential contaminant sources.

ATTACHMENT B – GPS COORDINATES

Drinking Water Source Location

Public Water System Name: Alameda County Flood Control and Water Conservation District,
Zone 7 Water Agency
System No: 0110010
Name of Source: Patterson Pass WTP Raw Water Reservoir
Source No.: 0110010-009
Date: 8/1/02
Name of person completing form: Elaine Archibald, Archibald & Wallberg Consultants

LOCATION OF INTAKE: (decimal degrees)

Latitude, degrees N: 37.6967231

Longitude, degrees W: -121.6841081

Horizontal Datum: NAD27

DESCRIPTION:

Patterson Pass Reservoir on South Bay Aqueduct.

METHOD OF DETERMINING LOCATION:

Global Positioning System
Ashtech Reliance SCA-12 Receiver
Accuracy \pm 6 feet