File 140945

April 2013

DRAFT
Environmental Impact Report

Volume 3 of 3

For the
San Francisco Public Utilities Commission's

Regional Groundwater Storage and Recovery Project

Important Dates:

Draft EIR Publication Date:	April 10, 2013
Draft EIR Hearing Dates:	May 14, 2013 in San Mateo County
	May 16, 2013 in San Francisco
Draft EIR Public Comment Period:	April 10, 2013 through May 28, 2013

San Francisco Planning Department
Case No. 2008.1396E
State Clearinghouse No. 2005092026

Regional Groundwater Storage and Recovery Project

Draft Environmental Impact Report
Volume 3 of 3

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Written comments should be sent to:

Sarah Jones, Acting Environmental Review Officer
Regional Groundwater Storage and Recovery Project
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

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Volume 3 – Appendices

Appendix A

Notice of Preparation

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Notice of Preparation of an Environmental Impact Report

Date:	June 24, 2009
Case No.:	~~[illegible]~~ 2008.1396E
Project Title:	**Regional Groundwater Storage and Recovery Project**
Location:	The proposed Project is located in the South Westside Groundwater Basin in San Mateo County, and the proposed facilities will be constructed in northern San Mateo County. The South Westside Groundwater Basin is located in San Mateo County within the larger Westside Groundwater Basin which underlies both San Francisco and San Mateo counties. Proposed facilities are located in the cities of South San Francisco, Colma, San Bruno, Millbrae, and Daly City and in unincorporated portions of San Mateo County.
BPA Nos.:	N/A
Zoning:	N/A
Block/Lot:	N/A
Lot Size:	Various
Project Sponsor	Greg Bartow, San Francisco Public Utilities Commission (415) 934-5724
Lead Agency:	San Francisco Planning Department
Staff Contact:	Diana Sokolove – (415) 575-9046 diana.sokolove@sfgov.org

PROJECT DESCRIPTION

The purpose of the Regional Groundwater Storage and Recovery (GSR) Project (Project or proposed Project) is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. This new dry-year water supply would be made available to the cities of Daly City and San Bruno, the California Water Company (Cal Water) in its South San Francisco service area (collectively referred to as Partner Agencies) and San Francisco Public Utilities Commission (SFPUC) wholesale water customers.

The SFPUC proposes to provide surface water, when available, to Partner Agencies, to be used by these agencies in lieu of pumping groundwater during normal and wet rainfall years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. This supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of pumping by Partner Agencies would ultimately increase groundwater storage within the South Westside Groundwater Basin by up to 61,000 acre-feet (AF) (approximately 20 billion gallons). Stored groundwater would be utilized by pumping new Project wells during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would construct new groundwater production well facilities, which would be operated by either the Partner Agencies or SFPUC for pumping groundwater at a rate of 7.2 million gallons per day during dry years. The proposed Project would help meet the water supply reliability needs of all SFPUC customers during dry years and may provide some increased level of regional operational flexibility to respond and restore service during unplanned outages.

The proposed Project is one of several facility improvement projects identified in the San Francisco Region as part of the SFPUC's Water System Improvement Program (WSIP). The WSIP was adopted by the SFPUC in October 2008 to improve the SFPUC's regional water system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area and establishes level of service goals and system performance objectives. The proposed Project's primary contribution to the WSIP goals is its ability to meet the water supply needs of SFPUC customers during drought years.

The proposed Project consists of 1) cooperative management of surface water and groundwater to optimize the water demand and supply balance; and 2) construction and operation of groundwater production well facilities on 16 of 19 potential sites in northern San Mateo County. Each groundwater well facility site would contain a groundwater production well, pump station, underground distribution piping, and utility connections. Some well facility sites would contain groundwater disinfection units and groundwater treatment facilities. Well facilities would connect to distribution systems for Daly City, San Bruno, Cal Water, and SFPUC. In addition, the Westlake Pump Station in Daly City may need to be upgraded and treatment facilities may need to be added to several well facility sites.

FINDING

This project may have a significant effect on the environment and an Environmental Impact Report is required. This determination is based upon the criteria of the State CEQA Guidelines, Sections 15063 (Initial Study), 15064 (Determining Significant Effect), and 15065 (Mandatory Findings of Significance), and for the reasons documented in the attached project description and description of potential environmental effects. (Documents are also available online at: http://www.sfgov.org/planning/mea.)

PUBLIC SCOPING PROCESS

Pursuant to the State of California Public Resources Code Section 21083.9 and CEQA Guidelines Section 15206, a public scoping meeting will be held to receive oral comments concerning the scope of the EIR at the following location, date, and time.

DATE: Thursday, July 9, 2009

6:15-7:00 p.m. Informational Session

7:00 p.m. Scoping meeting

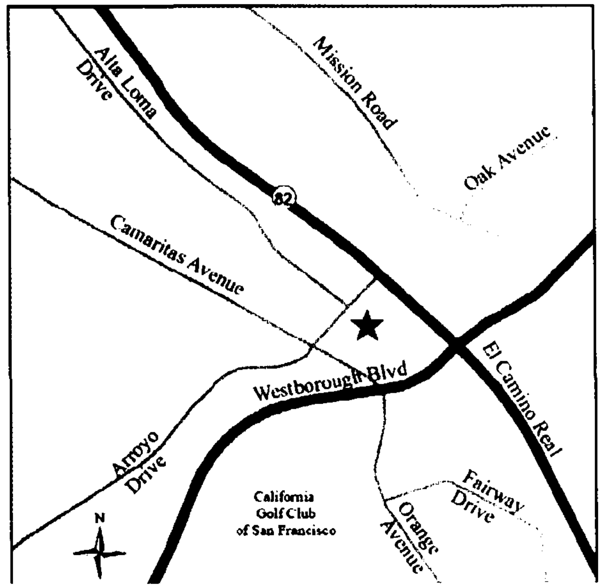
LOCATION:

South San Francisco Municipal Services Building

Community Room

33 Arroyo Drive

South San Francisco, CA



Written comments will also be accepted at this meeting and until the close of business on **July 28, 2009**. Written comments should be sent to Bill Wycko, Environmental Review Officer, Regional Groundwater Storage and Recovery Project Scoping Comments, San Francisco Planning Department, 1650 Mission Street, Suite 400, San Francisco, CA 94103. They also may be submitted by fax to (415) 558-6409 or sent by email to diana.sokolove@sfgov.org.

If you work for a Responsible or Trustee Agency, we need to know the views of your agency regarding the scope and content of the environmental information that is germane to your agency's statutory responsibilities in connection with the proposed Project. Your agency may need to use the EIR when considering a permit or other approval for this proposed Project. Please include the name of a contact person in your agency.

June 24, 2009
Date

for
Bill Wycko
Environmental Review Officer

Regional Groundwater Storage and Recovery Project

2008.1396E
~~Case No. 2005.0164E~~

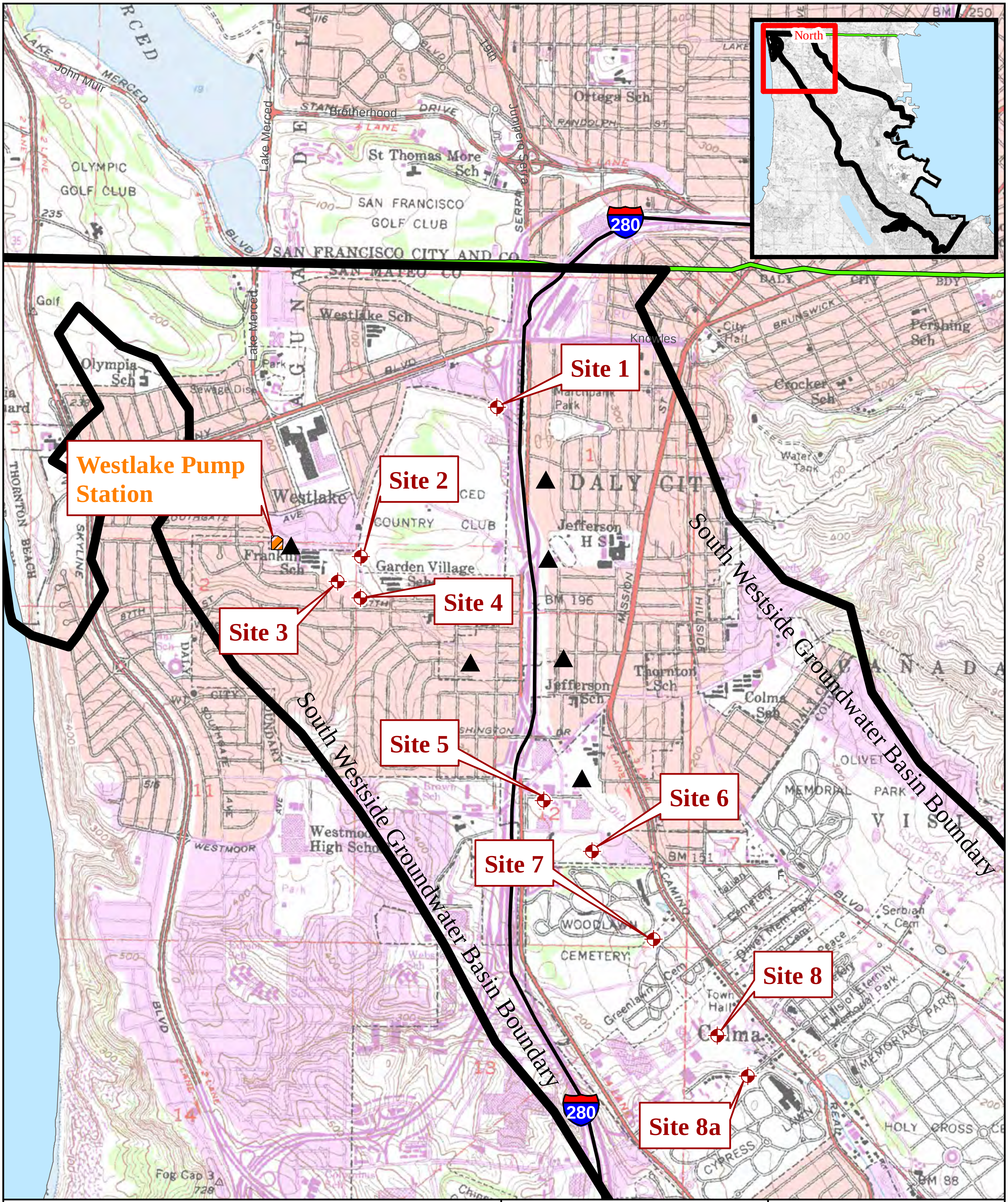
1.0 OVERVIEW AND BACKGROUND

The San Francisco Public Utilities Commission (SFPUC) is proposing the Regional Groundwater Storage and Recovery (GSR) Project (Project or proposed Project), which would be located in northern San Mateo County, California (see Figures 1, 2, and 3). To meet California Environmental Quality Act (CEQA) requirements, the San Francisco Planning Department's Major Environmental Analysis Division (MEA) will prepare and distribute an Environmental Impact Report (EIR) describing and analyzing the environmental effects of the proposed Project. This Notice of Preparation (NOP) provides a description of the Project background, a brief description of the proposed Project elements, and describes some of the proposed Project's potential environmental effects.

The purpose of the proposed Project is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. This new dry-year water supply would be made available to the cities of Daly City and San Bruno, the California Water Company (Cal Water) in its South San Francisco service area (collectively designated as Partner Agencies) and SFPUC wholesale water customers.

SFPUC proposes to provide excess surface water when available to the Partner Agencies to be used by these agencies in lieu of pumping groundwater during normal and wet years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. This supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of groundwater pumping by Partner Agencies would ultimately increase groundwater storage within the South Westside Groundwater Basin by up to 61,000 acre-feet[1] (AF) (approximately 20 billion gallons). Stored

[1] The SFPUC plans for an 8.5-year drought. Over this 8.5-year period, the SFPUC anticipates it will exercise its dry-year supplies after the first year of the drought. Therefore, the 61,000 AF of storage is assumed to be used over 7.5 years of the design drought, with wells operating at a maximum capacity of 7.2 MGD.



Legend

- Proposed Well Facility Sites
- Partner Agency Well
- County Boundary
- Westlake Pump Station
- South Westside Groundwater Basin

Scale: 0 — 1,000 — 2,000 Feet
1" = 2000'

N

Project Location Map-North

Regional Groundwater Storage and Recovery Project

Figure 1

Source: SFPUC and Kennedy/Jenks

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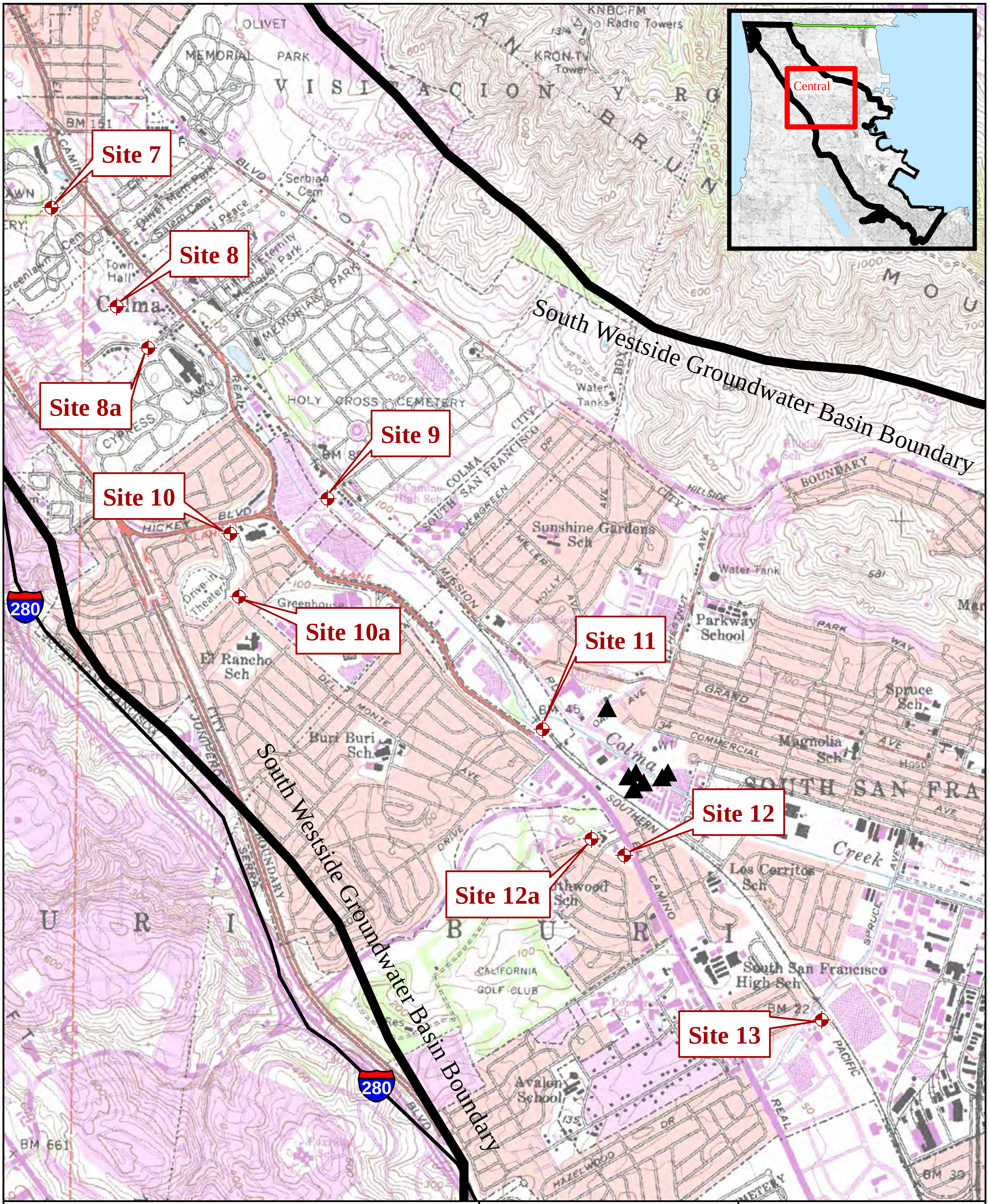

Legend

- Proposed Well Facility Sites
- Partner Agency Well
- South Westside Groundwater Basin

0 1,000 2,000

Scale Feet

1" = 2000'

N

Project Location Map-Central

Regional Groundwater Storage and Recovery Project

Figure 2

Source: SFPUC and Kennedy/Jenks

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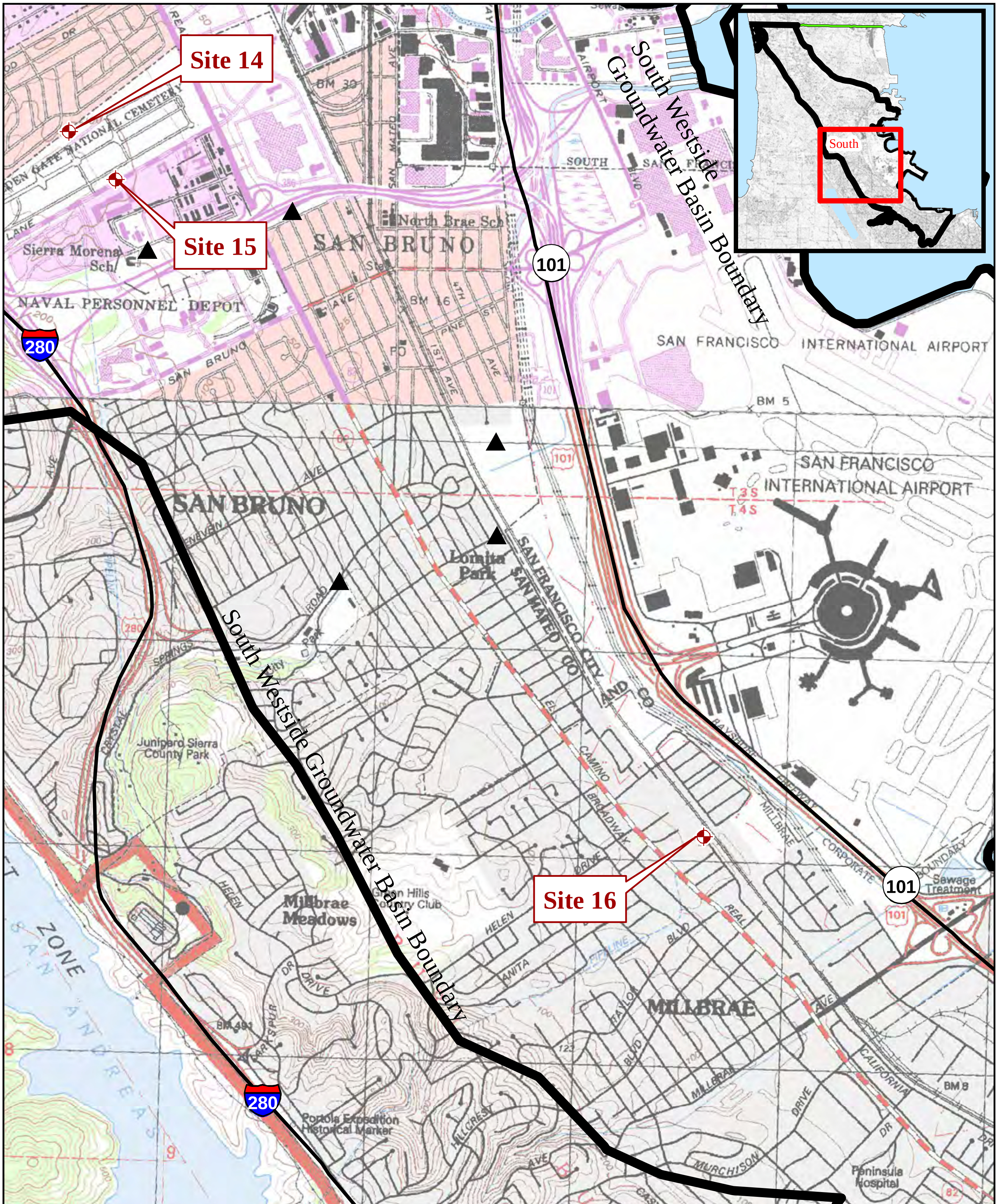

Legend

Proposed Well Facility Sites

Partner Agency Well

South Westside Groundwater Basin

0 1,000 2,000

Scale Feet

1" = 2000'

N

Project Location Map-South

Regional Groundwater Storage and Recovery Project

Figure 3

Source: SFPUC and Kennedy/Jenks

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groundwater would be utilized by pumping new Project wells during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would create new groundwater production well facilities, which would be operated by either the Partner Agencies or SFPUC for pumping groundwater at a rate of up to 7.2 million gallons per day (MGD) during dry years. The proposed Project would help meet the water supply reliability needs of all SFPUC customers during dry years and may provide some increased level of regional operational flexibility to respond and restore service during unplanned outages.

The proposed Project is a component of the SFPUC's proposed Water System Improvement Program (WSIP) (see www.sfwater.org). The basic goals of the WSIP are to increase the reliability of the regional water system with respect to water quality, seismic response, delivery, and water supply to meet water delivery needs in the service area. A Program EIR (PEIR) for the WSIP was certified by the San Francisco Planning Commission, and the WSIP was adopted by the SFPUC on October 30, 2008. The PEIR addresses the potential environmental impacts of the WSIP facilities on a programmatic level and evaluates regional water supply alternatives. The proposed Project, which is the subject of this NOP, is one component of the WSIP[2]; implementation of this proposed Project would contribute to meeting the WSIP's overall goals and objectives.

For purposes of the WSIP PEIR, the SFPUC's regional water system facilities were subdivided into six regions: Hetch Hetchy, San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco. The proposed Project would occur in the San Francisco Region.

2.0 PROPOSED PROJECT FACILITIES

The proposed Project facilities would consist of new groundwater production well facilities within the South Westside Groundwater Basin (Basin); the facilities are designed to withdraw up to 7.2 MGD from the volume of stored groundwater directly resulting from Project-related reduced groundwater

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[2] The Regional Groundwater Storage and Recovery Project was listed as the Conjunctive Use Project in the PEIR.

pumping in the Basin by Partner Agencies during normal and wet years. Up to 16 new groundwater well facilities would be constructed on 16 of the 19 potential sites in northern San Mateo County to supply the needed withdrawal capacity. Well facilities would be connected to Daly City, San Bruno, Cal Water, or SFPUC distribution systems. In addition, the existing Westlake Pump Station in Daly City may need to be modified and treatment facilities may need to be added.

Each groundwater well facility site would contain a groundwater production well, pump station, underground distribution piping, and utility connections. Each well facility would have a disinfection unit as required, unless it is near an existing disinfection unit that can accommodate the additional volume, in which case the well would be connected to the existing unit. Well facility sites where the groundwater may need treatment have been designed with appropriate treatment facilities.

3.0 ENVIRONMENTAL REVIEW PROCESS

As described above, the San Francisco Planning Commission certified the WSIP PEIR in October 2008. The PEIR addressed the potential environmental impacts of the WSIP facilities on a programmatic level and evaluated regional water supply alternatives. The PEIR is available on the San Francisco Planning Department website at www.sfgov.org/planning/mea.

The San Francisco Planning Department will prepare a project-specific EIR to evaluate the environmental effects of the proposed Project. The EIR will be prepared in compliance with the CEQA Guidelines Section 15161 and will address project-specific construction and operational impacts.

The first step in the environmental review process is the formal public scoping process, for which this NOP has been prepared. Following the public scoping period, a Draft EIR will be prepared and circulated for a 45-day public review period. Public comments on the Draft EIR will be accepted in writing during the review period or verbally at a formal public hearing to be held by the San Francisco Planning Commission. The San Francisco Planning Department then will prepare written responses to comments on environmental issues raised during the public review period, and a Response to Comments document will be prepared. That document will be considered by the San Francisco Planning

Commission, along with the Draft EIR and any revisions to the draft based on the response to comments, for certification as a Final EIR.

4.0 PUBLIC SCOPING MEETING

The San Francisco Planning Department will hold a public scoping meeting at the following location, date, and time.

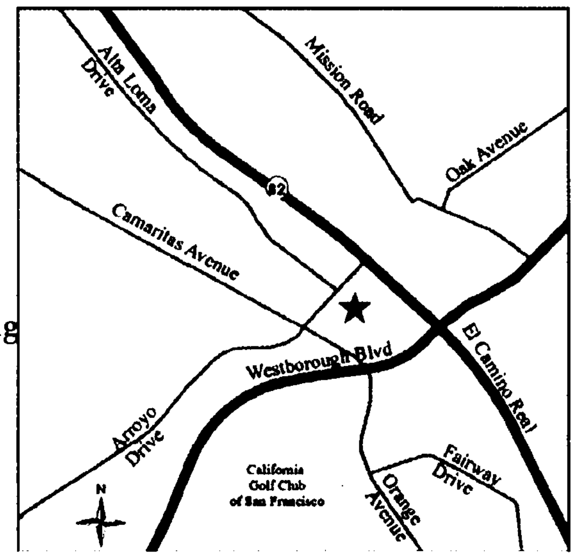
DATE: Thursday, July 9, 2009

6:15-7:00 p.m. Informational Session

7:00 p.m. Scoping meeting

LOCATION:

South San Francisco Municipal Services Building
Community Room
33 Arroyo Drive
South San Francisco, CA



The purpose of this meeting is to assist the Planning Department with its review of the proposed scope and content of the EIR as summarized in this NOP. The public will be given the opportunity to provide comment for consideration. The San Francisco Planning Department also will accept written comments on the scope of the EIR at the meeting or by mail, email, or fax until close of business (5:00 p.m.) on **July 28, 2009**. Written comments may be submitted by mail to the San Francisco Planning Department, Attn: Bill Wycko, Environmental Review Officer, Regional Groundwater Storage and Recovery Project Scoping Comments, 1650 Mission Street, Suite 400, San Francisco, CA 94103. They also may be submitted by fax to (415) 558-6409, or sent by email to diana.sokolove@sfgov.org.

5.0 PROJECT DESCRIPTION

5.1 Project Location

The proposed Project is located in the South Westside Groundwater Basin in San Mateo County, and the proposed facilities will be constructed in northern San Mateo County as shown in Figures 1, 2, and 3. The South Westside Groundwater Basin is located in San Mateo County within the larger Westside Groundwater Basin[3], which underlies both San Francisco and San Mateo counties. The Project is also located within the water service areas for the cities of Daly City, San Bruno, and Millbrae and within the Cal Water service area, which includes portions of South San Francisco, Colma, and unincorporated San Mateo County.

Groundwater well facilities would be constructed and operated at up to 16 locations in the cities of Colma, Daly City, South San Francisco, San Bruno, Millbrae, and unincorporated San Mateo County (see Figures 1, 2, and 3). Well facilities would be connected to existing water distribution pipelines owned by Daly City, San Bruno, Cal Water, and SFPUC. The Project also includes an upgrade of the existing Westlake Pump Station in Daly City to serve the proposed new well facility sites.

5.2 Project Objectives

The proposed Project is a regional groundwater storage and recovery project that is part of the SFPUC's WSIP. The overall goals of the WSIP for the regional water system are to maintain high-quality water; reduce vulnerability to earthquakes; increase water delivery reliability; meet customer water supply needs; enhance sustainability; and achieve a cost-effective, fully operational system. The proposed Project's primary contribution to the WSIP goals is its ability to meet the water supply needs of SFPUC customers during drought years. In addition,

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[3] The Westside Groundwater Basin extends from western San Francisco south into San Mateo County. The Basin has an area of approximately 40 square miles and underlies Daly City, Colma, South San Francisco, San Bruno, Millbrae, and Burlingame. The Westside Groundwater Basin has been administratively divided at the San Francisco County-San Mateo County line. This is a political boundary, not a physical boundary. The portion of the basin that lies within San Francisco County is referred to as the North Westside Groundwater Basin. The portion of the basin that lies within San Mateo County is referred to as the South Westside Groundwater Basin. The Project would occur solely within the South Westside Groundwater Basin.

the Project may provide some increased level of regional operational flexibility to respond and restore service under unplanned outages.

The specific objectives of the proposed Project are to:

- Cooperatively manage the South Westside Groundwater Basin through the coordinated use of SFPUC surface water and the groundwater pumped by the Partner Agencies;
- Provide increased SFPUC surface water to the Partner Agencies in normal and wet years, resulting in a reduction of groundwater pumping by these agencies and an increase in groundwater storage in the South Westside Groundwater Basin;
- Increase the pumping capacity from the South Westside Groundwater Basin by up to 7.2 MGD to supply water during dry years and emergencies; and
- Provide a new dry-year groundwater supply for SFPUC customers and increase water supply reliability during the 8½-year design drought cycle.

5.3 Proposed Project

The proposed Project is a groundwater storage and recovery project, which includes the operation of new groundwater production wells and associated distribution and treatment facilities. This section includes a description of these proposed Project components.

5.3.1 *Groundwater Storage and Recovery*

The Partner Agencies currently supply potable water to their customers through a combination of groundwater from the South Westside Groundwater Basin and purchase of SFPUC surface water. The proposed Project would provide additional SFPUC surface water to the Partner Agencies during normal and wet years when sufficient surface water supplies are available. The Partner Agencies would reduce their groundwater pumping by a comparable amount and allow the groundwater basin to recharge naturally during these periods.

Figure 4 illustrates the increase in groundwater storage expected from a reduction in pumping during normal and wet years, as well the decrease in groundwater storage projected from an increase in pumping during dry years.

During normal and wet years, the volume of groundwater in the South Westside Groundwater Basin would naturally increase due to the reduced groundwater pumping, eventually reaching an increased storage volume of up to 61,000 AF. During dry or drought years, the Partner Agencies and SFPUC would pump previously stored groundwater. This new dry-year water supply would be made available to both the Partner Agencies and SFPUC wholesale customers under the terms of the Shortage Allocation Plan between the SFPUC and its wholesale customers[4]. A groundwater storage and recovery agreement would be negotiated by and between the SFPUC and Partner Agencies for groundwater and surface water management. Specifically, the agreement would cover water accounting; ownership principles; and operation, maintenance and replacement of facilities.

5.3.2 Production Wells and Associated Facilities

The proposed Project includes new groundwater production well facilities within the South Westside Groundwater Basin to withdraw the increased volume of stored groundwater at a rate of 7.2 MGD. Up to 16 new groundwater well facilities would be constructed on 16 of the 19 potential sites in northern San Mateo County. Of the 19 sites, 5 well facilities would connect to Daly City's distribution system, 3 well facilities would connect to San Bruno's distribution system, 4 well facilities would connect to Cal Water's distribution system, and 7 well facilities would connect to the SFPUC distribution system. In addition, the Westlake Pump Station in Daly City may be expanded and additional treatment facilities added.

Each groundwater well facility site would contain a groundwater production well, a pump station, underground distribution piping, and

[4] The Shortage Allocation Plan identified a water allocation method to be used to determine the share of water for wholesale customers during shortages caused by drought.

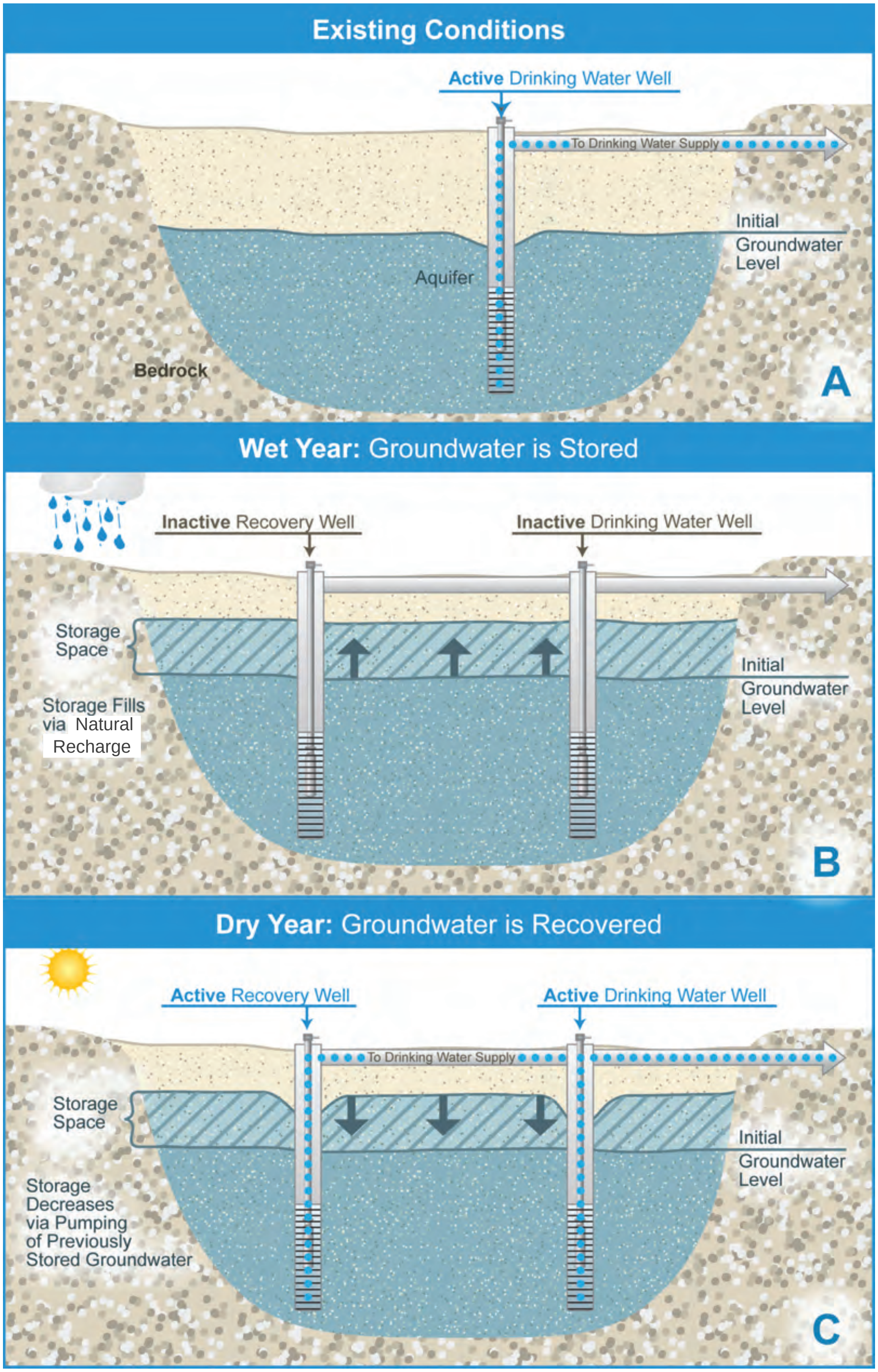

Figure (A) reflects the existing groundwater conditions, showing available storage space above the aquifer. In (B) the upward arrows represent the filling of the storage space with groundwater during wet years; in (C) the downward arrows represent the decline in stored water during dry years. The "Drinking Water Wells" represent the existing wells operated by the Cities of San Bruno and Daly City and California Water Service Company. The "Recovery Wells" represent the new wells that are proposed as part of the Project.

Groundwater Storage and Recovery

Regional Groundwater Storage and Recovery Project

Figure 4

utility connections. Each well facility also would have a disinfection unit, unless it is located near an existing disinfection unit that can accommodate the additional volume, in which case the well would be connected to the existing unit. Well facility sites where the groundwater may need treatment have been designed with appropriate treatment facilities (e.g., disinfection and manganese treatment). The facilities and the nature, extent and anticipated duration of construction activities are described further below.

Prior to confirming the final selected sites and full development of the groundwater well facilities, monitoring wells and test wells may be installed at the well facility sites to gather information about local groundwater characteristics and to determine the technical feasibility of each of the sites to produce sufficient volumes and quality of water for operation of a groundwater production well. If selected, sites would be converted from test wells to permanent production wells; pumps would be added, well enclosures would be built (fencing or building), disinfection units and treatment facilities would be constructed as needed, and utility and distribution pipelines would be installed.

A list of the 19 potential well facility sites and pump station upgrade is provided in Table 1.

TABLE 1
Well Facility Locations

Site ID[a]	Site Name	Location
1	Lake Merced Golf Course	Daly City
2	Park Plaza Meter	Daly City
3	Ben Franklin Intermediate School	Unincorporated San Mateo County (Broadmoor)
4	Garden Village Elementary School	Unincorporated San Mateo County (Broadmoor)
5	Right-of-Way at Serra Bowl	Daly City
6	Right-of-Way at Colma BART	Daly City
7	Right-of-Way at Colma Boulevard	Colma
8	Right-of-Way at Serramonte Boulevard	Colma

TABLE 1
Well Facility Locations

Site ID[a]	Site Name	Location
8a	Standard Plumbing Supply	Colma
9	Treasure Island Trailer Court	South San Francisco
10	Right-of-Way at Hickey Boulevard	South San Francisco
10a	Alta Loma Drive	South San Francisco
11	South San Francisco Main Area	South San Francisco
12	Funeral Home	South San Francisco
12a	Funeral Home	South San Francisco
13	South San Francisco Linear Park	South San Francisco
14	Golden Gate National Cemetery	San Bruno
15	Golden Gate National Cemetery	San Bruno
16	Millbrae Corporation Yard	Millbrae
PS	Westlake Pump Station Upgrade	Daly City

a. The EIR will evaluate the environmental effects of the development of all 19 well facility sites, even though a maximum of 16 well facilities would be constructed.

Well Station Design

The SFPUC has considered institutional, regulatory, operational, maintenance, and technical information in the design of the well stations. Three well station types are included in the proposed Project:

- Type 1 - well only, building or fenced enclosure;
- Type 2 - well plus chemical treatment building; and
- Type 3 - well plus chemical treatment and filtration building.

Site-specific well station design characteristics are listed in Table 2 and described in detail below. These characteristics include proposed building type, pump type, water distribution system connection point, groundwater disinfection location, and the method that would be used to achieve agency-specific water quality goals (i.e., blending with surface water or treatment).

TABLE 2
Site-Specific Well Station Characteristics

Site ID	Site Description	Well Station Type[a]	Pump Type	Connection Point	Alternate Connection Point	Disinfection Location	Method for Achieving Water Quality Goals
1	Lake Merced Golf Club	Type 2	Above-ground	SFPUC San Andreas Pipeline #2	Daly City	At site	Blending[b]
2	Park Plaza Meter	Type 1 with fenced enclosure	Submersible	Daly City	SFPUC Sunset Supply	Westlake Pump Station	Blending
3	Ben Franklin Intermediate School	Type 1 with fenced enclosure	Submersible	Daly City	SFPUC Sunset Supply	Westlake Pump Station	Blending
4	Garden Village Elementary School	Type 1 with fenced enclosure	Submersible	Daly City	SFPUC Sunset Supply	Westlake Pump Station	Blending or iron/manganese treatment
5	Right-of-Way at Serra Bowl	Type 2	Above-ground	Daly City	Cal Water	At site	Blending or iron/manganese treatment
6	Right-of-Way at Colma BART	Type 2	Above-ground	Cal Water	SFPUC Pipeline	At site	Blending or iron/manganese treatment
7	Right-of-Way at Colma Boulevard	Type 2	Above-ground	Cal Water	SFPUC Pipeline	At site	Blending or iron/manganese treatment
8	Right-of-Way at Serramonte Boulevard	Type 2	Above-ground	Cal Water	SFPUC Pipeline	At site	Blending or iron/manganese treatment
8a	Standard Plumbing Supply	Type 2	Above-ground	Cal Water	SFPUC	At site	Blending
9	Treasure Island Trailer Court	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	None	At site	Blending

TABLE 2
Site-Specific Well Station Characteristics

Site ID	Site Description	Well Station Type[a]	Pump Type	Connection Point	Alternate Connection Point	Disinfection Location	Method for Achieving Water Quality Goals
10	Right-of-Way at Hickey Boulevard	Type 2	Above-ground	Daly City	SFPUC San Andreas #2	At site	Blending
10a	Alta Loma Drive	Type 2	Above-ground	SFPUC San Andreas Pipeline #2	Cal Water	At site	Blending
11	SSF Main Area	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	Cal Water	At site	Blending
12	Funeral Home	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	Cal Water or other SFPUC pipeline	At site	Blending
12a	Funeral Home	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	Cal Water or other SFPUC pipeline	At site	Blending
13	SSF Linear Park	Type 3	Above-ground	San Bruno	Cal Water, SFPUC, or other San Bruno	At site	Blending or iron/manganese treatment
14	Golden Gate National Cemetery	Type 1 with building enclosure	Above-ground	San Bruno	SFPUC pipeline	At site	Blending or iron/manganese treatment
15	Golden Gate National Cemetery	Type 3	Above-ground	San Bruno	SFPUC pipeline	At site	Blending or iron/manganese treatment
16	Millbrae Corp Yard	Type 2	Above-ground	SFPUC Crystal Springs Pipeline #2	None	At site	Blending

a. Type 1 is Well Only; Type 2 is Well plus Chemical Treatment Building; Type 3 is Well plus Chemical Treatment and Filtration Building; see text below for further description of conceptual layouts.

b. Blending is the mixing of groundwater with other potable supply water

Buildings would be about 15 feet tall and constructed of concrete block. Acoustical louvers for noise reduction would be used. The buildings would be painted in neutral colors with anti-graffiti coating.

It is anticipated that all outdoor site lighting would be activated by motion-controlled sensors, with manual switching available for as-needed night operations. Facilities would be designed to meet California's energy efficiency standards outlined in Title 24 of the California Code of Regulations and use recycled materials to the extent possible.

Type 1 Conceptual Layout: Well-Only. The conceptual layout for the "well-only" type includes an approximately 40-foot by 20-foot building or fenced enclosure to house the wellhead, pump, piping, and associated electrical and control equipment.

Type 2 Conceptual Layout: Well plus Chemical Treatment. The conceptual layout for the "well with chemical treatment" type would consist of a 40-foot by 20-foot building to house the wellhead, pump, pipeline, and associated electrical and control equipment, plus an approximately 15-foot by 15-foot building extension for chemical storage and handling. Space would be provided onsite for disinfection, pH adjustment, and fluoride addition if needed.

Type 3 Conceptual Layout: Well plus Chemical Treatment and Filtration. The conceptual layout for the "well with chemical treatment and filtration" type would be similar to Type 2 but with the addition of a filtration system. The building dimensions would be approximately 25 feet by 80 feet. Filtration would be located only at well facilities that require manganese and/or iron removal. This well station type would be larger than the other types to provide space for the wellhead, treatment facilities, and filtration vessels. The filtration system consists of a series of vertical pressure vessels. The number and size of the pressure vessels would depend on the well yield and the number of wells connected to the filtration system. The backwash water from the system would connect to a nearby sanitary sewer. It is anticipated that filters would be backwashed, on average, once a day for 4 minutes.

Well Pumps

Each well facility site would contain either a submersible or above-ground pump. The selection of the pump type is based on the preference of the Partner Agency responsible for well operation. In most cases, the wells would be equipped with above-ground pumps. In comparison to submersible motors, above-ground motors are more efficient, have a longer service life, are more durable in cases where variable frequency drives are required, and are more accessible and thus easier to maintain. In cases where noise, visibility, or lack of space is an issue, submersible pumps would be used. Submersible motors are quieter to operate, but more difficult to maintain, because maintenance requires the removal of the entire pump assembly. Any wells that are in fenced enclosures (i.e., without buildings) have been designated for submersible pumps.

Utility and Distribution Piping

Underground piping would connect the wells to the local distribution systems or SFPUC water distribution system. In addition, underground piping would connect well facilities to the storm drain system and/or the sanitary sewer system to allow discharge of the initial flush of water. Chloraminated water would be de-chlorinated or sent to the local sanitary sewer system. Backwash from the manganese treatment facilities would also be sent to the local sanitary sewer system. The piping for all selected sites would consist of a total of approximately 4,600 feet of 6-inch pipe and 12,500 feet of 8-inch pipe. In general, the pipeline route would be excavated to a depth of 6 feet. The maximum width of the pipeline work area (including the trenches) would be 20 feet. The pipelines would be constructed using conventional open-cut trenching techniques. Above or underground electrical lines would also be installed from the groundwater well facilities to the nearest power source (PG&E facilities). The dimension of the trenches for the underground electrical lines would be smaller than those of the water pipelines.

Westlake Pump Station Upgrade

Upgrades to the Westlake Pump Station may be necessary to serve the well stations at Sites 2, 3 and 4. The upgrades would include new chemical storage tanks, replaced or upgraded chemical metering pumps, a resized transformer, and up to three new booster pumps to deliver the additional water into the distribution system.

5.3.3 *Construction Methods*

Monitoring Wells, Geotechnical Borings, and Test Wells

Prior to the selection and full development of the groundwater production well sites, monitoring wells and test wells may be installed and geotechnical borings may be drilled at the well facility sites to gather information about local groundwater characteristics and to determine the technical feasibility of each of the sites to produce sufficient volumes and quality of water for operation of a groundwater production well. Depending upon the results of the testing, well facility sites would be selected, and test wells converted to permanent production wells, which would consist of full development of the well facility site to include the addition of pumps to the wells, the addition of enclosures around the well, installation of disinfection units and treatment facilities as needed, and installation of utilities and distribution pipelines.

In the event that additional monitoring or test wells are needed, the selected site would need to be cleared of vegetation and graded for installation and drilling of the borehole. For monitoring wells, a borehole would be drilled to a depth of approximately 750 feet below ground. For test wells, one steel casing would be installed to a depth of approximately 50 feet, with a borehole drilled to a depth of approximately 550 to 700 feet. Equipment used for well drilling and construction would include a mounted drill rig on a support truck, pump and pick up trucks or trailers and similar equipment. Construction of a monitoring well would be completed in approximately three weeks, with construction activities occurring between 8:00 AM and 7:00 PM Monday through Friday only. Construction and testing of test wells would require approximately 4 weeks. Drilling would extend for about a week both during the day and night. If the results of the test wells were favorable and the wells were selected as permanent production well sites, then development of production well facilities would occur, as described below.

Additional geotechnical borings may be required and would be drilled to a depth of approximately 50 feet below ground surface (deeper if fill or soft soil is encountered). A boring would be completed in approximately two days. Drilling activities would occur between 8:00 AM and 7:00 PM Monday through Friday only.

Construction of Well Station Facilities

Each well facility site would include a construction staging area; some sites may have two optional locations for staging areas. The minimum size of the staging area would be 1,500 square feet. Staging areas would be fenced. Any temporary spoils (excavated material) storage would occur inside the staging areas.

Construction of facilities at the well sites would require site clearing and grubbing. Site excavation and grading would be minor, with grading to a maximum depth of 5 feet for the building foundation (if the well facility includes a building) and utilities underneath the building. After the foundation and utilities connections are constructed, the remainder of the building would be constructed and the well pump and other equipment installed, as needed. No significant near-surface groundwater is expected at any site; therefore dewatering for construction of project facilities is not anticipated. Diesel generators with self-contained fuel tanks may be used during construction. Construction equipment is expected to include: a front end loader, backhoe/excavator, fork lift, telescopic crane, cement mixer, concrete pump truck, compactor, hauling trucks, pump-setting rig, and arc welder.

It is estimated that during the peak construction period, the maximum number of construction workers at any one site would be 15.

Construction of Distribution and Utility Connections

In general, the pipeline routes would be excavated up to a depth of 6 feet. The width of pipeline construction zones would be generally 20 feet, and the width of the electrical connection construction zones would be less than 20 feet. The pipelines would be constructed using conventional open-cut trenching techniques. Construction equipment is expected to include: an excavator, front-end loader, hauling trucks, compactor, asphalt trucks, and arc welder. Diesel generators with self-contained fuel tanks may be used during construction. At some sites, pipeline excavation would generate excess soil (called spoils) that would be reused onsite (for engineering fill) or disposed of at a Class III non-hazardous waste disposal site. After pipeline placement, the trenched area would be restored to its original condition.

5.3.4 *Operation and Maintenance*

Project operations would be designed to allow natural recharge of the South Westside Groundwater Basin through reduced Partner Agency groundwater pumping, to provide up to 61,000 AF of increased groundwater in storage to be used by the SFPUC and Partner Agencies during drought conditions.

Figure 5 illustrates how the Project would change the source of water supply for the Partner Agencies. During normal and wet years, the portion of water supply coming from SFPUC surface water would increase compared to the existing condition. During dry years, the portion of water supply coming from groundwater would increase compared to the existing condition. For SFPUC wholesale water customers, the source of water supply would not change during normal and wet years; but the portion of groundwater delivered to some SFPUC customers would increase during dry years, compared to existing conditions.

An accounting of additional storage volumes (called the SFPUC Storage Account) would track the amount of water that has been stored during the normal and wet years and the amount of water pumped during dry years. The specific volumes shown in Figure 5 are based on historic rainfall and hydrology (MWH, 2007), but actual volumes in any given year would vary depending on several factors, including: 1) the final location and capacity of the project well facilities, 2) the availability of additional stored water in the SFPUC Storage Account, and 3) direction from the Operating Committee[5] regarding which wells should be used.

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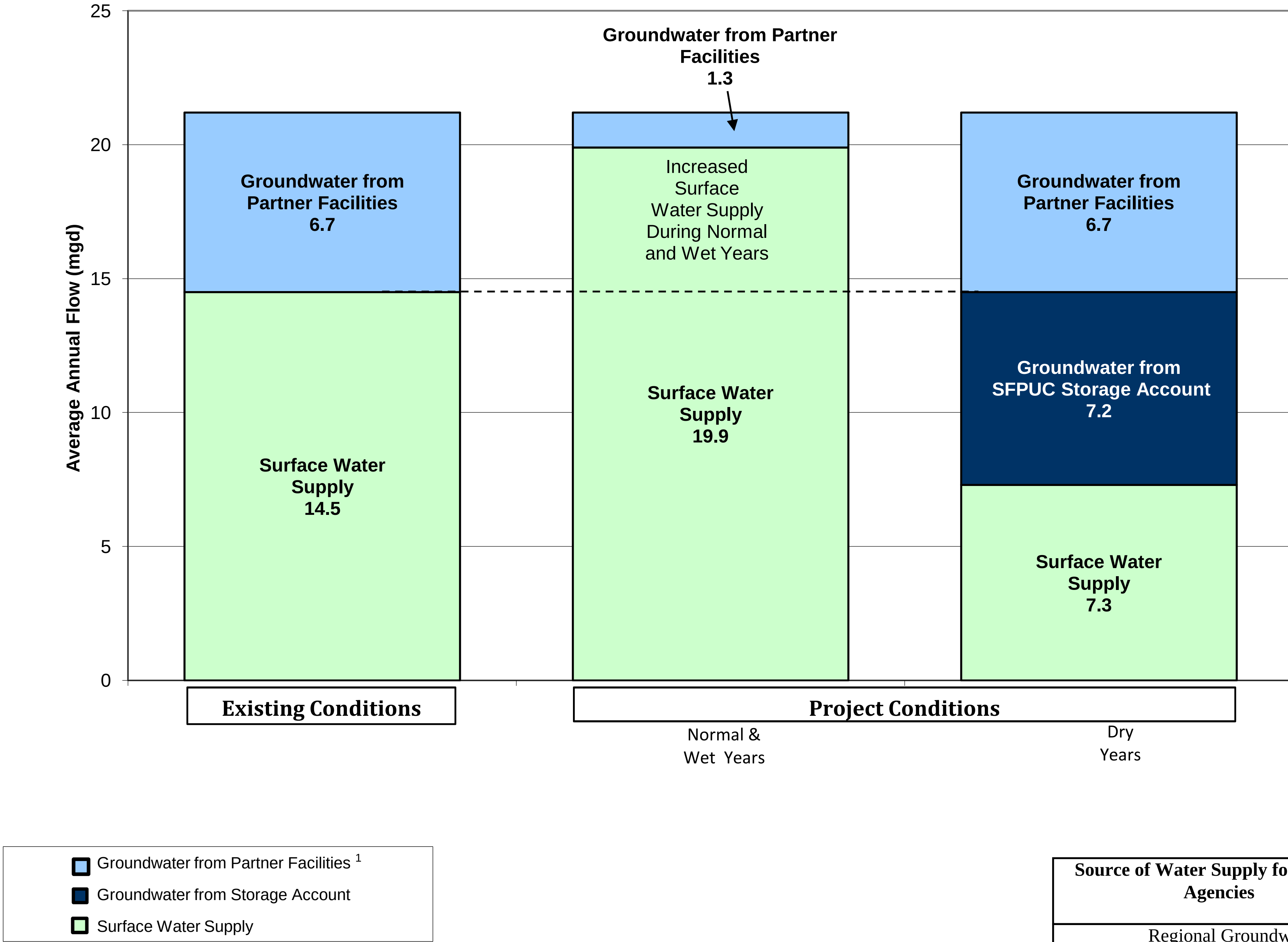
[5] It is expected that a Project agreement by and between SFPUC and the Partner Agencies would establish an Operating Committee. The role of the Operating Committee would be to monitor and track the SFPUC Storage Account, including any losses from the system, and establish pumping schedules for the project wells.



[1] Partner facilities are operated by City of Daly City, City of San Bruno, and Cal Water.

Source of Water Supply for Partner Agencies

Regional Groundwater Storage and Recovery Project

Figure 5

During normal and wet years, the proposed groundwater well facilities would be operated by SFPUC or by Partner Agencies only periodically for maintenance purposes. During dry years, the proposed groundwater well facilities would be operated by SFPUC or by Partner Agencies for additional water supply.

All well stations would be unmanned, but subject to remote monitoring and operation by the Partner Agency or SFPUC who would operate the well facility. Each well station would be visited daily when wells are operating for routine equipment checks, lasting approximately 30 minutes each. During normal and wet years, wells would be visited on a weekly basis, would be normally off, but regular exercising would be conducted. Longer term maintenance would include removal and repair or replacement of pumps, valves, and other equipment. Production wells may require redevelopment and/or rehabilitation on an infrequent basis.

6.0 PERMITS AND APPROVALS REQUIRED

The SFPUC may be required to obtain the following permits and approvals for Project construction and operation:

- Section 404 Permit from the U.S. Army Corps of Engineers (USACE) if the Project affects jurisdictional wetlands or waters of the U.S.
- U.S. Department of Veterans Affairs approval and National Environmental Policy Act (NEPA) review for Sites 14 and 15 at the Golden Gate National Cemetery.
- U.S. Fish & Wildlife Service Section 7 consultation under the federal Endangered Species Act, if the Project affects threatened or endangered species or their habitat.
- Review by the Advisory Council on Historic Preservation may be required if the Project affects properties listed on or eligible for the National Register of Historic Places.
- Permit amendments and approval of well construction and operation from the California Department of Public Health, Water Supply Division.
- Section 1602 Lake and Streambed Alteration Agreement from the California Department of Fish and Game if the Project could affect streambeds under California jurisdiction.
- Section 2081/2080.1 Incidental Take Permit from the California Department of Fish and Game if a "take" (to hunt, pursue, catch, capture,

or kill, or attempt the same) could occur to state-listed species as a result of the Project.

- California Department of Fish and Game Memorandum of Agreement if needed to ensure no effect to fully protected species.
- Preparation of a California Department of Toxic Substances Control Contaminated Soil Treatment Work Plan (required only if contaminated soil is encountered during construction).
- San Francisco Bay Regional Water Quality Control Board Discharge permits, if required, for emergency and/or maintenance water discharges, and for "overboard" pumping of well waters.
- San Francisco Bay Regional Water Quality Control Board Section 401 Certification, the state certification of the federal Section 404 Wetlands Permit.
- California Department of Transportation Encroachment permits to cross State roadways and Interstate Highways.
- State Water Resources Control Board Stormwater General Permit and Stormwater Pollution Prevention Plan, if more than one acre of land is disturbed.
- Bay Area Air Quality Management District permit for stationary equipment that may generate air pollutants (e.g., generators).
- EIR certification by the San Francisco Planning Commission.
- Board of Supervisors approval may be needed for funding appropriation or property rights acquisition.
- SFPUC approval, adoption of CEQA findings and mitigation monitoring and reporting program (MMRP).
- Adoption of CEQA findings and MMRP by local City Councils or Boards of Supervisors.
- San Francisco Historic Preservation Commission review of local, state and national landmarks and historical landscapes.
- Determination of Project consistency with park use by local Recreation and Park Commissions and approval of use of property under their jurisdiction.
- Approval of local Unified School District(s) for use of property under their jurisdiction.
- Approval of exterior design of proposed facilities on SFPUC property or right-of-way by the San Francisco Arts Commission.
- Agreements with Partner Agencies.
- Local Department(s) of Public Health approval of well construction and operation permits in accordance with California Department of Water Resources Standards.

- Local Department(s) of Public Health approval of Certified Unified Program Agencies (CUPA)/Hazardous Materials Business Plan for Project operations.
- Local Department(s) of Public Works approval of excavation permits, encroachment permits, and temporary occupancy permits for street space.
- Bay Area Rapid Transit (BART) encroachment permits to cross existing BART system.

7.0 PROPERTY RIGHTS ACQUISITION

Several types of property rights would be needed for Project construction and operation, as shown in Table 3. The process for acquiring right-of-way involves the preparation of deed and appraisal map, an appraisal of fair market value, negotiations with property owners, and condemnation (if necessary).

TABLE 3
Property Rights Proposed for Acquisition

Property Acquisition Type	Rights
Access Easement	Temporary or permanent rights to enter or cross another property
Pipeline Easement	Rights to install and maintain a pipeline over or across another property
Fee Acquisition	Purchase of all the property rights, land, improvements (if any), etc.
Encroachment Permit	Rights to encroach across a publicly-owned street or highway for pipeline or other purposes

Of the 19 potential well sites, 12 sites are on SFPUC fee-owned land or within SFPUC right-of-way. The other seven well sites are on other public and private parcels which would require an acquisition of property use rights for the well(s), connecting pipelines, and/or access. Lastly, several sites have lengthy connecting pipeline requirements that would most likely be constructed on a combination of public and private parcels.

8.0 CONSTRUCTION SCHEDULE

The proposed Project schedule expected at the time of this NOP includes construction of permanent well facilities and pipeline connections from April 2012 through approximately May 2014.

9.0 ENVIRONMENTAL ANALYSIS

9.1 Environmental Issues to be Addressed in the EIR

The EIR will address all environmental issue areas required under CEQA. The EIR will address environmental impacts of the proposed Project due to construction and operation activities and will propose mitigation measures for impacts considered to be significant. The following sections describe the anticipated environmental issues that will be addressed by the EIR.

9.1.1 Land Use and Visual Quality

Construction and operation of the proposed Project could affect land uses and visual quality of the Project sites and surrounding areas. Potential impacts to be evaluated in the EIR include:

- Temporary and permanent disruption or displacement of existing land uses during construction including construction impacts on such sensitive land uses as schools, residences and funeral homes, and the potential temporary closure of a portion of South San Francisco Linear Park to the public.
- Impacts on scenic vistas or visual character, including potential impacts on the visual character of Golden Gate National Cemetery, Woodlawn Cemetery, Greenlawn Memorial Park, and Lake Merced Golf Club.

9.1.2 *Geology, Soils and Seismicity*

Construction and operation of new well facilities and below-ground distribution pipelines and electrical power lines could result in site-specific impacts on or from local geology and soils conditions. Potential impacts to be evaluated in the EIR include:

- Seismic hazards and/or increased exposure of people and structures to seismic hazards, including impacts from ground-shaking in the event of an earthquake on the San Andreas fault or other Bay Area fault.
- Increased exposure of people or structures to geologic hazards (such as liquefaction, poor soil conditions, or unstable slopes) from construction in geologic hazard zones.
- Soil erosion potential from construction activities.
- Potential land subsidence from drawdown of the groundwater aquifer.

9.1.3 *Hydrology and Water Quality*

Construction and operation of the Project could affect surface water quality and could affect groundwater levels and quality in the Project area and in the South Westside Groundwater Basin as a whole. Potential impacts to be evaluated include:

- Changes in local groundwater quality and levels within the South Westside Groundwater Basin as a whole.
- Changes in drinking water quality due to use of treated groundwater.
- Alteration of drainage patterns and increase in stormwater flows due to increase in the amount of impervious surfaces.
- Degradation of surface water quality as a result of erosion and sedimentation, hazardous materials release during construction, and construction dewatering discharges.

9.1.4 *Biological Resources*

The proposed Project could result in a permanent loss of wetlands and sensitive habitats and could directly impact special-status wildlife and plant species. Temporary impacts to biological resources could result from proximity to construction activities, including noise, vibration, and dust. Potential impacts to be evaluated include:

- Impacts on wetlands and aquatic resources.
- Impacts on sensitive wildlife habitats and protected/heritage trees.
- Impacts on special-status wildlife and plant species – direct mortality and/or habitat effects.
- Conflicts with adopted conservation plans or other approved biological resources plans.

9.1.5 *Cultural Resources*

The proposed Project could affect archaeological, historical, or paleontological resources through ground-disturbing activities during construction, or by introducing new facilities that compromise the historic integrity of historic buildings or landscapes. Potential impacts to be evaluated include:

- Impacts on archaeological and paleontological resources.
- Impacts on the historical significance of a historic district, contributor to a historic district, or historic landscape. Of particular focus will be the proposed well facilities on 1920s Lake Merced Golf Club; the turn of the century Woodlawn Cemetery, the Cypress Lawn Cemetery, and the Golden Gate National Cemetery.
- Impacts on Native American cultural resources.

9.1.6 *Traffic, Transportation and Circulation*

Construction could have temporary impacts on traffic volumes, traffic safety, and parking in the vicinity of the well facility sites and at the Westlake Pump Station. Potential impacts to be evaluated EIR include:

- Temporary reduction in roadway capacity and increased traffic delays, including impacts from short-term closure of one parking and/or traffic lane. Impaired access to adjacent roadways and land uses.
- Temporary displacement of on- or off-street parking.
- Increased traffic safety hazards during construction.
- Long-term traffic increases during facility operation.

9.1.7 Noise and Vibration

Construction noise and vibration impacts from the proposed Project would be associated with facility construction activities, and therefore, would be temporary and short-term. Operation of the proposed pumps and treatment facilities could create permanent noise impacts. Potential impacts to be evaluated include:

- Impacts of construction noise and vibration on sensitive receptors in the vicinity of Project construction sites, especially such sensitive land uses as schools, health care facilities, cemeteries, funeral homes, and churches.
- Noise impacts from groundwater well station operation, including pumps and groundwater treatment facilities.

9.1.8 Recreational Resources

Construction could temporarily disrupt recreational uses in the vicinity of the well facility sites as a result of noise, dust, and temporary access restrictions. The EIR will evaluate the impact of the Project on recreational resources. Potential impacts to be evaluated include:

- Temporary and permanent impacts on recreational facilities, including but not limited to Lake Merced Golf Club and Linear Park in South San Francisco.

9.1.9 Other Environmental Issues

Other environmental issues that will be evaluated in the EIR include the Project's potential impacts on air quality and greenhouse gas emissions; public services and utilities, including the Project's beneficial effect on water supply; agricultural resources; hazards, including the potential hazards from chemical storage at the well sites; and energy resources.

The EIR also will evaluate any potential growth-inducing impacts that could result from implementation of the Project. The EIR also will address whether the Project could result in impacts that would be significant when combined with the impacts of other SFPUC or non-SFPUC projects occurring in the same geographic area as the Project and at the same time.

9.2 Alternatives

CEQA requires that an EIR evaluate a reasonable range of feasible alternatives to the project, or to the location of the project, that would attain most of the basic project objectives but that could avoid or substantially lessen any of the significant effects of the project. The EIR will identify the potentially significant impacts of the proposed Project. The findings of the EIR impact analysis will guide the refinement of an appropriate range of alternatives to be evaluated in the EIR that would avoid or substantially lessen significant impacts, while still meeting the project objectives. Alternatives suggested during the public scoping period would also be considered. The EIR will include a discussion of impacts associated with the No Project Alterative.

10.0 REFERENCES

MWH. 2007. Final Alternatives Analysis Report, Groundwater Conjunctive Use Project. October.

MWH. 2008. San Francisco Public Utilities Commission Water System Improvement Project Groundwater Conjunctive Use Project WSIP Project CUW30103 Conceptual Engineering Report. November.

SFPUC. 2005. 2005 Urban Water Management Plan for the City and County of San Francisco. December.

SFPUC. 2009. Conceptual Engineering Report Checklist for Environmental Review. February.

City of San Francisco Planning Department. Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program (State Clearinghouse No. 2005092026). 2008. September.

Appendix B

GSR Scoping Report

SCOPING SUMMARY MEMORANDUM

REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT

October 2009

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1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The San Francisco Planning Department is the lead agency for implementation of the California Environmental Quality Act (CEQA) for all projects sponsored by the City and County of San Francisco or conducted within San Francisco. The San Francisco Planning Department is preparing an Environmental Impact Report (EIR) on the San Francisco Public Utilities Commission's (SFPUC's) proposed Regional Groundwater Storage and Recovery Project (Project or proposed Project). The EIR, which will assess the potential impacts of the Project on the physical environment of the project area, is being prepared in accordance with CEQA. CEQA requires the preparation of an EIR when a proposed project could significantly affect the physical environment.

As part of the EIR process, the San Francisco Planning Department conducted a public scoping meeting in July 2009, soliciting comments from the public to help determine the scope of the EIR. This report describes the scoping process and summarizes the public's and regulatory agencies' comments received during scoping.

1.2 NOTICE OF PREPARATION

As the first step in the CEQA process, the San Francisco Planning Department published a Notice of Preparation (NOP) on June 24, 2009, announcing the anticipated preparation of the Draft EIR for the proposed Project. The NOP summarized the goals, objectives, and elements of the proposed Project, and presented the San Francisco Planning Department's determination that the proposed Project may have a significant effect on the environment. The NOP also described the requirement for preparation of an EIR on the proposed Project under CEQA. The San Francisco Planning Department determined that an EIR is the appropriate environmental document for the proposed Project. The NOP also described the scoping process and included information on a public scoping meeting. The scoping process, notification procedures, and outcome of the scoping meetings are described below, following a brief description of the proposed Project.

1.3 REGIONAL GROUNDWATER AND STORAGE RECOVERY PROJECT

The purpose of the Project is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. This new dry-year water supply would be made available to the cities of Daly City and San Bruno, the California Water Company (Cal Water) in its South San Francisco service area (collectively referred to as Partner Agencies) and San Francisco Public Utilities Commission (SFPUC) retail water customers.

The SFPUC proposes to provide surface water, when available, to Partner Agencies, to be used by these agencies in lieu of pumping groundwater during normal and wet rainfall years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. This supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of pumping by Partner Agencies would ultimately increase groundwater storage within the South Westside Groundwater Basin by up to 61,000 acre-feet (AF) (approximately 20 billion gallons). Stored groundwater would be utilized by pumping new Project wells during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would construct new groundwater production well facilities, which would be operated by either the Partner Agencies or SFPUC for pumping groundwater at a rate of 7.2 million gallons per day during dry years. The proposed Project would help meet the water supply reliability needs of all SFPUC customers during dry years and may provide some increased level of regional operational flexibility to respond and restore service during unplanned outages.

The proposed Project is one of several facility improvement projects identified in the SFPUC's Water System Improvement Program (WSIP). The WSIP was adopted by the SFPUC in October 2008 to improve the SFPUC's regional water system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area and establishes level of service goals and system performance objectives. The proposed Project's primary contribution to the WSIP goals is its ability to meet the water supply needs of SFPUC customers during drought years. To address the potential environmental impacts of the WSIP, the San Francisco Planning Department prepared a Program EIR (PEIR) on the proposed WSIP, which was certified by the San Francisco Planning Commission on October 30, 2008 (San Francisco Planning Commission Motion No. 17734). At a project-level of detail, the PEIR evaluated the environmental impacts of the WSIP's water supply strategy and, at a program level of detail, it evaluated the environmental impacts of the WSIP's facility improvement projects, including the proposed Project.

The proposed Project consists of: 1) cooperative management of surface water and groundwater to optimize the water demand and supply balance; and 2) construction and operation of groundwater production well facilities on 16 of 19 potential sites in northern San Mateo County. Each groundwater well facility site would contain a groundwater production well, pump station, underground distribution piping, and utility connections. Some well facility sites would contain groundwater disinfection units and groundwater treatment facilities. Well facilities would connect to distribution systems for Daly City, San Bruno, Cal Water, and to the SFPUC regional water transmission system for delivery of blended surface and grounwater supplies to retail customers in San Francisco. In addition, the Westlake Pump Station in Daly City may need to be upgraded, and treatment facilities may need to be added to several well facility sites.

2. SCOPING MEETING PROCESS

2.1 PURPOSE OF SCOPING MEETING

The purpose of scoping is to solicit input from the public and agencies on the appropriate scope, focus, and content of the EIR. The San Francisco Planning Department will consider all of the input received during the scoping process in the preparation of the Draft EIR. The Draft EIR will describe the existing environmental conditions of the area that could be affected by the proposed Project and evaluate the potential effects of the proposed Project in accordance with CEQA. The comments provided by the public and agencies during scoping will help the San Francisco Planning Department identify pertinent issues, methods of analyses, and level of detail that should be addressed in the Draft EIR. The scoping comments will also provide the basis for developing a reasonable range of feasible alternatives that will be evaluated in the Draft EIR. The Draft EIR is scheduled to be available for public comment in summer 2010. In addition to facilitating public and regulatory agency input on the scope and focus of the Draft EIR, scoping allows the San Francisco Planning Department to explain the EIR process to the public and to identify additional opportunities for public comment and public involvement during the EIR process. CEQA requires that the public be informed about the significant environmental effects of a proposed project, and the ways in which those environmental effects can be avoided or reduced, before the project is approved.

2.2 NOTIFICATION OF SCOPING MEETING

The scoping period began on June 24, 2009, with the issuance of the NOP. A public scoping meeting was held on July 9, 2009, and written comments were accepted through July 28, 2009. Agencies and the public were notified about the availability of the NOP and the public scoping meeting date and location, and were provided with details on the comment process. The following methods of notification were used:

Mailing List. A mailing list was compiled, including approximately 1,500 contacts for affected federal, state, regional, and local agencies; federal, state, regional, and local elected officials; regional and local interest groups; member agencies of the Bay Area Water Supply and Conservation Agency (BAWSCA) within San Mateo County; other potentially affected groundwater and irrigation users; and land owners and residents within approximately 300 feet of the Project well facility sites.

NOP Form and Report. On June 24, 2009, the NOP Form and Report (Appendix A) were distributed via certified mail to 32 potentially affected agencies and the State Clearinghouse. The NOP Form was also sent via first-class mail to the entire mailing list.

Meeting Notification. Notice of the public scoping meeting was provided to individuals and the general public through the following means (see Appendix B):

- **Legal notices.** Notices of the public scoping meeting, including information on how to obtain a copy of the NOP and provide public comment, were placed in the legal classified section of the San Francisco Examiner (6/24/09) and San Mateo County Times (6/24/09).

- **Display ads.** Display ads with information about the public scoping meeting, including information on how to obtain a copy of the NOP and provide public comment, were placed in the San Francisco Examiner (date) and San Mateo County Times (date) by the PUC.

- **Locations where NOP was made available.** The NOP Form and Report were posted to the San Francisco Planning Department's website (www.sfgov.org/planning/mea) as well as the SFPUC project website (www.sfwater.org). A printed copy of the NOP was also provided to anyone who requested it from the San Francisco Planning Department or the SFPUC.

2.3 SCOPING MEETING

The public scoping meeting was held on July 9, 2009 at the South San Francisco Municipal Services Building at 33 Arroyo Drive in South San Francisco, California, and was attended by 33 individuals.

The meeting included a presentation on the environmental review process and the proposed Project, followed by a formal public comment period. Attendees interested in presenting verbal comments submitted speaker cards and were called upon to speak. The meetings concluded with closing remarks. A transcript of this meeting is provided in Appendix C. Appendix D contains copies of the scoping meeting presentation, handout agenda, fact sheet, comment cards, speaker cards and sign-in sheets.

Immediately prior to the scoping meeting, an Informational Session was held by the SFPUC at the scoping meeting location where attendees were invited to view Project display boards and ask questions of the SFPUC project team.

3. SCOPING COMMENTS RECEIVED

3.1 OVERVIEW

Table 1 lists comments received by commenter type and source. Six people spoke at the scoping meeting, and ten comment letters were received during the comment period. One additional comment letter was received after the close of the comment period. This additional written comment is included in this summary.

TABLE 1
Comments Received by Commenter Type and Source

Commenter Type	Comment Source
Federal Agency	• None
State Agencies	• Governor's Office of Planning and Research, State Clearinghouse and Planning Unit, Scott Morgan (Written Comment #1) • California Department of Transportation, Lisa Carboni (Written Comment #2) • California Department of Water Resources, Karl P. Winkler (Written Comment #3)
Regional and Local Agencies	• County of San Mateo Planning and Building Department, Melissa Ross (Written Comment #4) • Town of Colma, Laura Allen (Written Comment #5) • Bay Area Water Supply & Conservation Agency, Nicole M. Sandkulla (Written Comment #6) • Town of Colma, Andrea Ouse (Oral Comment #101) • Montara Water and Sanitary District, Paul Perkovic (Oral Comment #106)
Business	• Bold, Polisner, Maddow, Nelson, & Judson, Robert B. Maddow (BPMNJ) (Written Comment #7) • Kathryn Slater Carter (Oral Comment #103) • BPMNJ, Robert B. Maddow (Oral Comment #105)
Groups	• California Trout, Mondy Lariz (Written Comment #8) • Committee to Save Lake Merced, Jerry Cadagan (Written Comment #9) • Tuolumne River Trust, Peter Drekmeier (Written Comment #10) • Restore Hetch Hetchy, Bob Hackamack (Written Comment #11) • Tuolumne River Trust, Peter Drekmeier (Oral Comment #102) • Lakeshore Area Improvement Club, Jim Stark (Oral Comment #104)

3.2 SUBJECT AREA OF COMMENTS

This section presents a summary of the comments received during the scoping process period. Table 2 identifies the issue areas raised by individual commenters. The corresponding comment number is provided in parentheses at the end of each comment. A transcript of the oral comments from the public scoping meeting is provided in Appendix C. The written comments (by number) can be found in Appendix E.

TABLE 2

Comments Received by Commenter and Type of Communication

No.	Commenter	Date	Notice of Preparation	Scope of EIR	Project Description	Project Alternatives	Permits and Approvals	Water Rights	Hydrology & Water Quality	Land Use & Planning	Aesthetics	Cultural Resources	Transportation/Circulation	Climate Change	Cumulative Impacts
Written Comments															
#1	Scott Morgan, State Clearinghouse	6/25/09	X												
#2	Lisa Carboni, California Department of Transportation	7/13/09	X									X	X		
#3	Karl P. Winkler, California Department of Water Resources	7/28/09							X						
#4	Melissa Ross, County of San Mateo	7/24/09								X					
#5	Laura Allen, Town of Colma	7/28/09		X	X			X	X	X					

TABLE 2

Comments Received by Commenter and Type of Communication

No.	Commenter	Date	Notice of Preparation	Scope of EIR	Project Description	Project Alternatives	Permits and Approvals	Water Rights	Hydrology & Water Quality	Land Use & Planning	Aesthetics	Cultural Resources	Transportation/Circulation	Climate Change	Cumulative Impacts
#6	Nicole M. Sandkulla, BAWSCA	7/31/09		X	X	X	X		x						
#7	Robert B. Maddow, Bold, Polisner, Maddow, Nelson & Judson	7/28/09		X				X	X						X
#8	Mondy Lariz, California Trout	7/28/09	X						X						
#9	Jerry Cadagan, Committee to Save Lake Merced	7/28/09	X		X	X			X					X	
#10	Peter Drekmeier, Tuolumne River Trust	7/28/09				X			X						
#11	Bob Hackamack, Restore Hetch Hetchy	7/28/09		X	X			X							
Oral Comments															
101	Andrea Ouse, Town of Colma	7/9/09		X				X	X		X				

TABLE 2

Comments Received by Commenter and Type of Communication

No.	Commenter	Date	Notice of Preparation	Scope of EIR	Project Description	Project Alternatives	Permits and Approvals	Water Rights	Hydrology & Water Quality	Land Use & Planning	Aesthetics	Cultural Resources	Transportation/Circulation	Climate Change	Cumulative Impacts
102	Peter Drekmeier, Tuolumne River Trust	7/9/09				X			X						
103	Kathryn Slater Carter	7/9/09				X			X						
104	Jim Stark, Lakeshore Area Improvement Club	7/9/09							X						
105	Robert B. Maddow, BPMNJ	7/9/09		X		X		X	X						
106	Paul Perkovic, resident of Montara and a member of the Board of Directors of the Montara Water and Sanitary District	7/9/09							X						

Please note that some of the comments summarized below may not characterize the project or its potential effects correctly. It is not uncommon for scoping comments to misrepresent the proposed project. The meaning of the comment summaries has not been changed, even if the comments appear to be incorrect. This summary does not include commentary on the comments. The comments will be considered in preparation of the EIR.

Notice of Preparation

Comment: The commenter states that he was dismayed to find no mention of Lake Merced in the NOP. (#8, California Trout)

Comment: The commenter states that there are too few details in the project description found in the NOP. Nowhere in the NOP or related material presented at the scoping meeting is Lake Merced or the Tuolumne River mentioned. It is within these two water bodies that the potentially significant negative environmental effects of the Project might materialize. Amplifying the project description after the deadline for scoping comments has passed would seem inconsistent with the spirit of the scoping process. Based on the inadequacy of the detail in the project description, the NOP should be withdrawn at this time and reissued only when an adequately detailed project description is submitted by the SFPUC. (#9, Committee to Save Lake Merced)

Scope of EIR

Comment: Several commenters expressed uncertainty over whether the test wells warrant a categorical exemption under CEQA. The Town of Colma requested that the project description and any other available information about the test wells be provided to the Town of Colma for review and comment. The test wells and the rest of the Project are all part of the same reasonably foreseeable "project" under CEQA, and that the EIR should describe the construction and operational impacts of the test wells; provide information regarding rates of pumping to be used to test the stability of the underlying aquifer, planned draw-down of groundwater levels to evaluate subsurface hydrogeological conditions, and the potential for well testing to result in a cone of depression affecting nearby groundwater users). It is appropriate to include the test wells in the EIR, so that they cannot be placed in full operation until the EIR is certified and the Project is approved. (#101, Andrea Ouse, Town of Colma; #5, Town of Colma; #7, Bold, Polisner, Maddow, Nelson & Judson)

Comment: Commenters suggest that the EIR should look at the additional use of recycled water as a source of water for irrigation purposes. The EIR should address how the water recycling program could work in parallel with the proposed project a the EIR should include an assessment of potential impacts if recycled water is used. (#105, Robert B. Maddow, Bold, Polisner, Maddow, Nelson & Judson; #6, BASWCA)

Comment: The environmental impacts of planned upgrades to the Westlake Pump Station and the addition of treatment facilities at well facility sites should be addressed in the EIR. (#5, Town of Colma)

Comment: The EIR should present the detailed operation strategy for the proposed Project, including the individual facilities, along with a detailed hydrological and environmental impact analysis of the proposed Project and associated facilities based upon the known operational strategy. (#6, BAWSCA)

Comment: The EIR should clarify how the administrative board for the management of the Westside Basin was arranged, and asks if the SFPUC intends to include representatives from the neighboring jurisdictions, public representatives, and representatives from existing irrigators (cemeteries and golf courses). The purview of the administrative board also should be described, as well as regulations and administrative rules that will govern the Board and the South Westside Groundwater Basin, and the notification process and timing for review and comment by users on any proposed administrative regulations. Describe if the board (assuming there will be an oversight committee) has a right to dictate how much water can be pumped and if there will be pumping limits. The EIR should clarify the rules that the SFPUC and participating pumpers have agreed to that will govern the operation of the Project during wet, normal, and dry periods, as well as the development of additional groundwater capability to meet future local water supply reliability needs. (#6, BAWSCA; #5, Town of Colma)

Comment: The EIR should describe how the baseline data for existing groundwater users, such as irrigators, will be determined, and if there has been an assessment of their future needs and the associated impacts. (#5, Town of Colma)

Comment: The EIR should describe the jurisdiction the water providers would have over procedures for replacement of existing wells, which is currently permitted by the County. The EIR should describe if there will be another approval process that will have oversight in these requests. (#5, Town of Colma)

Comment: The EIR should describe the bases for the establishment of the various baseline quantity numbers provided in the NOP, including 1) the estimate of the quantity currently in storage in the groundwater basin, 2) how it was determined that 61,000 acre-feet of groundwater storage is available in the Westside Basin, 3) the method of determining that 7.2 million gallons a day would be pumped in dry years, and 4) the length of time it will take for the aquifer to be replenished or brought to the desired levels. (#5, Town of Colma)

Comment: The EIR should describe if there is a plan to assemble an agreement (Memorandum of Understanding) between the irrigators, water providers, and legislative bodies in each jurisdiction to define the various limits and protections for current and future activities. (#5, Town of Colma)

Comment: The EIR should describe if irrigation uses have been factored into the calculations for replenishing the water table. (#5, Town of Colma)

Comment: The project description must include information on the location of the distribution system extensions necessary to connect Project facilities to existing distribution lines. Issues addressed should include aesthetics impacts, street and on-street parking closures affecting traffic, parking, and emergency response, and any economic impacts on local businesses that would result in indirect impacts on the physical environment. (#5, Town of Colma)

Comment: The existing project description (provided with the NOP) is inadequate to allow for meaningful CEQA review for the following reasons:

1) It lacks definitions of critical terms such as "excess surface water", "dry, normal and wet" years, and "sufficient surface water supplies."
2) It lacks adequate information regarding the aquifer in question to give meaning and context to the stated Project purposes. For example, the total capacity, current storage volume, and unused capacity for future conjunctive use in the South Westside Groundwater Basin are not given.
3) It should spell out how the proposed Project integrates with SFPUC's plans for groundwater development in the North Westside Groundwater Basin.

The commenter states that many answers to these issues may be found in the "groundwater storage and recovery agreement" mentioned in the project description. If so, then that agreement should be publicly disclosed before preparation of the EIR, and the scoping process should occur after, not before, those critical details are revealed. (#302-3, Jerry Cadagan, Committee to Save Lake Merced)

Comment: If this is a regional project, why is the North Westside Groundwater Basin not included? (#11, Restore Hetch Hetchy)

Comment: The EIR should repeat the clarification made on Page 1, Footnote 1 of the NOP whenever the 8.5-year design drought cycle is discussed. (#6, BAWSCA)

Comment: The EIR should address the potential for other users of the basin, who are not participating in this Project, to affect the overall storage level in the basin and the amount of water potentially available for withdrawal under the Project. The EIR should discuss what mechanisms can be implemented to protect the Program Storage against withdrawal by other non-participating pumpers. (#6, BAWSCA)

Comment: The EIR should clarify exactly how the new dry-year water supply would be made available to Partner Agencies and SFPUC wholesale customers under the terms of the Shortage Allocation Plan between the SFPUC and its wholesale customers. If the intent is that the available Program Storage, as quantified by the SFPUC Storage Account, will be taken into consideration by the SFPUC when determining how much water is available for delivery and whether a shortage condition exists, the EIR should provide this clarity. (#6, BAWSCA)

Comment: The EIR should address how the Program Storage and associated Project facilities might be used during an emergency, what rules would be applied to such operations, and who the beneficiaries would potentially be. (#6, BAWSCA)

Comment: The EIR should provide the water supply availability criteria to be used to determine the conditions of a “normal”, “wet”, and “dry” year associated with Project operation. (#6, BASWCA)

Comment: The EIR should provide a definition of “excess surface water” that determines the amount of reduced groundwater pumping in normal and wet years. (#6, BASWCA)

Comment: The EIR should define the methods to determine the amount of groundwater in the storage account at any point in time. Also, the basis for estimating underground losses of stored water that is not subsequently available for recapture needs to be explained. (#6, BASWCA)

Project Alternatives

Comment: Several commenters suggested that the EIR look at the possibility of using stormwater as a component of the recharge of the basin. The EIR should look at recharge of the groundwater with stormwater even in wet years, thus decreasing reliance on the Tuolumne River. The EIR should study using treated stormwater runoff, since most of the cities have existing stormwater drainage systems. Preliminary inquiry into the injection of stormwater and/or recycled water to the aquifer in this regard was that local geological conditions do not lend themselves to effective use of injection wells. This issue needs to be examined and discussed in the EIR in greater detail, including consideration of using the soon-to-be-made-available public groundwater model to determine optimum locations for injecting stormwater and recycled water. (#105, Robert B. Maddow, Bold, Polisner, Maddow, Nelson & Judson; #102, Peter Drekmeier, Tuolumne River Trust; #103, Kathryn Slater-Carter; #10, Tuolomne River Trust; #9, Committee to Save Lake Merced)

Comment: The EIR should discuss what would be necessary to recharge more of the 75,000 acre feet vacant storage available in this aquifer and the time to accomplish refilling. (#11, Restore Hetch Hetchy)

Comment: If there are alternatives that consider different well locations than those listed in the NOP, the EIR should discuss the siting criteria used to select an alternative well site. (#6, BASWCA)

Comment: Discuss using recycled water and urban stormwater runoff after the first flushing rain as source to raise the level in Lake Merced for this recharge purpose. (#11, Restore Hetch Hetchy)

Permits and Approvals

Comment: The California Department of Public Health (CDPH) should be added to the list of permitting agencies. (#6, BASWCA)

Hydrology and Water Quality

Groundwater Levels

Comment: The EIR should study the potential settlement issues associated with the more active management of the aquifer, including recharging the aquifer and deleting a part of the aquifer. It appears there is a gradual decrease in the amount of water in the aquifer right now. (#101, Andrea Ouse, Town of Colma)

Comment: Several of the golf courses throughout the basin have switched from use of groundwater to use of recycled water, and they have worked hard and paid money to preserve the aquifer. The proposed doubling of production of groundwater from the aquifer is of concern to some owners of private wells who have the legal rights to groundwater use within the basin. Beyond the in-lieu pilot program, no one knows what will happen when the aquifer is refilled. The EIR should describe how the effects of refilling the aquifer will be measured, both from the standpoint of its long-term productivity and from the standpoint of the impact on private well owners who have legal right to use water from the aquifer. There is potential for negative impacts to the production wells of pumpers, including the golf clubs, particularly during dry years. Should water levels be depressed below the screened intervals of the well casings, there is possibility of long-term well damage. The impacts on private wells may require mitigation by the SFPUC, and this needs to be analyzed and disclosed in the EIR. The locations of the new extraction wells proposed by the SFPUC, and any new wells planned by their municipal partners, need to be fully disclosed and analyzed in the EIR, with detailed maps. The results of the analysis, to be determined by mutual interference modeling, needs to be fully disclosed and analyzed in the EIR and the mitigation plan. (#105, Robert B. Maddow, Bold, Polisner, Maddow, Nelson & Judson; #7, Bold, Polisner, Maddow, Nelson & Judson)

Comment: The EIR should address the effect of aquifer replenishment to the assessed amounts (61,000 acre feet) on whatever lies above the basin, and also the effect of lowering the water table on whatever lies above the basin. (#5, Town of Colma)

Comment: There is the possibility that the ratio of "stored" to future extracted water is not actually or even close to 1:1. There is the potential for new users, or the potential for the "stored" water to be lost (not remain within the aquifer or the portion that is utilized), or the actual "usable" available storage may not be accurate. Careful environmental and technical analysis of the actual storage capacity and the effects of its use are needed before the Project is approved. (#7, Bold, Polisner, Maddow, Nelson & Judson)

Groundwater Quality

Comment: Will contaminants be remobilized when the basin is refilled? Numerous gas stations are located throughout the urbanized area in the basin. Some may have had leakage problems with MTBE-supplemented fuel. Some contaminants may have adhered to the soil particles when water levels were lower, and as the water levels are raised, the contaminants may be remobilized. Beyond leaking underground storage tanks, contaminants might have been deposited in the basin through industrial activity long ago and during the time when the aquifer was being hit hard. (#106, Paul Perkovic, member of the Board of Directors of the Montara Water and Sanitary District; #105, Robert B. Maddow, Bold, Polisner, Maddow, Nelson & Judson; #5, Town of Colma)

Comment: The potential for water levels to decline, even temporarily, as a result of dry year pumping may negatively impact water quality by concentrating contaminants and minerals. There may also be a potential for mixing of waters (and minerals) that may not otherwise have occurred, which would be a cause of concern and should be analyzed in the EIR. (#7, Bold, Polisner, Maddow, Nelson & Judson)

Comment: The EIR should explain how the high nitrate and manganese concentrations in water from the aquifer will be handled during drought when about 7.2 mgd will be added to the diminished surface supply. Describe if wellhead treatment will be used to accomplish reduction of these two chemicals or of blending with system water take care of these problems. (#11, Restore Hetch Hetchy)

Comment: The EIR should discuss the reason(s) for providing disinfection facilities at each well as disinfection is not necessarily required under Title 22 of the California Code of Regulations. It should specify the type of disinfection method to be used (chlorine or chloramines) and discuss any blending impacts or water quality compatibility issues. (#6, BASWCA)

Comment: The EIR should include the site-specific water quality testing data which is required in the pre-design. (#6, BASWCA)

Comment: The EIR should include an assessment to determine the ability to meet water quality goals when blending under the planned operational scheme. Project documentation indicates this will be verified from water samples collected from the test wells in the pre-design phase. The commenter asks if sufficient information will be available at the time of the EIR analysis to confirm that blending is a viable method to achieve water quality goals. (#6, BASWCA)

Comment: The EIR should provide the details of the long term monitoring program which will be used to assess changes in local groundwater quality and levels within the South Westside Groundwater Basin as a whole. The program should include the development of a best practices plan to protect the groundwater basin if not already developed. (#6, BASWCA)

Comment: It is indicated in the documentation for this Project that Drinking Water Source Assessments will be performed during pre-design. The commenter asks if these assessments will be available for use in the EIR analysis. (#6, BASWCA)

Water Supply

Comment: The commenter asks if the rate of recharge for the basin has been calculated and how long the water supply will last given that during dry years there would be more water extracted. (#103, Kathryn Slater-Carter)

Comment: The commenter asks how the Project will stabilize the water supplies that would be available from Hetch Hetchy to meet the coastal needs, including within the Montara Water and Sanitary District and the Coastside County Water District. (#106, Paul Perkovic, member of the Board of Directors of the Montara Water and Sanitary District)

Comment: It would be prudent to include in Project plans emergency generators or backup generators in the well pump-housing and treatment facilities. (#106, Paul Perkovic, member of the Board of Directors of the Montara Water and Sanitary District)

Comment: The Bay Area Water Supply and Conservation agency has a very complex water allocation scheme for drought periods, which is based on historic use and recent use. If participating agencies take delivery of a much higher quantity of water from the SFPUC system during the recharge period, then would their groundwater allocation be much higher during a drought? (#106, Paul Perkovic, member of the Board of Directors of the Montara Water and Sanitary District)

Comment: The Department of Water Resources states that it strongly supports the concept of the Project, and recognizes the importance of this Project and similar groundwater storage projects that meet the State of California's future water supply needs. (#3, Department of Water Resources)

Comment: The EIR should address any effect of the Project on reducing the availability of water supplies provided by California Water Company to the Town of Colma and its residents, thus requiring the Town and its residents to acquire water from other sources, and to identify other sources that are available. (#5, Town of Colma)

Comment: The current Notice and Description did not mention the specific source of the surface water supply that would be used to replace the present well water being pumped. The concern is that more water will be drawn from other watersheds. Those sources must be acknowledged and their impacts shown and mitigation provided in the Project EIR. The EIR should present a water balance stating the source of replacement water and provide a detailed water balance for the SFPUC delivery system as a whole. The comment provides a list of surface water diversions and inputs that should be presented in the water balance. (#11, Restore Hetch Hetchy).

Comment: The EIR should include a groundwater recovery assessment. (#6, BASWCA)

Surface Water – Lake Merced

Comment: The Lakeshore Acres Improvement Club has been concerned with lake levels at Lake Merced. The EIR should examine Lake Merced water levels and respond to all the concerns that are already known regarding the lake's water levels. (#104, Lakeshore Area Improvement Club)

Comment: The commentor states that a significant contributing factor to the decline in Lake Merced lake levels during the 80's was excessive pumping from the Westside Basin, resulting in an overdraft condition of the aquifer. The EIR should analyze whether the Project would cause excessive aquifer pumping and resultant overdraft, resulting in significant harm to the environment. (#9, Committee to Save Lake Merced)

Comment: The EIR should discuss the "potential for the flow from the shallow aquifer/lake system toward the underlying aquifer from which nearby production wells withdraw water" in the South Westside Groundwater Basin south of Lake Merced (quote from the Draft WSIP PEIR). (#11, Restore Hetch Hetchy)

Comment: The EIR should discuss the lake level management plan for Lake Merced. (#6, BASWCA)

Surface Water – Tuolumne River

Comment: The EIR should address the impacts of what sounds like the diversion of an extra 6.7 million gallons of water per day from the Tuolumne River in wet years, in addition to what was studied in the WSIP EIR. Additional information will be available at the end of this year or early next year that was not available at the time of the WSIP EIR. The PUC is doing a biological study of the stretch of the river below Hetch Hetchy as part of the Kirkwood Powerhouse Agreement in 1988. (#102, Peter Drekmeier, Tuolumne River Trust)

Comment: The commenter states that in general the Tuolumne River Trust supports the concept of cooperative management of surface water and groundwater to optimize the water demand and supply balance. However, the trust has concerns that the Project could harm the Tuolumne River by increasing diversions in normal and wet years. The EIR needs to identify the source(s) of the additional surface water that would provide an additional 5.4 millions gallons per day to SFPUC customers in normal and wet years. It also should define wet, normal and dry years. (#10, Tuolumne River Trust)

Comment: Currently, 60 percent of the Tuolumne River is used for agricultural and urban uses, and even more water is diverted, causing significant impacts to the river ecosystem, including a decline in anadromous fish. Diverting more water from the river would exacerbate this problem. The commenter states that the WSIP PEIR analysis of the impacts on salmon and steelhead from diverting more water from the Tuolumne River was wholly inadequate. New information about potential impacts to the Tuolumne River from increasing diversion should be included in the EIR for the Project, such as the SFPUC study of biological resources in the stretch of the river downstream of the Hetch Hetchy Reservoir, expected to be completed by the end of 2009. (#10, Tuolumne River Trust)

Comment: The EIR should address comments submitted by the Department of Fish and Game on January 15, 2009 for the San Joaquin Pipeline System Project regarding the effect of increased diversions from the Tuolumne River on fish species in the river. (#10, Tuolumne River Trust)

Comment: Wet years do not result in "wasted" water. Wet years can provide better flows for juvenile salmon and steelhead, enabling them to get flushed out into the Bay and Ocean in higher numbers. The EIR should study the impacts of diverting additional water from the Tuolumne River on fish populations even in wet and normal years. (#10, Tuolumne River Trust)

Comment: Requirements for instream flows in the lower Tuolumne River are likely to increase as a result of the Federal Energy Regulatory Commission (FERC) relicensing process that will begin in 2011 and be completed in 2016. FERC actions must be considered in the CEQA analysis for the Project. (#10, Tuolumne River Trust)

Water Rights

Comment: The EIR should describe if the water in the South Westside Groundwater Basin is to be used for the purposes of supplying residential, commercial, agricultural and recreational needs of those who reside over the basin, or if there are plans to export the water to communities beyond the underlying limits of the basin. If the plans are to export the water, describe of this will affect the ability of existing users to access more of the water in the basin. Describe if those jurisdictions that are not Partner Agencies will be allowed to review any agreement made with customers not located directly over the basin. (#5, Town of Colma)

Comment: The EIR should describe if the current and future water rights of an established pumper will be preserved by their current standard (#5, Town of Colma).

Comment: The project description should identify the proposed management structure in terms of the assertion of authority over the aquifer. It should address whether the Project will change the rights and ownership of the water to include entities other than those that already have rights to the water (#101, Andrea Ouse, Town of Colma).

Comment: The commenter asks about the legal implications of the undertaking and the impact of the Project on private property owners' rights to extract water from the basin for productive, beneficial uses, including the potential for some wells to be rendered obsolete, or require deepening, or require users to make new pumping or water supply arrangements. (#105, Robert B. Maddow, Bold, Polisner, Maddow, Nelson & Judson)

Comment: The EIR should discuss the rights that municipalities, residents, and property owners that are located in the overlying lands of the South Westside Groundwater Basin have to the use of groundwater within the Basin. The comment also provides a summary of water use rights under California law. (#5, Town of Colma)

Comment: The EIR should address any reasonably likely effects of the Project on groundwater rights, including the effects of water storage during wet periods and water recapture during dry periods on the town of Colma and its residents' use of the groundwater. (#5, Town of Colma)

Comment: The EIR should describe the provisions the City of San Francisco plans to make to avoid or minimize any adverse effects on groundwater rights of overlying municipalities, including through project design or compensation. (#5, Town of Colma)

Comment: The EIR needs to address protection of existing overlying rights, including any existing overlying rights that are not currently utilized due to the use of recycled water for irrigation in areas served by the aquifer. If the SFPUC seeks to recover the 15,000 AF they have already stored, the EIR should indicate how the interests of the overlying owners will be protected – i.e. how will the SFPUC assure other pumpers that their water rights will not be impaired by this excess pumping? (#7, Bold, Polisner, Maddow, Nelson & Judson)

Water Supply Cost

Comment: What would be the cost of the increased use of Hetch Hetchy water, which is very expensive water, and would business owners see an increase in their water rates. Daly City is able to keep the cost down by also using groundwater? (#103, Kathryn Slater-Carter)

Comment: If Daly City, South San Francisco, and Cal Water are provided additional water from Hetch Hetchy instead of pumping groundwater, would these entities pay the current Hetch Hetchy wholesale price for this water or would it be treated as an advance of so many acre feet of water that could be drawn on in the future? Because the cost for Hetch Hetchy water increases each year, paying current prices to purchase water to allow recharge, and then drawing on that water in the future when the agencies otherwise would be paying much higher rates to purchase Hetch Hetchy water, would mean that the other Hetch Hetchy water users, the Bay Area Water Supply and Conservation Agency, are underwriting the cost of water to South City, Daly City, and Cal Water. It would seem fairer to treat it as an advance of water that is then repaid later by drawing on groundwater, and the payments for Hetch Hetchy water remain at an average use and escalating price to pay for the seismic improvement program. (#106, Paul Perkovic, member of the Board of Directors of the Montara Water and Sanitary District)

Comment: Energy costs for irrigation users of the aquifer should be analyzed in the EIR. (#7, Bold, Polisner, Maddow, Nelson & Judson)

Climate Change

Comment: The EIR must consider climate change in detail given that the Project is partially based on the premise that there will be undefined "excess" surface water available in the undefined "normal and wet years." (#9, Committee to Save Lake Merced)

Land Use and Planning

Comment: The two potential Project sites located in Broadmoor are within unincorporated San Mateo County jurisdiction. Therefore, the SFPUC is required to submit a project description for review and determination of General Plan conformity pursuant to Government Code Section 65402. (#4, County of San Mateo)

Comment: The EIR should list the municipalities that are located in the overlying lands of the South Westside Groundwater Basin. The commenter asks if the Town of Colma, in particular, is located in these lands. (#5, Town of Colma)

Aesthetics

Comment: The commenter is concerned about the buildings associated with each well site, specifically their location and physical appearance. The Town of Colma tries to keep its policies in line with the Town's existing tranquil and serene environment. (#101, Andrea Ouse, Town of Colma)

Cultural Resources

Comment: If construction activities are proposed within the State's Right-of-Way (ROW), Caltrans requires documented results of a current (no more than 5 years old) archaeological record search at the Northwest Information Center of the California Historical Resources Information System before an encroachment permit can be issued. If warranted, a cultural resource study by a qualified, professional archaeologist in compliance with NEPA (if there is a federal action on the Project), CEQA, and PRC section Section 5024.5 (for state-owned historic resources), and Volume 2 of Caltrans "Standard Environmental Reference." (#2, California Department of Transportation)

Transportation and Circulation

Comment: Caltrans comments that, as lead agency, the San Francisco Planning Department is responsible for all Project mitigation, including any needed improvements to State Highways. The EIR should fully discuss the Project's fair share contribution, financing, scheduling, and implementation responsibilities as well as lead agency monitoring for all proposed mitigation measures. The Project's traffic mitigation fees should also be specifically identified. (#2, California Department of Transportation)

Comment: Any required roadway improvements must be completed prior to issuance of Project occupancy permits. Also, an encroachment permit is required when a project involves work in the State's ROW so the lead agency should ensure resolution of Caltrans concerns prior to submittal of the encroachment permit application. Traffic-related mitigation measures will be incorporated into the construction plans during the encroachment permit process. (#2, California Department of Transportation)

Comment: Because the proposed Project is located adjacent to State highway facilities, the EIR must evaluate traffic impacts on State facilities to determine if a Traffic Impact Study is warranted. In addition, Project vehicle trips and hours of operation should be discussed and street routes for vehicles should be identified. Use of the Caltrans guidance for preparation of traffic impact studies is recommended. (#2, California Department of Transportation)

Comment: Project work that requires movement of oversized or excessive load vehicles on State facilities requires a transportation permit. (#2, California Department of Transportation)

Comment: Caltrans encourages the San Francisco Planning Department to coordinate with Caltrans for all SFPUC WSIP projects, and provides a contact name and address. (#2, California Department of Transportation)

Cumulative Impacts

Comment: The Draft WSIP PEIR lists several golf courses located atop the aquifer that are successfully using recycled water for irrigation. The EIR should discuss the impact on aquifer recovery from conversion to using recycled water for additional golf courses and other irrigated landscapes that still pump from this aquifer or use system water for irrigation. (#11, Restore Hetch Hetchy)

Comment: The commenter expresses concern about the test wells and indicates that the test wells appear to be handled as a separate project and not encompassed as part of a cumulative review of the Groundwater Storage and Recovery Project. (#101, Andrea Ouse, Town of Colma)

Comment: The EIR needs to fully analyze the impacts of the Project and other groundwater-related projects in the area, including, but not limited to the SFPUC's proposed lake level restoration project for Lake Merced; the project to pump groundwater at production rates from the North Westside Basin; the variety of recycled water projects proposed in various portions of the land overlying the aquifer; and stormwater management projects being considered in the area, particularly to the extent they may involve detention basins. (#7, Bold, Polisner, Maddow, Nelson & Judson)

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Appendix A
Notice of Preparation

SAN FRANCISCO
PLANNING DEPARTMENT

1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479

Reception:
415.558.6378

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415.558.6409

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415.558.6377

Notice of Preparation of an Environmental Impact Report

Date:	June 24, 2009
Case No.:	~~[illegible]~~ 2008.1396E
Project Title:	**Regional Groundwater Storage and Recovery Project**
Location:	The proposed Project is located in the South Westside Groundwater Basin in San Mateo County, and the proposed facilities will be constructed in northern San Mateo County. The South Westside Groundwater Basin is located in San Mateo County within the larger Westside Groundwater Basin which underlies both San Francisco and San Mateo counties. Proposed facilities are located in the cities of South San Francisco, Colma, San Bruno, Millbrae, and Daly City and in unincorporated portions of San Mateo County.
BPA Nos.:	N/A
Zoning:	N/A
Block/Lot:	N/A
Lot Size:	Various
Project Sponsor	Greg Bartow, San Francisco Public Utilities Commission (415) 934-5724
Lead Agency:	San Francisco Planning Department
Staff Contact:	Diana Sokolove – (415) 575-9046 diana.sokolove@sfgov.org

PROJECT DESCRIPTION

The purpose of the Regional Groundwater Storage and Recovery (GSR) Project (Project or proposed Project) is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. This new dry-year water supply would be made available to the cities of Daly City and San Bruno, the California Water Company (Cal Water) in its South San Francisco service area (collectively referred to as Partner Agencies) and San Francisco Public Utilities Commission (SFPUC) wholesale water customers.

The SFPUC proposes to provide surface water, when available, to Partner Agencies, to be used by these agencies in lieu of pumping groundwater during normal and wet rainfall years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. This supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of pumping by Partner Agencies would ultimately increase groundwater storage within the South Westside Groundwater Basin by up to 61,000 acre-feet (AF) (approximately 20 billion gallons). Stored groundwater would be utilized by pumping new Project wells during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would construct new groundwater production well facilities, which would be operated by either the Partner Agencies or SFPUC for pumping groundwater at a rate of 7.2 million gallons per day during dry years. The proposed Project would help meet the water supply reliability needs of all SFPUC customers during dry years and may provide some increased level of regional operational flexibility to respond and restore service during unplanned outages.

The proposed Project is one of several facility improvement projects identified in the San Francisco Region as part of the SFPUC's Water System Improvement Program (WSIP). The WSIP was adopted by the SFPUC in October 2008 to improve the SFPUC's regional water system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area and establishes level of service goals and system performance objectives. The proposed Project's primary contribution to the WSIP goals is its ability to meet the water supply needs of SFPUC customers during drought years.

The proposed Project consists of 1) cooperative management of surface water and groundwater to optimize the water demand and supply balance; and 2) construction and operation of groundwater production well facilities on 16 of 19 potential sites in northern San Mateo County. Each groundwater well facility site would contain a groundwater production well, pump station, underground distribution piping, and utility connections. Some well facility sites would contain groundwater disinfection units and groundwater treatment facilities. Well facilities would connect to distribution systems for Daly City, San Bruno, Cal Water, and SFPUC. In addition, the Westlake Pump Station in Daly City may need to be upgraded and treatment facilities may need to be added to several well facility sites.

FINDING

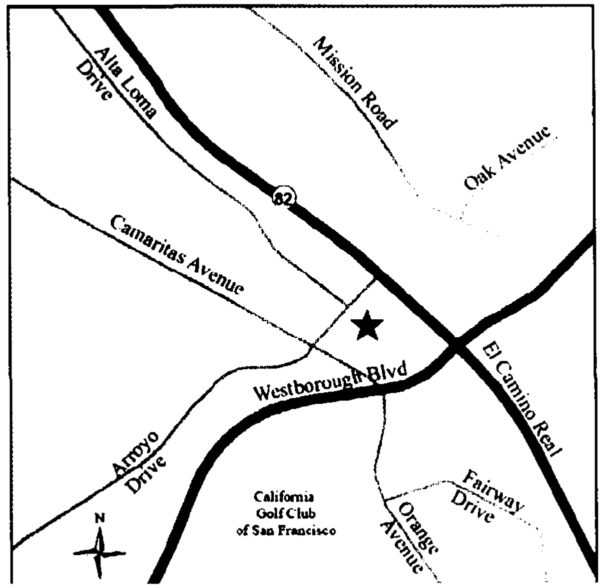
This project may have a significant effect on the environment and an Environmental Impact Report is required. This determination is based upon the criteria of the State CEQA Guidelines, Sections 15063 (Initial Study), 15064 (Determining Significant Effect), and 15065 (Mandatory Findings of Significance), and for the reasons documented in the attached project description and description of potential environmental effects. (Documents are also available online at: http://www.sfgov.org/planning/mea.)

PUBLIC SCOPING PROCESS

Pursuant to the State of California Public Resources Code Section 21083.9 and CEQA Guidelines Section 15206, a public scoping meeting will be held to receive oral comments concerning the scope of the EIR at the following location, date, and time.

DATE: Thursday, July 9, 2009
6:15-7:00 p.m. Informational Session
7:00 p.m. Scoping meeting

LOCATION:
South San Francisco Municipal Services Building
Community Room
33 Arroyo Drive
South San Francisco, CA



Written comments will also be accepted at this meeting and until the close of business on **July 28, 2009**. Written comments should be sent to Bill Wycko, Environmental Review Officer, Regional Groundwater Storage and Recovery Project Scoping Comments, San Francisco Planning Department, 1650 Mission Street, Suite 400, San Francisco, CA 94103. They also may be submitted by fax to (415) 558-6409 or sent by email to diana.sokolove@sfgov.org.

If you work for a Responsible or Trustee Agency, we need to know the views of your agency regarding the scope and content of the environmental information that is germane to your agency's statutory responsibilities in connection with the proposed Project. Your agency may need to use the EIR when considering a permit or other approval for this proposed Project. Please include the name of a contact person in your agency.

June 24, 2009
Date

for
Bill Wycko
Environmental Review Officer

Regional Groundwater Storage and Recovery Project

2008.1396E
~~Case No. 2005.0164E~~

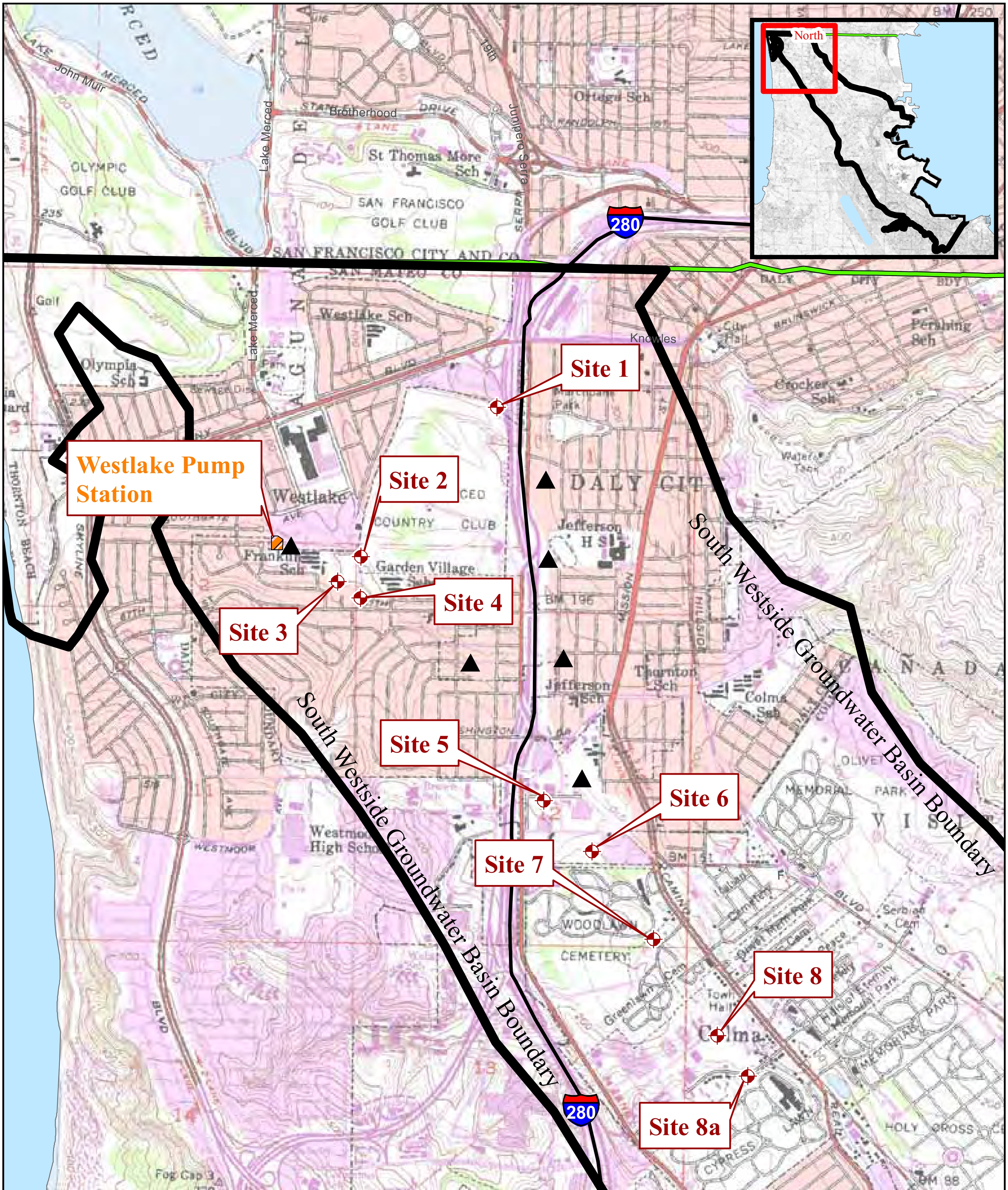
1.0 OVERVIEW AND BACKGROUND

The San Francisco Public Utilities Commission (SFPUC) is proposing the Regional Groundwater Storage and Recovery (GSR) Project (Project or proposed Project), which would be located in northern San Mateo County, California (see Figures 1, 2, and 3). To meet California Environmental Quality Act (CEQA) requirements, the San Francisco Planning Department's Major Environmental Analysis Division (MEA) will prepare and distribute an Environmental Impact Report (EIR) describing and analyzing the environmental effects of the proposed Project. This Notice of Preparation (NOP) provides a description of the Project background, a brief description of the proposed Project elements, and describes some of the proposed Project's potential environmental effects.

The purpose of the proposed Project is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. This new dry-year water supply would be made available to the cities of Daly City and San Bruno, the California Water Company (Cal Water) in its South San Francisco service area (collectively designated as Partner Agencies) and SFPUC wholesale water customers.

SFPUC proposes to provide excess surface water when available to the Partner Agencies to be used by these agencies in lieu of pumping groundwater during normal and wet years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. This supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of groundwater pumping by Partner Agencies would ultimately increase groundwater storage within the South Westside Groundwater Basin by up to 61,000 acre-feet[1] (AF) (approximately 20 billion gallons). Stored

[1] The SFPUC plans for an 8.5-year drought. Over this 8.5-year period, the SFPUC anticipates it will exercise its dry-year supplies after the first year of the drought. Therefore, the 61,000 AF of storage is assumed to be used over 7.5 years of the design drought, with wells operating at a maximum capacity of 7.2 MGD.



Legend

Proposed Well Facility Sites	Westlake Pump Station
Partner Agency Well	South Westside Groundwater Basin
County Boundary	

0 1,000 2,000

Scale Feet

1" = 2000'

N

Project Location Map-North

Regional Groundwater Storage and Recovery Project

Figure 1

Source: SFPUC and Kennedy/Jenks

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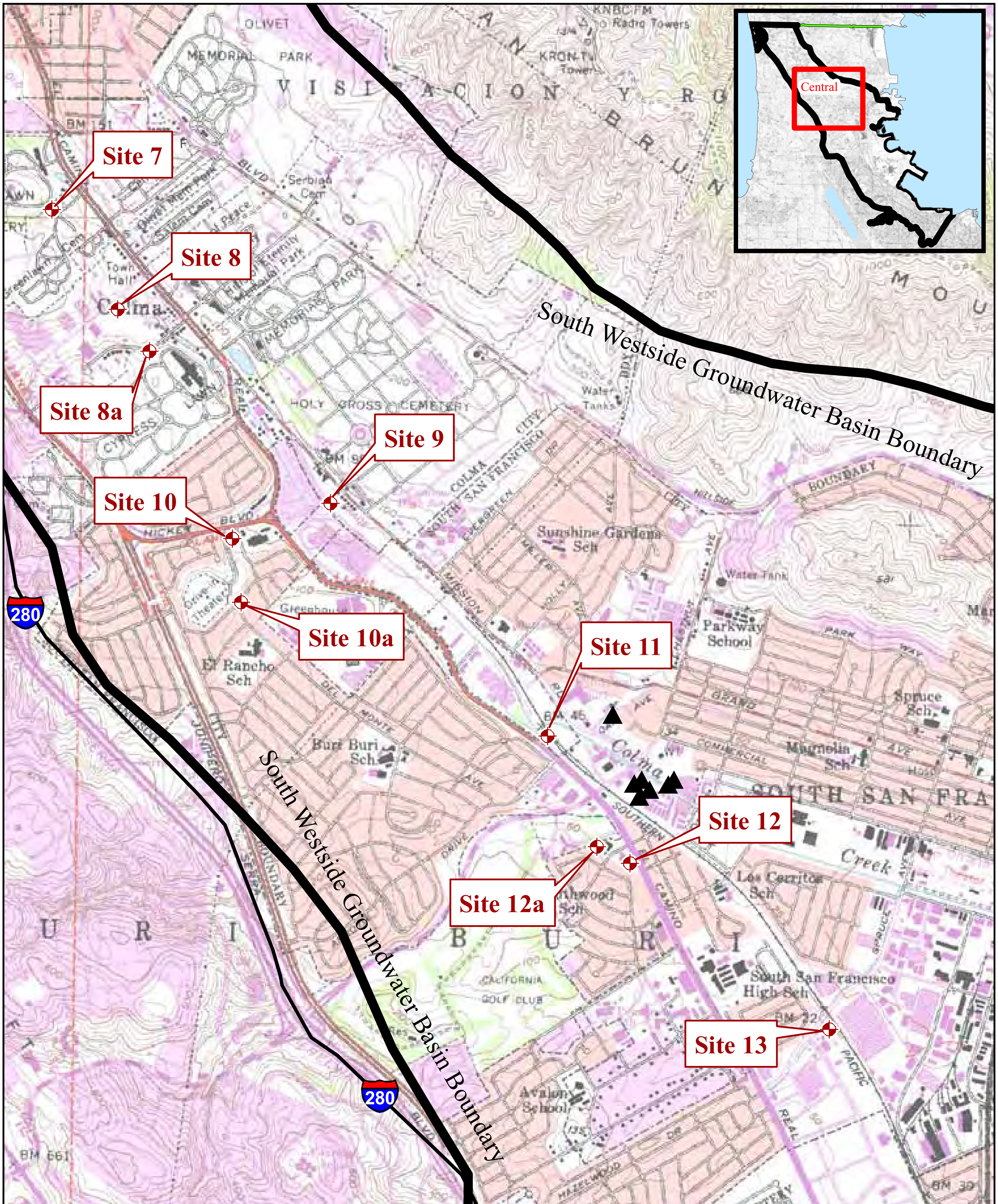

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Proposed Well Facility Sites

Partner Agency Well

South Westside Groundwater Basin

0 1,000 2,000

Scale Feet

1" = 2000'

N

Project Location Map-Central

Regional Groundwater Storage and Recovery Project

Figure 2

Source: SFPUC and Kennedy/Jenks

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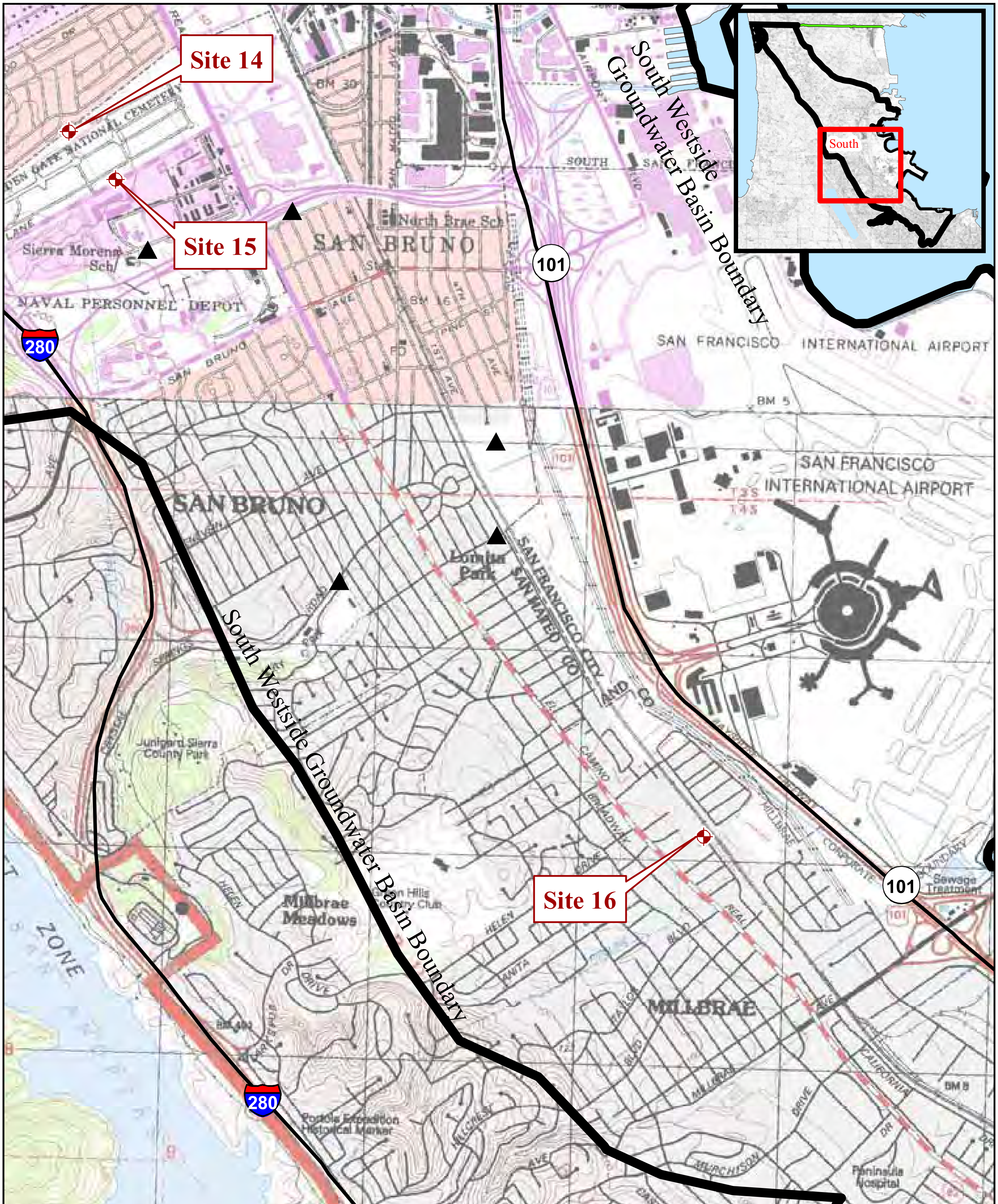

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Proposed Well Facility Sites

Partner Agency Well

South Westside Groundwater Basin

0 1,000 2,000

Scale Feet

1" = 2000'

N

Project Location Map-South

Regional Groundwater Storage and Recovery Project

Figure 3

Source: SFPUC and Kennedy/Jenks

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groundwater would be utilized by pumping new Project wells during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would create new groundwater production well facilities, which would be operated by either the Partner Agencies or SFPUC for pumping groundwater at a rate of up to 7.2 million gallons per day (MGD) during dry years. The proposed Project would help meet the water supply reliability needs of all SFPUC customers during dry years and may provide some increased level of regional operational flexibility to respond and restore service during unplanned outages.

The proposed Project is a component of the SFPUC's proposed Water System Improvement Program (WSIP) (see www.sfwater.org). The basic goals of the WSIP are to increase the reliability of the regional water system with respect to water quality, seismic response, delivery, and water supply to meet water delivery needs in the service area. A Program EIR (PEIR) for the WSIP was certified by the San Francisco Planning Commission, and the WSIP was adopted by the SFPUC on October 30, 2008. The PEIR addresses the potential environmental impacts of the WSIP facilities on a programmatic level and evaluates regional water supply alternatives. The proposed Project, which is the subject of this NOP, is one component of the WSIP[2]; implementation of this proposed Project would contribute to meeting the WSIP's overall goals and objectives.

For purposes of the WSIP PEIR, the SFPUC's regional water system facilities were subdivided into six regions: Hetch Hetchy, San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco. The proposed Project would occur in the San Francisco Region.

2.0 PROPOSED PROJECT FACILITIES

The proposed Project facilities would consist of new groundwater production well facilities within the South Westside Groundwater Basin (Basin); the facilities are designed to withdraw up to 7.2 MGD from the volume of stored groundwater directly resulting from Project-related reduced groundwater

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[2] The Regional Groundwater Storage and Recovery Project was listed as the Conjunctive Use Project in the PEIR.

pumping in the Basin by Partner Agencies during normal and wet years. Up to 16 new groundwater well facilities would be constructed on 16 of the 19 potential sites in northern San Mateo County to supply the needed withdrawal capacity. Well facilities would be connected to Daly City, San Bruno, Cal Water, or SFPUC distribution systems. In addition, the existing Westlake Pump Station in Daly City may need to be modified and treatment facilities may need to be added.

Each groundwater well facility site would contain a groundwater production well, pump station, underground distribution piping, and utility connections. Each well facility would have a disinfection unit as required, unless it is near an existing disinfection unit that can accommodate the additional volume, in which case the well would be connected to the existing unit. Well facility sites where the groundwater may need treatment have been designed with appropriate treatment facilities.

3.0 ENVIRONMENTAL REVIEW PROCESS

As described above, the San Francisco Planning Commission certified the WSIP PEIR in October 2008. The PEIR addressed the potential environmental impacts of the WSIP facilities on a programmatic level and evaluated regional water supply alternatives. The PEIR is available on the San Francisco Planning Department website at www.sfgov.org/planning/mea.

The San Francisco Planning Department will prepare a project-specific EIR to evaluate the environmental effects of the proposed Project. The EIR will be prepared in compliance with the CEQA Guidelines Section 15161 and will address project-specific construction and operational impacts.

The first step in the environmental review process is the formal public scoping process, for which this NOP has been prepared. Following the public scoping period, a Draft EIR will be prepared and circulated for a 45-day public review period. Public comments on the Draft EIR will be accepted in writing during the review period or verbally at a formal public hearing to be held by the San Francisco Planning Commission. The San Francisco Planning Department then will prepare written responses to comments on environmental issues raised during the public review period, and a Response to Comments document will be prepared. That document will be considered by the San Francisco Planning

Commission, along with the Draft EIR and any revisions to the draft based on the response to comments, for certification as a Final EIR.

4.0 PUBLIC SCOPING MEETING

The San Francisco Planning Department will hold a public scoping meeting at the following location, date, and time.

DATE: Thursday, July 9, 2009

6:15-7:00 p.m. Informational Session

7:00 p.m. Scoping meeting

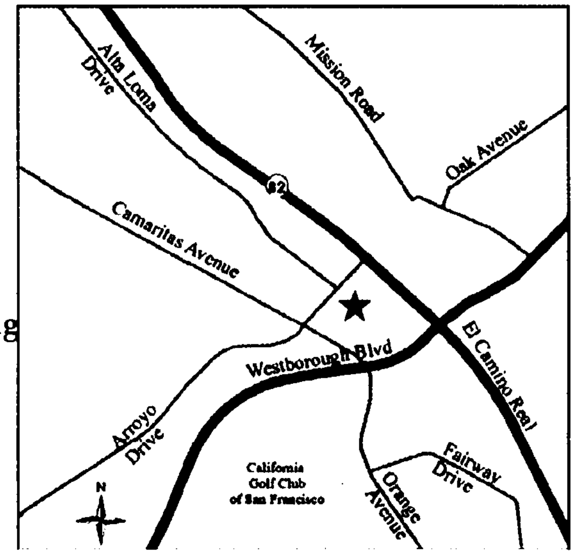
LOCATION:

South San Francisco Municipal Services Building

Community Room

33 Arroyo Drive

South San Francisco, CA



The purpose of this meeting is to assist the Planning Department with its review of the proposed scope and content of the EIR as summarized in this NOP. The public will be given the opportunity to provide comment for consideration. The San Francisco Planning Department also will accept written comments on the scope of the EIR at the meeting or by mail, email, or fax until close of business (5:00 p.m.) on **July 28, 2009**. Written comments may be submitted by mail to the San Francisco Planning Department, Attn: Bill Wycko, Environmental Review Officer, Regional Groundwater Storage and Recovery Project Scoping Comments, 1650 Mission Street, Suite 400, San Francisco, CA 94103. They also may be submitted by fax to (415) 558-6409, or sent by email to diana.sokolove@sfgov.org.

5.0 PROJECT DESCRIPTION

5.1 Project Location

The proposed Project is located in the South Westside Groundwater Basin in San Mateo County, and the proposed facilities will be constructed in northern San Mateo County as shown in Figures 1, 2, and 3. The South Westside Groundwater Basin is located in San Mateo County within the larger Westside Groundwater Basin[3], which underlies both San Francisco and San Mateo counties. The Project is also located within the water service areas for the cities of Daly City, San Bruno, and Millbrae and within the Cal Water service area, which includes portions of South San Francisco, Colma, and unincorporated San Mateo County.

Groundwater well facilities would be constructed and operated at up to 16 locations in the cities of Colma, Daly City, South San Francisco, San Bruno, Millbrae, and unincorporated San Mateo County (see Figures 1, 2, and 3). Well facilities would be connected to existing water distribution pipelines owned by Daly City, San Bruno, Cal Water, and SFPUC. The Project also includes an upgrade of the existing Westlake Pump Station in Daly City to serve the proposed new well facility sites.

5.2 Project Objectives

The proposed Project is a regional groundwater storage and recovery project that is part of the SFPUC's WSIP. The overall goals of the WSIP for the regional water system are to maintain high-quality water; reduce vulnerability to earthquakes; increase water delivery reliability; meet customer water supply needs; enhance sustainability; and achieve a cost-effective, fully operational system. The proposed Project's primary contribution to the WSIP goals is its ability to meet the water supply needs of SFPUC customers during drought years. In addition,

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[3] The Westside Groundwater Basin extends from western San Francisco south into San Mateo County. The Basin has an area of approximately 40 square miles and underlies Daly City, Colma, South San Francisco, San Bruno, Millbrae, and Burlingame. The Westside Groundwater Basin has been administratively divided at the San Francisco County-San Mateo County line. This is a political boundary, not a physical boundary. The portion of the basin that lies within San Francisco County is referred to as the North Westside Groundwater Basin. The portion of the basin that lies within San Mateo County is referred to as the South Westside Groundwater Basin. The Project would occur solely within the South Westside Groundwater Basin.

the Project may provide some increased level of regional operational flexibility to respond and restore service under unplanned outages.

The specific objectives of the proposed Project are to:

- Cooperatively manage the South Westside Groundwater Basin through the coordinated use of SFPUC surface water and the groundwater pumped by the Partner Agencies;

- Provide increased SFPUC surface water to the Partner Agencies in normal and wet years, resulting in a reduction of groundwater pumping by these agencies and an increase in groundwater storage in the South Westside Groundwater Basin;

- Increase the pumping capacity from the South Westside Groundwater Basin by up to 7.2 MGD to supply water during dry years and emergencies; and

- Provide a new dry-year groundwater supply for SFPUC customers and increase water supply reliability during the 8½-year design drought cycle.

5.3 Proposed Project

The proposed Project is a groundwater storage and recovery project, which includes the operation of new groundwater production wells and associated distribution and treatment facilities. This section includes a description of these proposed Project components.

5.3.1 *Groundwater Storage and Recovery*

The Partner Agencies currently supply potable water to their customers through a combination of groundwater from the South Westside Groundwater Basin and purchase of SFPUC surface water. The proposed Project would provide additional SFPUC surface water to the Partner Agencies during normal and wet years when sufficient surface water supplies are available. The Partner Agencies would reduce their groundwater pumping by a comparable amount and allow the groundwater basin to recharge naturally during these periods.

Figure 4 illustrates the increase in groundwater storage expected from a reduction in pumping during normal and wet years, as well the decrease in groundwater storage projected from an increase in pumping during dry years.

During normal and wet years, the volume of groundwater in the South Westside Groundwater Basin would naturally increase due to the reduced groundwater pumping, eventually reaching an increased storage volume of up to 61,000 AF. During dry or drought years, the Partner Agencies and SFPUC would pump previously stored groundwater. This new dry-year water supply would be made available to both the Partner Agencies and SFPUC wholesale customers under the terms of the Shortage Allocation Plan between the SFPUC and its wholesale customers[4]. A groundwater storage and recovery agreement would be negotiated by and between the SFPUC and Partner Agencies for groundwater and surface water management. Specifically, the agreement would cover water accounting; ownership principles; and operation, maintenance and replacement of facilities.

5.3.2 *Production Wells and Associated Facilities*

The proposed Project includes new groundwater production well facilities within the South Westside Groundwater Basin to withdraw the increased volume of stored groundwater at a rate of 7.2 MGD. Up to 16 new groundwater well facilities would be constructed on 16 of the 19 potential sites in northern San Mateo County. Of the 19 sites, 5 well facilities would connect to Daly City's distribution system, 3 well facilities would connect to San Bruno's distribution system, 4 well facilities would connect to Cal Water's distribution system, and 7 well facilities would connect to the SFPUC distribution system. In addition, the Westlake Pump Station in Daly City may be expanded and additional treatment facilities added.

Each groundwater well facility site would contain a groundwater production well, a pump station, underground distribution piping, and

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[4] The Shortage Allocation Plan identified a water allocation method to be used to determine the share of water for wholesale customers during shortages caused by drought.

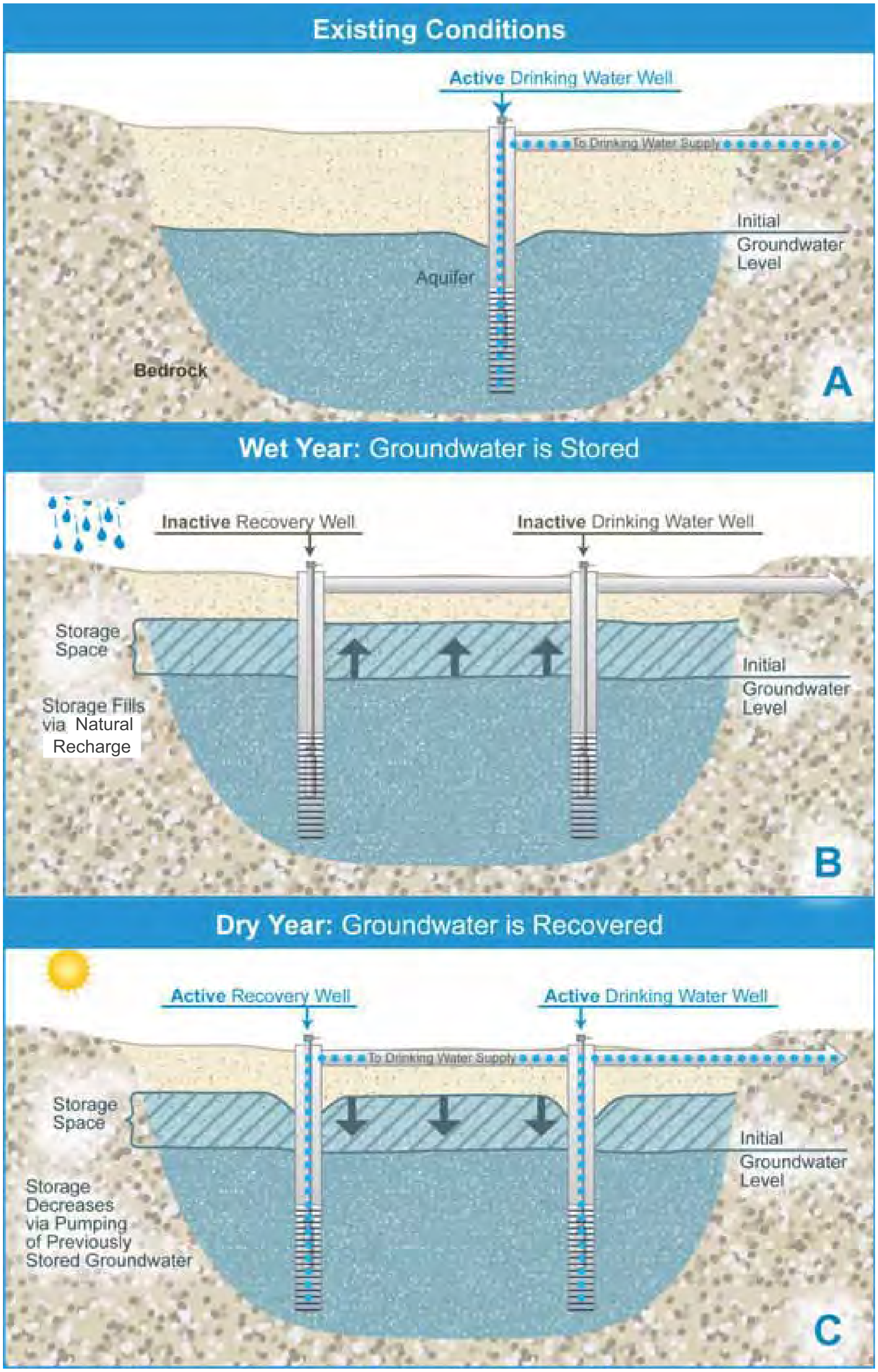


Figure (A) reflects the existing groundwater conditions, showing available storage space above the aquifer. In (B) the upward arrows represent the filling of the storage space with groundwater during wet years; in (C) the downward arrows represent the decline in stored water during dry years. The "Drinking Water Wells" represent the existing wells operated by the Cities of San Bruno and Daly City and California Water Service Company. The "Recovery Wells" represent the new wells that are proposed as part of the Project.

Groundwater Storage and Recovery

Regional Groundwater Storage and Recovery Project

Figure 4

utility connections. Each well facility also would have a disinfection unit, unless it is located near an existing disinfection unit that can accommodate the additional volume, in which case the well would be connected to the existing unit. Well facility sites where the groundwater may need treatment have been designed with appropriate treatment facilities (e.g., disinfection and manganese treatment). The facilities and the nature, extent and anticipated duration of construction activities are described further below.

Prior to confirming the final selected sites and full development of the groundwater well facilities, monitoring wells and test wells may be installed at the well facility sites to gather information about local groundwater characteristics and to determine the technical feasibility of each of the sites to produce sufficient volumes and quality of water for operation of a groundwater production well. If selected, sites would be converted from test wells to permanent production wells; pumps would be added, well enclosures would be built (fencing or building), disinfection units and treatment facilities would be constructed as needed, and utility and distribution pipelines would be installed.

A list of the 19 potential well facility sites and pump station upgrade is provided in Table 1.

TABLE 1
Well Facility Locations

Site ID[a]	Site Name	Location
1	Lake Merced Golf Course	Daly City
2	Park Plaza Meter	Daly City
3	Ben Franklin Intermediate School	Unincorporated San Mateo County (Broadmoor)
4	Garden Village Elementary School	Unincorporated San Mateo County (Broadmoor)
5	Right-of-Way at Serra Bowl	Daly City
6	Right-of-Way at Colma BART	Daly City
7	Right-of-Way at Colma Boulevard	Colma
8	Right-of-Way at Serramonte Boulevard	Colma

TABLE 1
Well Facility Locations

Site ID[a]	Site Name	Location
8a	Standard Plumbing Supply	Colma
9	Treasure Island Trailer Court	South San Francisco
10	Right-of-Way at Hickey Boulevard	South San Francisco
10a	Alta Loma Drive	South San Francisco
11	South San Francisco Main Area	South San Francisco
12	Funeral Home	South San Francisco
12a	Funeral Home	South San Francisco
13	South San Francisco Linear Park	South San Francisco
14	Golden Gate National Cemetery	San Bruno
15	Golden Gate National Cemetery	San Bruno
16	Millbrae Corporation Yard	Millbrae
PS	Westlake Pump Station Upgrade	Daly City

a. The EIR will evaluate the environmental effects of the development of all 19 well facility sites, even though a maximum of 16 well facilities would be constructed.

Well Station Design

The SFPUC has considered institutional, regulatory, operational, maintenance, and technical information in the design of the well stations. Three well station types are included in the proposed Project:

- Type 1 - well only, building or fenced enclosure;
- Type 2 - well plus chemical treatment building; and
- Type 3 - well plus chemical treatment and filtration building.

Site-specific well station design characteristics are listed in Table 2 and described in detail below. These characteristics include proposed building type, pump type, water distribution system connection point, groundwater disinfection location, and the method that would be used to achieve agency-specific water quality goals (i.e., blending with surface water or treatment).

TABLE 2
Site-Specific Well Station Characteristics

Site ID	Site Description	Well Station Type[a]	Pump Type	Connection Point	Alternate Connection Point	Disinfection Location	Method for Achieving Water Quality Goals
1	Lake Merced Golf Club	Type 2	Above-ground	SFPUC San Andreas Pipeline #2	Daly City	At site	Blending[b]
2	Park Plaza Meter	Type 1 with fenced enclosure	Submersible	Daly City	SFPUC Sunset Supply	Westlake Pump Station	Blending
3	Ben Franklin Intermediate School	Type 1 with fenced enclosure	Submersible	Daly City	SFPUC Sunset Supply	Westlake Pump Station	Blending
4	Garden Village Elementary School	Type 1 with fenced enclosure	Submersible	Daly City	SFPUC Sunset Supply	Westlake Pump Station	Blending or iron/manganese treatment
5	Right-of-Way at Serra Bowl	Type 2	Above-ground	Daly City	Cal Water	At site	Blending or iron/manganese treatment
6	Right-of-Way at Colma BART	Type 2	Above-ground	Cal Water	SFPUC Pipeline	At site	Blending or iron/manganese treatment
7	Right-of-Way at Colma Boulevard	Type 2	Above-ground	Cal Water	SFPUC Pipeline	At site	Blending or iron/manganese treatment
8	Right-of-Way at Serramonte Boulevard	Type 2	Above-ground	Cal Water	SFPUC Pipeline	At site	Blending or iron/manganese treatment
8a	Standard Plumbing Supply	Type 2	Above-ground	Cal Water	SFPUC	At site	Blending
9	Treasure Island Trailer Court	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	None	At site	Blending

TABLE 2
Site-Specific Well Station Characteristics

Site ID	Site Description	Well Station Type[a]	Pump Type	Connection Point	Alternate Connection Point	Disinfection Location	Method for Achieving Water Quality Goals
10	Right-of-Way at Hickey Boulevard	Type 2	Above-ground	Daly City	SFPUC San Andreas #2	At site	Blending
10a	Alta Loma Drive	Type 2	Above-ground	SFPUC San Andreas Pipeline #2	Cal Water	At site	Blending
11	SSF Main Area	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	Cal Water	At site	Blending
12	Funeral Home	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	Cal Water or other SFPUC pipeline	At site	Blending
12a	Funeral Home	Type 2	Above-ground	SFPUC Sunset Supply Pipeline	Cal Water or other SFPUC pipeline	At site	Blending
13	SSF Linear Park	Type 3	Above-ground	San Bruno	Cal Water, SFPUC, or other San Bruno	At site	Blending or iron/manganese treatment
14	Golden Gate National Cemetery	Type 1 with building enclosure	Above-ground	San Bruno	SFPUC pipeline	At site	Blending or iron/manganese treatment
15	Golden Gate National Cemetery	Type 3	Above-ground	San Bruno	SFPUC pipeline	At site	Blending or iron/manganese treatment
16	Millbrae Corp Yard	Type 2	Above-ground	SFPUC Crystal Springs Pipeline #2	None	At site	Blending

a. Type 1 is Well Only; Type 2 is Well plus Chemical Treatment Building; Type 3 is Well plus Chemical Treatment and Filtration Building; see text below for further description of conceptual layouts.

b. Blending is the mixing of groundwater with other potable supply water

Buildings would be about 15 feet tall and constructed of concrete block. Acoustical louvers for noise reduction would be used. The buildings would be painted in neutral colors with anti-graffiti coating.

It is anticipated that all outdoor site lighting would be activated by motion-controlled sensors, with manual switching available for as-needed night operations. Facilities would be designed to meet California's energy efficiency standards outlined in Title 24 of the California Code of Regulations and use recycled materials to the extent possible.

Type 1 Conceptual Layout: Well-Only. The conceptual layout for the "well-only" type includes an approximately 40-foot by 20-foot building or fenced enclosure to house the wellhead, pump, piping, and associated electrical and control equipment.

Type 2 Conceptual Layout: Well plus Chemical Treatment. The conceptual layout for the "well with chemical treatment" type would consist of a 40-foot by 20-foot building to house the wellhead, pump, pipeline, and associated electrical and control equipment, plus an approximately 15-foot by 15-foot building extension for chemical storage and handling. Space would be provided onsite for disinfection, pH adjustment, and fluoride addition if needed.

Type 3 Conceptual Layout: Well plus Chemical Treatment and Filtration. The conceptual layout for the "well with chemical treatment and filtration" type would be similar to Type 2 but with the addition of a filtration system. The building dimensions would be approximately 25 feet by 80 feet. Filtration would be located only at well facilities that require manganese and/or iron removal. This well station type would be larger than the other types to provide space for the wellhead, treatment facilities, and filtration vessels. The filtration system consists of a series of vertical pressure vessels. The number and size of the pressure vessels would depend on the well yield and the number of wells connected to the filtration system. The backwash water from the system would connect to a nearby sanitary sewer. It is anticipated that filters would be backwashed, on average, once a day for 4 minutes.

Well Pumps

Each well facility site would contain either a submersible or above-ground pump. The selection of the pump type is based on the preference of the Partner Agency responsible for well operation. In most cases, the wells would be equipped with above-ground pumps. In comparison to submersible motors, above-ground motors are more efficient, have a longer service life, are more durable in cases where variable frequency drives are required, and are more accessible and thus easier to maintain. In cases where noise, visibility, or lack of space is an issue, submersible pumps would be used. Submersible motors are quieter to operate, but more difficult to maintain, because maintenance requires the removal of the entire pump assembly. Any wells that are in fenced enclosures (i.e., without buildings) have been designated for submersible pumps.

Utility and Distribution Piping

Underground piping would connect the wells to the local distribution systems or SFPUC water distribution system. In addition, underground piping would connect well facilities to the storm drain system and/or the sanitary sewer system to allow discharge of the initial flush of water. Chloraminated water would be de-chlorinated or sent to the local sanitary sewer system. Backwash from the manganese treatment facilities would also be sent to the local sanitary sewer system. The piping for all selected sites would consist of a total of approximately 4,600 feet of 6-inch pipe and 12,500 feet of 8-inch pipe. In general, the pipeline route would be excavated to a depth of 6 feet. The maximum width of the pipeline work area (including the trenches) would be 20 feet. The pipelines would be constructed using conventional open-cut trenching techniques. Above or underground electrical lines would also be installed from the groundwater well facilities to the nearest power source (PG&E facilities). The dimension of the trenches for the underground electrical lines would be smaller than those of the water pipelines.

Westlake Pump Station Upgrade

Upgrades to the Westlake Pump Station may be necessary to serve the well stations at Sites 2, 3 and 4. The upgrades would include new chemical storage tanks, replaced or upgraded chemical metering pumps, a resized transformer, and up to three new booster pumps to deliver the additional water into the distribution system.

5.3.3 *Construction Methods*

Monitoring Wells, Geotechnical Borings, and Test Wells

Prior to the selection and full development of the groundwater production well sites, monitoring wells and test wells may be installed and geotechnical borings may be drilled at the well facility sites to gather information about local groundwater characteristics and to determine the technical feasibility of each of the sites to produce sufficient volumes and quality of water for operation of a groundwater production well. Depending upon the results of the testing, well facility sites would be selected, and test wells converted to permanent production wells, which would consist of full development of the well facility site to include the addition of pumps to the wells, the addition of enclosures around the well, installation of disinfection units and treatment facilities as needed, and installation of utilities and distribution pipelines.

In the event that additional monitoring or test wells are needed, the selected site would need to be cleared of vegetation and graded for installation and drilling of the borehole. For monitoring wells, a borehole would be drilled to a depth of approximately 750 feet below ground. For test wells, one steel casing would be installed to a depth of approximately 50 feet, with a borehole drilled to a depth of approximately 550 to 700 feet. Equipment used for well drilling and construction would include a mounted drill rig on a support truck, pump and pick up trucks or trailers and similar equipment. Construction of a monitoring well would be completed in approximately three weeks, with construction activities occurring between 8:00 AM and 7:00 PM Monday through Friday only. Construction and testing of test wells would require approximately 4 weeks. Drilling would extend for about a week both during the day and night. If the results of the test wells were favorable and the wells were selected as permanent production well sites, then development of production well facilities would occur, as described below.

Additional geotechnical borings may be required and would be drilled to a depth of approximately 50 feet below ground surface (deeper if fill or soft soil is encountered). A boring would be completed in approximately two days. Drilling activities would occur between 8:00 AM and 7:00 PM Monday through Friday only.

Construction of Well Station Facilities

Each well facility site would include a construction staging area; some sites may have two optional locations for staging areas. The minimum size of the staging area would be 1,500 square feet. Staging areas would be fenced. Any temporary spoils (excavated material) storage would occur inside the staging areas.

Construction of facilities at the well sites would require site clearing and grubbing. Site excavation and grading would be minor, with grading to a maximum depth of 5 feet for the building foundation (if the well facility includes a building) and utilities underneath the building. After the foundation and utilities connections are constructed, the remainder of the building would be constructed and the well pump and other equipment installed, as needed. No significant near-surface groundwater is expected at any site; therefore dewatering for construction of project facilities is not anticipated. Diesel generators with self-contained fuel tanks may be used during construction. Construction equipment is expected to include: a front end loader, backhoe/excavator, fork lift, telescopic crane, cement mixer, concrete pump truck, compactor, hauling trucks, pump-setting rig, and arc welder.

It is estimated that during the peak construction period, the maximum number of construction workers at any one site would be 15.

Construction of Distribution and Utility Connections

In general, the pipeline routes would be excavated up to a depth of 6 feet. The width of pipeline construction zones would be generally 20 feet, and the width of the electrical connection construction zones would be less than 20 feet. The pipelines would be constructed using conventional open-cut trenching techniques. Construction equipment is expected to include: an excavator, front-end loader, hauling trucks, compactor, asphalt trucks, and arc welder. Diesel generators with self-contained fuel tanks may be used during construction. At some sites, pipeline excavation would generate excess soil (called spoils) that would be reused onsite (for engineering fill) or disposed of at a Class III non-hazardous waste disposal site. After pipeline placement, the trenched area would be restored to its original condition.

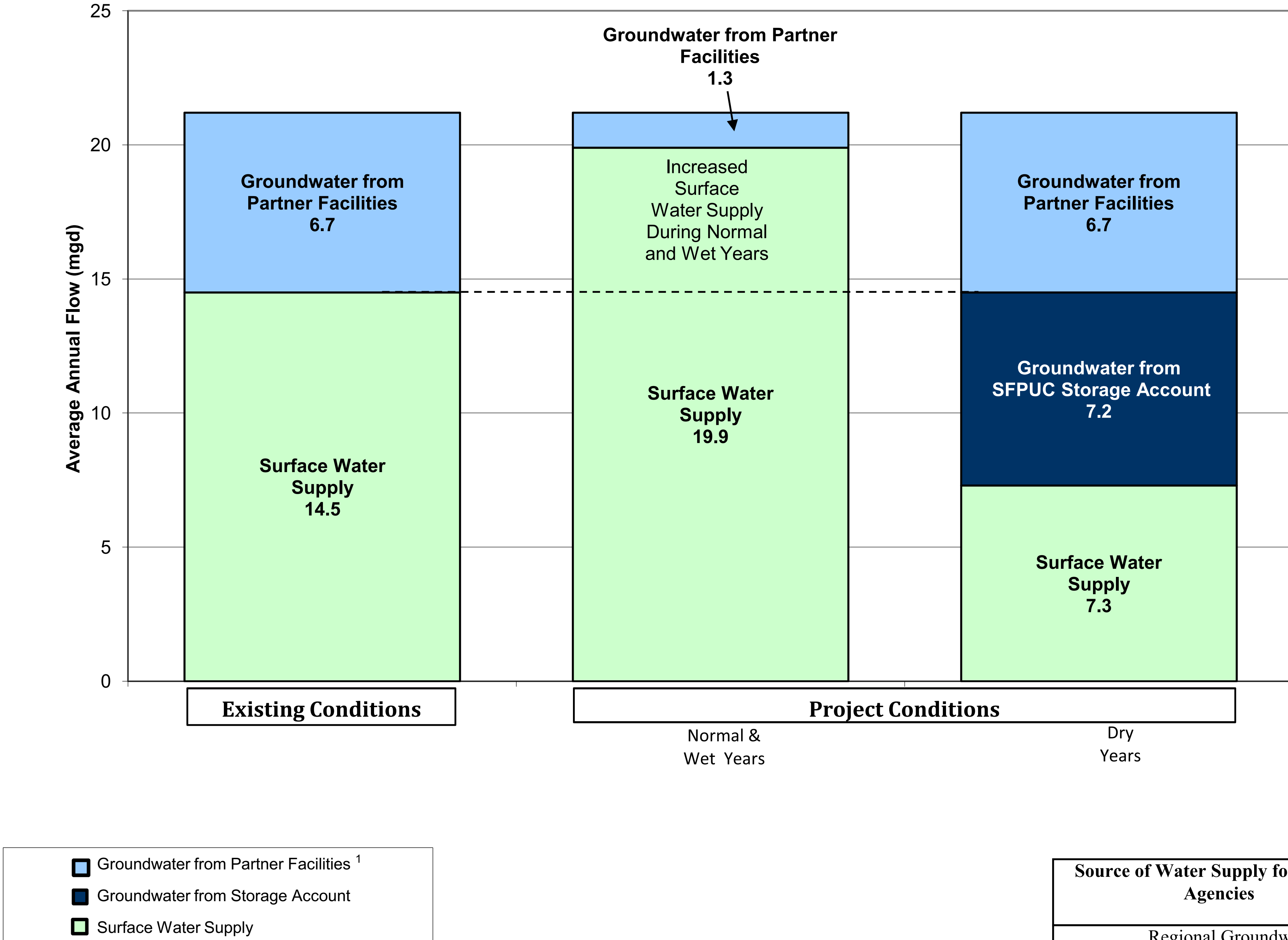
5.3.4 *Operation and Maintenance*

Project operations would be designed to allow natural recharge of the South Westside Groundwater Basin through reduced Partner Agency groundwater pumping, to provide up to 61,000 AF of increased groundwater in storage to be used by the SFPUC and Partner Agencies during drought conditions.

Figure 5 illustrates how the Project would change the source of water supply for the Partner Agencies. During normal and wet years, the portion of water supply coming from SFPUC surface water would increase compared to the existing condition. During dry years, the portion of water supply coming from groundwater would increase compared to the existing condition. For SFPUC wholesale water customers, the source of water supply would not change during normal and wet years; but the portion of groundwater delivered to some SFPUC customers would increase during dry years, compared to existing conditions.

An accounting of additional storage volumes (called the SFPUC Storage Account) would track the amount of water that has been stored during the normal and wet years and the amount of water pumped during dry years. The specific volumes shown in Figure 5 are based on historic rainfall and hydrology (MWH, 2007), but actual volumes in any given year would vary depending on several factors, including: 1) the final location and capacity of the project well facilities, 2) the availability of additional stored water in the SFPUC Storage Account, and 3) direction from the Operating Committee[5] regarding which wells should be used.

[5] It is expected that a Project agreement by and between SFPUC and the Partner Agencies would establish an Operating Committee. The role of the Operating Committee would be to monitor and track the SFPUC Storage Account, including any losses from the system, and establish pumping schedules for the project wells.



[1] Partner facilities are operated by City of Daly City, City of San Bruno, and Cal Water.

Source of Water Supply for Partner Agencies

Regional Groundwater Storage and Recovery Project

Figure 5

During normal and wet years, the proposed groundwater well facilities would be operated by SFPUC or by Partner Agencies only periodically for maintenance purposes. During dry years, the proposed groundwater well facilities would be operated by SFPUC or by Partner Agencies for additional water supply.

All well stations would be unmanned, but subject to remote monitoring and operation by the Partner Agency or SFPUC who would operate the well facility. Each well station would be visited daily when wells are operating for routine equipment checks, lasting approximately 30 minutes each. During normal and wet years, wells would be visited on a weekly basis, would be normally off, but regular exercising would be conducted. Longer term maintenance would include removal and repair or replacement of pumps, valves, and other equipment. Production wells may require redevelopment and/or rehabilitation on an infrequent basis.

6.0 Permits and Approvals Required

The SFPUC may be required to obtain the following permits and approvals for Project construction and operation:

- Section 404 Permit from the U.S. Army Corps of Engineers (USACE) if the Project affects jurisdictional wetlands or waters of the U.S.
- U.S. Department of Veterans Affairs approval and National Environmental Policy Act (NEPA) review for Sites 14 and 15 at the Golden Gate National Cemetery.
- U.S. Fish & Wildlife Service Section 7 consultation under the federal Endangered Species Act, if the Project affects threatened or endangered species or their habitat.
- Review by the Advisory Council on Historic Preservation may be required if the Project affects properties listed on or eligible for the National Register of Historic Places.
- Permit amendments and approval of well construction and operation from the California Department of Public Health, Water Supply Division.
- Section 1602 Lake and Streambed Alteration Agreement from the California Department of Fish and Game if the Project could affect streambeds under California jurisdiction.
- Section 2081/2080.1 Incidental Take Permit from the California Department of Fish and Game if a "take" (to hunt, pursue, catch, capture,

or kill, or attempt the same) could occur to state-listed species as a result of the Project.

- California Department of Fish and Game Memorandum of Agreement if needed to ensure no effect to fully protected species.
- Preparation of a California Department of Toxic Substances Control Contaminated Soil Treatment Work Plan (required only if contaminated soil is encountered during construction).
- San Francisco Bay Regional Water Quality Control Board Discharge permits, if required, for emergency and/or maintenance water discharges, and for "overboard" pumping of well waters.
- San Francisco Bay Regional Water Quality Control Board Section 401 Certification, the state certification of the federal Section 404 Wetlands Permit.
- California Department of Transportation Encroachment permits to cross State roadways and Interstate Highways.
- State Water Resources Control Board Stormwater General Permit and Stormwater Pollution Prevention Plan, if more than one acre of land is disturbed.
- Bay Area Air Quality Management District permit for stationary equipment that may generate air pollutants (e.g., generators).
- EIR certification by the San Francisco Planning Commission.
- Board of Supervisors approval may be needed for funding appropriation or property rights acquisition.
- SFPUC approval, adoption of CEQA findings and mitigation monitoring and reporting program (MMRP).
- Adoption of CEQA findings and MMRP by local City Councils or Boards of Supervisors.
- San Francisco Historic Preservation Commission review of local, state and national landmarks and historical landscapes.
- Determination of Project consistency with park use by local Recreation and Park Commissions and approval of use of property under their jurisdiction.
- Approval of local Unified School District(s) for use of property under their jurisdiction.
- Approval of exterior design of proposed facilities on SFPUC property or right-of-way by the San Francisco Arts Commission.
- Agreements with Partner Agencies.
- Local Department(s) of Public Health approval of well construction and operation permits in accordance with California Department of Water Resources Standards.

- Local Department(s) of Public Health approval of Certified Unified Program Agencies (CUPA)/Hazardous Materials Business Plan for Project operations.
- Local Department(s) of Public Works approval of excavation permits, encroachment permits, and temporary occupancy permits for street space.
- Bay Area Rapid Transit (BART) encroachment permits to cross existing BART system.

7.0 PROPERTY RIGHTS ACQUISITION

Several types of property rights would be needed for Project construction and operation, as shown in Table 3. The process for acquiring right-of-way involves the preparation of deed and appraisal map, an appraisal of fair market value, negotiations with property owners, and condemnation (if necessary).

TABLE 3
Property Rights Proposed for Acquisition

Property Acquisition Type	Rights
Access Easement	Temporary or permanent rights to enter or cross another property
Pipeline Easement	Rights to install and maintain a pipeline over or across another property
Fee Acquisition	Purchase of all the property rights, land, improvements (if any), etc.
Encroachment Permit	Rights to encroach across a publicly-owned street or highway for pipeline or other purposes

Of the 19 potential well sites, 12 sites are on SFPUC fee-owned land or within SFPUC right-of-way. The other seven well sites are on other public and private parcels which would require an acquisition of property use rights for the well(s), connecting pipelines, and/or access. Lastly, several sites have lengthy connecting pipeline requirements that would most likely be constructed on a combination of public and private parcels.

8.0 CONSTRUCTION SCHEDULE

The proposed Project schedule expected at the time of this NOP includes construction of permanent well facilities and pipeline connections from April 2012 through approximately May 2014.

9.0 ENVIRONMENTAL ANALYSIS

9.1 Environmental Issues to be Addressed in the EIR

The EIR will address all environmental issue areas required under CEQA. The EIR will address environmental impacts of the proposed Project due to construction and operation activities and will propose mitigation measures for impacts considered to be significant. The following sections describe the anticipated environmental issues that will be addressed by the EIR.

9.1.1 Land Use and Visual Quality

Construction and operation of the proposed Project could affect land uses and visual quality of the Project sites and surrounding areas. Potential impacts to be evaluated in the EIR include:

- Temporary and permanent disruption or displacement of existing land uses during construction including construction impacts on such sensitive land uses as schools, residences and funeral homes, and the potential temporary closure of a portion of South San Francisco Linear Park to the public.
- Impacts on scenic vistas or visual character, including potential impacts on the visual character of Golden Gate National Cemetery, Woodlawn Cemetery, Greenlawn Memorial Park, and Lake Merced Golf Club.

9.1.2 *Geology, Soils and Seismicity*

Construction and operation of new well facilities and below-ground distribution pipelines and electrical power lines could result in site-specific impacts on or from local geology and soils conditions. Potential impacts to be evaluated in the EIR include:

- Seismic hazards and/or increased exposure of people and structures to seismic hazards, including impacts from ground-shaking in the event of an earthquake on the San Andreas fault or other Bay Area fault.
- Increased exposure of people or structures to geologic hazards (such as liquefaction, poor soil conditions, or unstable slopes) from construction in geologic hazard zones.
- Soil erosion potential from construction activities.
- Potential land subsidence from drawdown of the groundwater aquifer.

9.1.3 *Hydrology and Water Quality*

Construction and operation of the Project could affect surface water quality and could affect groundwater levels and quality in the Project area and in the South Westside Groundwater Basin as a whole. Potential impacts to be evaluated include:

- Changes in local groundwater quality and levels within the South Westside Groundwater Basin as a whole.
- Changes in drinking water quality due to use of treated groundwater.
- Alteration of drainage patterns and increase in stormwater flows due to increase in the amount of impervious surfaces.
- Degradation of surface water quality as a result of erosion and sedimentation, hazardous materials release during construction, and construction dewatering discharges.

9.1.4 *Biological Resources*

The proposed Project could result in a permanent loss of wetlands and sensitive habitats and could directly impact special-status wildlife and plant species. Temporary impacts to biological resources could result from proximity to construction activities, including noise, vibration, and dust. Potential impacts to be evaluated include:

- Impacts on wetlands and aquatic resources.
- Impacts on sensitive wildlife habitats and protected/heritage trees.
- Impacts on special-status wildlife and plant species – direct mortality and/or habitat effects.
- Conflicts with adopted conservation plans or other approved biological resources plans.

9.1.5 *Cultural Resources*

The proposed Project could affect archaeological, historical, or paleontological resources through ground-disturbing activities during construction, or by introducing new facilities that compromise the historic integrity of historic buildings or landscapes. Potential impacts to be evaluated include:

- Impacts on archaeological and paleontological resources.
- Impacts on the historical significance of a historic district, contributor to a historic district, or historic landscape. Of particular focus will be the proposed well facilities on 1920s Lake Merced Golf Club; the turn of the century Woodlawn Cemetery, the Cypress Lawn Cemetery, and the Golden Gate National Cemetery.
- Impacts on Native American cultural resources.

9.1.6 *Traffic, Transportation and Circulation*

Construction could have temporary impacts on traffic volumes, traffic safety, and parking in the vicinity of the well facility sites and at the Westlake Pump Station. Potential impacts to be evaluated EIR include:

- Temporary reduction in roadway capacity and increased traffic delays, including impacts from short-term closure of one parking and/or traffic lane. Impaired access to adjacent roadways and land uses.
- Temporary displacement of on- or off-street parking.
- Increased traffic safety hazards during construction.
- Long-term traffic increases during facility operation.

9.1.7 *Noise and Vibration*

Construction noise and vibration impacts from the proposed Project would be associated with facility construction activities, and therefore, would be temporary and short-term. Operation of the proposed pumps and treatment facilities could create permanent noise impacts. Potential impacts to be evaluated include:

- Impacts of construction noise and vibration on sensitive receptors in the vicinity of Project construction sites, especially such sensitive land uses as schools, health care facilities, cemeteries, funeral homes, and churches.
- Noise impacts from groundwater well station operation, including pumps and groundwater treatment facilities.

9.1.8 *Recreational Resources*

Construction could temporarily disrupt recreational uses in the vicinity of the well facility sites as a result of noise, dust, and temporary access restrictions. The EIR will evaluate the impact of the Project on recreational resources. Potential impacts to be evaluated include:

- Temporary and permanent impacts on recreational facilities, including but not limited to Lake Merced Golf Club and Linear Park in South San Francisco.

9.1.9 Other Environmental Issues

Other environmental issues that will be evaluated in the EIR include the Project's potential impacts on air quality and greenhouse gas emissions; public services and utilities, including the Project's beneficial effect on water supply; agricultural resources; hazards, including the potential hazards from chemical storage at the well sites; and energy resources.

The EIR also will evaluate any potential growth-inducing impacts that could result from implementation of the Project. The EIR also will address whether the Project could result in impacts that would be significant when combined with the impacts of other SFPUC or non-SFPUC projects occurring in the same geographic area as the Project and at the same time.

9.2 Alternatives

CEQA requires that an EIR evaluate a reasonable range of feasible alternatives to the project, or to the location of the project, that would attain most of the basic project objectives but that could avoid or substantially lessen any of the significant effects of the project. The EIR will identify the potentially significant impacts of the proposed Project. The findings of the EIR impact analysis will guide the refinement of an appropriate range of alternatives to be evaluated in the EIR that would avoid or substantially lessen significant impacts, while still meeting the project objectives. Alternatives suggested during the public scoping period would also be considered. The EIR will include a discussion of impacts associated with the No Project Alterative.

10.0 References

MWH. 2007. Final Alternatives Analysis Report, Groundwater Conjunctive Use Project. October.

MWH. 2008. San Francisco Public Utilities Commission Water System Improvement Project Groundwater Conjunctive Use Project WSIP Project CUW30103 Conceptual Engineering Report. November.

SFPUC. 2005. 2005 Urban Water Management Plan for the City and County of San Francisco. December.

SFPUC. 2009. Conceptual Engineering Report Checklist for Environmental Review. February.

City of San Francisco Planning Department. Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program (State Clearinghouse No. 2005092026). 2008. September.

Appendix B
Notification Materials (Proof of Publication)

San Mateo County Times

c/o Bay Area News Group-East Bay, Legal Advertising
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Legal Advertising
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Santa Rosa CA 95401-4619

PROOF OF PUBLICATION

FILE NO.

In the matter of

The undersigned deposes that he/she is the Public Notice Advertising Clerk of the SAN MATEO COUNTY TIMES, a newspaper of general circulation as defined by Government Code Section 6000, adjudicated as such by the Superior Court of the State of California, County of San Mateo (Order Nos. 55795 on September 21, 1951), which is published and circulated in said county and state daily (Sunday excepted).

The PUBLIC NOTICE

was published in every issue of the SAN MATEO COUNTY TIMES on the following date(s):

6/24/2009

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Public Notice Advertising Clerk

Legal No. **0003188359**

SAN FRANCISCO PLANNING DEPARTMENT ENVIRONMENTAL REVIEW NOTICE

Notice is hereby given to the general public of the following actions under the Environmental Review Process. Review of the documents concerning these projects can be arranged by calling (415) 558-6378 and asking for the staff person indicated.

NOTICE OF PREPARATION OF EIR AND NOTICE OF SCOPING MEETING

The initial evaluation conducted by the Planning Department determined that the following project(s) may have significant effects on the environment and that an Environmental Impact Report (EIR) must be prepared.

Case No. 2005.0164E: Regional Groundwater Storage and Recovery Project

The San Francisco Public Utilities Commission (SFPUC) is proposing the Regional Groundwater Storage and Recovery Project to provide surface water to the cities of Daly City and San Bruno and the California Water Service Company (Cal Water) (collectively referred to as Partner Agencies), to be used by these agencies in lieu of pumping groundwater during normal and wet years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. The supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of pumping by Partner Agencies would increase groundwater storage in northern San Mateo County within the southern portion of the Westside Groundwater Basin, known as the :South Westside Groundwater Basin." The Westside Groundwater Basin spans northern San Mateo County and the City and County of San Francisco. Stored groundwater would be pumped during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would construct new groundwater production well facilities in the cities of Colma, Daly City, South San Francisco, San Bruno, Millbrae, and unincorporated San Mateo County that would be operated by SFPUC and the Partner Agencies. Well facilities would be connected to Daly City, San Bruno, Cal Water, or SFPUC distribution systems.
The project is part of the SFPUC's Water System Improvement Program (WSIP). The WSIP was adopted in October 2008 to improve the SFPUC's regional water system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area.

Notice is hereby given to the general public as follows:

1)A Notice of Preparation of an EIR was published on June 24, 2009 by the Planning Department in connection with this project.

2)Public comments concerning the scope of the EIR will be accepted from June 24, 2009 to July 28, 2009, 5:00 p.m. Mail written comments to the San Francisco Planning Department, Attn. Bill Wycko, Environmental Review Officer, Regional Groundwater

Storage and Recovery Project NOP, 1650 Mission Street, Suite 400, San Francisco, CA 94103. Comments also may be submitted by fax to (415) 558-6409, or sent by email to diana.sokolove@sfgov.org.

3)The San Francisco Planning Department will hold a scoping meeting starting at 7:00 p.m. at the South San Francisco Municipal Services Building, Community Room, 33 Arroyo Drive, South San Francisco, CA. Preceding the Scoping Meeting, the San Francisco Public Utilities Commission will hold a Public Information Session from 6:15-7:00 p.m.

San Mateo County Times, #3188359
June 24, 2009

SAN FRANCISCO EXAMINER

This space for filing stamp only

450 MISSION ST 5TH FL, SAN FRANCISCO, CA 94105
Telephone (415) 359-2723 / Fax (415) 359-2659

VIRNALIZA BYRD
S.F. PLANNING DEPT
1650 MISSION ST #400
SAN FRANCISCO, CA - 94103

EXM#: 1628277

PROOF OF PUBLICATION

(2015.5 C.C.P.)

State of California)
County of SAN FRANCISCO) ss

Notice Type: GPN - GOVT PUBLIC NOTICE

Ad Description: 2005.0164E: Regional Groundwater Storage and Recovery Project

I am a citizen of the United States and a resident of the State of California; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer and publisher of the SAN FRANCISCO EXAMINER, a newspaper published in the English language in the city of SAN FRANCISCO, county of SAN FRANCISCO, and adjudged a newspaper of general circulation as defined by the laws of the State of California by the Superior Court of the County of SAN FRANCISCO, State of California, under date 10/18/1951, Case No. 410667. That the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

06/24/2009

Executed on: 06/24/2009
At Los Angeles, California

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Signature

SAN FRANCISCO PLANNING DEPARTMENT NVIRONMENTAL REVIEW NOTICE

Notice is hereby given to the general public of the following actions under the Environmental Review Process. Review of the documents concerning these projects can be arranged by calling (415) 575-9025 and asking for the staff person indicated.

PRELIMINARY MITIGATED NEGATIVE DECLARATION

The initial evaluation conducted by the Planning Department determined that the following projects could not have a significant effect on the environment, and that no environmental impact report is required. Accordingly, a Preliminary Mitigated Negative Declaration has been prepared.

Public recommendations for amendment of the text of the finding, or any appeal of this determination to the Planning Commission (with $500 filing fee) must be filed with the Department within 20 days following the date of this notice. In the absence of an appeal, the Negative Declaration shall be made final, subject to any necessary modifications, 20 days from the date of this notice.

2008.1286E: 1100 Ellis Street/Sacred Heart Cathedral Preparatory Theatre. The 61,105 square?foot project site (Assessor's Block 0711, Lot 031) is located on the north side of Ellis Street, on a block bounded by Gough, Ellis and Laguna Streets, and Geary Boulevard, within the Western Addition neighborhood. The site is located in an RM-4 (Residential Mixed-Use, High Density) District and 80-B Height and Bulk District. The proposed project involves the construction of a new theater, renovation of two existing buildings, and construction of a new elevator within the Sacred Heart Cathedral Preparatory school campus. The proposed theater would be located within the existing interior courtyard of the campus, would total approximately 11,513 square feet, would be 36 feet 9 inches in height, and would seat approximately 299 people. The proposed project would not result in an increase in the number of students or staff. (FORDHAM)

NOTICE OF PREPARATION OF EIR AND NOTICE OF SCOPING MEETING

The initial evaluation conducted by the Planning Department determined that the following project(s) may have significant effects on the environment and that an Environmental Impact Report (EIR) must be prepared.

2005.0164E: Regional Groundwater Storage and Recovery Project - The San Francisco Public Utilities Commission (SFPUC) is proposing the Regional Groundwater Storage and Recovery Project to provide surface water to the cities of Daly City and San Bruno and the California Water Service Company (Cal Water) (collectively referred to as Partner Agencies), to be used by these agencies in lieu of pumping groundwater during normal and wet years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. The supply would be partially replaced by surface water supplies from the SFPUC regional water system. The reduction of pumping by Partner Agencies would increase groundwater storage in northern San Mateo County within the southern portion of the Westside Groundwater Basin, known as the "South Westside Groundwater Basin." The Westside Groundwater Basin spans northern San Mateo County and the City and County of San Francisco. Stored groundwater would be pumped during periods of insufficient surface water supplies (i.e., dry years). As part of the proposed Project, SFPUC would construct new groundwater production well facilities in the cities of Colma, Daly City, South San Francisco, San Bruno, Millbrae, and unincorporated San Mateo County that would be operated by SFPUC and the Partner Agencies. Well facilities would be connected to Daly City, San Bruno, Cal Water, or SFPUC distribution systems. The project is part of the SFPUC's Water System Improvement Program (WSIP). The WSIP was adopted in October 2008 to improve the SFPUC's regional water system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area.

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1) A Notice of Preparation of an EIR was published on June 24, 2009 by the Planning Department in connection with this project.
2) Public comments concerning the scope of the EIR will be accepted from June 24, 2009 to July 28, 2009, 5:00 p.m. Mail written comments to the San Francisco Planning Department, Attn. Bill Wycko, Environmental Review Officer, Regional Groundwater Storage and Recovery Project NOP, 1650 Mission Street, Suite 400, San Francisco, CA 94103. Comments also may be submitted by fax to (415) 558-6409, or sent by email to diana.sokolove@sfgov.org.
3) The San Francisco Planning Department will hold a scoping meeting starting at 7:00 p.m. at the South San Francisco Municipal Services Building, Community Room, 33 Arroyo Drive, South San Francisco, CA. Preceding the Scoping Meeting, the San Francisco Public Utilities Commission will hold a Public Information Session from 6:15-7:00 p.m.

Appendix C
Public Scoping Meeting Transcript

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SAN FRANCISCO PLANNING DEPARTMENT

PUBLIC SCOPING MEETING

PROPOSED REGIONAL GROUNDWATER STORAGE & RECOVERY PROJECT

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THURSDAY, JULY 9, 2009

SOUTH SAN FRANCISCO, CALIFORNIA

REPORTED BY: Katy Leonard
Certified Shorthand Reporter
License Number 11599

A P P E A R A N C E S

Moderator:
DIANA H. SOKOLOVE, Senior Environmental Planner
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Presenter:
GREG BARTOW, Project Manager
SAN FRANCISCO PUBLIC UTILITIES COMMISSION

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A G E N D A

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A T T A C H M E N T S

SF Planning Department Public Scoping Meeting Agenda 1 page

SF Planning Department "Notice of Preparation of an Environmental Impact Report," 30 pages

Regional Groundwater Storage and Recovery Project handout, 2 pages

Regional Groundwater Storage and Recovery project "Frequently Asked Questions" handout, 2 pages

SF Public Utilities Commission "WSIP" brochure, 1 page

(Attached to the original transcript)

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P R O C E E D I N G S

JULY 9, 2009 7:02 P.M.

INTRODUCTION

MS. SOKOLOVE: Hi. Good evening. Thank you for coming tonight.

Welcome to tonight's Public Scoping Meeting for the Regional Groundwater Storage and Recovery Project.

Can everyone hear me?

My name is Diana Sokolove, and I'm a Senior Environmental Planner with the San Francisco Planning Department, and I'll be the moderator for tonight's meeting.

So, I just wanted to review with you briefly the purpose of the meeting tonight for those of you who may be unfamiliar with the environmental review process.

Essentially, I'm here to hear from you. And I want to hear your comments on the scope and focus of the proposed project that's sponsored by the San Francisco Public Utilities Commission.

Your comments tonight can help me understand the depth of analysis that I need to perform in the

Environmental Impact Report, the alternatives to the proposed project, et cetera. So, we really want to understand what you think about the environmental effects of the project. So, that's the main reason why

I'm here tonight.

Here's our agenda: I'm going to introduce some folks from the project team here from the City and County of San Francisco and some other folks who are here from the partner agencies.

I'll make a brief presentation about the environmental review process in general, and then a representative from the San Francisco Public Utilities Commission will give a brief presentation and overview of the proposed project. Then we'll take your comments, and I'll make some closing remarks, and you can all go home.

So, just some reminders: If you haven't already, please sign in at the front desk. That's our way of keeping in touch with you, unless, of course, you don't want us to keep in touch with you, but that is our way to keep track and make sure that you receive our notices and publications regarding this project, so please do sign in. Pick up copies of the meeting materials, such as the Notice of Preparation.

And if you would like to speak tonight, you'll

fill out one of these yellow cards, please, and you can hand those cards to Pat and she'll give them to me.

And if you don't want to speak tonight, but you want to submit comments, you can fill out one of these sheets of paper. (Indicating) They're at the front desk, and I think we have some up here as well so you can submit some written comments.

And if you so choose, when we're done with the presentation, you can speak directly to the Court Reporter here and she can transcribe your comments directly.

Please do hold all of your comments until the end of the meeting so that we can -- I'm sorry -- until the end of the presentation so that we can get through the presentation as quickly as possible.

And I know you all have cell phones and pagers and lots of beeping things, so just turn those off. And if you do need to take a call, feel free to step outside. And I know there are restrooms. If you go out this door, make a right. And there is also a water fountain over there.

---oOo---

ENVIRONMENTAL REVIEW PROCESS OVERVIEW

MS. SOKOLOVE: So, again, my name is Diana Sokolove. I'm with the San Francisco Planning Department, and the Planning Department is the lead agency for performing the environmental review of this proposed project under the California Environmental

Quality Act, or CEQA, and the project sponsor is the San Francisco Public Utilities Commission.

And here tonight is the Project Manager, Greg Bartow. And we also have Sue Chau, who is the Environmental Project Manager. Michele Liapes in the back with communications, and also, Les Chau with Kennedy/Jenks, who's a designer working with the Public Utilities Commission.

And I think there's some folks from the partner agencies here.

MR. BARTOW: I just want to acknowledge our three partner agency representatives that are here tonight: Patrick Sweetland from Daly City, Tom Salzano from Cal Water, and Steve Davis from the City of San Bruno.

Also, two managers from the San Francisco Public Utilities Commission that are here tonight: Andrew Degraco, Manager of our Water Quality Department,

and Paula Kehoe, Director of Water Resources.

MS. SOKOLOVE: So, I did want to talk to you a little bit about the California Environmental Quality Act. Proposed projects do require environmental review under CEQA before they can be considered for approval. So, again, we're here tonight to hear your comments on what the environmental effects of the project will be so that we can be sure to disclose all of those facts in the environmental document.

And again, as I explained, for projects that are sponsored by or within the City and County of San Francisco, including San Francisco Public Utilities Commission Projects, CEQA is implemented by the San Francisco Planning Department, and that's who I represent.

Here are the objectives of CEQA -- I'll just read these off to you: To prevent environmental impact of proposed projects; identify ways to avoid or reduce environmental impacts; support the agency decision-making process, such as planning commissions or the San Francisco Public Utilities Commissions or any of the partner agencies commissions, and also, resource agencies; to encourage public participation -- so, this is another reason why we're here tonight -- and to enhance interagency coordination.

So, what will our Environmental Impact Report do. Well, the -- the meat of the Environmental Impact Report is an analysis of the environmental effects of the project and looking at alternatives to the proposed project that could reduce or avoid or lessen environmental effects.

So, it's going to have a really good description of the proposed project, and it's going to talk about the environmental effects of the project. And those environmental effects range from air quality impacts, transportation impacts, traffic, hazardous materials impacts, impacts on plants and wildlife. Those kinds of things.

And then there will be a section on ways that we can reduce the environmental impacts of the project, be that through mitigation measures or through alternatives to the project.

So, now, a representative from the San Francisco Public Utilities Commission, Greg Bartow, will talk to you a little bit about the project itself.

---oOo---

PROJECT OVERVIEW

MR. BARTOW: Thanks, Diana.

Good evening, everybody. I'm Greg Bartow, the Project Manager for this project, and I want to thank everybody for coming out this evening to learn more about the project. I'm just going to give you a brief overview of the project. The Notice of Preparation goes into the project in a lot more detail. There's also information on our Web site, and materials on the back of the table.

First, I want to just talk about the

San Francisco Public Utilities Commission in general. We're a wholesale water provider and resale water supplier in the San Francisco Bay Area.

We supply 2.4 million residents in the Bay Area. About a third of those are San Francisco retail customers, and two-thirds of those are wholesale suburban customers, as -- the light area around the Bay shows the service area, which is a portion of the East Bay, a portion of the South Bay, almost all of San Mateo County, and all of San Francisco. (Indicating)

The Water System Improvement Program was a voter-approved bond measure in 2002 to do seismic restoration or rehabilitation of the project -- of a

number of our projects, including pipelines, reservoirs, and treatment plants.

It also included a component to diversify our water supply, and that's where this project fits in. It includes this project, as well as drilling new wells in San Francisco for a water supply, recycled water facilities, as two other examples.

So, on the need for the project, so that it -- this is basically a dry-year water supply project, and what it is designed to do is to meet our commission-approved 80 percent reliability goal, which said another way is, we have -- the Commission has adopted a policy to not -- in any dry year, not have our

cutbacks to be more than 20 percent so we wouldn't have
mandatory rationing greater than 20 percent.

But this is part of the project that would
need to happen to keep that mandatory rationing at no
greater than 20 percent in any one year or any series of
years.

Okay. So, now I'll take you into the Westside
Basin here. And so, the Westside Basin is about 40
square miles. It extends from Golden Gate Park to the
north, all the way down to Burlingame.

And the focus of this project is the South
Westside Basin. And we're working with three partner

agencies: Daly City to the north, Cal Water, which
serves South San Francisco and Colma and some
unincorporated areas in San Mateo County, and then the
City of San Bruno.

This is a Conjunctive Use Project, and so
to -- that term means the use of the -- the managed use
of groundwater and surface water. And what really works
out for this part of the basin is that these utilities
already use groundwater to meet a portion of their water
supply needs, and they have an ability to use
San Francisco surface water supplies.

So, what is groundwater. Groundwater is water
that has -- that is in the subsurface that has been
recharged, either from rainfall or from streams and
irrigation.

And so, what this map or this cross section shows is the unsaturated zone above the groundwater table and a typical well. (Indicating) So, just schematically just to give you a little overview of what we're talking about. Groundwater.

How would the project work? So, there's sort of the three components of the project here. The existing conditions, which is the cross section on the upper -- just first of all, I think a simple way to look at the west -- South Westside Basin, if you think about

it as a bathtub full of sand, and then the water levels, due to historic pumping, have been depressed, and so, there's some available storage.

So, that bathtub is roughly a half or two-thirds full of water, and the space between the sand grains above that water has available storage space to it. And so, currently, water levels are, in some cases, 200 feet below sea level. There's a significant amount of available storage in this underground reservoir. And that's what we want to utilize for this project.

So, the existing condition is that there's -- the pumping has decreased and stabilized over the years, and the existing conditions is that there are those municipal pumpers and some other irrigation pumpers in the basin that are used in the basin.

And the way the project works is, in normal

and wet years, when we have water, extra water within
the system, we have no -- we don't have places to put
it. We top off our reservoirs, and there's no other
location where we can store this. And the South
Westside Basin provides such a storage location.
So, you can see what we do is, in normal and
wet years, we would supply to those three partner
agencies more surface water and they would reduce their
pumping from the groundwater basin. By reducing the

groundwater pumping, that allows the natural recharge to
build up.
So, we're not talking about injecting water.
We're not talking about recharged ponds like some other
utilities. It's just going to be the natural recharge
that accumulates in the basin over time. So, that's the
middle slide. That's how we've increased the storage
there.
And then when we get to a drought, we will
have installed 16 new wells in the basin that we can
draw from this stored water, and then those partner
agencies -- the City of Daly City, Cal Water, and
San Bruno -- would turn their existing wells back on and
pump the amount of water they had previously pumped, and
will be able to pump from these new wells.
So, that's the benefit of the project, is
being able to recover that stored water.
To say this a little differently, we'll just

look at those same time slices that we were showing from top to bottom, only this time it's left to right.

So, under existing conditions right now, if you take those three agencies together -- Daly City, Cal Water, and San Bruno -- and look at how much water they're using collectively, they're using 14.5 million gallons per day of surface water and 5.7 million gallons

per day of groundwater. So, this is collectively. In Daly City and San Bruno, it's more 50/50. In Cal Water, it's a smaller percent, but it averages out to be about a third, two-thirds.

So, then we get into the storage component of the project, and in wet or normal years, they'll reduce their pumping. So, you can see the blue portion of the chart is decreasing.

And then we're adding -- we're providing more surface water to them. So, that's how the water then -- by reducing that pumping, then that's allowing groundwater to accumulate in the basin.

Then the payout where this project makes -- provides the benefit is during the dry year. And during the dry year, we would reduce our surface water deliveries to those utilities, and then we would pump through those 16 new wells -- the middle, the darker blue portion of the water (Indicating) -- and then they would return to pumping their previously pumped amount of water.

This is -- this provides a regional benefit to all the 2.4 million customers. It sort of helps float everybody's boat by having this additional pumping -- pumped groundwater in dry years in this project.

I'll talk now more about how we got these well

sites. How did we get to these 16 well sites. Initially, we started with 48 sites that we looked at throughout the basin. We were looking for sites on properties we owned, on other public properties, and private properties.

We ranked those relative to a number of criteria, but, for example, distance to transmission lines, location of where they are in the basin. The center of the basin is deeper, so we wanted to stay away from the sides of the basin, which are shallower. We wanted to stay away from potential contaminating activities like underground storage tanks.

And so, we winnowed that down from 48 to 19 sites that are in the Environmental Impact Report that are listed in this Notice of Preparation. And then of those, we want to build up to 16 sites. So, there's maps in the Notice of Preparation, and this exact map is in there.

But just to take you through -- so, starting in the north -- and these are a series of three overlapping maps showing you the location of these 19 sites. So, that's in the Daly City and Colma area, Colma, South San Francisco area, and then San Bruno and down to Millbrae.

So, let me go over the overall project

description. So, we're working on an agreement with these three utilities to store up to 61,000-acre-feet of water in the South Westside Basin. That's about as much water as in our Crystal Springs Reservoir. If you ever go down 280 or cross over 92 to go to Half Moon Bay, you're going through upper and lower Crystal Springs Reservoirs.

Starting this spring, there were 54,000-acre-feet, and at that time the reservoir was full, so, this is a lot of water that we're able to store in this -- this South Westside Basin. The scope is to develop 7.2 million gallons per day pumping capacity, and to be able to pump that for 7 1/2 years.

So, the map is, if you pumped that amount at that rate for that amount of time, that would equal 61,000-acre-feet. And we'd only pump the stored water, the water that we had stored through the exchange program with those agencies.

I mentioned this before, the project is to construct 16 wells. Each of the facilities would also have pipelines there. There would be electrical connections. There would be connections to the stormwater in the sanitary sewer.

We'd disinfect the water per the California Department of Public Health requirements. We'd provide

other treatment, if needed. If the water naturally doesn't meet the drinking water standards, then we would treat it to be below those standards. And then the wells would be connected to either Daly City, San Bruno, Cal Water, or the SFPUC pipelines. It will be a combination of those up and down the basin.

I want to emphasize that the water will -- you'll continue to have high-quality drinking water from this project. The groundwater will be in compliance with the California Department of Public Health requirements. There will be disinfection of the water where we'll have a monitoring program, and in most cases, the groundwater will continue to be blended with San Francisco's imported surface water.

Just a typical site layout. So, this is a site in South San Francisco off of Hickey Boulevard. We own the right of way along this proposed site, and the -- this is the well. This is the building. (Indicating) These other lines are existing pipelines or proposed pipelines. (Indicating)

As I mentioned, we're going to need connections to the sanitary sewer, storm drains, etc. And then there's a larger line drawn around this that would be the areas of construction, so when we're constructing the facility, we'd have a larger area that

would be impacted, and then we'll end up with a smaller building there when we're all done.

This is a sample facility from Southern California, a well station. This is a well only. If we have to have disinfection or treatment, the facility could be twice that size.

And then I'll turn it back over to Diana.

MS. SOKOLOVE: So, here's our environmental review schedule. We distributed the Notice of Preparation on June 24th of this year. Tonight is our Public Scoping Meeting. The scoping period ends on July 28th, so that's the last day that we'll be accepting scoping comments. And then we begin our draft Environmental Impact Report. We hope to publish the draft Environmental Impact Report next summer, and then we would release that Environmental Impact Report for a 45-day review. Once we get comments back, we will prepare responses to comments, and we would release the response-to-comments document, or the final Environmental Impact Report the following year. We hope to certify in mid 2001.

So, here is your chance to give me your comments, and I'm just wondering if anyone has a speaker card, if they wanted to speak tonight.

Given the fact that we have a court

transcriber here, if you could stay up in the front of the room and sort of speak to her and the audience, that would be great.

---oOo---

PUBLIC COMMENT

PUBLIC SPEAKER: Hi. My name is Andrea Ouse. ORAL COMMENT 101
I'm the City Planner for the Town of Colma. Thank you very much for the Scoping Meeting tonight. I'm here on behalf of the Town of Colma, its residents, and property owners.

First of all, I think in concept, the Town agrees with and respects the type of work that's being done here. It's an overall public good. I do think that there are some considerations that maybe haven't been vetted out quite yet.

Um, one of the things that concerns us in the Town is the test wells. The test wells appear to be being handled as a separate project and not encompassed as part of a cumulative review of the recharge project.

So, I understand from talking to staff, and from a workshop that was held in Colma, that it's -- they're being considered under a categorical exemption.

Also, what I understand is there's a cluster of wells. There's approximately five or six different sites in our town of Colma, and there's many others throughout the stretch.

There are approximately five different wells in each site, so there's a number of very large, deep holes that will be dug throughout our community, and we're really not sure that that warrants a categorical exemption under CEQA, and we would appreciate being forwarded any paperwork that's been already developed on the test-well issue so that we have the opportunity to review and comment on it.

The scope of those test wells, we really didn't know to much about it, but we would also appreciate it, if there's any project description on those test wells, to be sent that information.

On the project description of the storage project here, we don't feel at this point that it is quite adequate to describe the -- sort of the depth, and again whether or not this will include clustering. I didn't know that there's going to be buildings associated with each well site.

Maybe there is or isn't, but this is kind of -- this was new information for me. We do have some pretty significant concerns if buildings are going to be associated with each well site and where those are going to be located and what they're going to look like.

For any of you not familiar, Colma has 76 percent of its land in cemetery use. And there's -- you know, we try to keep our policies in line with a very tranquil and serene environment. Our cemeteries have been there over a hundred years and they use a lot of the groundwater to irrigate their property, so we have a very distinct, vested interest in maintaining some sort of rights associated with that usage.

At this point I'm not quite sure what the management structure is going to be in terms of the assertion of authority over this -- this aquifer, so I think the project description should include a description of what that breakdown is going to be and what that authority -- who's going to have the authority over this water, and if it's going to change the rights and the ownership of that water to the partner agencies or different entities, other than those that are already existing and have those rights to the water.

One of the things I would like to see in the Environmental Impact Report is some sort of study of the potential settlement issues associated with recharging the aquifer and deleting the part of the aquifer.

Since it appears to be either a gradual decrease in the amount of water in the aquifer right now, is there going to be any consideration for potential settlement issues with sort of a more active management of the aquifer?

And that concludes my comments. Thank you.

MS. SOKOLOVE: Thank you.

Did anybody else want to make any comments tonight?

PUBLIC SPEAKER: Good evening. My name is Peter Drekmeier. I'm with the Tuolumne River Trust. ORAL COMMENT 102

And I'm curious if the EIR is going to look at the impacts of -- it sounds like it might divert an extra 6.7 million gallons of water per day from the Tuolumne in wet years, and I'm wondering if in addition to what was studied in the program EIR for the WSIP, that that would be looked at.

If that wasn't the plan, I would encourage you to do that, because there's going to be additional information coming out at the end of this year or early next year. The PC is doing a biological study of the stretch below Hetch Hetchy as part of the settlement on the Kirkwood Powerhouse Agreement in 1988. So, we're going to have additional information that wasn't available at the time of the WSIP, and that would be good to incorporate that.

I'd also encourage you to look at the recharge

of the groundwater with stormwater so that we might be able to tap it sustainably ongoing even in wet years and rely less on the Tuolumne River.

Thank you.

MS. SOKOLOVE: (Indicating)

PUBLIC SPEAKER: Good evening. I'm Kathryn Slater-Carter, and I am a business owner in Daly City and a property owner in Pacifica. ORAL COMMENT 103

I have a question, actually, about whether the rate of recharge for the basin has been calculated and is part of this, given that during the dry years there would be more water taken out of it, how long will that water supply be good for.

There's substantial impervious surface in the basin, and to Peter's earlier comments, I think it might be worthwhile to be looking at treated stormwater runoff, since most of the cities do have stormwater drainage systems in them.

The other question is, What will the cost of the -- from the increased use of Hetch Hetchy water be? It's a very expensive water. I'm sure that Daly City is able to blend its rates to keep the cost down by using groundwater.

Is this going to cause me, as a business owner that uses a significant amount of water, to see an

increase in my rates?

Thank you.

MS. SOKOLOVE: (Indicating)

PUBLIC SPEAKER: My name is Jim Stark. I reside in San Francisco, and I live in the area known as "Lakeshore" or "Lakeshore Acres," and for many years, our organization, the Lakeshore Acres Improvement Club, has been concerned with lake levels at Lake Merced, and we hope that the Environmental Impact Report will examine it and respond to all the concerns that are already known regarding lake levels at Lake Merced. ORAL COMMENT 104

Thank you.

MS. SOKOLOVE: (Indicating)

PUBLIC SPEAKER: I'm going to talk to you since you're the one who's writing everything the EIR, and I'm happy to have everybody who's here hear me say what I have to say.

My name is Bob Maddow. I'm an attorney. I represent a number of golf courses throughout the basin. Several of them have switched from use of groundwater from this very same aquifer to use of recycled water. That's been an important achievement that the City and County of San Francisco and the City of Daly City are very proud of, and rightly so, and so are those golf courses. And they're very satisfied with the recycled ORAL COMMENT 105

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water as a substitute supply for the groundwater that was being pumped.

I have to say that a number of my clients, which are owners of private wells in this same basin who have the legal right to use groundwater within this basin -- that they find it somewhat ironic that we're now looking at more than doubling the production of groundwater from this aquifer, which they have worked hard and they are paying good money to preserve, and they're very concerned about making sure that in the long run, the doubling of the production of this aquifer is thought through very carefully before it's undertaken.

Greg talked about the aquifer and analogized with the bathtub full of sand, and that's pretty good, because he did not do something that I have seen suggested, or at least implied, in some of the things that I have read about the Conjunctive Use Program, and that's an intent to analogize this to a lake. It's not a lake.

You've got -- Greg talked about the fact that the groundwater levels within this basin are depressed dramatically from years of pumping, but it's still an aquifer that has enormous productivity and enormous potential for storage, but nobody knows what's going to

happen when you refill it.

There's been a pilot program in which something on the order of 15,000-acre-feet was, in fact, recharged into this aquifer as a result of the same kind of in-lieu program that you're talking about on a larger scale now, but beyond that 15,000-acre-foot pilot program, nobody really knows exactly what's going to happen.

So, I think it's very important that the Environmental Impact Report describe how it is that that -- the effects of refilling that aquifer will, in fact, be measured, both from the standpoint of its long-term productivity, from the standpoint of the impact of private well owners who still have the legal right to use water from that aquifer.

And with regard to water-quality issues, I realize that the water that is extracted from that basin now for municipal purposes is a high-quality water. In fact, the water quality in this area is excellent, if you compare it with what you can find in most of California and much of the nation.

But you're dealing with refilling a basin that has been empty, and a significant portion of that basin underlies something that is proudly called "The Industrial City." I don't know what kind of quality

considerations might crop up once that basin is refilled. In other words, are there contaminants that will be remobilized? Let me put it that way.

Greg mentioned leaking underground storage tanks. I think it could conceivably go beyond that. I don't have any particular contaminant in mind or source of contaminants in mind.

It just occurs to me that there's the potential for remobilization of contaminants that might have been deposited there through industrial activity long, long ago and during the time when this aquifer was, in fact, being hit pretty hard.

From the standpoint of private well owners throughout the basin, both those whom I represent and others whom I know to exist, there needs to be a clear understanding of the possibility for mutual interference. I'm aware of a little work that's been done with regard to mutual interference. I'm not aware of all that has been done or will be done.

I hope that that issue is, in fact, discussed in the environmental analysis and in the technical memoranda that accompanies the environmental analysis so that the owners of private wells will understand exactly what they can anticipate. This is not an adjudicated basin.

I really appreciate the comments made by the woman from Colma. What are the legal implications of the type of program that you are actually talking about undertaking? And what are the rights of the private-property owners who are going to find that as a result -- who might find -- we'll know from your EIR, I hope -- that the rights that they have to extract water for productive, beneficial uses from this basin are adversely impacted?

They might -- might some of their wells be rendered obsolete? Might some of their wells have to be deepened? Might they need new pumping arrangements? Might they have to move to entirely new water supply arrangements as a result of this?

We don't know any of that yet. Those are among the suite of issues that need to be addressed. And, of course, there is the overlay of the legal issue that has been referred to a couple of times tonight.

All in all, it's an exciting project. It's the kind of project that should be done. It needs to be done in a careful, integrated way, looking at all the opportunities.

There was a reference to -- by Mr. Drekmeier to the possibility of using stormwater as a component of the recharge of this basin. And that obviously is a

potential. I'm not quite sure how you intend to look at that, but it is an issue that needs to be addressed.

A parallel issue is one that comes right out of your Water System Improvement Program, and that's the additional use of recycled water as a source of water for irrigation purposes throughout the portions of the basin where it is not now available.

I know that San Francisco is working hard with Daly City to extend the use of the tertiary water that's produced at the Daly City plant, to move it to Harding

Park, and I know at various times, San Francisco has considered other aspects of the water recycling program that would be a part of and would work in conjunction with the WSIP program.

How does that work throughout the balance of the Westside Basin?

There are a number of opportunities there, it would seem to me, for there to be a recycled water program that might allow you to get even more bang for your conjunctive use if you were to get those two things in parallel.

In other words, integrated water resources management. Paula Kehoe's favorite term. Integrated water resources management needs to be considered and analyzed in this EIR just as it would need to be

considered and analyzed in an EIR for a stormwater treatment program of the type Mr. Drekmeier referred to for an extended recycled water program.

We look forward to participating. We appreciate the opportunity, and hope to be able to submit comments by the 28th and participate in the balance of the project.

MS. SOKOLOVE: Does anybody else want to speak tonight?

PUBLIC SPEAKER: Good evening. My name is Paul Perkovic. I live in Montara, and I'm on the Board ← ORAL COMMENT 106
of Directors along with Kathryn of the Montara Water and

Sanitary District which serves the Montara, Moss Beach area.

Our water -- our district does not receive water from the Hetch Hetchy system. However, the neighboring district to our south, Coastside County Water District, does receive water from Hetch Hetchy. And because the entire coastside is affected by water supplies that meet our domestic and agricultural needs, I'm interested in how this project may stabilize the water supplies that would be available from Hetch Hetchy to meet the coastside needs.

Coming from the coastside, I have a different perspective on a couple of the items. I just got

through the materials this evening and scanned through them fairly quickly, but we have a frequent problem where we lose power, and I didn't see any plans for emergency generators, backup generators in any of the well pump-housing or treatment facilities.

Certainly, I think that it would be prudent, unless your power supplies are much more reliable here than they are on the coast, that you have some provision for emergency power, unless you have 99.9 percent availability from your public power supplier. We often lose power for hours at a time, sometimes several days at a time, and backup power is necessary on all our facilities.

Secondly, before our district acquired the water system from the previous owners, (Inaudible) Corporation of California, there was an instance where an underground fuel tank that was used to store gasoline leaked into our -- one of the aquifers that served our community, and the resulting MTBE contamination meant that two of the major production wells were taken out of service for a period of time, and that had a very dramatic impact on our district.

You mentioned that the siting looked at potential contaminant sources. However, there are numerous gas stations located throughout the urbanized

area in the basin area, and I don't know if any of those have had any leakage problems with MTPE-supplemented fuel.

And I share the concern of the attorney who just spoke, in that some of the materials -- some of the contaminants may have adhered to the soil particles when water levels were at a lower level, and as the water levels are raised, they may be remobilized.

Um, those are the major concerns or questions I have that are directly relevant to the EIR scoping process. However, I have a number of other questions that are sort of business-related questions, and if I may, I'd like to just put those forward.

Kathryn raised the question about how the cost of the water would effect the relevant agencies. It looks to me like the plan is during years when there is an adequate supply, Daly City and South San Francisco and Cal Water would take additional water from Hetch Hetchy and not pump the groundwater wells.

Would they be paying the current Hetch Hetchy wholesale prices for the water that they take, or would that be treated as an advance of so many million acre feet or so many thousand acre feet that could be drawn on in the future?

This is particularly important, because the

price of an acre foot of water this year is about 17 percent less than the price of an acre foot of water next year, and about 21 percent less than the price of an acre -- or, cumulative, you know, 38 percent less than the cost of an acre foot two years from now.

So, if the agency is paying 2009 prices to purchase water to allow recharge, and then that agency can draw on that water two years from now when they otherwise would be paying much higher rates to purchase water from the Hetch Hetchy system, basically the other users of the Hetch Hetchy water, the Bay Area Water Supply and Conservation Agency, are underwriting the cost of water to the South City and Daly City and CalAm [sic] users.

If it's treated as an advance of water that is then repaid later by dry underground water basin, and the payments to Hetch Hetchy to SFPUC remain at the sort of average use and escalating price to pay for the seismic improvement program, that would seem to me to be more fair.

The second question that's related to that -- and maybe this is within the scope of the EIR, at least within our scope, the Bay Area Water Supply and conservation agency -- there's a very complex water allocation scheme, as I understand it, for drought

periods.

And agencies get some percentage of their water purchase in a base year, plus some percentage of their water purchased in the previous water year, and that affects the water supply assurance during a drought period so that it's based on sort of historic use and recent use to determine how much is delivered. Coastside County Water District is in a very unfortunate situation that their historic water use is very low, and during the planning for this year's drought, it was looking like if Hetch Hetchy -- if the SFPUC cut back 20 percent, their water delivery would be cut back 36 percent.

Now, how will those formulas apply for the agencies we're looking at here that are participants if they are taking delivery of a much higher quantity of water from the SFPUC system during the recharge period?

Then when the drought period comes, is their allocation much higher as a consequence?

Now, again, this may be something that's part of the contract negotiations. That's true.

And those are the only comments I have at the moment. Thank you very much.

(To Mr. Maddow) And I very much appreciated your comments, sir.

MS. SOKOLOVE: Anyone else?

(No response from the audience)

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CLOSING REMARKS

MS. SOKOLOVE: I just wanted to let you know where you can send your comments, if you have any further comments.

If you didn't speak tonight, or even if you did speak tonight, and you want to submit some additional comments, you should feel free to send them to me at my E-mail address. You can fax them to my office or you can send them in by mail to the Planning Department through July 28th.

And I believe that all of this information is also on your agenda. It's in the Notice of Preparation, et cetera, but if you need my business card, I can give one to you.

And for more information, you can contact me. There's my phone number, my E-mail. Please do read the Notice of Preparation. We have extra copies here tonight, so if you'd like to take one with you, I can give you one.

And if you have questions or comments about

the project itself, you can contact the San Francisco Public Utilities Commission. And again, all of this information is on your agenda.

So, that concludes our presentation for this evening. And I really do want to thank you for coming tonight. Your comments were excellent, and we will certainly take them all into consideration when we're preparing the Environmental Impact Report.

Again, thank you very, very much for your time.

(Whereupon the Public Scoping Meeting was concluded at 7:49 p.m.)

---oOo---

STATE OF CALIFORNIA) SS.

I, Katy Leonard, CSR No. 11599, in and for the State of California, do hereby certify:

That the foregoing is a true, correct, and complete transcript of the Public Scoping Meeting made this date.

I further certify:

That I am not interested in the events of this action.

WITNESS MY HAND this 15th day of July, 2009.

Katy Leonard
CSR No. 11599

Appendix D
Public Scoping Meeting Materials (Handouts, etc.)

San Francisco Planning Department

Major Environmental Analysis Division

SCOPING MEETING

REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT

Environmental Impact Report

JULY 9, 2009

Scoping Meeting Purpose

- Hear your comments on the proposed scope and focus of environmental review of the proposed Regional Groundwater Storage and Recovery Project
- Help identify the following to be analyzed in depth:
  - ***Range of alternatives***
  - ***Environmental effects***
  - ***Methods of assessment***
  - ***Mitigation measures***

Scoping Meeting Agenda

- Introductions
- Presentation
  - ***Overview of Environmental Review Process***
  - ***Overview of Regional Groundwater Storage and Recovery Project***
- Public Comments
- Closing Remarks

Scoping Meeting Reminders

- Sign in at the table near the entrance.
- Pick up copies of meeting materials.
- If you would like to speak during tonight's hearing, fill out a speaker card.
- To make written comments, pick up comment cards.
  - *Drop off at the end of the meeting*
  - *Mail or fax later*
- Please hold all comments until the end of the presentation.

Project Team Introductions

San Francisco Planning Department
(Lead Agency under CEQA)

- ***Diana Sokolove, Senior Environmental Planner***

San Francisco Public Utilities Commission
(Project Sponsor)

- ***Greg Bartow, Project Manager***
- ***Suet Chau, Environmental Project Manager***
- ***Michele Liapes, Communications***
- ***Les Chau, Kennedy/Jenks Consultants***

ENVIRONMENTAL REVIEW PROCESS

California Environmental Quality Act

Proposed projects require environmental review under the California Environmental Quality Act (CEQA) before they can be considered for approval

For SFPUC projects, CEQA is implemented by the San Francisco Planning Department

CEQA Objectives

- Present environmental impacts of proposed projects
- Identify ways to avoid or reduce environmental impacts
- Support the agency decision-making process
- Encourage public participation
- Enhance interagency coordination

What will the EIR do?

- Provide a detailed description of the project and the existing environment
- Identify potential environmental impacts
- Identify ways to avoid or reduce significant environmental effects through mitigation or alternatives to the proposed project

PROPOSED REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT

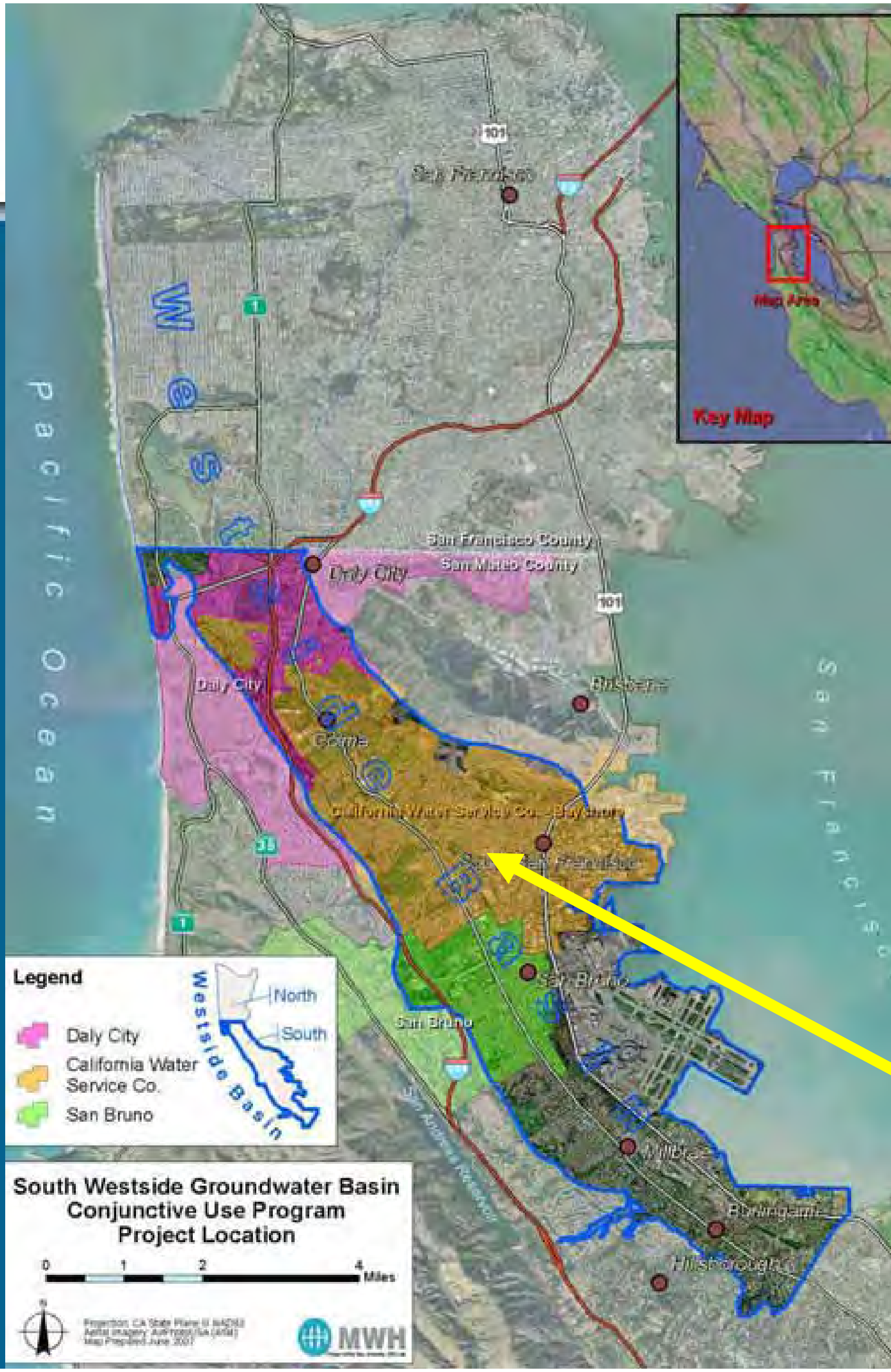
SFPUC Hetch Hetchy Water System

Water System Improvement Program (WSIP)

- Voter Approved November 2002
- More than 85 projects to:
  - ***repair, replace and seismically upgrade key water system facilities***
  - ***add new, redundant facilities to insure system reliability***
  - ***diversify water supply and increase dry year supplies***

Need for the Project

- Develop dry-year water supply
- Meet the 80% water supply reliability goal adopted by the SFPUC Commission



Partner Agencies:

City of Daly City

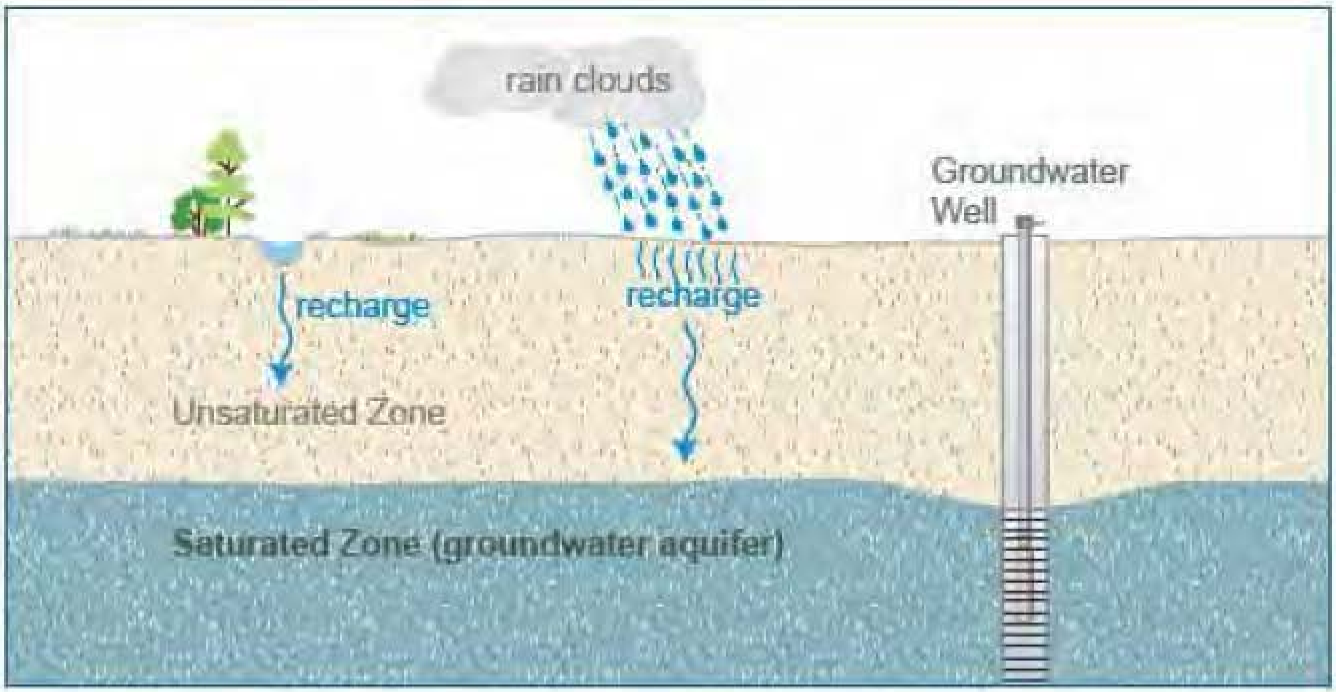
California Water Service Co

City of San Bruno

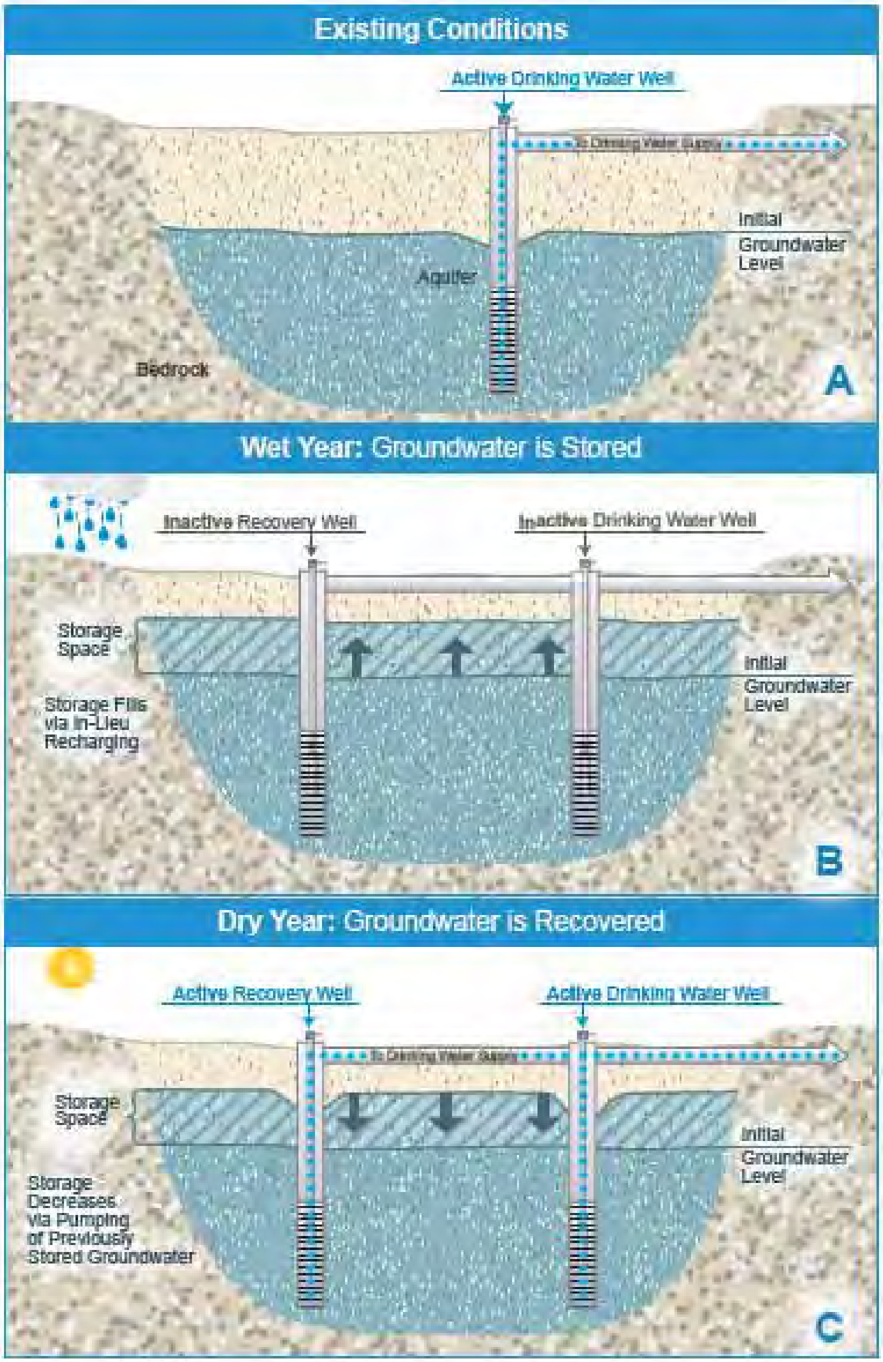
South Westside Groundwater Basin

What Is Groundwater?

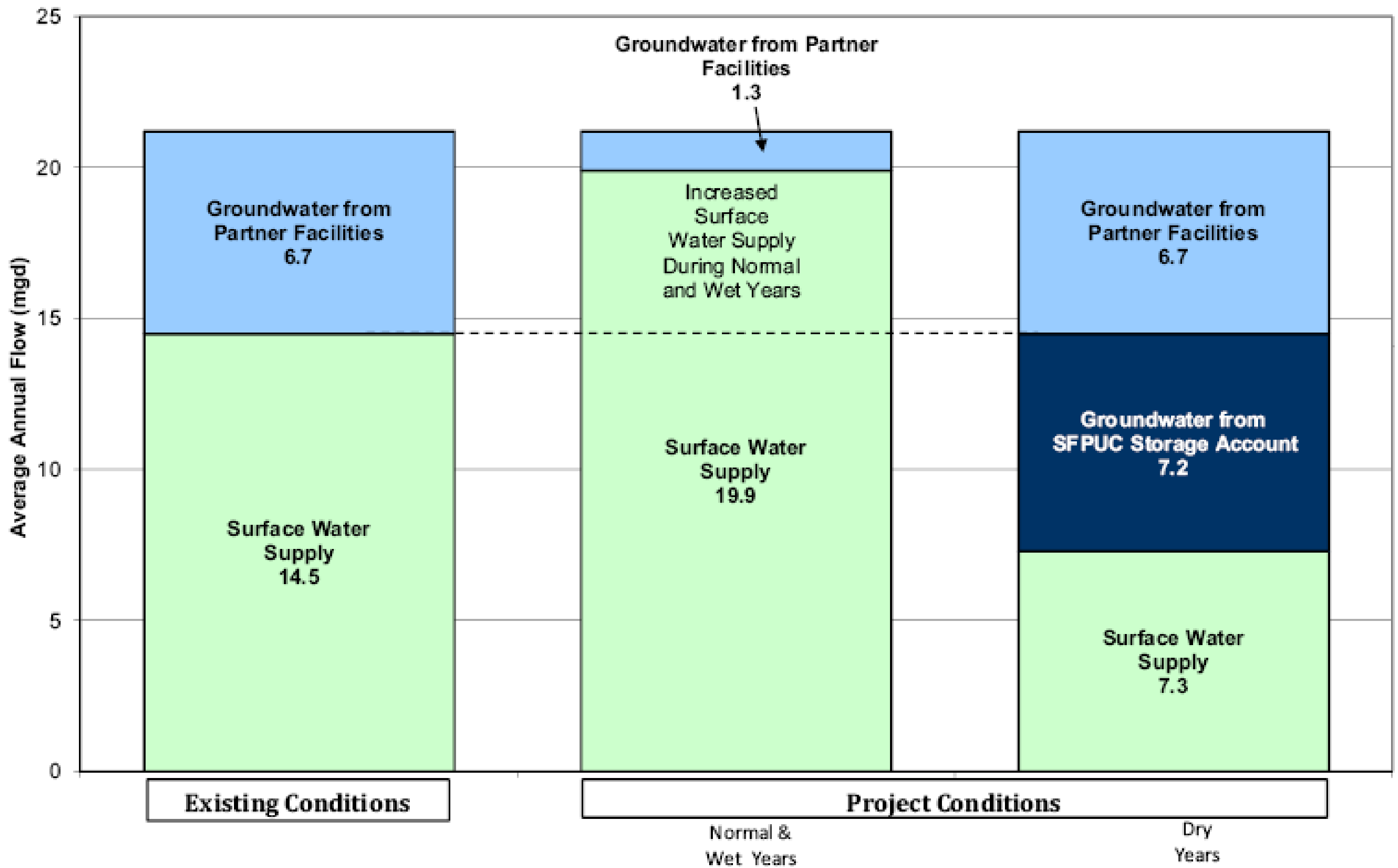
As rainwater or surface water seeps into the ground, it moves downward between soil particles and collects in an underground geologic reservoir. When such a reservoir can readily yield water to springs or wells, it is called an aquifer and is a potential source of drinking water.



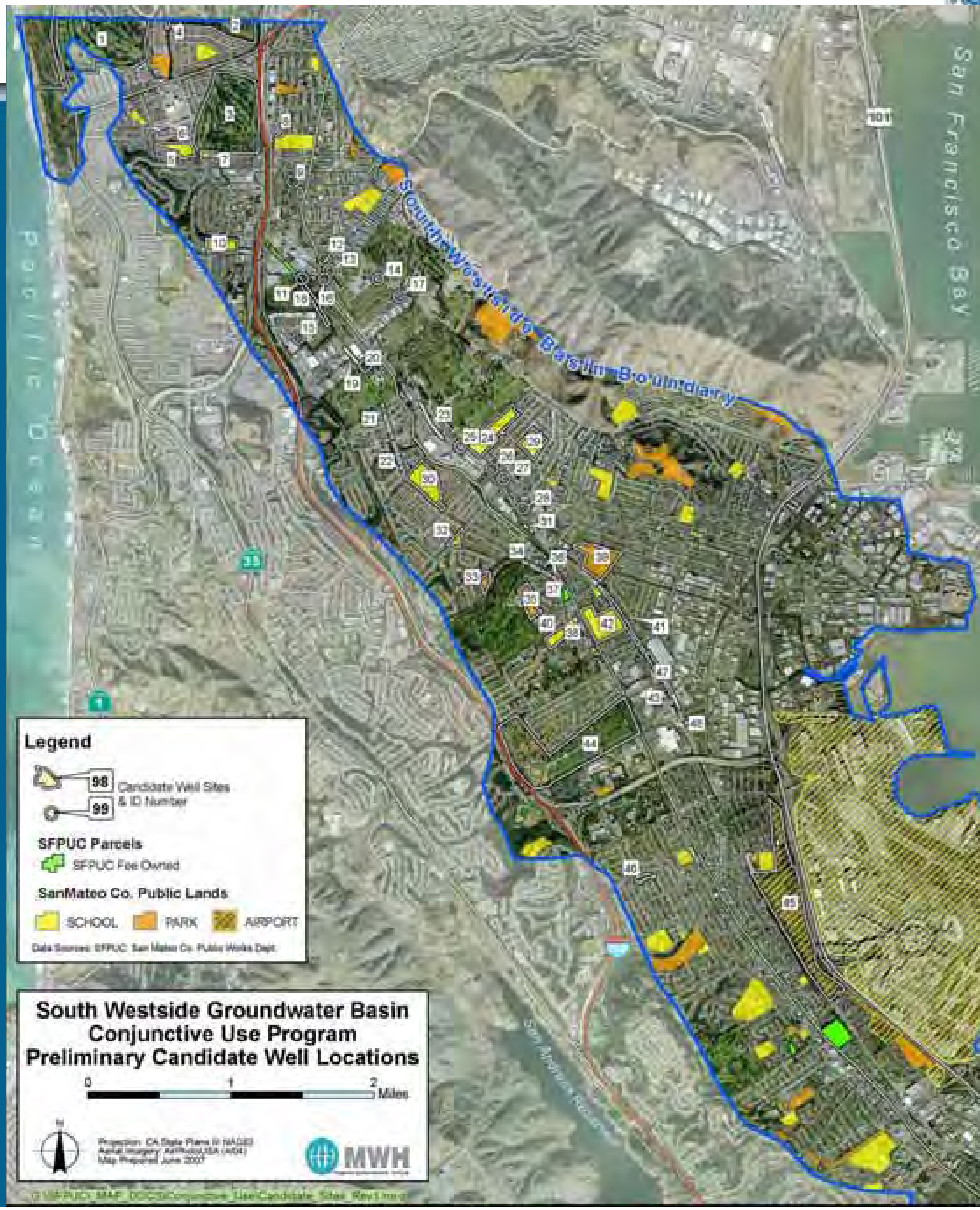
How Would The Project Work?



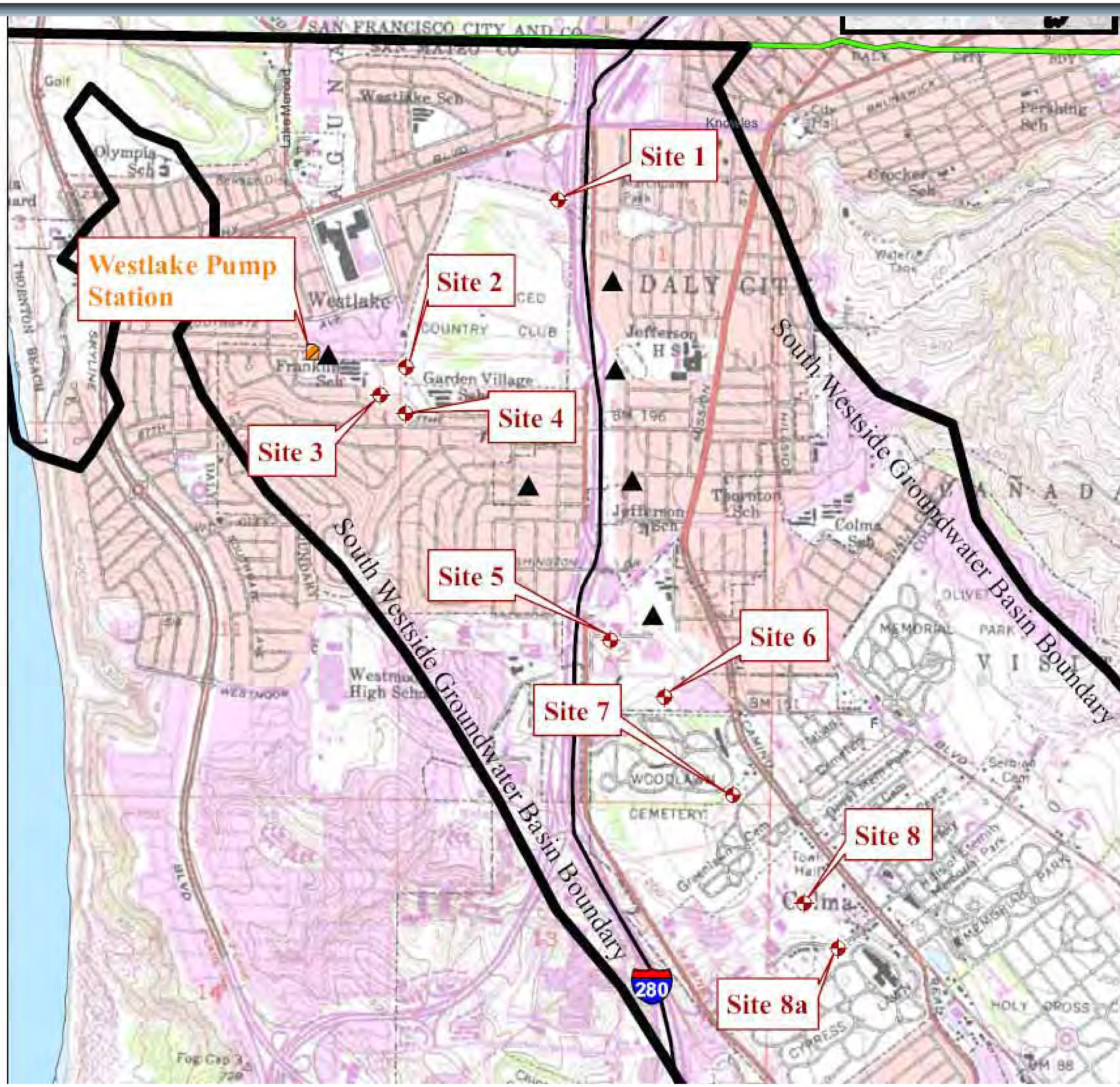
How Would The Project Work?



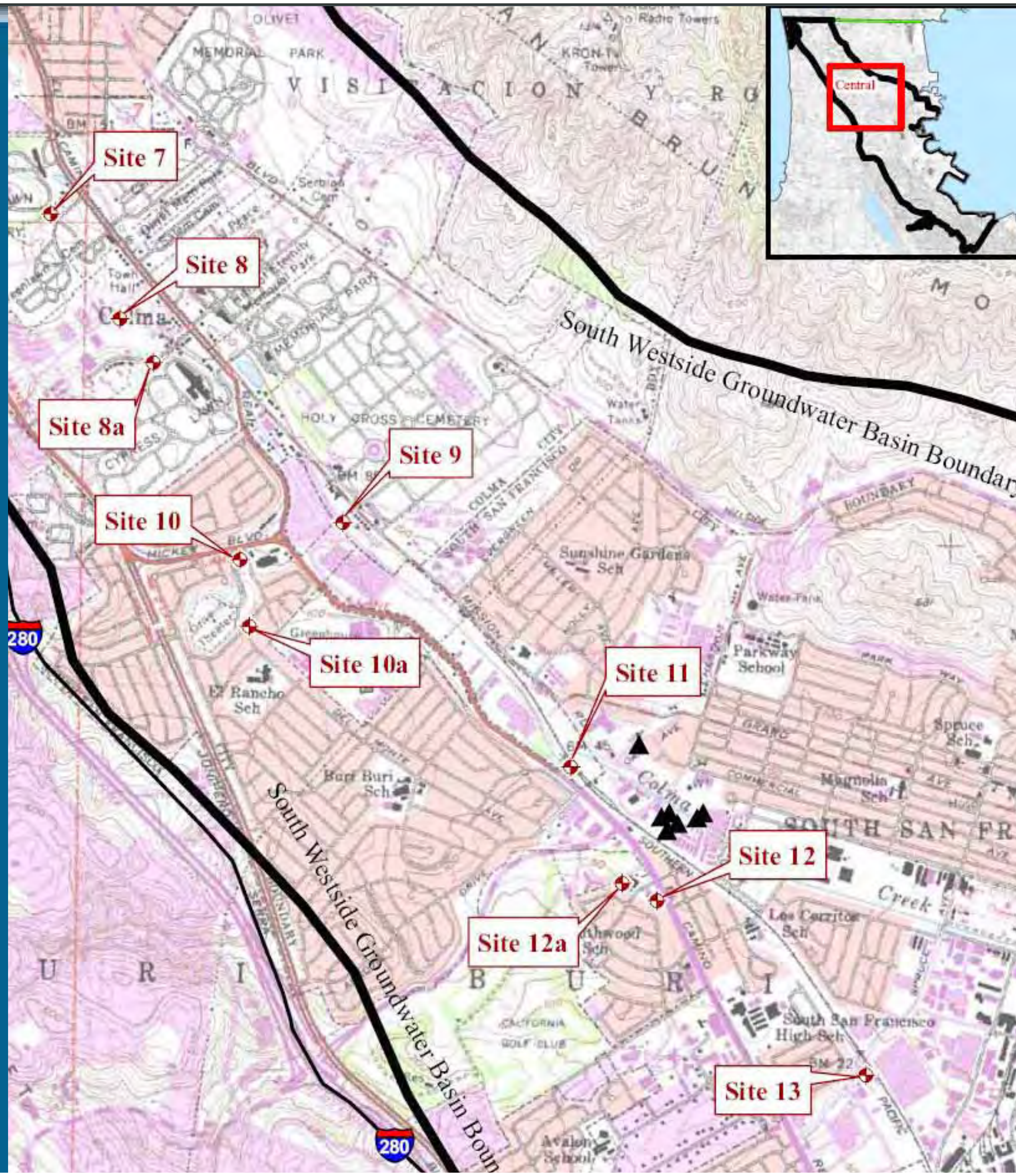
- 48 Potential Well Sites Evaluated
- 19 Sites advanced for EIR
- Up to 16 sites would be developed



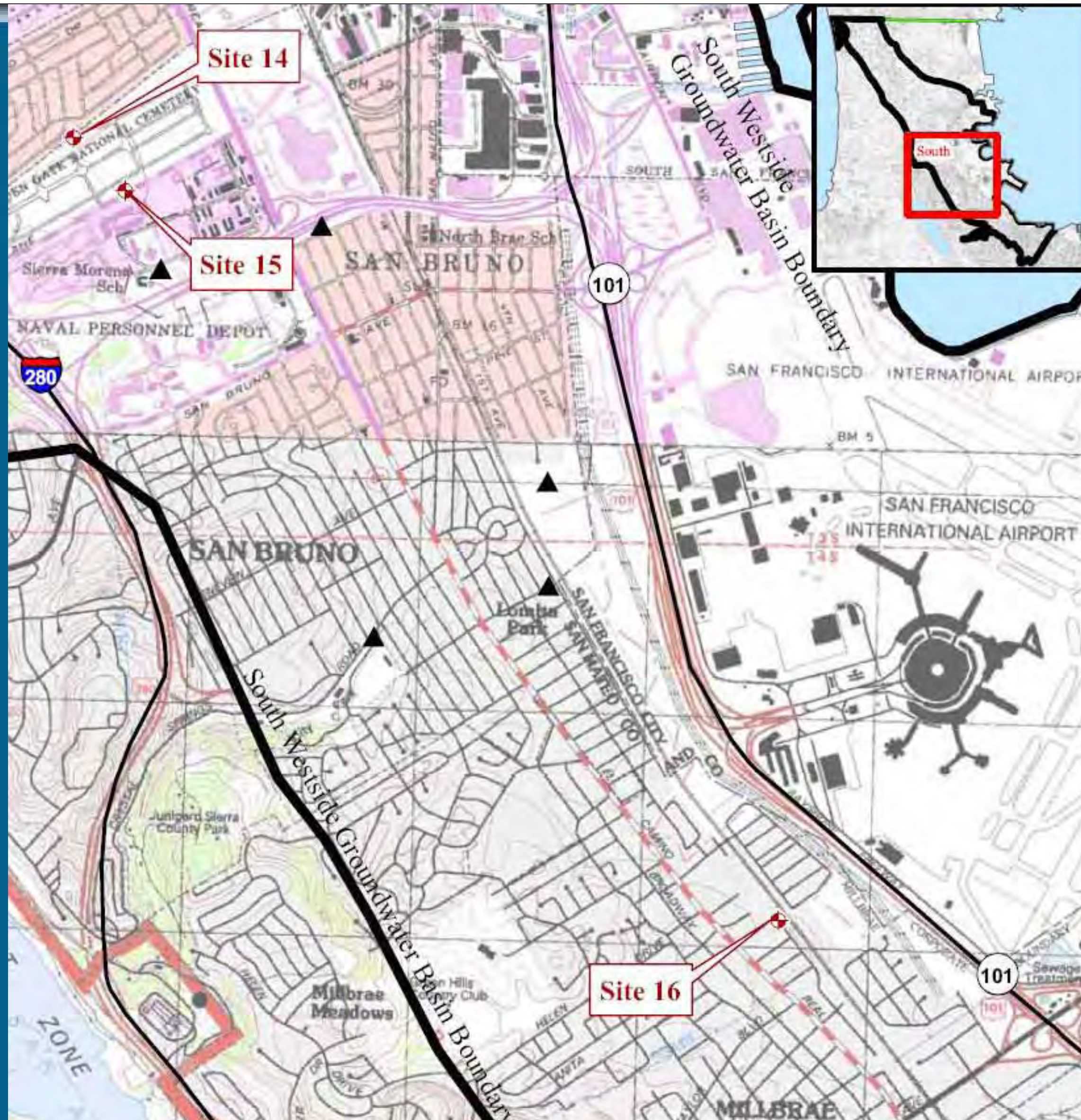
Well Facility Locations (1 of 3)



Well Facility Locations (2 of 3)



Well Facility Locations (3 of 3)



Project Description

- Develop agreements with Daly City, San Bruno, and Cal Water to store 61,000 acre feet of water (approximately 20 billion gallons)
- Develop capacity to pump 7.2 million gallons per day over 7.5 years
- Pump only stored water (an operating committee would be created to monitor the volume of stored and pumped project water)

Project Description

- Construct up to 16 well facilities (including pipelines, etc.)
- Disinfect water per state Department of Public Health requirements
- Provide other treatment if needed (e.g., manganese)
- Connect to Daly City, San Bruno, Cal Water or SFPUC drinking water systems (depending on location).

Ensuring a High Quality Drinking Water

Groundwater Safety

- Groundwater will be in compliance with all California Department of Public Health requirements
- In addition, groundwater will be disinfected before entering the municipal drinking water supply

For over 100 years, groundwater from the Westside Basin has been used for irrigation and drinking water purposes. The cities of Daly City, South San Francisco, and San Bruno currently use groundwater from the Basin as part of their drinking water supply.

Ensuring a high quality drinking water supply

- Monitoring programs will be established to ensure the continued safety and quality of groundwater supplies
- In most cases, groundwater will be blended with imported surface water from the Regional Water System

Typical Site Layout

Sample Well Facility (with Enclosure)

Environmental Review Schedule

- Notice of Preparation – June 24, 2009
- Public Scoping Meeting – July 9, 2009
- Scoping Period Ends – July 28, 2009
- Public Review of Draft EIR – Summer 2010
- Release of Final EIR – Mid 2011
- Certification of Final EIR – Mid 2011

PUBLIC COMMENT

Comment Session Ground Rules

- Submit speaker cards to speak
- Wait until your name is called
- Speak into the microphone and state your name
- Summarize comments verbally and provide more detail in writing
- Use comment forms for more extensive input

CLOSING REMARKS

Where to Send Comments

Scoping comments accepted through July 28, 2009

Send by email to: ***diana.sokolove@sfgov.org***

Send by fax to: (415) 558-6409

Send by U.S. mail to:

San Francisco Planning Dept
Attn: Bill Wycko, ERO
Groundwater Storage and Recovery
1650 Mission Street, Suite 400
San Francisco, CA 94103

For More Information

About the Environmental Review Process:

Diana Sokolove, San Francisco Planning Department, Major Environmental Analysis Division

(415) 575-9046, diana.sokolove@sfgov.org

The Notice of Preparation is available online at www.sfgov.org/planning/mea

About the Regional Groundwater Storage and Recovery Project

Michele Liapes, SFPUC

(415) 554-3211, mliapes@sfwater.org

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

AGENDA

7:00 PM

Introductions - Diana Sokolove, San Francisco Planning Department

Presentation:

- **Environmental Review Process Overview -** Diana Sokolove, San Francisco Planning Department
- **Project Overview -** Greg Bartow, San Francisco Public Utilities Commission

Public Comment

Closing Remarks

Glossary

SFPUC: San Francisco Public Utilities Commission

MEA: Major Environmental Analysis Division, San Francisco Planning Department

CEQA: California Environmental Quality Act

WSIP: Water System Improvement Program

GSR*: Regional Groundwater Storage and Recovery Project

EIR: Environmental Impact Report

* *The GSR was formerly called the Groundwater Conjunctive Use Project*

Documents Currently Available

The following document is available by calling (415) 575-9046 or at www.sfgov.org/site/uploadedfiles/planning/NOP(1).pdf

- GSR Notice of Preparation of an EIR

The following documents are available by calling (415) 554-3211 or at www.sfwater.org/msc_main.cfm/MC_ID/13/MSC_ID/427

- GSR Fact Sheet
- 2008 Annual Groundwater Monitoring Report, Westside Basin

For More Information

Planning Department Web Site: www.sfgov.org/site/planning

SFPUC Web Site: www.sfwater.org

For GSR Project: Michele Liapes at SFPUC, (415)554-3211 or mliapes@sfwater.org

For EIR: Diana Sokolove at SF Planning, (415) 575-9046 or diana.sokolove@sfgov.org

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting

Proposed Regional Groundwater Storage and Recovery Project

South San Francisco, CA - July 9, 2009

SIGN-IN SHEET

(Please print)

NAME	AFFILIATION	ADDRESS	PHONE	EMAIL

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SPEAKER CARD

CONTACT INFORMATION

Name:

Affiliation:

Street Address:

City, State, Zip:

Phone:

Email:

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SPEAKER CARD

CONTACT INFORMATION

Name:

Affiliation:

Street Address:

City, State, Zip:

Phone:

Email:

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting

Proposed Regional Groundwater Storage and Recovery Project

South San Francisco, CA - July 9, 2009

COMMENTS

Thank you for participating in tonight's Public Scoping Meeting on the SFPUC's Regional Groundwater Storage and Recovery Project. Your comments on the scope and focus of the environmental review are encouraged.

Name (Please print): ____________________

Affiliation (if applicable): ____________________

Phone: ____________________ Email: ____________________

Address: ____________________

City, State, Zip: ____________________

COMMENTS

Mail Questions to: Diana Sokolove, San Francisco Planning Department, 1650 Mission Street, Suite 400, San Francisco, CA 94103

Fax: (415) 558-6409 Email: diana.sokolove@sfgov.org

For more information on SFPUC's project, contact: Michele Liapes, SFPUC Communications Division

Phone: (415) 554-3211 Email: mliapes@sfwater.org

Appendix E
Written Comments Received During Scoping Process

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

June 25, 2009

To: Reviewing Agencies

Re: Regional Groundwater Storage and Recovery Project
SCH# 2009062096

Attached for your review and comment is the Notice of Preparation (NOP) for the Regional Groundwater Storage and Recovery Project draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Diana Sokolove
City and County of San Francisco
Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Assistant Deputy Director & Senior Planner, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# **2009062096**
Project Title Regional Groundwater Storage and Recovery Project
Lead Agency San Francisco, City and County of

Type **NOP** Notice of Preparation

Description NOTE: Review per lead.

The Project would provide potable surface water to the cities of Daly City and San Bruno and the California Water Service Company (Cal Water) (Collectively referred to as Partner Agencies), to be used by these agencies in lieu of pumping groundwater during normal and wet years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. The supply would be partially replaced by surface water supplies from the San Francisco Public Utilities Commission (SFPUC) regional water system. The reduction of pumping by Partner Agencies would increase groundwater storage within the South Westside Groundwater Basin. Stored groundwater would be pumped during periods of insufficient surface water supplies: (i.e., dry years).

Lead Agency Contact

Name Diana Sokolove
Agency City and County of San Francisco
Phone 415-575-9046 ***Fax***
email
Address Planning Department
1650 Mission Street, Suite 400
City San Francisco ***State*** CA ***Zip*** 94103-2479

Project Location

County San Mateo
City Daly City, South San Francisco, San Bruno, Burlingame
Region
Cross Streets Various (16 sites)
Lat / Long
Parcel No. Various
Township ***Range*** ***Section*** ***Base***

Proximity to:

Highways 280, 101, 82, 380, 1, 35
Airports SFO, San Carlos
Railways BART, Caltrain
Waterways Various
Schools Various
Land Use Various

Project Issues Aesthetic/Visual; Archaeologic-Historic; Biological Resources; Geologic/Seismic; Noise; Public Services; Recreation/Parks; Schools/Universities; Soil Erosion/Compaction/Grading; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Cumulative Effects

Reviewing Agencies Resources Agency; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 3; Public Utilities Commission; Native American Heritage Commission; Department of Health Services; Caltrans, Division of Aeronautics; California Highway Patrol; Caltrans, District 4; State Water Resources Control Board, Division of Loans and Grants; Department of Toxic Substances Control; Regional Water Quality Control Board, Region 2

Date Received 06/25/2009 ***Start of Review*** 06/25/2009 ***End of Review*** 07/28/2009

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

County: San Mateo

SCH#

Resources Agency

- [x] **Resources Agency**
  Nadell Gayou
- [ ] **Dept. of Boating & Waterways**
  Mike Sotelo
- [ ] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Gerald R. Zimmerman
- [ ] **Dept. of Conservation**
  Rebecca Salazar
- [ ] **California Energy Commission**
  Dale Edwards
- [ ] **Cal Fire**
  Allen Robertson
- [ ] **Office of Historic Preservation**
  Wayne Donaldson
- [x] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **Central Valley Flood Protection Board**
  Jon Yego
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [x] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou
- [ ] ____________________
  Conservancy

Fish and Game

- [ ] **Depart. of Fish & Game**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Game Region 1**
  Donald Koch
- [ ] **Fish & Game Region 1E**
  Laurie Harnsberger
- [ ] **Fish & Game Region 2**
  Jeff Drongesen
- [x] **Fish & Game Region 3**
  Robert Floerke
- [ ] **Fish & Game Region 4**
  Julie Vance
- [ ] **Fish & Game Region 5**
  Don Chadwick
  Habitat Conservation Program
- [ ] **Fish & Game Region 6**
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M**
  Gabrina Getchel
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Anna Garbeff
  Environmental Services Section
- [x] **Dept. of Public Health**
  Bridgette Binning
  Dept. of Health/Drinking Water

Independent Commissions, Boards

- [ ] **Delta Protection Commission**
  Linda Flack
- [ ] **Office of Emergency Services**
  Dennis Castrillo
- [ ] **Governor's Office of Planning & Research**
  State Clearinghouse
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [x] **Public Utilities Commission**
  Leo Wong
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [ ] **State Lands Commission**
  Marina Brand
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Business, Trans & Housing

- [x] **Caltrans - Division of Aeronautics**
  Sandy Hesnard
- [ ] **Caltrans - Planning**
  Terri Pencovic
- [x] **California Highway Patrol**
  Scott Loetscher
  Office of Special Projects
- [ ] **Housing & Community Development**
  CEQA Coordinator
  Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Bruce de Terra
- [x] **Caltrans, District 4**
  Lisa Carboni
- [ ] **Caltrans, District 5**
  David Murray
- [ ] **Caltrans, District 6**
  Michael Navarro
- [ ] **Caltrans, District 7**
  Elmer Alvarez
- [ ] **Caltrans, District 8**
  Dan Kopulsky
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Jacob Armstrong
- [ ] **Caltrans, District 12**
  Chris Herre

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Douglas Ito
  - [ ] Industrial Projects
    Mike Tollstrup
- [ ] **California Integrated Waste Management Board**
  Sue O'Leary
- [x] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [ ] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Steven Herrera
  Division of Water Rights
- [x] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [x] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [ ] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)
- [ ] Other ____________________

Last Updated on 03/24/2009

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P. O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH # 2009062096

Project Title: Regional Groundwater Storage and Recovery Project

Lead Agency: San Francisco Planning Department, City and County
Contact Person: Diana Sokolove
Mailing Address: 1650 Mission Street, Suite 400
Phone: (415) 575-9046
City: San Francisco Zip: 94103-2479 County: San Francisco

Project Location: County: San Mateo City/Nearest Community: Daly City, So. San Francisco, San Bruno, Burlingame
Cross Streets: Various Zip Code:
Lat. / Long.: ____° ____' ____" N/ ____° ____' ____" W Total Acres: 0.3-1.2 ea. at 16 sites
Assessor's Parcel No.: Various Section: Twp.: Range: Base:
Within 2 Miles: State Hwy #: 280, 101, 82, 380, 1, 35 Waterways: Various
Airports: SFO, San Carlos Railways: BART, Caltrain Schools: Various

RECEIVED
JUN 25 2009
STATE CLEARING HOUSE

Document Type:

CEQA:
- [x] NOP
- [ ] Early Cons
- [ ] Neg Dec
- [ ] Mit Neg Dec
- [ ] Draft EIR
- [ ] Supplement/Subsequent EIR (Prior SCH No.) ________
- Other ________

NEPA:
- [ ] NOI
- [ ] EA
- [ ] Draft EIS
- [ ] FONSI

Other:
- [ ] Joint Document
- [ ] Final Document
- [ ] Other ________

Local Action Type:

- [ ] General Plan Update
- [ ] General Plan Amendment
- [ ] General Plan Element
- [ ] Community Plan
- [ ] Specific Plan
- [ ] Master Plan
- [ ] Planned Unit Development
- [ ] Site Plan
- [ ] Rezone
- [ ] Prezone
- [ ] Use Permit
- [ ] Land Division (Subdivision, etc.)
- [ ] Annexation
- [ ] Redevelopment
- [ ] Coastal Permit
- [x] Other Water Supp

Development Type:

- [ ] Residential: Units ____ Acres ____
- [ ] Office: Sq.ft. ____ Acres ____ Employees ____
- [ ] Commercial: Sq.ft. ____ Acres ____ Employees ____
- [ ] Industrial: Sq.ft. ____ Acres ____ Employees ____
- [ ] Educational ________
- [ ] Recreational ________
- [x] Water Facilities: Type Production Wells MGD Up to 7.2
- [ ] Transportation: Type ________
- [ ] Mining: Mineral ________
- [ ] Power: Type ________ MW ____
- [ ] Waste Treatment: Type ________ MGD ____
- [ ] Hazardous Waste: Type ________
- [ ] Other: ________

Project Issues Discussed in Document:

- [x] Aesthetic/Visual
- [ ] Agricultural Land
- [ ] Air Quality
- [x] Archeological/Historical
- [x] Biological Resources
- [ ] Coastal Zone
- [ ] Drainage/Absorption
- [ ] Economic/Jobs
- [ ] Fiscal
- [ ] Flood Plain/Flooding
- [ ] Forest Land/Fire Hazard
- [x] Geologic/Seismic
- [ ] Minerals
- [x] Noise
- [ ] Population/Housing Balance
- [x] Public Services/Facilities
- [x] Recreation/Parks
- [x] Schools/Universities
- [ ] Septic Systems
- [ ] Sewer Capacity
- [x] Soil Erosion/Compaction/Grading
- [ ] Solid Waste
- [ ] Toxic/Hazardous
- [x] Traffic/Circulation
- [x] Vegetation
- [x] Water Quality
- [x] Water Supply/Groundwater
- [ ] Wetland/Riparian
- [ ] Wildlife
- [ ] Growth Inducing
- [ ] Land Use
- [x] Cumulative Effects
- [ ] Other ________

Present Land Use/Zoning/General Plan Designation:
Various

Project Description: *(please use a separate page if necessary)*
The Project would provide potable surface water to the cities of Daly City and San Bruno and the California Water Service Company (Cal Water) (collectively referred to as Partner Agencies), to be used by these agencies in lieu of pumping groundwater during normal and wet years. The Partner Agencies currently use groundwater as one of the sources of their drinking water supply. The supply would be partially replaced by surface water supplies from the San Francisco Public Utilities Commission (SFPUC) regional water system. The reduction of pumping by Partner Agencies would increase groundwater storage within the South Westside Groundwater Basin. Stored groundwater would be pumped during periods of insufficient surface water supplies (i.e., dry years). (see continuation sheet)

Note: The state Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

WRITTEN COMMENT #2

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
111 GRAND AVENUE
P. O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 622-5491
FAX (510) 286-5559
TTY 711

Flex your power!
Be energy efficient!

July 13, 2009

BAG0044
SM – 280/82 - VAR
SCH#2009062096

Ms. Diane Sokolove
City and County of San Francisco
Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Ms. Sokolove:

Regional Groundwater Storage and Recovery – Notice of Preparation (NOP)

Thank you for including the California Department of Transportation (Department) in the environmental review process for the Regional Groundwater Storage and Recovery Project. The following comments are based on the Notice of Preparation.

As lead agency, the San Francisco Planning Department is responsible for all project mitigation, including any needed improvements to State highways. The project's fair share contribution, financing, scheduling, and implementation responsibilities as well as lead agency monitoring should be fully discussed for all proposed mitigation measures and the project's traffic mitigation fees should be specifically identified in the Draft Environmental Impact Report. Any required roadway improvements should be completed prior to issuance of project occupancy permits. An encroachment permit is required when the project involves work in the State's Right of Way (ROW). Therefore, we strongly recommend that the lead agency ensure resolution of the Department's concerns prior to submittal of the encroachment permit application; see the end of this letter for more information regarding the encroachment permit process.

Traffic Impact Study (TIS)
The Department is primarily concerned with impacts to the State Highway System. The proposed project is located adjacent to State facilities. Please ensure that the environmental analysis evaluates the traffic impacts on State facilities by applying the following criteria to determine if a TIS is warranted:

1. The project will generate over 100 peak hour trips assigned to a State highway facility.

2. The project will generate between 50 to 100 peak hour trips assigned to a State highway facility, and the affected highway facilities are experiencing noticeable delay; approaching unstable traffic flow (level of service (LOS) "C" or "D") conditions.

3. The project will generate between 1 to 49 peak hour trips assigned to a State highway facility, and the affected highway facilities are experiencing significant delay; unstable or forced traffic flow (LOS "E" or "F") conditions.

In addition to evaluating peak hour trips for the facility, project vehicle trips and hours of operations should be discussed to determine traffic impacts on roadways. Anticipated street routes for construction vehicles should be identified as well.

We recommend using the Department's "*Guide for the Preparation of Traffic Impact Studies*" for determining which scenarios and methodologies to use in the analysis. It is available at the following website address:
http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

Cultural Resources
If construction activities are proposed within the State's ROW, the Department requires documented results of a current archaeological record search from the Northwest Information Center (NIC) of the California Historical Resources Information System before an encroachment permit can be issued. Current record searches must be no more than five years old.

The Department requires the records search, and if warranted, a cultural resource study by a qualified, professional archaeologist, to ensure compliance with NEPA (if there is federal action on the project), CEQA, Section 5024.5 of the California Public Resources Code (for state-owned historic resources) and Volume 2 of the Department's "*Standard Environmental Reference*" available at http://www.dot.ca.gov/hq/env/index.htm). Work subject to these requirements includes, but is not limited to: lane widening, channelization, auxiliary lanes, and/or modification of existing features such as slopes, drainage features, curbs, sidewalks and driveways within or adjacent to State ROW.

Transportation Permit
Project work that requires movement of oversized or excessive load vehicles on State facilities requires a transportation permit issued by the Department. To apply, a completed transportation permit application with the determined specific route(s) for the shipper to follow from origin to destination must be submitted to the address below.

Office of Transportation Permits
California DOT Headquarters
P.O. Box 942874
Sacramento, CA 94274-0001

See the following website link for more information:
http://www.dot.ca.gov/hq/traffops/permits/.

Encroachment Permit

Any work or traffic control within the State ROW requires an encroachment permit issued by the Department. Traffic-related mitigation measures will be incorporated into the construction plans during the encroachment permit process. See the following website link for more information: http://www.dot.ca.gov/hq/traffops/developserv/permits/

To apply for an encroachment permit, submit a completed encroachment permit application, environmental documentation, and five (5) sets of plans which clearly indicate State ROW to the address at the top of this letterhead, marked ATTN: Michael Condie, Mail Stop #5E.

Water System Improvement Projects

We encourage the San Francisco Planning Department to coordinate with our Project Manager, Howard Reynolds, at 510-286-7252 for all San Francisco Public Utilities Commission Water System Improvement Program (WSIP) Projects.

Should you have any questions regarding this letter, please contact Lisa Courington of my staff at (510) 286-5505 or via email at lisa.ann.courington@dot.ca.gov.

Sincerely,

Lisa Carboni

LISA CARBONI
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

STATE OF CALIFORNIA - CALIFORNIA NATURAL RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

July 28, 2009

Mr. Bill Wycko
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

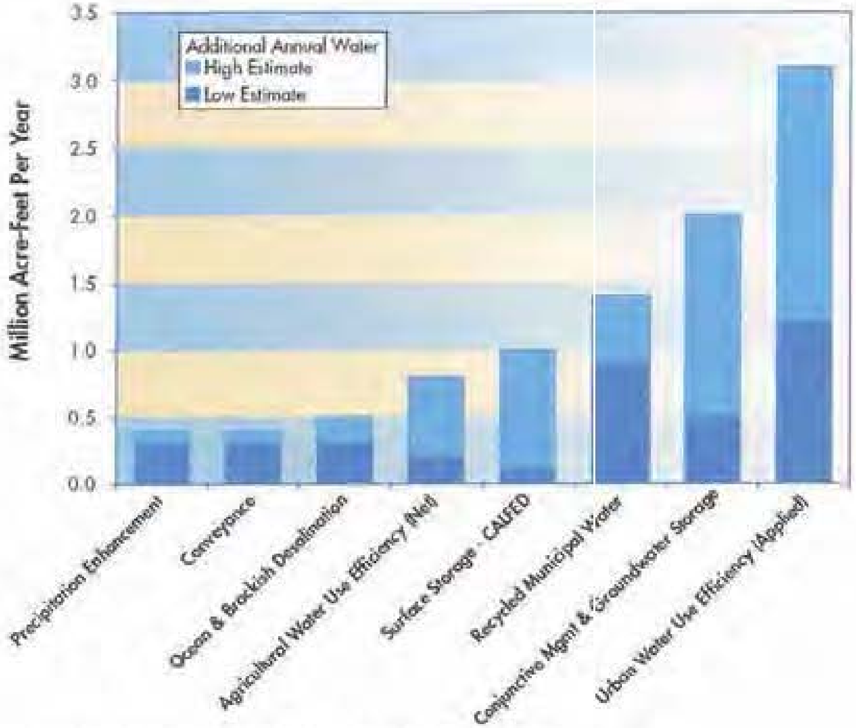
REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT

Dear Mr. Wycko:

The Department of Water Resources (DWR) appreciates the opportunity to express support for the concept of San Francisco Public Utilities Commission's (SFPUC) Regional Groundwater Storage and Recovery Project. DWR is aware SFPUC is currently asking for public comments on the above referenced project as SFPUC will soon begin preparation of a Draft Environmental Impact Report (EIR). It is understood specifically that the EIR will document potential impacts resulting from the use of the South Westside Groundwater Basin (basin) as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods.

The intent of this letter is not to comment specifically on any technical aspects of SFPUC's project but rather to recognize the importance of SFPUC's groundwater storage project and other similar groundwater storage projects that meet the State of California's future water supply needs.

The State of California faces a number of challenges to meet its water supply needs in the future, a growing population, changing land use, and environmental and legal restrictions on diversions from the Delta and Colorado River, not to mention the decreasing snow pack and changed hydrology that will result from climate change. A number of approaches will be needed to meet future demands, including water conservation, recycled water, and desalination. As illustrated below, DWR has identified conjunctive management and groundwater storage as one of the resource management strategies in the California Water Plan Update 2005 for making new water supplies available to meet future 2030 year water demands. In fact, conjunctive management and groundwater projects are projected to play a relatively large role in meeting future demands. Groundwater storage projects will provide flexibility as well as water supply reliability improvements on the local, regional, and statewide levels and may equate to an increase in supply up to 2 million acre-feet per year.



Source: *California State Water Plan Update 2005*

DWR strongly supports and has been working aggressively for the last decade to implement additional groundwater storage through locally driven projects such as SFPUC's project. For this reason, DWR will continue to support and look for potential opportunities to work with SFPUC, other state agencies, and project stakeholders to develop successful groundwater storage projects to meet California's water needs. Furthermore, DWR looks forward to the opportunity to review SFPUC's project as outlined in a future EIR.

If you have any questions or wish to discuss this matter further, please contact Trevor Joseph of my staff at (916) 376-9619.

Sincerely,

for Karl P. Winkler, Chief
North Central Region Office

WRITTEN COMMENT #4

County of San Mateo

Planning & Building Department

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PLANNING DEPARTMENT
MEA

July 23, 2009

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Wycko:

SUBJECT: Comments on the San Francisco Public Utilities Commission (SFPUC) Regional Groundwater Storage and Recovery Project

Thank you for the opportunity to comment on the Notice of Preparation of an Environmental Impact Report for the SFPUC Regional Groundwater Storage and Recovery Project. Of the various locations noted in the proposal, two sites located in Broadmoor are within the Unincorporated San Mateo County jurisdiction. As such, the SFPUC is required to submit a project description to the San Mateo County Planning Department for review and determination of General Plan conformity pursuant to Government Code Section 65402.

If you have questions, please do not hesitate to contact Melissa Ross at 650/599-1559 or via email at mross@co.sanmateo.ca.us. Thank you again for the opportunity to review and provide comments on the above referenced project and please continue to include the County Planning Department in the processing of the project.

Sincerely,

Melissa Ross, Planner II

MR:pac – MART0573_WPN.DOC

cc: Lisa Grote, Community Development Director
Jim Eggemeyer, Community Development Deputy Director
Steve Monowitz, Long Range Planning Manager

WRITTEN COMMENT #5

TOWN OF COLMA
1198 El Camino Real • Colma, California • 94014-3212
Tel 650-997-8300 • Fax 650-997-8308

July 28, 2009

Mr. Bill Wycko
Environmental Review Officer
1650 Mission Street
San Francisco, CA. 94103

RE: *Regional Groundwater Storage and Recovery Programs, Notice of Preparation of an Environmental Impact Report and Scoping Meeting – Written Comments*

Dear Mr. Wycko,

Thank you for the opportunity to comment on the Regional Groundwater Storage and Recovery Project. Attached are several concerns and questions that the Town of Colma has in regards to the project.

Please contact Brad Donohue, Deputy Director of Public Works at 650-757-8895 or bdonohue@colma.ca.gov or myself at 650-997-8318, if you have any questions.

Sincerely,

Laura Allen

Laura Allen
City Manager

c: Honorable Mayor and Members of the City Council
Roger Peters, City Attorney
Andrea Ouse, City Planner
Rick Mao, City Engineer
Diana Sokolove, SF Planner-Senior Planner

The Town of Colma believes that the following questions are relevant to the environmental impacts of the proposed project, as well as reasonable alternatives and mitigation measures relating to the project, and therefore should be analyzed in the proposed Environmental Impact Report (EIR) for the project.

1. What municipalities are located in the overlying lands of the South Westside Groundwater Basin? In particular, is the Town of Colma located in the overlying lands?

2. What rights do the overlying municipalities, including the Town of Colma, and the residents of and property owners within such municipalities have to the use of groundwater in the South West Groundwater Basin (SWGB)? Under California law, an overlying landowner has the right to reasonable use of groundwater located in an underlying basin, subject to reasonable use by other overlying landowners. In addition, landowners may have other rights to the use of groundwater, consisting of appropriative rights (where the landowner has appropriated water from the basin) and prescriptive rights (where the landowner has used the groundwater with knowledge by other groundwater users).

3. Assuming that the overlying municipalities, including the Town of Colma, the residents of and property owners within such municipalities have the right to use groundwater from the SWGB, based on any of the rights described above, would the project have any effect on such groundwater rights, and if so, what effects would be reasonably likely to occur? In particular, would the storage of water in the SWBG during wet periods have any reasonably-foreseeable effects on the Town of Colma and its residents to the use of the groundwater during such periods, and if so, what would be the effects? Would the recapture of water from the SWBG during dry periods have any reasonably-foreseeable effects on the Town of Colma and its residents to the use of the groundwater during these periods, and if so, what would be the effects?

4. If the project has an adverse effect on the Town of Colma, its residents and property owners to the use of groundwater in the SWBG, what provision, if any, does the City of San Francisco, through its planning department or other agencies, plan to take to avoid or minimize such adverse effects? Does the City of San Francisco plan to design the project in a way that avoids or minimizes such effects, and if so, how? If not, does the City of San Francisco plan to provide compensation to those whose rights have been lost or reduced? Does the City of San Francisco plan to take any other action to prevent or minimize the loss or reduction of such rights?

5. The project description in the Notice of Preparation states that California Water Company would provide the water "in its South San Francisco service area . . . ." Does this service area include the Town of Colma, including residential areas located in the Town of Colma? If not, does the project have an adverse environmental effect by reducing the availability of water supplies provided by California Water Company to the Town of Colma and its residents, thus requiring the Town of Colma and its residents to acquire water from other sources? What other sources are available to the Town of Colma and its residents under such circumstances?

6. It is stated that SF Water (SFPUC), Daly City, San Bruno and Cal Water will be the administrative board overseeing the management of the Westside Basin. Please clarify how that was arranged; does the SFPUC intend to include representatives from the neighboring jurisdictions, public representatives and representatives from already existing irrigators (Cemeteries and golf courses)? Why or why not?

7. What will be the purview of the administrative board? Will there be regulations and administrative rules that will govern both the Board and the SWGB? What type and form of notice and how much time will be given to jurisdictions and direct users of the Basin to review and comment on any administrative regulations that may be proposed?

8. How will the baseline data for existing users, such as irrigators, be determined? For existing irrigators who use groundwater for their agriculture or recreational needs, has it been calculated what their daily/monthly and yearly needs are currently. Has there been an assessment of their future needs, for example the expansion of a cemetery site and what impacts that may have (With the expansion more irrigation will be required). Will the current and future water rights of an established pumper be preserved by their current standard? Does the board (Assuming there will be an oversight committee) have a right to dictate how much water can be pumped and will there be limits?

9. When existing wells need to be replaced, what kind of jurisdiction do the water providers have in the replacement procedures? Currently this is permitted by the County, will there be another approval process that will have oversight in this request?

10. Establishing the various base line quantity numbers that has been posted in the Notice of Preparation is critical to current and future assessments. Please provide the data that establishes the bases of:
    An estimate of how much water is currently being stored.
    How it was determined that 61,000 acre foot of groundwater storage is available in the West Side Basin?
    The 7.2 million gallons a day that would be pumped out in dry years, how was that determined?

How long will it take for the aquifer to be replenished or brought to the desired levels.

11. Is the water in the SWGB to be used for the purposes of supplying residential, commercial, agricultural and recreational needs of those who reside over the basin or are there plans to export the water to communities beyond the underlying limits of the SWGB? If so, will this affect the ability of existing users to access more of the resource in the Basin? Will those jurisdictions that are not Partner Agencies be able to review any agreement made with customers not directly over the Basin?

12. Is there a plan to assemble an agreement (Memorandum of Understanding) between the irrigators, water providers and legislative bodies in each jurisdiction to define the various limits and protections for current and future activities?

13. To replenish the aquifer to the assessed amounts stated in various publications (61,000 acre foot), will this harm or potentially damage whatever is above the basin? In turn when the water table is drawn down, will it potentially cause damage?

14. Will any contaminants that lie in stasis above the water table be disturbed with the possible infiltration of groundwater and will the raising of the groundwater table causing contamination of the water?

15. It was stated in the Scoping Meeting (Public Meeting in SSF) that the aquifer is replenished by rain, streams and irrigation through ground peculation. Since irrigation is very similar to rain and rain has a positive effect on replenishing the water table, have irrigation uses been factored into the calculations in replenishing the water table?

16. The project description has been impermissibly piecemealed by omitting the test wells that will be constructed and operated as part of the Regional Groundwater Storage and Recovery Project. In so far as the Project is already defined and proceeding forward to environmental review, it is not tenable to maintain that the test wells are to collect data for a project that may or may not be proposed in the future. Clearly, here the test wells and rest of the Project are all part of the same reasonably foreseeable "project" under CEQA. Thus, the construction impacts of the test wells should be described. How the test wells will be operated should also be discussed. For instance, will excessive rates of pumping be used to test the stability of the underlying aquifers, and will groundwater levels be "drawn down" to evaluate subsurface hydrogeological conditions? Will this result in a cone of depression affecting nearby groundwater users? Also, what will be done with the quantities of water pumped by the test wells?

17. The project description must include information on distribution system extensions necessary to connect Project facilities to existing distribution lines. Where will these lines be placed, and what aesthetic and construction impacts would result? Will there be lengthy street closures or closures of on-street parking along pipeline rights-of-way, affecting traffic, parking, and emergency response, and will economic impacts on local businesses result in indirect impacts on the physical environment?

18. The NOP mentions that "the Westlake Pump Station in Daly City may need to be upgraded and treatment facilities may need to be added to several well facility sites." Pursuant to CEQA, the environmental impacts of both of these additional Project components should be addressed in the EIR (i.e., the full possible extent of the Project's impacts must be analyzed).

BAWSCA

Bay Area Water Supply & Conservation Agency

July 31, 2008

Mr. Bill Wycko
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: **<u>Case No. 2005.0164E</u> – Response to Notice of Preparation (NOP) of an EIR for the SFPUC Regional Groundwater Storage and Recovery Project**

Dear Mr. Wycko,

Thank you for the opportunity to provide the following comments from the Bay Area Water Supply & Conservation Agency (BAWSCA). BAWSCA represents the interests of the 26 water utilities, including an investor-owned utility and a university, that purchase water on a wholesale basis from the San Francisco Regional Water System. These agencies, in turn, provide water to 1.7 million people, businesses and community organizations in Alameda, Santa Clara and San Mateo Counties. These comments are in response to the Notice of Preparation of an Environmental Impact Report (EIR) for the Regional Groundwater Storage and Recovery project dated June 24, 2009. They are intended as input to the scope and focus of the project.

The comments below follow the report organization and do not reflect the level or priority.

1. **Section 5.2 – Project Objectives**
   The EIR should repeat the clarification made on Page 1, Footnote 1 whenever the 8.5 year design drought cycle is discussed.

2. **Section 5.3 – Proposed Project**
   - The EIR should clarify what rules the SFPUC and Participating Pumpers have agreed to that will govern the operation of the proposed project during wet, normal, and dry periods as well as the development of additional groundwater capability to meet future local water supply reliability needs. The EIR should present the detailed operational strategy for the proposed project, including the individual facilities, along with a detailed hydrologic and environmental impact analysis of the proposed project and associated facilities based upon the known operational strategy.
   - The EIR should address the potential for other users of the basin, who are not participating in this project, to affect the overall storage level in the basin and the amount of water potentially available for withdrawal under this project. The EIR should discuss what mechanisms can be implemented to protect the Program Storage against withdrawal by other non-participating pumpers.

155 Bovet Road, Suite 302 • San Mateo, CA 94402 • *ph* 650 349 3000 • *fx* 650 349 8395 • www.bawsca.org

3. **Section 5.3.1 – Groundwater Storage and Recovery**
   - The NOP states "This new dry-year water supply would be made available to both the Partner Agencies and SFPUC wholesale customer under the terms of the Shortage Allocation Plan between the SFPUC and its wholesale customers." The EIR should clarify exactly how this new dry-year water supply would be incorporated into that Plan. If the intent is that the available Program Storage, as quantified by the SFPUC Storage Account, will be taken into consideration by the SFPUC when determining how much water is available for delivery to customer and whether a shortage condition exists, then the EIR should provide this clarity.
   - The EIR should address how the Program Storage and associated project facilities might be used during an emergency, what rules would be applied to such operations, and who the beneficiaries would potentially be.

4. **Section 5.3.2 – Production Wells and Associated Facilities**
   - The EIR should discuss the reason(s) for providing disinfection facilities at each well as disinfection is not necessarily required under Title 22 of the California Code of Regulations.
   - The EIR should specify the type of disinfection method to be used (chlorine or chloramines) and discuss any blending impacts or water quality compatibility issues.

5. **Section 5.3.4 – Operations and Maintenance**
   - The EIR should provide the water supply availability criteria to be used to determine the conditions of a "normal", "wet", and "dry" year associated with the proposed conjunctive use operation. Also, the definition of "excess surface water" that determines the amount of reduced groundwater pumping in normal and wet years needs to be provided.
   - The EIR should define the methods to determine the amount of groundwater in the storage account at any point in time. Also, the basis for estimating underground losses of stored water that is not subsequently available for recapture needs to be explained.

6. **Section 6.0 – Permits and Approvals Required**
   The California Department of Public Health (CDPH) should be added to the list of permitting agencies.

7. **Section 9.1.3 – Hydrology and Water Quality**
   - It is indicated in the documentation for this project that Drinking Water Source Assessments will be performed during pre-design. Will these assessments be available for use in the EIR analysis?
   - The EIR should include a groundwater recovery assessment.
   - The EIR should discuss the lake level management plan for Lake Merced.
   - The EIR should include the site-specific water quality testing data which is required in the pre-design.

- The EIR should include an assessment to determine the ability to meet water quality goals when blending under the planned operational scheme. Project documentation indicates this will be verified from water samples collected from the test wells in the pre-design phase. Will there be sufficient information available at the time of the EIR analysis to confirm that blending is a viable method to achieve water quality goals?
- The EIR should provide the details of the long term monitoring program which will be used to assess changes in local groundwater quality and levels within the South Westside Groundwater Basin as a whole. This program should include the development of a best practices plan to protect the groundwater basin if not already developed.
- Is there any plan for using recycled water in the groundwater basin? If so, then an assessment of potential impacts of this practice should be performed.

8. **Section 9.2 – Alternatives**
If there are alternatives that consider different well locations than those listed in Table 1, the EIR should discuss the siting criteria used to select an alternative well site.

Thank you for the opportunity to provide these comments on the Notice of Preparation dated June 24, 2009 regarding the Regional Groundwater Storage and Recovery project. If you have any questions, please contact me at (650) 349-3000.

Sincerely,

Nicole M. Sandkulla

Nicole M. Sandkulla, P.E.
Senior Water Resources Engineer

cc: G. Bartow, SFPUC Project Manager
A. Jensen, BAWSCA
R. McDevitt, Hanson Bridgett
D. Newkirk, Newkirk Environmental
T. Roberts, Terry Roberts Consulting
File

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FREDERICK BOLD, JR.
(1913-2003)

July 28, 2009

Mr. Bill Wycko
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Regional Groundwater Storage and Recovery Project – Scoping Comments

Dear Mr. Wycko:

This law firm represents the Green Hills Country Club, the Lake Merced Golf Club, the Olympic Club, and the San Francisco Golf Club (the Clubs) with regard to certain water-related matters, including the Regional Groundwater Storage and Recovery Project (Project) being proposed by the San Francisco Public Utilities Commission. This letter constitutes scoping comments by the Clubs for the anticipated environmental impact report (EIR) that will be prepared for the Project.

The Clubs are interested in the proposed Project because they each pump groundwater from the South Westside Basin Groundwater Basin (Aquifer) for a portion of their irrigation water supply, a recognized beneficial use of the available groundwater resource. As overlying property owners, the Clubs each have the legal right to pump that amount of water reasonably needed for their use for irrigation of their property, and their rights are protected against injury by California law. The Clubs recognize the efforts being made by the SFPUC to improve water supplies and water management for the utilities and communities in the region, including increased use of groundwater resources. The Clubs do not oppose the proposed Project, but believe that it should be the subject of full evaluation in the EIR before any portion of it is approved by the SFPUC. The Clubs' comments set forth below should be among the matters taken into account in preparing the EIR.

As the Clubs understand the proposed Project, the SFPUC will deliver imported Hetch Hetchy surface water supplies to municipal water utilities in Daly City, San Bruno, and other communities which pump all or a portion of their water supply from the Aquifer, in an effort to take the place of groundwater during normal and wet years. Approximately 5.4 million gallons per day (mgd) of surface supplies will be substituted for the approximately 6.7 mgd of groundwater that is currently extracted from the Aquifer by the municipal utilities. Irrigation well users will not get substitute supplies.

In dry years, the SFPUC would plan on extracting up to 7.2 mgd from the presumably fuller Aquifer, in addition to the 6.7 mgd that would be extracted by the municipal utilities which are the SFPUC's "partners" in the proposed Project. In other words, although current extractions from the Aquifer in dry years are at the rate of approximately 6.7 mgd, if the Project is approved and fully implemented, a total of 13.9 mgd of groundwater will be pumped. The SFPUC plans are for this higher rate of pumping to be made possible by removal of the increment of additional water that remained in the Aquifer rather than being pumped during the normal to wet years when surface water is provided to the municipal partners. This form of storage and recovery of water from a groundwater basin is commonly called "in-lieu recharge" or "conjunctive use."

Overall, the Clubs' understanding is that the SFPUC's fundamental Project idea is to utilize approximately 60,000 acre-feet (AF) of the estimated 70,000 AF of available groundwater storage in the Aquifer. In addition, the SFPUC apparently wishes to "recover" the estimated 15,000 AF which it asserts has been "stored" during a "pilot study" of this in-lieu process; that study began in approximately 2002. The Clubs understand that the proposed Project includes construction of up to sixteen new extraction wells from 19 preferred sites, which will be spread from Daly City to Millbrae, generally along El Camino Real (Hwy 82). No injection or recharge "spreading" of groundwater is planned as part of this Project. The Project will also include a number of monitoring wells, some of which have already been constructed.

Approximately three test wells will apparently be constructed in 2009-2010, and the SFPUC staff has indicated they will not be part of the EIR. Instead those test wells are deemed by the SFPUC to be categorically exempt from the need to do more detailed environmental documentation. However, the Clubs understand that the test wells will be constructed so as to function as operational wells (and will be at planned extraction well locations), so they will be more fully examined as part of the Project CEQA process. The Clubs believe that it is appropriate to include the test wells in the EIR so that they cannot be placed in full operation until the EIR is certified and the Project is approved.

The Clubs see the following as potentially important issues that should be addressed in the EIR:

1. Protection of Existing Water Rights – The EIR needs to address protection of existing overlying rights and protection of any existing overlying rights that are not currently utilized due to the use of recycled water for irrigation where that is done in areas served by the Aquifer. If the SFPUC seeks to recover the 15,000 AF they have already "stored," the EIR should indicate how the interests of

overlying owners will be protected—i.e., how will the SFPUC assure other pumpers that their water rights will not be impaired by this excess pumping?

2. Protection of Water Quality - Both extremes of this situation (high water levels and low water levels in the Aquifer) can negatively impact water quality. Higher water levels may mobilize minerals and potential contaminants that have been previously stationary. Conversely, the potential for water levels to decline, even temporarily, as a result of the dry year pumping may negatively impact water quality by concentrating contaminants and minerals. There may also be potential for mixing of waters (and minerals) that may not otherwise have occurred, which could be a cause for concern and should be analyzed..

3. Potential Impacts on Wells – Since historic pumping by the municipal utilities (and to a more limited degree by irrigators) has lowered water levels in the Aquifer, one challenge of the Project and especially the EIR is to analyze the potential impacts of refilling the Aquifer in the event of a series of wet or normal years. There is potential for negative impacts to the production wells of pumpers, including the Clubs, particularly during dry years. The Clubs understand that the initial modeling that has been done suggests that only a few municipal wells (1930's-vintage California Water Service Company wells) are expected to be impacted, but that modeling did not address impacts on irrigators. Should water levels be depressed below the screened intervals of the well casings, there is a possibility of long-term well damage. Energy costs for irrigation users of the Aquifer should also be analyzed. Adverse impacts on private wells may require mitigation by the SFPUC, and this needs to be analyzed and disclosed.

4. Location of Wells (Well Interference) - The locations of the new extraction wells proposed by the SFPUC, and any new wells planned by their municipal partners, need to be fully disclosed and analyzed, and included in the draft EIR, with detailed maps. The potential for direct impacts from the effects of the extraction wells is real and needs careful analysis. The results of the analysis to be determined by mutual interference modeling needs to be fully disclosed and analyzed in the EIR and the mitigation plan.

5. Available Aquifer Storage – In all aquifer storage and recovery projects, and particularly in the case of an in-lieu project such as this, there is always the possibility that the ratio of "stored" to future extracted water is not actually or even close to 1:1. There is always the potential for new users. There is also the potential that the "stored" water is simply lost (i.e., the stored water may not stay within the Aquifer, or at least within that portion of it utilized). The actual "usable" available storage may also not be accurate (i.e. the 70,000 AF estimate).

This issue is fraught with the potential for dispute, as many groundwater users experienced in the long fight over the Santa Maria Basin. Careful environmental and technical analysis of the actual storage capacity and the effects of its use are needed before the proposed Project is approved. None of the interested parties would be benefited if inadequate analysis leads to a project that results in conflict and controversy, particularly if it leads to the possibility of a basin adjudication.

6. Cumulative Impacts – The EIR needs to fully analyze the impacts of the proposed Project and other groundwater-related projects in the area, including but not limited to the SFPUC's proposed Lake level restoration project for Lake Merced, the project to pump groundwater at production rates from the North Westside Basin, and the variety of recycled water projects proposed in various portions of the lands overlying the Aquifer. Stormwater management projects being considered in the area, particularly by Daly City, also need to be taken into account, particularly to the extent they may involve detention basins. All of these related types of projects should be considered as elements of a comprehensive integrated water resources management approach to deal with the many challenges facing the SFPUC and the other water agencies in the area

The Clubs appreciate the opportunity to submit these comments on the proposed Project during the scoping phase. The Clubs hope to have the opportunity to participate in future phases of the Project, including possibly serving on an advisory committee of groundwater users if one is formed. If you have any questions about this letter, please contact me or Douglas E. Coty at the address and telephone number shown above.

Very truly yours,

Robert B Maddow

Robert B. Maddow

RBM:b

cc: Clubs
Joshua D. Milstein, SF City Attorney's Office
Copy sent via e-mail to diana.sokolove@sfgov.org
Copy sent via fax to (415) 558-6409

"Mondy Lariz" <mlariz@comcast.net>
07/28/2009 04:17 PM
Please respond to
<mlariz@comcast.net> To
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cc

bcc

Subject
Regional Groundwater Storage and Recovery Project Scoping Comments

By email to diana.sokolove@sfgov.org

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission St., #400
San Francisco, CA 94103

July 28, 2009

Re: Regional Groundwater Storage and Recovery Project Scoping Comments
--- Case No. 2005.0164E

Dear Mr. Wycho:

I was dismayed to find no mention of Lake Merced in the above referenced document.
Rather than supply additional comments I will simple say that I agree with the comments made by Mr. Cadagan for the Committee to Save Lake Merced.
Thank you considering these comments and working to ensure an adequate CEQA document and project.
Sincerely,

For California Trout
Mondy Lariz
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San Jose, CA 95124
(408) 358-6963

WRITTEN COMMENT #9

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cc
"Peter Drekmeier" <Peter@Tuolumne.org>, "Bob Hackamack" <jdmack@jps.net>, "mike marshall" <mike@hetchhetchy.org>, "Mondy Lariz" <mlariz@comcast.net>, rrcollins@n-h-i.org, ajensen@bawsca.org, "Bartow, Greg" <GBartow@sfwater.org>
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Subject
Regional Groundwater Storage, etc. Case No. 2005.0164E

Committee to Save Lake Merced
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By Fax to diana.sokolove@sfgov.org

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission St., #400
San Francisco, CA 94103

July 28, 2009

Re: Regional Groundwater Storage and Recovery Project Scoping Comments --- Case No. 2005.0164E

Dear Mr. Wycho:

What follows are the comments of the Committee to Save Lake Merced (the "Committee") on the June 24, 2009 Notice of Preparation (and Project Description and related materials) of an Environmental Impact Report ("EIR") for the San Francisco Public Utilities Commission's Groundwater Storage and Recovery Project (the "Project"). The Committee is a coalition of users of Lake Merced formed in 1993 to address the declining water levels in the lake. The Committee has since 1993 remained active in the efforts to permanently reverse those declining water levels and anticipates remaining active until a final resolution of the lake level issue is reached. Thus, our comments here are primarily directed at matters that relate to Lake Merced water levels. However, we anticipate that one or more organizations concerned with issues affecting the Tuolumne River will also comment on the scope of the EIR for the Project. We are firm supporters of the goals of those organizations and in no fashion do we intend that our comments be inconsistent with the goals of those concerned with the health and welfare of the Tuolumne River.

The Project is a conjunctive use project and, as the NOP points out, was listed as the "Conjunctive Use Project" in the SFPUC's Water System Improvement Program and the related Program Environmental Impact Report. The Committee is fully supportive of conjunctive use of water, but also mindful of the old adage that "the devil is in the details". In this case it can't be determined if there is a devil in the details because there are far too few details in the project description found in the NOP. Some of the more important matters that need to be in the project description before meaningful environmental analysis can be done appear in the numbered paragraphs below.

The primary purpose of an EIR is to "identify significant effects on the environment of a project". The NOP lists in Section 9.1 some of the environmental issues to be addressed, including land use; geology, etc; hydrology and water quality; biological resources; cultural resources; traffic,etc; noise and vibration; and recreational resources. Surprisingly, nowhere in Section 9 of the NOP (or elsewhere in the project description or related material presented at the July 9 scoping meeting) is mention made whatsoever of "Lake Merced" or the "Tuolumne River". It is in those two bodies of water that the potentially truly significant negative environmental effects of the Project might materialize. Being specifically interested in Lake Merced, the Committee notes that it is fairly well acknowledged that a significant contributing factor to the environmentally damaging decline in lake levels during the 80's was excessive pumping from the Westside Basin aquifer. That resulted in an overdraft condition in the aquifer. The Committee does not find comfort in the material currently available that excessive aquifer pumping and resultant aquifer overdraft might not result from operation of the Project thereby causing significant and unnecessary harm to the environment.

It is fundamental to CEQA that an EIR must be prepared with "a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences." CEQA Guidelines ¶ 15151. No citation should be needed for the proposition that an EIR cannot meet that test if the description of the project that is the subject of the EIR is fundamentally inadequate. It is possible that SFPUC plans to amplify the project description after the deadline for scoping comments has passed. That would seem inconsistent with the spirit of the scoping process and, in this case, the requirement that at least one scoping meeting be held in connection with projects of statewide, regional or areawide significance. CEQA Guidelines ¶ 15082(ç)(1). In other words, what is the point in having a mandatory scoping procedure if the project description in existence at the time of the scoping meeting and during the scoping comment period is so lacking in basic information?

Based on the foregoing, and taking into the specific comments below on the inadequacy of the detail in the project description, the Committee respectfully submits that the NOP should be withdrawn at this time and reissued only when an adequately detailed project description is submitted by the SFPUC.

A second important purpose of an EIR is to identify alternatives to the project. One possible alternative (maybe better characterized as a "supplement") would be to add as a project feature the injection of stormwater and/or recycled water to the aquifer. Upon informal preliminary inquiry in this regard we were told that geological conditions in the area do not lend themselves to effective use of injection wells. This issue needs to be examined (and discussed in the EIR) in much greater detail, including consideration of using the soon-to-be-made-public groundwater model to determine optimum locations for injecting stormwater and/or recycled water.

We submit the following specific comments, most of which are consistent with our belief that the existing project description in inadequate to allow for meaningful CEQA review in an EIR.

1. The project description lacks definitions of critical terms such as "excess surface water" (¶1.0; p.1), "dry, normal and wet" years (throughout the project description); "sufficient surface water supplies" (¶5.3.1; p.9).

2. The project description lacks adequate information regarding the aquifer in question to give meaning and context to the stated project purposes (¶5.2; p.8). It is stated more than once (e.g. ¶5. 3.1; p.10) that storage in the aquifer will be increased by 61,000 AF "eventually". But neither the total capacity or current storage volume in the aquifer (or relevant portion of the larger Westside Basin aquifer) is given. This project relates to just the South Westside Groundwater Basin which is a part of the larger Westside Groundwater Basin. An earlier study of the entire Westside Groundwater Basin estimated that "on the order of 75,000 acre-feet of available storage" would be available for possible conjunctive use. Luhdorff and Scalmanini, Update of the Conceptualization of the Lake-Aquifer System: Westside Ground-Water Basin, April 2004. These numbers may possibly be reconcilable, but it would be essential for those doing the current environmental study to have up-to-date information on total capacity of the South Westside Groundwater Basin, its current storage situation, and unused capacity for future conjunctive use storage.

3. Related to paragraph 2 immediately above is that fact that SFPUC has plans for groundwater development in the North Westside Groundwater Basin. The current project description should spell out how these two seemingly closely related projects are being integrated.

4. Many of the answers to the specific issues raised above may ultimately be found in the "groundwater storage and recovery agreement" cryptically mentioned in ¶5.3.1 (p.10) and slightly more prominently mentioned in footnote 5 to ¶5.3.4 (p.20). If that agreement is intended to spell out critical questions such as the missing definitions and even more basic questions ---- such as whether pumping in dry years may occur before recharge has occurred ---- then that agreement should be prepared and publicly disclosed before preparation of the EIR. (As noted above, the scoping process should occur after, not before, those critical details are revealed.)

5. The Committee cannot keep current on evolving CEQA law regarding the need to consider climate change in EIRs under CEQA. Regardless of the current state of the law, in this instance it seems essential that climate change be considered in detail given that the project is partially based on the premise that there will be undefined "excess" surface water (presumably referring to Tuolumne River water --- 85% of SFPUC's surface supply) available in the undefined "normal and wet years".

Respectfully Submitted,

Committee to Save Lake Merced

By s/ Jerry Cadagan
Jerry Cadagan

cc. CalTrout
Tuolumne River Trust
Restore Hetch Hetchy
SFPUC
BAWSCA

Tuolumne River Trust

July 28, 2009

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission St., #400
San Francisco, CA 94103

Re: Regional Groundwater Storage and Recovery Project Scoping Comments

Dear Mr. Wycko:

The Tuolumne River Trust appreciates the opportunity to comment on the Notice of Preparation of an Environmental Impact Report for the Groundwater Storage and Recovery Project (Case No. 2005.0164E).

The purpose of the Project is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. The dry year water supply would be made available to the cities of Daly City and San Bruno, the California Water Company in its South San Francisco service area, and SFPUC wholesale water customers.

In general, the Tuolumne River Trust supports the concept of cooperative management of surface water and groundwater to optimize the water demand and supply balance. However, we have concerns that this project could harm the Tuolumne River by increasing diversions in normal and wet years.

Need to Study Impacts on the Tuolumne River

Figure 5 in the Notice of Preparation (Source of Water Supply for Partner Agencies) suggests that the SFPUC would provide an additional 5.4 million gallons of surface water per day (mgd) to its customers in normal and wet years to enable them to reduce groundwater pumping by an equal amount. The EIR needs to identify the source(s) of this additional surface water. It also should define wet, normal and dry years. Assuming most of the additional 5.4 mgd is expected to come from the Tuolumne River, the impacts of increasing diversions should be studied in the Project EIR.

Currently, 60% of the Tuolumne River is used for agricultural and urban uses, and even more water is diverted, causing significant impacts to the river ecosystem. For example, the population of Chinook salmon has declined from more than 100,000 individuals per year prior to dam building, to 18,000 in 2000, to less than 500 in 2008. In its comment letter on the Water System Improvement Program (WSIP) DPEIR dated October 1, 2007, the California Department of Fish and Game (CDFG) stated that lack of adequate instream flows was the primary cause of the decline in anadromous fish. Diverting more water from the Tuolumne would only exacerbate this problem.

The WSIP PEIR attempted to address the impacts on salmon and steelhead of diverting more water from the Tuolumne, however, the analysis was wholly inadequate. The Tuolumne River Trust and other conservation organizations did not issue a legal challenge to the PEIR because we did not want to delay the seismic upgrades to the Hetch Hetchy Water System.

New information about potential impacts to the Tuolumne River from increasing diversions should be included in the CEQA analysis for the Groundwater Storage and Recovery Project. For example, the SFPUC is currently conducting a study of biological resources in the stretch of the Tuolumne downstream of the Hetch Hetchy Reservoir to meet a condition of the 1987 Kirkwood Powerhouse Agreement. Because the study was not completed in time to be included in the WSIP PEIR, it is important that the results of this study be considered as soon as possible. This study is expected to be completed by the end of 2009.

On January 15, 2009, CDFG submitted comments on the San Joaquin Pipeline System Project. They stated:

> "We are concerned, however, that the addition of a new pipeline segment will provide conveyance capacity for increased diversions from the Tuolumne watershed. "To contribute toward meeting the overall program objectives of the WSIP, the SFPUC has designed the SJPL System Project to meet current and future water demand" (Pg. 1-2, DEIR). This implies the SJPL will be integral either now or in the future for conveying additional water supplies which would likely include diversions of about two million gallons per day (mgd) over existing conditions from the Tuolumne River. Be advised that for any activity that will divert or obstruct the natural flow…DFG may require a Lake and Streambed Alteration Agreement (LSAA), pursuant to Section 1600 et seq. of the Fish and Game Code, with the applicant."

CDFG went on to say:

> "In those documents (CDFG comments on the WSIP PEIR), we described in detail the critical and dire condition of native salmonids in the Tuolumne River. We thoroughly outlined the relationship between in-stream flows and native salmonid productivity, as well a the need for decreased, rather than increased, Tuolumne River diversions to sustain native salmonid populations at *high risk of extinction*. Increased diversions of two mgd would also likely worsen conditions for other fish species in the Tuolumne River, and would likely add to cumulative impacts to water quality of the San Joaquin River, that may further impact sensitive species including federally threatened steelhead (see Zimmerman et al. 2008), State and federally endangered Delta smelt (Hypomesus transpacificus), federally threatened southern distinct population segment (DPS) green sturgeon (Acipenser medirostris), and the State candidate longfin smelt (Spirinchus thaleichthys), currently petitioned for endangered status. DFG continues to respectfully request SFPUC consider all other

potential options for meeting increased customer demand until and after the year 2018."

These comments should be addressed in the Project EIR for the Groundwater Storage and Recovery Project.

It should be noted that wet years do not result in "wasted" water. Wet years can provide better flows for juvenile salmon and steelhead, enabling them to get flushed out into the Bay and Ocean in higher numbers. In big water years, such as 1982/83 and 1997/98, the two reservoirs on the Tuolumne River filled to capacity, causing spillage over the dams. As a result of the increased instream flows, the numbers of adult salmon and steelhead returning three years later increased dramatically. However, in 1994, despite the relative abundance of water, most of the River's flow was captured in the two reservoirs to fill them after several years of drought (see attached graph). As a result, the number of returning adult salmon three years later was much smaller than would otherwise have been expected.

The EIR for the Groundwater Storage and Recovery Project should study the impacts of diverting additional water from the Tuolumne on fish populations even in wet and normal years.

Furthermore, requirements for instream flows in the lower Tuolumne are likely to increase as a result of the FERC relicensing process that will begin in 2011 and be completed in 2016.

A recent FERC order on a rehearing request for the 1995 FERC Settlement Agreement acknowledged the existence of steelhead in the lower Tuolumne and the need for them to be addressed. It found that interim measures may be required prior to relicensing. It also determined that within four years an instream flow of 4,000 cfs in the spring would be needed for study purposes and that the instream flow study, including a plan for a temperature model, be developed by MID and TID in consultation with NMFS, FWS and CDFG.

This, and future FERC actions, must be considered in the CEQA analysis for the Groundwater Storage and Recovery Project.

Need to Study the Potential for Using Stormwater Runoff and/or Recycled Water to Enhance Recharge of the Groundwater Basin

In response to CDFG's request that "SFPUC consider all other potential options for meeting increased customer demand," the EIR for the Groundwater Storage and Recovery Project should study the potential for using stormwater runoff and/or recycled water to enhance the recharge of the groundwater basin. This would enable a higher sustainable rate of groundwater use in normal and wet years, thus reducing or eliminating increased diversions from the Tuolumne River.

We believe our concerns are shared by the SFPUC Commission and the San Francisco Planning Commission. SFPUC Resolution No. 08-0200, which approved the WSIP on October 30, 2008, states:

"Further resolved, the San Francisco Public Utilities Commission shall set aggressive water conservation and recycling goals, shall bring short and long-term conservation, recycling and groundwater programs on line at the earliest possible time, and shall undertake every effort to reduce demand and any further diversions from the San Francisco Public Utilities Commission watersheds…"

In a letter dated December 18, 2008 to SFPUC President, Ann Moller Caen and SFPUC General Manager, Ed Harrington, the San Francisco Planning Commission wrote:

"As you know, the Tuolumne River is a precious resource and the City and County of San Francisco should continue to protect it. Thus, the Commission urges the SFPUC to continue to find alternative ways to provide water supply to the service area that do not involve withdrawing additional water off the Tuolumne River."

Thank you for considering our comments.

Sincerely,

Peter Drekmeier

Peter Drekmeier
Bay Area Program Director

<u>Attachments</u>

CDFG WSIP DPEIR comments
CDFG letter dated January 15, 2009
1994 stream flow graph
FERC order on rehearing request
SFPUC Resolution #08-0200
SF Planning Dept. letter dated December 18, 2008

cc: CDFG
SFPUC
SF Planning Commission

RESTORE HETCH HETCHY
YOSEMITE NATIONAL PARK

Please reply to: PO Box 1886
Twain Harte CA 95383-1886
July 28, 2009

Mr. Bill Wycko
Environmental Review Officer
Regional Groundwater Storage and Recovery Project Scoping Comments
San Francisco Planning Department
Sent by email to diana.sokolove@sfgov.org submitted at 3:20 PM

Subject: South Westside Groundwater Basin EIR Scoping

Dear Mr. Wycko:

Restore Hetch Hetchy appreciates the opportunity to provide scoping input for the SFPUC WSIP Regional Groundwater Storage and Recovery Project EIR, Case No. 2005:0164E.

The use of this aquifer for domestic water supply during the design drought is good conjunctive-use, but the concept of replacing the present well water being pumping with surface supply to allow replenishment naturally during normal and wet years without listing the source of that surface water gives the impression that other watersheds will suffer impacts, which are not going to be addressed in this EIR. This is a serious omission that the EIR must address. Because you did not mention the specific source of the "surface water, when available" in your current Notice or Description, immediately makes those involved with the SFPUC source watersheds think the worst—that more water will be drawn from these watersheds for this project. The fear is that offsetting replenishment surface flow were not presented nor mitigation provided for in your department's 2008 PEIR for the WSIP, Case No. 2005.0159E referenced in your Description. They would want those sources to be acknowledged and their impacts shown and mitigation provided for in this project EIR. It would be a mistake not to do so if those assumptions are true.

To calm everyone we ask that you present a water balance in this EIR stating the source of this replacement water proposed and giving a

Tuolumne River at Moccasin in 2018 on a five-year rolling average; the same from Alameda Creek watershed to the Sunol Water Treatment Plant; from the Peninsular watersheds to Tracy WTP; from groundwater pumping inputs; purchases from other water suppliers; amount of Tuolumne River water put into and recovered from San Antonio Reservoir; amount of Tuolumne River diversion put into and recovered from Crystal Springs Reservoir; amount of Tuolumne River water put into and recovered from Pulgas Reservoir; amount traded to and from other water agencies (e.g. EBMUD); amount purchased from other agencies and delivered through the South Bay Aqueduct; the amount rejected from each of the two WTP as part of their normal operation; amount rejected at Livermore Lab water treatment facility; amount rejected by backwash from well water filtration; the amount sold to BAWSCA including "surface water, when available" "in lieu of pumping ground water" for this aquifer project as a separate item; sales within the City of SF; that sold to Lawrence Livermore Lab; that sold to GE nuclear power generation near Sunol; amount sold to or purchased from other government agencies not already included; evaporation from WTPs and storage; transmission losses; losses from meter failure in SF (delivered but not billed or over billed); accretions; water main flushing; fire fighting use and hydrant testing; and system operating spills and releases. The amount sold to GCSD and that served to Moccasin and Early Intake should be stated as separate diversions. Input flows will equal sales and outputs. The amount of 223 mgd total sales goal by 2018 was stated to your Planning Commission for the PEIR on Oct 30, 2008 by SFPUC General Manager, Ed Harrington, during the decision meeting for Case No. 2005.0159E. That amount has never appeared in print and this is the place for it to be stated and explained. That water balance will let everyone know where the surface water replacement flow is coming from for this project. Our expectation is that this water balance will show the well water replacement flow is part of the 223 mgd five-year rolling average goal for 2018.

A second reason we ask for this water balance is for you to explain how the goal of total sales got from 217.3 mgd (calculated from Figure 2.4 on page 2-18 of the DPEIR) to 223 mgd that the Commission accepted. Two mgd of the increase was noted in the WSIP Revision supplement (Chapter 13, Table 13.2, in the Phased WSIP column at page 13-13), but the purpose or reason for it was never given in print, nor was the other 3.7 mgd additional Tuolumne River diversion explained in print that was added by the General Manager just before October 30. This extra amount also needs to be explained. This EIR is the place to explain these increases as well as the source for the 4.5 mgd replacement surface (flow calculated from Figure 5 page 21 of this Description). Is the 4.5 mgd replacement flow part of the 223 mgd rolling average total sales as we expect? Or do you plan to purchase this replacement water from another source? A water balance will answer all these questions and restore our faith in your EIR process.

Although Lake Merced is just north of the study area of the South Westside Groundwater Basin, please discuss the "potential for flow from shallow aquifer/lake system toward the underlying

aquifer from which nearby production wells withdraw water" in the South Westside Groundwater Basin south of Lake Merced (quote from DPEIR page 5.6-15 paragraph two). Also discuss using recycled water, and urban storm runoff after the first flushing rain as sources to raise the level in Lake Merced for this recharge purpose.

The DPEIR lists several golf courses located atop this aquifer that are successfully using recycled water for irrigation (DPEIR page 5.6-8). Discuss the impact on aquifer recovery from conversion to using recycled water for additional golf courses and other irrigated landscapes located over this aquifer that still pump from this aquifer or use system water for irrigation.

Discuss the rate of aquifer refilling as related to less pumping and use of recycled water for irrigation above the aquifer.

Discuss what would be necessary to recharge more of the 75,000 acre feet vacant storage available in this aquifer for drought use (DPEIR p 5.6-25) and the time to accomplish refilling.

Explain how the high nitrate and manganese concentrations in water from this aquifer will be handled during drought when about 7.2 mgd will be added to the diminished surface supply (volume reference is from Section 5.3.2 of this Description and the minerals noted are in section 5.6.1.8 in DPEIR). Will wellhead treatment be used to accomplish reduction of these two chemicals or will blending with system water take care of these problems?

If this is a"Regional" Project, why is the North Basis not included?

Please acknowledging this submission from us at jdmack@jps.net Please mail the author a hard copy of this DEIR and FEIR when each is available.

Sincerely,

Bob Hackamack, P.E.
Chair Water, Power and Restoration Committee

Copy: BAWSCA
Committee to Save Lake Merced
SFPUC
Tuolumne River Trust

305 Fw RHH submissions to Regional Groundwater Storge Recovery Project scopinng
From: Diana Sokolove [diana.sokolove@sfgov.org]
Sent: Tuesday, July 28, 2009 5:36 PM
To: Pat Collins; Carol Kielusiak; schau@rmcwater.com; Lori Wider
Subject: Fw: RHH submissions to Regional Groundwater Storge & Recovery Project scopinng

FYI

----- Forwarded by Diana Sokolove/CTYPLN/SFGOV on 07/28/2009 05:35 PM -----

"Bob & Jean Hackamack" <jdmack@jps.net>

07/28/2009 05:22 PM

To
"'Diana Sokolove'" <diana.sokolove@sfgov.org>

cc
"'mike marshall'" <mike@hetchhetchy.org>, "Bob Hackamack" <jdmack@jps.net>

Subject
RE: RHH submissions to Regional Groundwater Storge & Recovery Project scopinng

Diana: Thanks for your reassuring response that my comments reached you before the deadline. You can tell from the typos in the subject line that I was worried that things might go wrong.

And thanks for your question about a few missing words at the bottom of page 1. Yes two lines dropped off. They are: "detailed water balance for the SFPUC delivery system as a whole. It should contain, as a minimum, how much the diversion goal is from the". Bob H

-----Original Message-----
From: Diana Sokolove [mailto:diana.sokolove@sfgov.org]
Sent: Tuesday, July 28, 2009 4:12 PM
To: Bob & Jean Hackamack
Cc: Bob Hackamack; 'mike marshall'
Subject: Re: RHH submissions to Regional Groundwater Storge & Recovery Project scopinng

Greetings,

Thank you for your comments. In reviewing the comments, it appears as though a few words or sentence may be missing in the transition from page one to page 2. Can you let me know? I combined the files into one Adobe Acrobat file (attached) in an effort to help you answer the question.

(See attached file: Restore Hetch Hetchy_072809.pdf)

Regards,
Diana

Diana Sokolove, Senior Environmental Planner City and County of San Francisco Planning Department Major Environmental Analysis Division 1650 Mission Street, Suite 400 San Francisco, CA 94103
t: 415.575.9046
f: 415.558.6409
e: diana.sokolove@sfgov.org

"Bob & Jean Hackamack" <jdmack@jps.net>

07/28/2009 03:19 PM

To
<diana.sokolove@sfgov.org>

cc
"'mike marshall'" <mike@hetchhetchy.org>, "Bob Hackamack" <jdmack@jps.net>

Subject
RHH submissions to Regional Groundwater Storge & Recovery Project scopinng

Bill Wycko: Attached are two files comprising Restore Hetch Hetchy scoping input for Case No. 2005:0164E. Bob H(See attached file: RHH S Westside Groundwater scopinng p 1, 7-28-09.doc)(See attached file: RHH S Westside Groundwater Scoping p 2 & 3, 7-28-09.doc)

Appendix F
Scoping Meeting Sign-In Sheet

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SIGN-IN SHEET

(Please print)

NAME	AFFILIATION	ADDRESS	PHONE	EMAIL
Peter Drekmeier	TRT	111 New Montgomery St., #205 SF 94105	650-248-8025	Peter@Tuolumne.org
Matt Holt	MWH	2121 N. California Blvd Suite 600, Walnut Creek CA 94596		
Andy Tan	SSF	315 Maple Ave S.S.F CA 94080	(650) 829-6667	
James Carlson		1299 El Camino Real Colma 94014	755 4700	jcarlson@Emanuelsf.org

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SIGN-IN SHEET

(Please print)

NAME	AFFILIATION	ADDRESS	PHONE	EMAIL
MARK ADDIEGO	City of SSF	400 GRAND AVE SSF	650-877-8500	
Steve Davis	City of San Bruno	216 Cypress Ave	650-616-7075	
Gary Batis	City of SSF	550 N Canal SSF	650-877-8550	
PAUL PERKOVIC	MONTARA WATER & SANITARY DISTRICT	P.O. BOX 371149 MONTARA, CA 94037-1149	415 370-3897	PAUL_PERKOVIC @YAHOO.COM
MR & MRS Pedro GONZALEZ	City COUNCIL	400 GRAND AVE	877-8500	
David Canepa	City Council	397 Innsbrook Way 12/12 DC CA 94015	(650) 992-1165	
BOB MADDOW	GOLF COURSES	ASK SUZANNE GAMBA	925 933 7777	MADDOW @ BPMNJ.COM

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SIGN-IN SHEET

(Please print)

NAME	AFFILIATION	ADDRESS	PHONE	EMAIL
Leana Stephens	League of Women Voters	119 Shipley Ave Daly City 94015		
Rick Crump	DC Planning Comm	396 Imperial #305 DC 94015		
LY TENGAN	PRIVATE CITIZEN	637 SPRUCE AVE SSF 94080		
Pradeep Gupta	SSF Plng Commn	68 Nursery Way SSF CA 94080	650-794-1417	
PATRICK SWEETLAND	CITY of DALY CITY	153 LAKE MERCED BLVD DALY CITY CA 94015	650 991-8201	PSWEETLAND@DALYCITY.ORG
Wayne Ross		609 Theresa Dr SSF Ca	650 8718194	
VICTOR WIN	CITY OF (CITIZEN) DALY CITY	56 MAYFIELD AVE DALY CITY 94015		

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SIGN-IN SHEET

(Please print)

NAME	AFFILIATION	ADDRESS	PHONE	EMAIL
Andrea Ouse	Town of Colma	1190 El Camino Real Colma, CA 94014	650 985 2590	andrea.ouse@colma.ca.gov
Brad Donohue	Town of Colma	1188 El Camino Real Colma, CA 94014	650 757-8888	brad.donohue@colma.ca.gov
Trevor Joseph	DWR	3500 Industrial Blvd West Sacramento	916-376 9619	tjoseph@water.ca.gov
[illegible]	SSF	449 Forest View	650-588 3704	
Jeanette Acosta	SSF	276 Country Club Dr	589-7874	-0-
Jim Stark	Lakeshire Acres Imp. Club	124 Country Club Dr SF	731-9600	jesplom@aol.com
[illegible]	Colma	816 Maddux Dr. Colma		

SAN FRANCISCO PLANNING DEPARTMENT

Public Scoping Meeting
Proposed Regional Groundwater Storage and Recovery Project
South San Francisco, CA - July 9, 2009

SIGN-IN SHEET

(Please print)

NAME	AFFILIATION	ADDRESS	PHONE	EMAIL
Melissa Ross	SAN MATEO CO. PLANNING DEPT	455 COUNTY CENTER, 2ND FL REDWOOD CITY, CA 94063	(650) 599-1559	Mross@co.sanmateo.ca.us
Martha Ross		609 Theresa Drive S.S.F. CA 94080	(650) 871-8144	Tia1956@AOL.com
Kathryn Slater-Carter		PO 370321 Montara, CA 94037	650 346-5255	Kathryn.s.c@gmail.com
Steve Leonard	Black & Veatch	38 Woodfield Redwood City	925 324275	LeonardS@BV.com
Audrey Park	SFO Planning + Env. Affairs	PO BOX 8716 SF CA 94128	650 821.7844	audrey.park@flysfo.com
James Griffin		2104 Adeline DR. BGAME 94010	344-3556	JAGTRMG@ATT.NET
Elizabeth Flegel	EKI	1870 Ogden Drive Burlingame CA 94010	650-292-9100	eflegel@ekiconsult.com

Appendix C

Summary of Impacts Table

Appendix C
Summary of Impacts and Mitigation Measures for the Groundwater Storage and Recovery Project

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Section 5.2 Land Use																								
Impact LU-1. Project construction would have a substantial impact on the existing character of the vicinity and could substantially disrupt or displace existing land uses or land use activities.	SUM	LS	SUM	SUM	NI	SUM	LSM	LS	LS	LS	LSM	LS	SUM	LSM	LSM	SUM	LSM	SUM	LSM	SUM	LSM	SUM	SUM	M-LU-1: Maintain Internal Cemetery Access (Site 7 [Consolidated Treatment at Site 6] and Site 14) M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-3: Expanded Noise Control Plan (1, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-AQ-2a: BAAQMD Basic Construction Measures (All Sites) M-AQ-3: Construction Health Risk Mitigation (Site 5 On-site Treatment)
Impact LU-2. Project operations would result in substantial long-term or permanent impacts on the existing character or disrupt or displace land uses.	LSM	LS	LS	LS	LSM	LSM	LS	LS	LS	LS	LS	LS	LSM	LS	LS	LS	LS	LS	LS	LS	LS	LSM	LS	M-NO-5: Operational Noise Control Measures (Sites 1, 5 [On-site Treatment], 7 [On-site Treatment], 9, 12, 18 [Alternate], and the Westlake Pump Station)
Impact C-LU-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to land use.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	SUM	LS	LS	SUM	LS	LS	LS	LS	LS	LS	SUM	M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-3: Expanded Noise Control Plan (1, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-5: Operational Noise Control Measures (Sites 1, 5 [On-site Treatment], 7 [On-site Treatment], 9, 12, 18 [Alternate], and the Westlake Pump Station)
Section 5.3 Aesthetics																								
Impact AE-1. Project construction would have a substantial adverse impact on a scenic vista, resource, or on the visual character of a site or its surroundings.	LS	LS	LS	LSM	NI	LS	LS	LS	LS	SUM	SUM	LS	LS	LS	LS	LSM	LSM	LSM	LSM	LS	LS	LSM	LS	M-AE-1a: Site Maintenance (Sites 4, 7, 12, 13, 14, 15, and 18 [Alternate]) M-AE-1b: Tree Protection Measures (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate]) M-AE-1c: Develop and Implement at Tree Replanting Plan (Site 12) M-AE-1d: Construction Area Screening (Site 15) M-AE-1e: Tree Removal and Replacement (Site 7) M-CR-1a: Minimize Construction-related Impacts on Elements of the Historical Resource at Site 14
Impact AE-2. Project construction would not create a new source of substantial light that would adversely affect day or nighttime views in the area.	LS	NI	LS	LS	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	NI	LS	NI	LS	LS	LS	NI	LS	LS	None required
Impact AE-3. Project operation would have a substantial adverse impact on a scenic vista, resource, or on the visual character of a site or its surroundings.	LS	LS	LS	LSM	NI	LS	NI	LS	LS	LSM	LSM	LS	LS	LS	LS	LS	LS	LSM	LSM	NI	LS	LSM	LS	M-AE-3a: Implement Landscape Screening (Sites 4, 7, and 18 [Alternate]) M-CR-5a: Minimize Facilities Siting Impacts on Elements of the Historical Resource at Site 14 M-CR-5b: Minimize Facilities Siting Impacts on Elements of the Historical Resource at Site 15
Impact AE-4. Project operation would not create a new source of substantial light that would adversely affect day or nighttime views in the area.	LS	LS	LS	LS	NI	LS	LS	NI	NI	NI	NI	NI	LS	LS	NI	LS	LS	LS	LS	LS	NI	LS	LS	None required
Impact C-AE-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to scenic resources and visual character.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	LS	NI	LS	LSM	LSM	NI	NI	NI	LS	NI	LS	M-AE-1a: Site Maintenance (Sites 4, 7, 12, 13, 14, 15, and 18 [Alternate]) M-AE-1b: Tree Protection Measures (Sites 3, 4, 7, 10, 11, 12, 13,, 14, 15, and 17 [Alternate]) M-AE-1c: Develop and Implement a Tree Planting Program (Site 12)
Section 5.4 Population & Housing - None. No impacts would occur.																								
Section 5.5 Cultural and Paleontological Resources																								
Impact CR-1. Project construction could cause an adverse change in the significance of a historical resource.	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	LS	NI	NI	NI	NI	NI	NI	LSM	LSM	NI	NI	NI	NI	M-CR-1a: Minimize Construction-related Impacts to Elements of the Historical Resources at Site 14 M-CR-1b: Minimize Construction-related Impacts on Elements of the Historical Resources at Site 15 M-NO-2: Reduce Vibration Levels during Construction of Pipelines (Sites 1, 5 [On-site Treatment], 7 [On-site Treatment], 9, 12, 18 [Alternate], and the Westlake Pump Station)
Impact CR-2. Project construction could cause an adverse change in the significance of an archaeological resource.	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-CR-2: Discovery of Archaeological Resources (All Sites except Westlake Pump Station)
Impact CR-3. Project construction could result in a substantial adverse effect by destroying a unique paleontological resource or site.	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-CR-3: Suspend Construction Work if a Paleontological Resource is Identified (All Sites except Site 9 and Westlake Pump Station)

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Impact CR-4. Project construction could result in a substantial adverse effect related to the disturbance of human remains.	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-CR-4: Accidental Discovery of Human Remains (All Sites except Westlake Pump Station)
Impact CR-5. Project facilities could cause an adverse change in the significance of a historical resource.	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	LS	NI	NI	NI	NI	NI	NI	LSM	LSM	NI	NI	NI	NI	M-CR-5a: Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 14 M-CR-5b: Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 15
Impact C-CR-1. Construction of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts on historical, archaeological, or paleontological resources, or human remains.	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-CR-2: Discovery of Archaeological Resources (All Sites except Westlake Pump Station) M-CR-3: Suspend Construction Work if a Paleontological Resource is Identified (All Sites except Site 9 and Westlake Pump Station) M-CR-4: Accidental Discovery of Human Remains (All Sites except Westlake Pump Station)
Section 5.6 Transportation and Circulation																								
Impact TR-1. The Project would conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system.	LS	LS	LS	LSM	LS	LSM	LSM	LSM	LSM	LSM	LSM	LS	LS	LSM	LS	LSM	LSM	LSM	LSM	LS	LSM	LSM	LSM	M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
Impact TR-2. The Project would temporarily impair emergency access to adjacent roadways and land uses during construction.	NI	LSM	NI	LS	NI	LSM	LSM	LS	LS	LS	LS	NI	NI	LS	NI	LS	LSM	LS	LS	LS	LS	LS	LS	M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
Impact TR-3. The Project would temporarily decrease the performance and safety of public transit, bicycle, and pedestrian facilities during construction.	NI	LS	LS	LS	NI	LS	LS	LS	LS	LS	LS	NI	NI	LS	NI	LSM	LSM	LSM	LSM	LS	LS	LS	LSM	M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
Impact TR-4. Project operations and maintenance activities would not conflict with an applicable plan or policies regarding performance of the transportation system or alternative modes of transportation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-TR-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to transportation and circulation.	LS	LSM	LS	LSM	LS	LSM	LSM	LSM	LSM	LSM	LSM	LS	LS	LSM	LS	LSM	LSM	LSM	LSM	LS	LSM	LSM	LSM	M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-C-TR-1: Coordinate Traffic Control Plan with other SFPUC Construction Projects (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
Section 5.7 Noise and Vibration																								
Impact NO-1. Project construction would result in noise levels in excess of local standards.	SUM	NI	LSM	SUM	NI	NI	NI	NI	NI	LS	LS	LSM	SUM	LSM	LSM	SUM	LSM	LSM	LS	SUM	LSM	SUM	SUM	M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
Impact NO-2. Project construction would result in excessive groundborne vibration.	LS	LS	LSM	LSM	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LSM	LS	LS	LSM	LS	LS	LSM	LS	M-NO-2: Reduce Vibration Levels during Construction of Pipelines (Sites 3, 4, 12, 15, and 18 [Alternate])
Impact NO-3. Project construction would result in a substantial temporary increase in ambient noise levels.	SUM	LS	SUM	SUM	LS	SUM	LSM	LS	LS	LS	LS	LS	SUM	LSM	LSM	SUM	LSM	SUM	LSM	SUM	LSM	SUM	SUM	M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-3: Expanded Noise Control Plan (1, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
Impact NO-4. Project construction would not result in a substantial temporary increase in ambient noise levels along construction haul routes.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact NO-5. Operation of the Project would result in exposure of people to noise levels in excess of local noise standards or result in a substantial permanent increase in ambient noise levels in the Project vicinity.	LSM	NI	NI	NI	LSM	LSM	NI	LS	LS	LSM	NI	LS	LSM	LS	LS	LSM	LS	NI	NI	LS	LS	LSM	NI	M-NO-5: Operational Noise Control Measures (Sites 1, 5 [On-site Treatment], 7 [On-site Treatment], 9, 12, 18 [Alternate], and the Westlake Pump Station)
Impact C-NO-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise.	LSM	LS	LS	LS	LSM	LSM	LS	LS	LS	LSM	LS	LSM	LSM	LS	LSM	SUM	LS	LS	LS	LS	LSM	LSM	SUM	M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-3: Expanded Noise Control Plan (1, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-5: Operational Noise Control Measures (Sites 1, 5 [On-site Treatment], 7 [On-site Treatment], 9, 12, 18 [Alternate], and the Westlake Pump Station)
Section 5.8 Air Quality																								
Impact AQ-1. Construction of the Project would not conflict with or obstruct implementation of applicable air quality plans.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Impact AQ-2. Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-AQ-2a: BAAQMD Basic Construction Measures (All Sites) M-AQ-2b: NOx Reduction during Construction of Alternate Sites
Impact AQ-3. Project construction would expose sensitive receptors to substantial pollutant concentrations.	Group 1: Site 1 = LS Group 2: Sites 2, 3 and 4 = LS Group 3: Sites 5, 6 and 7 (Consolidated Treatment at Site 6) = LS Group 3: Sites 5, 6 and 7 (On-site Treatment) = LSM Group 4: Site 8 and Site 17 (Alternate) = LS Group 5: 9 and 10 and Site 18 (alternate) = LS Group 6: Sites 11 and 12 and Site 19 (Alternate) = LS Group 7: Site 13 = LS Group 8: Sites 14 and 15 = LS Group 9: Site 16 = LS																							M-AQ-3: Construction Health Risk Mitigation (Site 5 [On-site Treatment])
Impact AQ-4. Project construction activities would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact AQ-5. Project operations would not violate air quality standards or contribute substantially to an existing air quality violation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact AQ-6. Project operations would not expose sensitive receptors to substantial pollutant concentrations.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact AQ-7. Project operations would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-AQ-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to air quality.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-AQ-2a: BAAQMD Basic Construction Measures (All Sites) M-AQ-2b: NOx Reduction during Construction of Alternate Sites
Section 5.9 Greenhouse Gas Emissions																								
Impact GG-1. Project construction would generate GHG emissions, but not at levels that would have a significant impact on the environment.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact GG-2. Project operations would generate GHG emissions, but not at levels that would result in a significant impact on the environment.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-GG. The proposed Project would not result in a cumulatively considerable contribution to GHG emissions.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Section 5.10 Wind & Shadow - None. No impacts would occur.																								
Section 5.11 Recreation																								
Impact RE-1. The Project would not remove or damage existing recreational resources during construction.	LS	NI	LS	LS	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	None required
Impact RE-2. The Project would deteriorate the quality of the recreational experience during construction.	LSM	LSM	LS	LSM	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	LS	NI	NI	NI	NI	NI	NI	M-AQ-2a: BAAQMD Basic Construction Measures (All Sites)
Impact RE-3. The Project would not impair access to recreational resources during construction.	NI	LS	LS	LS	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	LS	NI	NI	NI	NI	NI	NI	None required
Impact RE-4. The Project would not damage recreational resources during operation.	NI	NI	LS	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	None required
Impact RE-5. The Project would not deteriorate the quality of the recreational experience during operation.	LS	NI	LS	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	LS	NI	NI	NI	NI	NI	NI	None required
Impact RE-6. Operation of the Project would not remove or damage recreational resources, impair access to, or deteriorate the quality of the recreational experience at Lake Merced.	LS																							None required
Impact C-RE-1. Construction and operation of the proposed Project would not result in significant cumulative impacts on recreational resources.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	LS	NI	NI	NI	NI	NI	NI	None required
Impact C-RE-2. Operation of the Project would not result in significant cumulative impacts on recreational resources at Lake Merced.	LS																							None required

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Section 5.12 Utilities & Service Systems																								
Impact UT-1. Project construction could result in potential damage to or temporary disruption of existing utilities during construction.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-UT-1a: Confirm Utility Line Information (All Sites) M-UT-1b: Safeguard Employees from Potential Accidents Related to Underground Utilities (All Sites) M-UT-1c: Notify Local Fire Departments (All Sites) M-UT-1d: Emergency Response Plan (All Sites) M-UT-1e: Advance Notification (All Sites) M-UT-1f: Protection of Other Utilities during Construction (All Sites) M-UT-1g: Ensure Prompt Reconnection of Utilities (All Sites) M-UT-1h: Avoidance of Utilities Constructed or Modified by Other SFPUC Projects (All Sites) M-UT-1i: Coordinate Final Construction Plans with Affected Utilities (All Sites)
Impact UT-2. Project construction would not exceed the capacity of wastewater treatment facilities, exceed wastewater treatment requirements, require or result in the construction of new or expansion of existing wastewater treatment facilities or stormwater drainage facilities, the construction of which could cause significant environmental effects.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact UT-3. Project construction would not result in adverse effects on solid waste landfill capacity.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact UT-4. Project construction could result in a substantial adverse effect related to compliance with federal, State and local statutes and regulations pertaining to solid waste.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-UT-4: Waste Management Plan (All Sites)
Impact UT-5. Project operation would not exceed the capacity of wastewater treatment facilities, exceed wastewater treatment requirements, require or result in the construction of new or expansion of existing wastewater treatment facilities or stormwater drainage facilities, the construction of which could cause significant environmental effects.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-UT-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to utilities and service systems.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-UT-1a: Confirm Utility Line Information M-UT-1b: Safeguard Employees from Potential Accidents Related to Underground Utilities M-UT-1c: Notify Local Fire Departments M-UT-1d: Emergency Response Plan M-UT-1e: Advance Notification M-UT-1f: Protection of Other Utilities during Construction M-UT-1g: Ensure Prompt Reconnection of Utilities M-UT-1h: Avoidance of Utilities Constructed or Modified by Other SFPUC Projects M-UT-1i: Coordinate Final Construction Plans with Affected Utilities M-UT-4: Waste Management Plan
Section 5.13 Public Services - None. No impacts would occur.																								
Section 5.14 Biological Resources																								
Impact BR-1. Project construction would adversely affect candidate, sensitive or special-status species.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-BR-1a: Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors (All Sites) M-BR-1b: Protection Measures for Special-status Bats during Tree Removal or Trimming (Sites 1, 3, 4, 7, 10, 11, 12, 15, and 16) M-BR-1c: Protection Measures during Structure Demolition for Special-status Bats (Site 1) M-BR-1d: Monarch Butterfly Protection Measures (Sites 1, 3, 7, 10, and 12)
Impact BR-2. Project construction could adversely affect riparian habitat or other sensitive natural communities.	LSM	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites) M-BR-2 Avoid Disturbance to Riparian Habitat (Site 1)
Impact BR-3. The Project would impact jurisdictional wetlands or waters of the United States	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSM	LSM	NI	LSM	NI	NI	NI	NI	NI	NI	NI	NI	M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
Impact BR-4. Project construction would conflict with local tree preservation ordinances.	NI	NI	LSM	LSM	NI	NI	NI	NI	NI	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	NI	LSM	LSM	NI	M-BR-4a: Identify Protected Trees (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate]) M-AE-1b: Tree Protection Measures (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate]) M-BR-4b: Protected Tree Replacement (Sites 4, 7, 9, 12, 15, and 18 [Alternate])

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Impact BR-5. Project operations could adversely affect candidate or sensitive special-status species.	LSM	NI	LS	LS	LSM	NI	NI	NI	NI	LSM	LS	NI	NI	LS	LS	LSM	LS	NI	LS	LS	LS	LSM	NI	M-NO-5: Operational Noise Control Measures (Sites 1, 5 [On-site Treatment], 7 [On-site Treatment], 9, 12, 18 [Alternate], and the Westlake Pump Station)
Impact BR-6. Operation of the Project would adversely affect species identified as candidate, sensitive, or special-status wildlife species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	LS																							None required
Impact BR-7. Operation of the Project could adversely affect sensitive habitat types associated with Lake Merced.	LSM																							M-BR-7: Lake Level Management for Water Level Increases for Lake Merced M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced M-HY-9b: Lake Level Management for Lake Merced
Impact BR-8. Operation of the Project could adversely affect wetland habitats and other waters of the United States associated with Lake Merced.	LSM																							M-BR-8: Lake Level Management for No-Net-Loss of Wetlands for Lake Merced M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced M-HY-9b: Lake Level Management for Lake Merced
Impact BR-9. Operation of the Project could adversely affect native wildlife nursery sites associated with Lake Merced.	LSM																							M-BR-7: Lake Level Management for Water Level Increases for Lake Merced M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced
Impact C-BR-1. Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-BR-1a: Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors (All Sites) M-BR-1b: Protection Measures for Special-status Bats during Tree Removal or Trimming (Sites 1, 3, 4, 7, 10, 11, 12, 15, and 16) M-BR-1c Protection Measures during Structure Demolition for Special-status Bats (Site 1) M-BR-1d: Monarch Butterfly Protection Measures (Sites 1, 3, 7, 10, 12) M-BR-2: Avoid Disturbance to Riparian Habitat (Site 1) M-BR-4a: Identify Protected Trees (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate]) M-AE-1b: Tree Protection Measures (Sites 3, 4, 7, 10. 11, 12, 13, 14, 15, and 17 [Alternate]) M-BR-4b: Protected Tree Replacement (Sites 4, 7, 9, 12, 15, and 18 [Alternate]) M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
Impact C-BR-2. The Project would result in cumulative construction or operational impacts related to special-status species, riparian habitat, sensitive communities, wetlands, or waters of the United States, or compliance with local policies and ordinances protecting biological resources.	LSM																							M-BR-7: Lake Level Management for Water Level Increases for Lake Merced M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced M-HY-9b: Lake Level Management for Lake Merced
Section 5.15 Geology and Soils																								
Impact GE-1. The Project would not be located on a geologic unit or soil that is unstable, or that would become unstable during construction.	NI	NI	NI	LS	NI	NI	NI	LS	LS	LS	LS	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	LS	NI	None required
Impact GE-2. The Project would not substantially change the topography or any unique geologic or physical features of the site(s).	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact GE-3. The Project would expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to fault rupture, seismic groundshaking, or landslides.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-GE-3: Conduct Site-Specific Geotechnical Investigations and Implement Recommendations (All Sites)
Impact GE-4. The Project would be located on a geologic unit or soil that is unstable, or that would become unstable.	LSM	LS	LS	LS	LS	LSM	LSM	LS	LS	LS	LS	LSM	LS	LS	LS	LSM	LSM	LSM	LSM	LSM	LSM	LS	LSM	M-GE-3: Conduct Site-Specific Geotechnical Investigation and Implement Recommendations (All Sites)
Impact GE-5. The Project would not be located on corrosive or expansive soil, creating substantial risks to life or property.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-GE-1. Construction and operation of the proposed Project could result in significant impacts related to soils and geology.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Section 5.16 Hydrology & Water Quality																								
Impact HY-1. Project construction activities would degrade water quality as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals during construction.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
Impact HY-2. Discharge of groundwater could result in minor localized flooding, violate water quality standards, and/or otherwise degrade water quality.	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-HY-2: Management of Well Development and Pump Testing Discharges (All Sites, Except Westlake Pump Station)

Appendix C
Summary of Impacts and Mitigation Measures for the Groundwater Storage and Recovery Project

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Impact HY-3. Project operation would not alter drainage patterns in such a manner that could result in degraded water quality or cause on- or off-site flooding.	LS	LS	LS	LS	NI	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact HY-4. Project operations would not impede or redirect flood flows.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	None required
Impact HY-5. Project operations would not result in a violation of water quality standards or in the degradation of water quality from the discharge of groundwater during well maintenance.	LS	LS	LS	LS	NI	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact HY-6. Project operations would decrease the production rate of existing nearby irrigation wells due to localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land use(s) may not be fully supported.	SUM																							M-HY-6: Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation
M-HY-6. Mitigation Action #1: Improve Irrigation Efficiency, and Mitigation Action #2: Modify Irrigation Operations	NI = Land Use, Aesthetics, Population and Housing, Cultural and Paleontological Resources, Transportation and Circulation, Noise and Vibration, Air Quality, Greenhouse Gas Emissions, Wind and Shadow, Recreation, Utilities and Service Systems, Public Services, Biological Resources, Geology and Soils, Hydrology and Water Quality, Hazards and Hazardous Materials, Mineral and Energy Resources, Agriculture and Forest Resources																							None required
M-HY-6. Mitigation Action #3: Redistribute GSR Pumping	NI = Land Use, Aesthetics, Population and Housing, Cultural and Paleontological Resources, Transportation and Circulation, Noise and Vibration, Air Quality, Greenhouse Gas Emissions, Wind and Shadow, Recreation, Utilities and Service Systems, Public Services, Biological Resources, Geology and Soils, Hazards and Hazardous Materials, Mineral and Energy Resources, Agriculture and Forest Resources LS = Hydrology and Water Quality																							None required
M-HY-6. Mitigation Action #4: Reduce GSR Pumping	NI = Land Use, Aesthetics, Population and Housing, Cultural and Paleontological Resources, Transportation and Circulation, Noise and Vibration, Air Quality, Greenhouse Gas Emissions, Wind and Shadow, Recreation, Utilities and Service Systems, Public Services, Biological Resources, Geology and Soils, Hydrology and Water Quality, Hazards and Hazardous Materials, Mineral and Energy Resources, Agriculture and Forest Resources																							None required
M-HY-6. Mitigation Action #5: Lower Pump in Irrigation Well and Mitigation Action #6: Lower and Change Pump in Irrigation Well	NI = Population and Housing, Cultural and Paleontological Resources, Wind and Shadow, Utilities and Service Systems, Public Services, Biological Resources, Geology and Soils, Hydrology and Water Quality, Mineral and Energy Resources, Agriculture and Forest Resources LS = Land Use, Transportation and Circulation, Noise and Vibration, Greenhouse Gas Emissions, Recreation LSM = Aesthetics, Air Quality, Hazards and Hazardous Materials																							M-AE-1a: Site Maintenance (Sites 4, 7, 12, 13, 14, 15, and 18 [Alternate]) M-AQ-2a: BAAQMD Basic Construction Measures (All Sites) M-HY-1: Develop and Implement a Stormwater Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)

Appendix C
Summary of Impacts and Mitigation Measures for the Groundwater Storage and Recovery Project

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
M-HY-6. Mitigation Action #7: Add Storage Capacity for Irrigation Supply	NI = Population and Housing, Wind and Shadow, Public Services LS = Transportation and Circulation, Greenhouse Gas Emissions, Recreation, and Agriculture and Forest Resources, Mineral and Energy Resources LSM = Land Use, Aesthetics, Cultural and Paleontological Resources, Noise and Vibration Air Quality, Utilities and Service Systems, Biological Resources, Geology and Soils, Hydrology and Water Quality, Hazards and Hazardous Materials																							M-AE-1a: Site Maintenance (Sites 4, 7, 12, 13, 14, 15, and 18 [Alternate]) M-AE-3a: Implement Landscape Screening (Sites 4, 7, and 18 [Alternate]) M-AQ-2a: BAAQMD Basic Construction Measures (All Sites) M-CR-2: Discovery of Archaeological Resources (All Sites except Westlake Pump Station) M-CR-3: Suspend Construction Work if a Paleontological Resource is Identified (All Sites except Site 9 and Westlake Pump Station) M-CR-4: Accidental Discovery of Human Remains (All Sites Except Westlake Pump Station) M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-2: Reduce Vibration Levels during Construction of Pipelines (Sites 3, 4, 12, 15, and 18 [Alternate]) M-UT-1a: Confirm Utility Line Information (All Sites) M-UT-1b: Safeguard Employees from Potential Accidents Related to Underground Utilities (All Sites) M-UT-1c: Notify Local Fire Departments (All Sites) M-UT-1d: Emergency Response Plan (All Sites) M-UT-1e: Advance Notification (All Sites) M-UT-1f: Protection of Other Utilities during Construction (All Sites) M-UT-1g: Ensure Prompt Reconnection of Utilities (All Sites) M-UT-1h: Avoidance of Utilities Constructed or Modified by Other SFPUC Projects (All Sites) M-UT-1i: Coordinate Final Construction Plans with Affected Utilities (All Sites) M-UT-4: Waste Management Plan (All Sites) M-BR-1a: Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors (All Sites) M-BR-1b: Protection Measures for Special-status Bats during Tree Removal or Trimming (Sites 1, 3, 4, 7, 10, 11, 12, 15, and 16) M-BR-4a: Identify Protected Trees (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate]) M-BR-4b: Protected Tree Replacement (Sites 4, 7, 9, 12, 15, and 18 [Alternate]) M-HY-1: Develop and Implement a Stormwater Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites) M-GE-3: Conduct Site-Specific Geotechnical Investigations and Implement Recommendations (All Sites) M-HZ-2a: Preconstruction Hazardous Materials Assessment (All Sites) M-HZ 2b: Health and Safety Plan (All Sites) M-HZ-2c: Hazardous Materials Management Plan (All Sites)
M-HY-6. Mitigation Action #8: Replace Irrigation Well	NI = Population and Housing, Wind and Shadow, Public Services LS = Transportation and Circulation, Greenhouse Gas Emissions, Recreation, Agriculture and Forest Resources, Geology and Soils, Mineral and Energy Resources LSM = Land Use, Aesthetics, Cultural and Paleontological Resources, Air Quality, Utilities and Service Systems, Biological Resources, Hydrology and Water Quality, Hazards and Hazardous Materials SUM = Noise and Vibration																							M-AE-1a: Site Maintenance (Sites 4, 7, 12, 13, 14, 15, and 18 [Alternate]) M-AE-3a: Implement Landscape Screening (Sites 4, 7, and 18 [Alternate]) M-AQ-2a: BAAQMD Basic Construction Measures (All Sites) M-CR-2: Discovery of Archaeological Resources (All Sites except Westlake Pump Station) M-CR-3: Suspend Construction Work if a Paleontological Resource is Identified (All Sites Except Site 9 and Westlake Pump Station) M-CR-4: Accidental Discovery of Human Remains (All Sites Except Westlake Pump Station) M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-1: Noise Control Plan (1, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 [Alternate], 18 [Alternate], and 19 [Alternate]) M-NO-2: Reduce Vibration Levels during Construction of Pipelines (Sites 3, 4, 12, 15, and 18 [Alternate]) M-UT-1a: Confirm Utility Line Information (All Sites) M-UT-1b: Safeguard Employees from Potential Accidents Related to Underground Utilities (All Sites) M-UT-1c: Notify Local Fire Departments (All Sites) M-UT-1d: Emergency Response Plan (All Sites) M-UT-1e: Advance Notification (All Sites) M-UT-1f: Protection of Other Utilities during Construction (All Sites) M-UT-1g: Ensure Prompt Reconnection of Utilities (All Sites) M-UT-1h: Avoidance of Utilities Constructed or Modified by Other SFPUC Projects (All Sites) M-UT-1i: Coordinate Final Construction Plans with Affected Utilities (All Sites) M-UT-4: Waste Management Plan (All Sites) M-BR-1a: Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors (All Sites) M-BR-1b: Protection Measures for Special-status Bats during Tree Removal or Trimming (Sites 1, 3, 4, 7, 10, 11, 12, 15, and 16) M-BR-4a: Identify Protected Trees (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate]) M-BR-4b: Protected Tree Replacement (Sites 4, 7, 9, 12, 15, and 18 [Alternate]) M-HY-1: Develop and Implement a Stormwater Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites) M-HZ-2a: Preconstruction Hazardous Materials Assessment (All Sites) M-HZ 2b: Health and Safety Plan (All Sites) M-HZ-2c: Hazardous Materials Management Plan (All Sites)

Appendix C
Summary of Impacts and Mitigation Measures for the Groundwater Storage and Recovery Project

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
M-HY-6. Mitigation Action #9: Replace Irrigation Water Source	NI = Population and Housing, Cultural and Paleontological Resources, Wind and Shadow, Utilities and Service Systems, Public Services, Biological Resources, Geology and Soils, Hydrology and Water Quality, Hazards and Hazardous Materials, Mineral and Energy Resources, Agriculture and Forest Resources LS = Land Use, Transportation and Circulation, Noise and Vibration, Greenhouse Gas Emissions, Recreation LSM = Aesthetics, Air Quality																							M-AE-1a: Site Maintenance (Sites 4, 7, 12, 13, 14, 15, and 18 [Alternate]) M-AQ-2a: BAAQMD Basic Construction Measures (All Sites)
Impacts of M-HY-9b: Lake Level Management for Lake Merced	LS = Well Interference, Subsidence, Seawater Intrusion, Adverse Effects on Beneficial Uses of Lake Merced, Water Quality Standards, Groundwater Depletion																							None required
Impact HY-7. Project operations would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin where the historical low water levels are exceeded.	LS																							None required
Impact HY-8. Project operations could result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.	LS																							None required
Impact HY-9. Project operations could have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced.	LSM																							M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced M-HY-9b: Lake Level Management for Lake Merced
Impact HY-10. Project operation would not have a substantial adverse effect on water quality that could affect the beneficial uses of Pine Lake.	LS																							None required
Impact HY-11. Project operation would not have a substantial adverse effect on water quality that could affect the beneficial uses of Colma Creek, San Bruno Creek, Lomita Channel, or Millbrae Creek.	LS																							None required
Impact HY-12. Project operation would not cause a violation of water quality standards due to mobilization of contaminants in groundwater from changing groundwater levels in the Westside Groundwater Basin.	LS																							None required
Impact HY-13. Project operation would not result in degradation of drinking water quality or groundwater quality relative to constituents for which standards do not exist.	LS																							None required
Impact HY-14. Project operation may have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin over the very long term.	LSM																							M-HY-14: Prevent Groundwater Depletion
Impact C-HY-1. Project construction could result in a cumulatively considerable contribution to cumulative impacts on surface water hydrology and water quality.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites) M-HY-2: Management of Well Development and Pump Testing Discharges (All Sites except Westlake Pump Station)
Impact C-HY-2. Operation of the proposed Project would result in a cumulatively considerable contribution to cumulative impacts related to well interference.	SUM																							M-HY-6: Ensure Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation
Impact C-HY-3. Operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to subsidence.	LS																							None required
Impact C-HY-4. Operation of the proposed Project would not have a cumulatively considerable contribution to seawater intrusion.	LS																							None required
Impact C-HY-5. Operation of the proposed Project could have a cumulatively considerable contribution to cumulative impacts on beneficial uses of surface waters.	LSM																							M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced M-HY-9b: Lake Level Management for Lake Merced
Impact C-HY-6. Operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to water quality standards	LS																							None required

Impact Statement	Site 1	Site 2	Site 3	Site 4	WLPS	Site 5 (On-site)	Site 5 (Consol)	Site 6 (On-site)	Site 6 (Consol)	Site 7 (On-site)	Site 7 (Consol)	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17 (A)	Site 18 (A)	Site 19 (A)	Mitigation
Impact C-HY-7. Operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to water quality degradation.	LS																							None required
Impact C-HY-8. Operation of the proposed Project would have a cumulatively considerable contribution to a cumulative impact related to groundwater depletion effect.	LSM																							M-HY-14: Prevent Groundwater Depletion
Section 5.17 Hazards and Hazardous Materials																								
Impact HZ-1. The Project would not create a significant hazard to the public or the environment related to transport, use, or disposal of hazardous materials during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact HZ-2. The Project would result in a substantial adverse effect related to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment during construction.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-HZ-2a: Preconstruction Hazardous Materials Assessment (All Sites) M-HZ 2b: Health and Safety Plan (All Sites) M-HZ-2c: Hazardous Materials Management Plan (All Sites) M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
Impact HZ-3. The Project would result in impacts from the emission or use of hazardous materials within 0.25 mile of a school during construction.	NI	LSM	LSM	LSM	LSM	LS	LS	LS	LS	NI	NI	NI	LS	LS	NI	LS	LS	NI	NI	NI	NI	LS	LSM	M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites) M-HZ-2c: Hazardous Materials Management Plan (All Sites)
Impact HZ-4. The Project would not create a hazard to the public or environment from the routine transport, use, or disposal of hazardous materials or accidental release of hazardous materials during operation.	LS	NI	NI	NI	LS	LS	NI	LS	LS	LS	NI	LS	LS	LS	LS	LS	LS	NI	LS	LS	LS	LS	NI	None required
Impact HZ-5. The Project would not result in impacts from the emission or use of hazardous materials within 0.25 mile of a school during operation.	NI	NI	NI	NI	LS	LS	NI	NI	NI	NI	NI	NI	LS	LS	NI	LS	LS	NI	NI	NI	NI	LS	NI	None required
Impact HZ-6. The Project would not result in a safety hazard for people residing or working in the vicinity of a public use airport.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	LS	LS	LS	LS	LS	LS	LS	NI	LS	LS	None required
Impact HZ-7. The Project would not expose people or structures to a significant risk of loss, injury, or death involving fires.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-HZ-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to hazards and hazardous materials.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	M-HZ-2a: Preconstruction Hazardous Materials Assessment (All Sites) M-HZ 2b: Health and Safety Plan (All Sites) M-HZ-2c: Hazardous Materials Management Plan (All Sites) M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
Section 5.18 Mineral and Energy Resources																								
Impact ME-1. The Project would not encourage activities that result in the use of large amounts of fuel and energy in a wasteful manner during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact ME-2. The Project would not encourage activities that result in the use of large amounts of fuel and energy in a wasteful manner during operation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Impact C-ME-1. Construction and operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to mineral and energy resources.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	None required
Section 5.19 Agriculture and Forest Resources - None. No impacts would occur.																								

Appendix D

WSIP PEIR WATER SUPPLY IMPACT AND MITIGATION AND CONSISTENCY ANALYSIS

APPENDIX D: WSIP PEIR WATER SUPPLY IMPACT AND MITIGATION AND CONSISTENCY ANALYSIS

SFPUC REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT (CASE NO. 2008.1396E)

The Regional Groundwater Storage and Recovery project (GSR or proposed Project) was analyzed at a program-level in the Water System Improvement Program (WSIP) Program Environmental Impact Report (PEIR)[1] as one of the facility improvement projects under the WSIP. The project details presented in the PEIR were based on the best information available at that time with respect to project design and construction. Details regarding project design, facility layout, construction, staging areas, and other project elements were not available at the time the PEIR was prepared.

The GSR EIR provides a detailed, project-level analysis of the proposed Project based on site-specific and up-to-date information developed subsequent to the preparation of the PEIR. Subsequent to publication of the PEIR, several modifications were made to the GSR Project as more detailed information regarding Project impacts was developed during Project design and site-specific analyses. Although the use of the Westside Groundwater Basin for the GSR Project was identified and analyzed in the PEIR, the location of each proposed well was not specifically identified in the PEIR. Additionally, the analysis of potential impacts of three alternate well sites is included in the project-level EIR to ensure that a total 16 out of 19 possible well sites could be operated, in the case where up to three of the preferred sites were found to be infeasible. However, the Project would only operate a total of 16 wells. Alternate pipeline connections, as well as on-site and consolidated treatment options for three well facilities, are also addressed in the EIR.

Tables D-1a through D-1e summarize the WSIP water supply and system operations impacts and the associated mitigation measures for each geographic region as presented in the PEIR. The reader is referred to the complete WSIP PEIR for a detailed explanation of these summary tables. Note that the categories of significance used in the PEIR are slightly different than those used in this EIR (see table footnotes in Tables D-1a through D-1e).

Table D-2 evaluates the consistency of the project-level impact analysis in the Groundwater Storage and Recovery EIR with the program-level impact analysis previously conducted in the PEIR. Where significance determinations vary between these documents, a brief explanation of the rationale for this determination is provided.

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[1] San Francisco Planning Department, Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program, File No. 2005-0159E, State Clearinghouse No. 2005092026. Certified October 30, 2008.

Table D-3 lists the programmatic mitigation measures identified in the WSIP PEIR and indicates which of these mitigation measures are applicable to the GSR Project. For the programmatic mitigation measures that are applicable, the table identifies the comparable project-level mitigation measure identified in the GSR Project EIR that either relies on the programmatic measures or identified an equivalent or better site-specific mitigation measure to address the programmatic mitigation measure. The table also provides an explanation for those programmatic mitigation measures that are not applicable to the GSR Project.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
STREAM FLOW						
Impact 5.3.1-1: Effects on flow along the Tuolumne River below O'Shaughnessy Dam.	LS					None required.
Impact 5.3.1-2: Effects on flow along Cherry Creek below Cherry Dam.	LS					None required.
Impact 5.3.1-3: Effects on flow along Eleanor Creek below Eleanor Dam.	LS					None required.
Impact 5.3.1-4: Effects on flow along the Tuolumne River below La Grange Dam.	LS					None required.
Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento–San Joaquin Delta.	LS					None required.
GEOMORPHOLOGY						
Impact 5.3.2-1: Effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir.	LS					None required.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
Impact 5.3.2-2: Effects on sediment transport and channel characteristics below La Grange Dam.	LS					None required.
SURFACE WATER QUALITY						
Impact 5.3.3-1: Effects on water quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam.	LS					None required.
Impact 5.3.3-2: Effects on water quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam.	LS					None required.
Impact 5.3.3-3: Effects on water quality along the San Joaquin River and the Sacramento–San Joaquin Delta.	LS					None required.
SURFACE WATER SUPPLIES						
Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River water users.	LS					None required.
Impact 5.3.4-2: Effects on Delta water users.	LS					None required.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
GROUNDWATER						
Impact 5.3.5-1: Alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and groundwater levels.	LS					None required.
Impact 5.3.5-2: Alteration of stream flows along the Tuolumne River, which could affect local groundwater quality.	LS					None required.
FISHERIES						
Impact 5.3.6-1: Effects on fishery resources in Hetch Hetchy Reservoir.	LS					None required.
Impact 5.3.6-2: Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir.	LS					None required.
Impact 5.3.6-3: Effects on fishery resources in Don Pedro Reservoir.	LS					None required.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

	Significance Determination					
		Biological Resource Impacts				
Impact	**All Impacts (except Biological Resources)**	**Sensitive Habitats**	**Key Special-Status Species**	**Other Species of Concern**	**Common Habitats and Species**	**Mitigation Measures**
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam.	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less; PSM if deliveries exceed 265 mgd					**Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water:** The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies which would offset the WSIP's effects on water storage in Don Pedro Reservoir and minimize WSIP-induced changes in releases from La Grange Dam. **If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b. **Measure 5.3.6-4b, Fishery Habitat Enhancement:** The SFPUC will implement or fund one of two fishery habitat enhancement projects that are consistent with the Lower Tuolumne River Restoration Plan; augmentation of spawning gravel at three selected sites or the filling or isolation from the river of one of the existing inactive quarry pits.
Impact 5.3.6-5: Effects on fishery resources along the San Joaquin River.	LS					None required.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY						
Impact 5.3.7-1: Impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir.		LS	LS	LS	LS	None required.
Impact 5.3.7-2: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir.		PSM	PSM	PSM	PSM	The SFPUC will implement Measure 5.3.7-2 to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. **Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits:** The SFPUC will manage releases to the Tuolumne River from Hetch Hetchy Reservoir during the spring with the goal of recharging groundwater that supports meadow and riparian habitat. The SFPUC will periodically survey meadow habitat to determine the efficacy of release management and will modify releases as necessary to sustain meadow habitat.
Impact 5.3.7-3: Impacts on biological resources in Lake Eleanor and along Eleanor Creek.		LS	LS	LS	LS	None required.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
Impact 5.3.7-4: Impacts on biological resources in Lake Lloyd and along Cherry Creek.		LS	LS	LS	LS	None required.
Impact 5.3.7-5: Impacts on biological resources in Don Pedro Reservoir.		LS	LS	LS	LS	None required.
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam.		LS when average annual deliveries from the watersheds are maintained at 265 mgd or less; PSM if deliveries exceed 265 mgd	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less; PSM if deliveries exceed 265 mgd	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less; PSM if deliveries exceed 265 mgd	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less; PSM if deliveries exceed 265 mgd	The SFPUC will implement Measures 5.3.6-4a or 5.3.7-6 to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. **Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water** – see description above. **If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.7-6. **Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement:** Consistent with the Lower Tuolumne River Restoration Plan, the SFPUC will protect and enhance one mile of riparian vegetation within the contemporary floodplain.
Impact 5.3.7-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans for the Tuolumne Wild and Scenic River.		LS				None required.

TABLE D-1a
Summary of Water Supply Impacts and Mitigation Measures—Tuolumne River System and Downstream Water Bodies

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
RECREATIONAL AND VISUAL RESOURCES						
Impact 5.3.8-1: Effects on reservoir recreation due to changes in water system operations.	LS					None required.
Impact 5.3.8-2: Effects on river recreation due to changes in water system operations.	LS					None required.
Impact 5.3.8-3: Effects on the aesthetic values of the Tuolumne Wild and Scenic River.	LS					None required.
ENERGY RESOURCES						
Impact 5.3.9-1: Effects on hydropower generation at facilities along the Tuolumne River	B					None required.

NI = No Impact
LS = Less than Significant Impact
PSM = Potentially Significant Impact, Mitigable
SU= Significant Unavoidable Impact
B = Beneficial effect
NA = Not Applicable

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
STREAM FLOW						
Impact 5.4.1-1: Effects on flow along Calaveras Creek below Calaveras Reservoir.	LS					None required
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam.	SU **(Note: subsequent to certification of the WSIP PEIR, this determination was changed to LS[2])**					**Measure 5.4.1-2, Diversion Tunnel Operation:** The SFPUC will implement operational criteria for the diversion dam which will require that water not needed to fill Calaveras Reservoir would be released to Alameda Creek below the diversion dam. **(Note: because Impact 5.4.1-2 was determined to be LS subsequent to certification of the WSIP PEIR, this mitigation measure is no longer required for program implementation.)**
Impact 5.4.1-3: Effects in San Antonio Reservoir and along San Antonio Creek.	LS					None required.

[2] Based on the best available information at that time, the WSIP PEIR made the conservative determination that the WSIP would result in a significant and unavoidable impact related to flow along Alameda Creek below the Alameda Creek Diversion Dam ("Alameda Creek Hydrologic Impact") (see PEIR Chapter 4, Section 5.4.1, Impact 5.4.1-2). Based upon more detailed site-specific data and analysis, the project-level analysis in the Calaveras Dam Replacement Project EIR modified this PEIR impact determination to be less than significant (San Francisco Planning Department 2011).

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
Impact 5.4.1-4: Effects on flow along Alameda Creek below the confluence of San Antonio Creek.	LS					None required.
GEOMORPHOLOGY						
Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek.	LS					None required.
Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.	LS					None required.
Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir.	LS					None required.
SURFACE WATER QUALITY						
Impact 5.4.3-1: Effects on water quality in Calaveras Reservoir.	LS					None required.
Impact 5.4.3-2: Effects on water quality in San Antonio Reservoir.	LS					None required.
Impact 5.4.3-3: Changes in water quality along Calaveras, San Antonio, and Alameda Creeks.	LS					None required.

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

Impact	Significance Determination: All Impacts (except Biological Resources)	Biological Resource Impacts: Sensitive Habitats	Biological Resource Impacts: Key Special-Status Species	Biological Resource Impacts: Other Species of Concern	Biological Resource Impacts: Common Habitats and Species	Mitigation Measures
GROUNDWATER BODIES						
Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies.	LS					None required.
FISHERIES						
Impact 5.4.5-1: Effects on fishery resources in Calaveras Reservoir.	B					None required.
Impact 5.4.5-2: Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek.	B					None required.
Impact 5.4.5-3: Effects on fishery resources along Alameda Creek downstream of Alameda Creek Diversion Dam.	PSM					**Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek:** The SFPUC will release a minimum flow of approximately 10 cubic feet per second from the diversion dam and monitor the effects of the release on resident trout spawning and egg incubation. ** If monitoring results for Measure 5.4.5-3a indicate the measure is unsuccessful, the SFPUC will implement Measure 5.4.5-3b. **Measure 5.4.5-3b, Alameda Diversion Dam Restrictions or Fish Screens:** If after 10 years the minimum release does

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
						not sustain the resident trout population, the SFPUC will either increase releases from the diversion dam or install a fish passage barrier on the diversion tunnel.
Impact 5.4.5-4: Effects on fishery resources in San Antonio Reservoir.	B					None required.
Impact 5.4.5-5: Effects on fishery resources along San Antonio Creek below San Antonio Reservoir.	LS					None required.
Impact 5.4.5-6: Effects on fishery resources along Alameda Creek below confluence with San Antonio Creek.	LS					None required.
TERRESTRIAL BIOLOGY						
Impact 5.4.6-1: Effects on riparian habitat and related biological resources in Calaveras Reservoir.		PSM	PSM	LS	LS	The SFPUC will implement Measure 5.4.6-1 to reduce adverse impacts on sensitive habitats and key special-status species to a less-than-significant level. **Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources:** The SFPUC will protect, restore, and enhance existing riparian habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Calaveras Reservoir. Compensatory habitat may be provided

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
						as part of the SFPUC's Habitat Reserve Program.
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek.		LS	PSM	LS	NA	The SFPUC will implement Measures 5.4.1-2 and 5.4.5-3a to reduce adverse impacts on key special-status species to a less-than-significant level. **Measure 5.4.1-2, Diversion Tunnel Operation** – see description above. **Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek** – see description above.
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek.		LS	PSM	LS	LS	The SFPUC will implement Measure 5.4.6-3 to reduce adverse impacts on key special-status species to a less-than-significant level. **Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases:** The SFPUC will manage releases from Calaveras Reservoir to mimic a more natural hydrologic regime in the creek for the benefit of terrestrial biological resources. The specifics of this mitigation measure will be determined as part of project-level CEQA review.

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

	Significance Determination					
		Biological Resource Impacts				
Impact	**All Impacts (except Biological Resources)**	**Sensitive Habitats**	**Key Special-Status Species**	**Other Species of Concern**	**Common Habitats and Species**	**Mitigation Measures**
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek.		LS	PSM	LS	LS	The SFPUC will implement Measures 5.4.6-3 and 5.4.5-3a to reduce adverse impacts on key special-status species to a less-than-significant level. **Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases** – see description above. **Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek** – see description above.
Impact 5.4.6-5: Effects on riparian habitat and related biological resources in San Antonio Reservoir.		LS	LS	LS	LS	None required.
Impact 5.4.6-6: Effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek.		LS	LS	LS	NA	None required.
Impact 5.4.6-7: Effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek.		LS	LS	LS	NA	None required.

TABLE D-1b
Summary of Water Supply Impacts and Mitigation Measures—Alameda Creek Watershed

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans.		LS				None required.
RECREATION AND VISUAL						
Impact 5.4.7-1: Effects on recreational facilities and/or activities.	LS					None required.
Impact 5.4.7-2: Visual effects on scenic resources or visual character of the water bodies.	LS					None required.

NI = No Impact

LS = Less than Significant

PSM = Potentially Significant, Mitigable

SU= Significant and Unavoidable

B = Beneficial

NA = Not Applicable

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination: All Impacts (except Biological Resources)	Biological Resource Impacts: Sensitive Habitats	Biological Resource Impacts: Key Special-Status Species	Biological Resource Impacts: Other Species of Concern	Biological Resource Impacts: Common Habitats and Species	Mitigation Measures
STREAM FLOW						
Impact 5.5.1-1: Effects on flow along San Mateo Creek.	LS					None required.
Impact 5.5.1-2: Effects on flow along Pilarcitos Creek.	LS					None required.
GEOMORPHOLOGY						
Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed.	LS					None required.
WATER QUALITY						
Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek.	LS					None required.
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek.	PSM					**Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir:** The SFPUC will install a permanent low-head pumping station at Pilarcitos Reservoir which would enable the SFPUC to access and use an additional 350 acre-feet of water from Pilarcitos Reservoir. In years when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than under the existing condition (about 25 percent of years in the

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
						hydrologic record), the SFPUC will use the pumping station to augment flow in Pilarcitos Creek with water from the reservoir. The pumping station will draw water from the cool pool of water below the thermocline during times when the reservoir is stratified. The pumping station outlet will be designed to ensure that water discharged to the creek is adequately aerated. **Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir:** The SFPUC will install a permanent aeration system at Pilarcitos Reservoir. The SFPUC will operate the aeration system as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir.
GROUNDWATER						
Impact 5.5.4-1: Alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality.	LS					None required.

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
FISHERIES						
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower).	PSU **(Note: subsequent to certification of the WSIP PEIR, this determination was changed to LS[3])**					**Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir:** The SFPUC will survey the extent and quality of fish spawning habitat lost due to inundation and, if feasible, create new spawning habitat at a higher elevation. The specifics of this mitigation measure will be determined as part of project-level CEQA review. **(Note: because Impact 5.5.5-5 was determined to be LS subsequent to certification of the WSIP PEIR, this mitigation measure is no longer required for program implementation).**
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir.	LS					None required.
Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek.	LS					None required.

[3] Based on the best available information at that time, the WSIP PEIR made the conservative determination that the WSIP could result in a significant and unavoidable impact on fishery resources in Crystal Springs Reservoir related to inundation of spawning habitat upstream of the reservoir (see PEIR Chapter 5, Section 5.5.5, Impact 5.5.5-1). Project-level review of updated, site-specific information that was developed following certification of the PEIR was incorporated into the project-level EIR for the Lower Crystal Springs Dam Improvements Project, and the project-level analysis determined that impacts on fishery resources due to inundation effects would be less than significant (San Francisco Planning Department 2010).

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir.	PSM					**Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir –** see description above.
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir.	PSM					**Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir –** see description above. **Measure 5.5.5-5 Establish Flow Criteria, Monitor and Augment Flow –** The SFPUC will develop a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years.
TERRESTRIAL BIOLOGY						
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.		PSM	PSM	PSM	PSM	The SFPUC will implement Measures 5.5.6-1a and 5.5.6-1b to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. In addition, the SFPUC will implement Measure 5.5.6-1c to mitigate adverse impacts on key special-status plant species (i.e., fountain thistle) adapted to serpentine seeps.

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
						Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs: The SFPUC will develop an adaptive management plan to minimize adverse effects of the WSIP-induced rise in average water levels, and periodic drawdown of reservoir water levels for maintenance, on San Francisco garter snakes and red-legged frogs. **Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources:** The SFPUC will protect, restore, and enhance existing wetland and upland habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Crystal Springs Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program. **Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants:** The SFPUC will protect, restore, and enhance existing habitat and/or create new habitat that compensates for WSIP-induced habitat losses for plant species adapted to serpentine seeps.

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir.		LS	LS	LS	LS	None required.
Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam.		LS	LS	LS	LS	None required.
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.		LS	PSM	LS	LS	**Measure 5.5.3-2c, Habitat monitoring and Compensation:** The SFPUC will protect, restore, and enhance existing habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Pilarcitos Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program.
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir.		LS	LS	LS	LS	None required.
Impact 5.5.6-6: Impacts along Pilarcitos Creek below Stone Dam.		LS	LS	LS	LS	None required.
Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans.		LS				None required.

TABLE D-1c
Summary of Water Supply Impacts and Mitigation Measures—Peninsula Watersheds

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
RECREATIONAL AND VISUAL RESOURCES						
Impact 5.5.7-1: Effects on recreational facilities and/or activities.	LS					None required.
Impact 5.5.7-2: Visual effects on scenic resources or the visual character of water bodies.	LS					None required.

NI = No Impact

LS = Less than Significant

PSM = Potentially Significant, Mitigable

SU= Significant and Unavoidable

B = Beneficial

NA = Not Applicable

TABLE D-1d
Summary of Water Supply Impacts and Mitigation Measures—Westside Groundwater Basin

Impact	Significance Determination		Mitigation Measures
	North Westside Groundwater Basin	South Westside Groundwater Basin	
RECREATIONAL AND VISUAL RESOURCES			
Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin.	PSM	LS	The SFPUC will implement Measure 5.6.1 to reduce adverse impacts on the North Westside Groundwater Basin to a less-than-significant level. **Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield:** The SFPUC will continue ongoing groundwater and lake level monitoring programs to determine the safe yield of the North Westside Groundwater Basin in order to avoid overdraft and associated effects including adverse effects on surface water features and seawater intrusion.
Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin.	PSM	NA	The SFPUC will implement Measures 5.6.1 and 5.6-2 to reduce adverse impacts on the North Westside Groundwater Basin to a less-than-significant level. **Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield** – see description above. **Measure 5.6-2, Implementation of a Lake Level Management Plan:** The SFPUC will develop and implement a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range.
Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.	PSM	LS	The SFPUC will implement Measure 5.6.1 to reduce adverse impacts on the North Westside Groundwater Basin to a less-than-significant level. **Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield** – see description above.
Impact 5.6-4: Land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded.	LS	LS	None required.
Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin.	PSM	PSM	The SFPUC will implement Measure 5.6.5 to reduce adverse impacts on the North Westside and South Westside Groundwater Basins to a less-than-significant level. **Measure 5.6.5, Drinking Water Source Assessments for Groundwater Wells:** The SFPUC will develop and implement a source water protection program for wells constructed under the Local and Regional Groundwater Projects that are considered vulnerable to contamination on the basis of the drinking water source assessment prepared in accordance with Department of Public Health Services regulations.

TABLE D-1d
Summary of Water Supply Impacts and Mitigation Measures—Westside Groundwater Basin

Impact	Significance Determination		Mitigation Measures
	North Westside Groundwater Basin	South Westside Groundwater Basin	
Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system.	LS	LS	None required.

NI = No Impact

LS = Less than Significant

PSM = Potentially Significant , Mitigable

SU= Significant and Unavoidable

B = Beneficial

NA = Not Applicable

TABLE D-1e
Summary of Water Supply Impacts and Mitigation Measures—Cumulative Water Supply

Cumulative Water Supply Impact	Cumulative Impact Significance Determination							Mitigation Measures
	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreation / Visual Quality	
Impact 5.7.2-1: Tuolumne River – Hetch Hetchy Reservoir to Don Pedro Reservoir.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.2-2: Tuolumne River – Don Pedro Reservoir to the San Joaquin River.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.2-3: San Joaquin River, Stanislaus River, and the Delta.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.3-1: Alameda Creek watershed.	NA	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.4-1: San Mateo Creek watershed.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.4-2: Pilarcitos Creek watershed.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.5-1: North Westside Groundwater Basin.	LS							None required.
Impact 5.7.5-2: South Westside Groundwater Basin.	LS							None required.

NOTE: Significance determinations presented in this table assume implementation of all mitigation measures as they are presented in PEIR Chapter 5, Section 5.6, and described in Chapter 6.

NI = No Impact

LS = Less than Significant

PSM = Potentially Significant, Mitigable

SU= Significant and Unavoidable

B = Beneficial

NA = Not Applicable

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Land Use				
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction.	PSM	SUM	N	See Impact LU-1: Project construction would have a substantial impact on the existing character of the vicinity and could substantially disrupt or displace existing land uses or land use activities. The PEIR assumed that the 24-hour construction activities would be required for well facility construction and assumed that a new well would be constructed at the Francis Scott Key Elementary School. The analysis assumed that construction activities could disrupt sensitive land uses such as schools and nearby residential uses but implementation of SFPUC Construction Measures #1, #3, #5, #6, #10 and mitigation measures identified in PEIR Chapter 6, would reduce the impact to less than significant. The project-level analysis determined that nighttime construction associated with well drilling would, at some sites, cause temporary construction-noise impacts which feasible mitigation measures cannot reduce to less-than-significant levels. Therefore, the project-level impact would be significant and unavoidable.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses.	PSU	LSM	N	See Impact LU-2: Project operations would result in substantial long-term or permanent impacts on the existing character or disrupt or displace land uses. The PEIR conservatively assumed that the PEIR Regional Groundwater Projects could include sites adjacent to Francis Scott Key School or other sites in San Francisco and northern San Mateo County, which could have resulted in significant and unavoidable impacts on these sensitive land uses even with implementation of SFPUC Construction Measures #6 (compliance with local noise ordinances to the extent feasible) and #10 (locating staging areas away from public view and directing nighttime lighting away from residential areas) as well as recommendations of facility siting studies (Measure 4.3-2). The project-level analysis determined that operation of some of the well facilities would generate nighttime noise levels that could be significant at nearby residences. Implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce noise levels to less-than-significant levels.
Impact 4.17-1: Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character.	LS	Land Use - SUM	N	See Impact C-LU-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to land use. The PEIR determined that cumulative development in the vicinity of WSIP projects could disrupt established communities and significantly alter existing land use patterns. However, implementation of SFPUC construction measures and PEIR Measure 4.3-2 would reduce the WSIP's land use and visual impact to less than significant. The project-level analysis determined that both nighttime and daytime construction noise at some well sites would result in significant disruptions to land use, and that combined with impacts of cumulative projects, cumulative land use impacts would be significant and unavoidable.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
		Visual Character - LSM	N	See Impact C-AE-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to scenic resources and visual character. The PEIR determined that cumulative development in the vicinity of WSIP projects could disrupt established communities and significantly alter existing land use patterns. However, implementation of SFPUC construction measures and PEIR Measure 4.3-2 would reduce the WSIP's land use and visual impact to less than significant. The project-level analysis identified the potential for cumulative impacts to visual character from multiple construction projects in the same geographic area. Implementation of mitigation would reduce the impact such that the GSR Project's contribution to cumulative impacts would not be cumulatively considerable.
Visual				
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character.	LS	SUM	N	See Impact AE-1: The Project would have a substantial adverse impact on a scenic vista, resource, or on the visual character of a site or its surroundings. The PEIR assumed that temporary effects on visual character would be less than significant with implementation of SFPUC Construction Measure #10 (Project Site). The project-level analysis determined that at one site, removal of trees within the SFPUC right-of-way would have a significant and unavoidable impact on the visual character of the site and to a tree mass specifically identified in a local General Plan.
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character.	PSM	LSM	Y	See Impact AE-3: The Project would have a substantial adverse impact on a scenic vista, resource, or on the visual character of a site or its surroundings. There is no difference in the impact determination.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.3-5: New permanent sources of light glare.	PSM	LS	Y	See Impact AE-4: The Project would not create a new source of substantial light that would adversely affect day or nighttime views in the area. Also see Impact AE-2: The Project would not create a new source of substantial light that would adversely affect day or nighttime views in the area. The PEIR conservatively assumed that all WSIP projects that include aboveground improvements could include a new source of light or glare and required implementation of design measures (Mitigation Measure 4.3-5) to reduce this impact to a less-than-significant level. Other well facilities would not result in substantial view blockage and therefore would not result in a substantial adverse effect on the site's visual quality. The project-level analysis determined that implementation of the proposed Project would result in additional temporary and permanent lighting; however, new permanent lighting would be in compliance with Title 24 of the California Code of Regulations, would be shielded to direct light downward, and would be controlled by motion sensors with automatic shut-offs. The GSR Project also includes development of a Lighting Plan that would ensure that temporary lighting is focused downward and inward and includes glare control. Therefore, the impact would be less than significant.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Geology, Soils, and Seismicity				
Impact 4.4-1: Slope instability during construction.	PSM	LS	Y	See Impact GE-1: The Project would not be located on a geologic unit or soil that is unstable, or that would become unstable during construction. The WSIP PEIR assumed that the pipelines associated with the PEIR Regional Groundwater Projects could cross areas of potential landslide susceptibility in San Mateo County but implementation of SFPUC Construction Measure #2 Seismic and Geotechnical Studies) as well as a quantified landslide analysis (Measure 4.4-1) would reduce this impact to a less-than-significant level. The project-level analysis included several site-specific geotechnical investigations to assess slope stability hazards. The potential for slopes at the sites to become destabilized during construction was determined to be less than significant, due to the mapped and documented presence of generally dense granular materials, the absence of shallow groundwater, and the presence of vegetation that provides additional strengthening of the near surface soils.
Impact 4.4-2: Erosion during construction.	LS	LSM	N	See Impact HY-1: Project construction activities would degrade water quality as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals during construction. The WSIP PEIR noted that all construction sites would be subject to soil loss and erosion and that implementation of the SFPUC Construction Measure #3 (on-site air and water quality measures) would result in less than significant impacts for all WSIP projects. The project-level EIR does not assume implementation of SFPUC Construction Measure #3. Elements of the SFPUC Standard Construction Measure #3 are included in Mitigation Measure M-HY-1 (Develop and Implement and Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan), which would reduce the GSR Project impact to a less-than-significant level.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.4-3: Substantial alteration of topography.	LS	LS	Y	See Impact GE-2: The Project would not substantially change the topography or any unique geologic or physical features of the site(s). There is no difference in the impact determination.
Impact 4.4-4: Squeezing ground and subsidence during tunneling.	N/A	N/A	Y	Tunneling is not included in the GSR Project. Thus, the significance criterion related to subsidence during tunneling is not applicable.
Impact 4.4-5: Surface fault rupture.	LS	LS	Y	See Impact GE-3: The Project would expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to fault rupture, seismic groundshaking, or landslides. The well facility sites, including pipelines, would not be located within the San Andreas Fault Zone and no other active or potentially active faults are known to cross the sites. There is no difference in the impact determination.
Impact 4.4-6: Seismically induced groundshaking.	LS	LSM	N	See Impact GE-3: The Project would expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to fault rupture, seismic groundshaking, or landslides. The WSIP PEIR evaluated the potential impacts of seismically induced groundshaking on WSIP facilities and concluded that all potential facilities would experience strong groundshaking from a seismic event, but that the impact would be less than significant. The project-level analysis included the implementation of several site-specific geotechnical investigations to assess groundshaking hazards. Assuming compliance with all applicable building codes and standards, and the recommendations of the site-specific geotechnical investigations as required in Mitigation Measure M-GE-3 (Conduct Site-Specific Geotechnical Investigations and Implement Recommendations), groundshaking risks to GSR facilities and operations would be reduced to a less-than-significant level.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement.	LS	LSM	N	See Impact GE-4: The Project would be located on a geologic unit or soil that is unstable, or that would become unstable. The WSIP PEIR evaluated the potential impacts of seismically induced ground failure and concluded that all potential facilities would be designed in accordance with the General Seismic Design Requirements and that impacts related to liquefaction and other seismically induced ground failures would be less than significant. The project-level analysis determined that the underlying soil at some of the sites have a moderately high hazard from settlement. Implementation of Mitigation Measure M-GE-3 (Conduct Site-Specific Geotechnical Investigations and Implement Recommendations) which incorporates site-specific geotechnical recommendations to reduce the GSR Project impact to a less-than-significant level.
Impact 4.4-8: Seismically induced landslides or other slope failures.	LS	LS	Y	See Impact GE-3: The Project would expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to fault rupture, seismic groundshaking, or landslides. The project-level analysis determined that the potential for seismically induced landslides or slope failures would be less than significant for all sites. There is no difference in the impact determination.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.4-9: Expansive or corrosive soils.	PSM	LS	N	See Impact GE-5: The Project would not be located on corrosive or expansive soil, creating substantial risks to life or property. Based on regional mapping reviewed for the WSIP PEIR, expansive and corrosive soils are mapped in the GSR Project area, and impacts related to these soils were considered potentially significant. The project-level analysis determined that site specific soils are not considered expansive, and that cathodic protection measures that have been incorporated into the design of the GSR Project would ensure that potential impacts related to corrosive soils are less than significant.
Impact 4.17-2: Cumulative exposure of people or structures to geologic and seismic hazards.	LS	LS	Y	See Impact C-GE-1: Construction and operation of the proposed Project could result in significant impacts related to soils and geology. There is no difference in the impact determination.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Hydrology and Water Quality				
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction.	LS	LSM	N	See Impact HY-1: Project construction activities would degrade water quality as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals during construction. Although final locations of the well facilities were not determined at the time of publication of the WSIP PEIR, the PEIR indicated that implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction), and implementation of control measures in compliance with NPDES permit requirements for projects disturbing more than one acre, would ensure that this impact is less than significant. The project-level EIR does not assume implementation of SFPUC Construction Measures. Implementation of Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) is included and would reduce the Project impact to a less-than-significant level.
Impact 4.5-2: Depletion of groundwater resources.	N/A	N/A	Y	The PEIR and project-level EIR determined that construction dewatering would not be required such that depletion of groundwater resources would occur. See PEIR Impacts 5.6-1 through 5.6-6 below for analysis of operational impacts on groundwater resources.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges.	N/A	LSM	N	See Impact HY-1: Project construction activities would degrade water quality as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals during construction. The PEIR assumed that the PEIR Regional Groundwater Projects would not involve dewatering. The project-level analysis determined that the discharge of sediment-laden groundwater to the storm drain system during excavation dewatering could degrade water quality and violate water quality standards, however, implementation of Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would reduce the impact to a less-than-significant level.
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water.	N/A	LSM	N	See Impact HY-2: Discharge of groundwater could result in minor localized flooding, violate water quality standards, and/or otherwise degrade water quality. The PEIR assumed that the PEIR Regional Groundwater Projects would not involve construction-related discharges of water; therefore this impact was determined to not be applicable. The project-level analysis determined that the discharge of sediment-laden groundwater to the storm drain system during well development and pumping tests could degrade water quality and violate water quality standards. Implementation of Mitigation Measure M-HY-2 (Management of Well Development and Pump Testing Discharges) would reduce GSR Project impacts to less-than-significant levels.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows.	PSM	LS	N	See Impact HY-4: Project operations would not impede or redirect flood flows. At the time the PEIR was prepared, the project design conservatively assumed that some Groundwater Project components could be constructed in San Mateo County and could be constructed in a flood zone. Thus, the PEIR determined that impacts related to flooding would be potentially significant but implementation of flood flow protection measures (Measure 4.5-4a), which would be prepared for the project, would reduce impacts to a less-than-significant level. The project-level analysis determined that only one of the proposed project sites is located within a special flood hazard zone. Given that the chemical treatment building at the site would be elevated above the 100-year flood elevation, and because the presence of an at-grade parking area would have a negligible effect on impeding or redirecting flood flows, this impact would be less than significant.
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation.	PSM	LS	N	See Impact HY-5: Project operations would not result in a violation of water quality standards or in the degradation of water quality from the discharge of groundwater during well maintenance. The PEIR analysis determined that the use of treated stormwater for groundwater recharge could affect groundwater quality if the bacterial standards for the source water were less stringent than those for drinking water, a potentially significant impact. Implementation of Measure 4.5-5, which requires treatment to remove nutrients from stormwater and implementation of groundwater monitoring in the vicinity of Lake Merced, would reduce this impact to less than significant. The project-level analysis determined that discharge water would be sent to either the sanitary sewer or the storm drain system; therefore, the discharge water associated with operations of the GSR Project would not violate water quality standards or degrade water quality and any such potential impacts on surface water would be less than significant.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces.	LS	LS	Y	See Impact HY-3: Project operation would not alter drainage patterns in such a manner that could result in degraded water quality or cause on- or off-site flooding. Also see Impact HY-5: Project operations would not result in a violation of water quality standards or in the degradation of water quality from the discharge of groundwater during well maintenance. There is no difference in the impact determination.
Impact 4.17-3: Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards.	LS	LSM	N	See Impact C-HY-1: Project construction could result in a cumulatively considerable contribution to cumulative impacts on surface water hydrology and water quality. The PEIR determined that the WSIP projects in conjunction with other projects would not result in cumulative water quality and hydrology effects related to increased erosion and sedimentation, construction-related discharges of treated water or groundwater produced during dewatering, or operational discharges of treated water with implementation of proper BMPs for temporary and permanent erosion control The project-level analysis identified the potential for cumulative impacts to hydrology and water quality from multiple construction projects in the same geographic area. With implementation of Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) and Mitigation Measure M-HY-2 (Management of Well Development and Pump Testing Discharge) and compliance with the Waste Discharge Requirements for the SFPUC Drinking Water Transmission System, the GSR Project's contribution to any such cumulative water quality impacts would not be cumulatively considerable.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin.	LS	SUM	N	See Impact HY-14: Project operation may have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin over the very long term. Also, see Impact HY-6: Project operation would decrease the production rate of existing nearby irrigation wells due to localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land use(s) may not be fully supported. The PEIR determined that impacts related to basin overdraft and associated adverse conditions in the South Westside Groundwater Basin would be less than significant, given that the overall conjunctive-use program would be designed to take advantage of vacated aquifer storage that has become available as a result of historical groundwater pumping in the basin. The project-level analysis also determined that the GSR Project may cause an incremental depletion of groundwater storage over the long-term, which is conservatively deemed a significant impact because over the very long-term this could result in a substantial regional deficit in aquifer storage that would may not fully support existing or planned land uses. Implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion) would reduce impacts of the Project on long-term depletion of groundwater storage to less-than-significant levels.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin.	N/A	LSM	N	See Impact HY-9: Project operation could have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced. Also see Impact HY-10: Project operation would not have a substantial adverse effect on water quality that could affect the beneficial uses of Pine Lake, and Impact HY-11: Project operation would not have a substantial adverse effect on water quality that could affect the beneficial uses of Colma Creek, San Bruno Creek, Lomita Channel, or Millbrae Creek. The PEIR determined that there are no major surface water features in the South Westside Groundwater Basin that would be affected. The project-level analysis determined that significant impacts could occur to Lake Merced, and Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) is provided to reduce impacts to a less-than-significant level. The project-level analysis determined that the impact on the beneficial uses of Pine Lake and other surface water bodies would be less than significant.
Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.	LS	LS	Y	See Impact HY-8: Project operation would not result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. The PEIR determined that impacts related to the potential to cause seawater intrusion the South Westside Groundwater Basin would be less than significant. The project-level analysis determined that the GSR Project would not cause lower average groundwater levels that would induce seawater intrusion in either the North or South Westside Groundwater Basin.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.6-4: Land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded.	LS	LS	Y	See Impact HY-7: Project operation would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin where the historical low water levels are exceeded. The PEIR determined that the potential for land subsidence would be less than significant, given the formations comprising the aquifers of the North Westside Groundwater Basin, and because groundwater levels associated with the PEIR Regional Groundwater Projects would likely be higher than historical flows in the South Westside Groundwater Basin. The project-level analysis estimated subsidence due to GSR Project operations at three representative locations. The estimated subsidence was less than the significance thresholds established for the analysis, therefore, subsidence due to Project operation was determined to be less than significant.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin.	PSM	LS	N	See Impact HY-12: Project operation would not cause a violation of water quality standards due to mobilization of contaminants in the groundwater from changing groundwater levels in the Westside Groundwater Basin. The PEIR noted that until production well locations were selected and a drinking water source assessment performed, the potential for contamination of a drinking water well could not be fully evaluated. Therefore, the PEIR considered impacts related to potential contamination of a drinking water source as potentially significant, which would be reduced to a less-than-significant level with implementation of Measure 5.6-5, Drinking Water Source Assessments for Groundwater Wells. The project-level analysis included preliminary Drinking Water Assessment and Protection Program reports used to characterize the vulnerability of proposed wells sites to possible contaminating activities. The analysis determined that potential GSR Project impacts on groundwater from possible contaminating activities would be less than significant, given that wells would be protected against contamination by the construction of an annular seal composed of sand/cement grout, water would be blended or treated to ensure all drinking water standards are met. The analysis also determined that the potential impact from mobilization or spreading of contaminants in groundwater as a result of increased pumping would be less than significant.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system.	LS	LS	N	See Impact HY-12: Project operation would not cause a violation of water quality standards due to mobilization of contaminants in groundwater from changing groundwater levels in the Westside Groundwater Basin. Also see Impact HY-13: Project operation would not result in degradation of drinking water quality or groundwater quality relative to constituents for which standards do not exist. The PEIR determined the groundwater developed for potable uses under the WSIP would be treated or blended with system water to meet all primary and secondary drinking water standards. Therefore, programmatic impacts related to exceedances in drinking water standards would be less than significant. The project-level analysis determined that potential GSR Project impacts on drinking water quality from regulated and non-regulated constituents would be less than significant. As described in GSR Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types), any violation of drinking water standards at production wells resulting from Project operation would be addressed by proposed treatment and/or blending.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.7.5-1: Cumulative impacts on the North Westside Groundwater Basin.	LS	LSM	N	See Impacts C-HY-2, C-HY-3, C-HY-4, C-HY-5, and C-HY-8. The PEIR did not evaluate cumulative impacts of the GSR Project in the North Westside Groundwater Basin The project-level analysis concludes that implementation of Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) would reduce the GSR Project's impact in the North Westside Groundwater Basin at Lake Merced on long-term lake-level declines to a less-than-cumulatively considerable level. The project-level analysis determined that the GSR Project would not have a considerable contribution to the cumulative impact relative to seawater intrusion in the North Westside Groundwater Basin, and the estimated subsidence due to operation of the cumulative conditions scenario in the North Westside Groundwater Basin was also determined to be less than significant. Implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion), which addresses impacts in both the North and South Westside Groundwater Basins would reduce the Project's impact on long-term depletion of groundwater storage to less-than-cumulatively considerable levels.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 5.7.5-2: Cumulative impacts on the South Westside Groundwater Basin.	LS	SUM	N	See Impacts C-HY-2, C-HY-3, C-HY-4, C-HY-5, C-HY-6, C-HY-7, and C-HY-8. The PEIR determined that implementation of the proposed conjunctive-use program should result in higher average groundwater levels in the northern portion of the South Westside Groundwater Basin as a result of the coordinated use of surface water and groundwater. The PEIR determined that implementation of the operating agreement(s) would ensure that impacts related to basin overdraft, saltwater intrusion, and land subsidence would be less than significant, and that because there are no other planned future uses of groundwater in this portion of the basin, cumulative groundwater impacts would be less than significant. The project-level analysis determined implementation of Mitigation Measure M-HY-6 (Ensure Existing Irrigator's Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation) would reduce the GSR Project's contribution to cumulative impacts on well interference. However, because the feasibility of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow mitigation to take place on their property, the Project's impact is conservatively deemed to be cumulatively considerable. Implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion) would reduce the Project's impact on long-term depletion of groundwater storage to less-than-cumulatively considerable levels in the South Westside Groundwater Basin. The Project-level analysis determined that the Project would not have a considerable contribution to the cumulative impact relative to seawater intrusion or subsidence in the South Westside Groundwater Basin.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Biological Resources				
Impact 4.6-1: Impacts on wetlands and aquatic resources.	PSM	LSM	Y	See Impact BR-3: The Project would impact jurisdictional wetlands or waters of the United States. There is no difference in the impact determination.
Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees.	PSM	LSM	Y	See Impact BR-2: Project construction would adversely affect riparian habitat or other sensitive natural communities. Also see Impact BR-4: Project construction would conflict with local tree preservation ordinances. There is no difference in the impact determination.
Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects.	LS	LSM	N	See Impact BR-1: Project construction would adversely affect candidate, sensitive, or special-status species. Also see Impact BR-5: Project operation would adversely affect candidate, sensitive, or special-status species. The PEIR analysis assumed that the PEIR Regional Groundwater Project facilities would be located in previously disturbed areas that do not support key special-status species; therefore, the impact in the PEIR was determined to be less than significant. The project-level analysis determined that vegetation removal and operational noise of the GSR Project at some sites could result in significant impacts to special-status birds, migratory passerines and raptors, special status bats, and monarch butterflies. Implementation of Mitigation Measures M-BR-1a, -1b, -1c, -1d and Mitigation Measure M-NO-5 would reduce impacts to a less-than-significant level.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources.	N/A	LSM	N	See Impact BR-3: The Project would impact jurisdictional wetlands or waters of the United States. The PEIR assumed that the Groundwater Projects would not involve dewatering. The Project-level analysis determined that construction at some sites could result in impacts due potential uncontrolled runoff and sedimentation to jurisdictional wetlands and waters. Implementation of Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would reduce the Project impact a less-than-significant level.
Impact 4.6-5: Conflicts with adopted conservation plans or other approved biological resources plans.	N/A	NI	Y	See GSR Section 5.14.3.2 (Approach to Analysis), under the heading "Areas of No Project Impact." The PEIR noted that there are no adopted plans in the area proposed for the PEIR Regional Groundwater Projects. The project-level analysis also determined that no such plans have been adopted in the areas that would be affected by the GSR Project.
Impact 4.17-4: Cumulative loss of sensitive biological resources.	LS	LSM	N	See Impact C-BR-1: Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources. The PEIR determined that cumulative impacts on biological resources would be less than significant through implementation of PEIR Measures 4.6-1 through 4.6-3 as well as Measure 4.16-4a. The project-level analysis identified the potential under the GSR Project for cumulative impacts to biological resources from multiple construction projects in the same geographic area. Implementation of mitigation measures would reduce the impact such that the GSR Project's contribution to cumulative impacts would not be cumulatively considerable.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
	N/A	LSM	N	Impacts BR-6 through BR-9 and C-BR-2 evaluate potential Project impacts on biological resources at Lake Merced. The PEIR did not evaluate the potential for adverse effects on biological resources at Lake Merced related to project operation. The project-level analysis determined that significant impacts could occur under the GSR Project to biological resources at Lake Merced, and mitigation is provided to reduce impacts to a less-than-significant level. Implementation of mitigation would also reduce the impact such that the GSR Project's contribution to cumulative impacts would not be cumulatively considerable.
Cultural Resources				
Impact 4.7-1: Impacts on paleontological resources.	PSM	LSM	Y	See Impact CR-3: Project construction could result in a substantial adverse effect by destroying a unique paleontological resource or site. There is no difference in the impact determination.
Impact 4.7-2: Impacts on archaeological resources.	PSM	LSM	Y	See Impact CR-2: Project construction could cause an adverse change in the significance of an archaeological resource. Also see Impact CR-4: Project construction could result in a substantial adverse effect related to the disturbance of human remains. There is no difference in the impact determination.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district.	N/A	LSM	N	See Impact CR-1: Project construction could cause an adverse change in the significance of a historical resource. Also see Impact CR-5: Project facilities could cause an adverse change in the significance of a historical resource. The WSIP PEIR concluded that the PEIR Regional Groundwater Projects would add new facilities to the WSIP system or upgrade existing non-historic facilities, and therefore, would not affect historic components of the regional system. The project-level analysis determined that construction and operation of the GSR Project could affect the eligibility of listing the Golden Gate National Cemetery to the National Register. Implementation of mitigation is therefore included to reduce the Project impact to a less-than-significant level.
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration.	N/A	LSM	N	See Impact CR-1: Project construction could cause an adverse change in the significance of a historical resource. Also see Impact CR-5: Project facilities could cause an adverse change in the significance of a historical resource. The PEIR assumed that demolition under the PEIR Regional Groundwater Projects would be limited to paved areas and playgrounds at the Francis Scott Key School Annex, and West and South Sunset Playgrounds. The project-level analysis determined that construction and operation of the GSR Project could affect the eligibility of listing the Golden Gate National Cemetery to the National Register. Implementation of mitigation is therefore included to reduce the Project impact to a less-than-significant level.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.7-5: Impacts on adjacent historic architectural resources.	LS	LSM	N	See Impact CR-1: Project construction could cause an adverse change in the significance of a historical resource. Also see Impact CR-5: Project facilities could cause an adverse change in the significance of a historical resource. The WSIP PEIR noted that under the PEIR Regional Groundwater Projects new facilities would be added to existing, non-historic facilities. The project-level analysis determined that construction and operation of the GSR Project could affect the eligibility of listing the Golden Gate National Cemetery to the National Register. Implementation of mitigation is therefore included to reduce the Project impact to a less-than-significant level.
Impact 4.17-5: Cumulative increase in impacts on archaeological, paleontological, and historical resources.	PSU	LSM	N	See Impact C-CR-1: Construction of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts on historical, archaeological, or paleontological resources, or human remains. The PEIR conservatively assumed that, in combination, projects in the Sunol Valley and Peninsula regions could result in significant impacts on individual historical resources or on potential historic districts (if historic districts were determined to be present). The PEIR did not describe cumulative impacts on cultural resources in the San Francisco region. The project-level analysis identified the potential under the GSR Project for cumulative impacts to cultural resources from multiple construction projects in the same geographic area. Implementation of mitigation would reduce the impact such that the GSR Project's contribution to cumulative impacts would not be cumulatively considerable.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Traffic, Transportation, and Circulation				
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays.	PSM	LSM	Y	See Impact TR-1: The Project would conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. There is no difference in the impact determination.
Impact 4.8-2: Short-term traffic increases on roadways.	LS	LS	Y	See Impact TR-1: The Project would conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. There is no difference in the impact determination.
Impact 4.8-3: Impaired access to adjacent roadways and land uses.	PSM	LSM	Y	See Impact TR-2: The Project would temporarily impair emergency access to adjacent roadways and land uses during construction. There is no difference in the impact determination.
Impact 4.8-4: Temporary displacement of on-street parking.	PSM	NI	N	Since publication of the PEIR, the significance criterion specifically pertaining to displacement of on-street parking has been deleted from the San Francisco Planning Department's initial study checklist (San Francisco Planning Department 2010). The GSR Project EIR did not identify any secondary impacts associated with loss of parking.
Impact 4.8-5: Increased traffic safety hazards during construction.	PSM	LSM	Y	See Impact TR-1: The Project would conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. Also see Impact TR-3: The Project would temporarily decrease the performance and safety of public transit, bicycle, and pedestrian facilities during construction. There is no difference in the impact determination.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.8-6: Long-term traffic increases during facility operation.	LS	LS	Y	See Impact TR-4: Project operations and maintenance activities would not conflict with an applicable plan or policies regarding performance of the transportation system or alternative modes of transportation. There is no difference in the impact determination.
Impact 4.17-6: Cumulative traffic increases on local and regional roads.	PSU	LSM	N	See Impact C-TR-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to transportation and circulation. The WSIP PEIR cumulative analysis determined that significant cumulative impacts could occur during concurrent construction of nearby projects, including non-SFPUC projects, and based on the conservative assumption that interagency coordination of construction traffic might not always be possible; this impact was determined to be potentially significant and unavoidable. The project-level analysis identified the potential under the GSR Project for cumulative impacts from multiple construction projects in the same geographic area. Implementation of mitigation would reduce the impact such that the GSR Project's contribution to cumulative impacts would not be cumulatively considerable.

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WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Air Quality				
Impact 4.9-1: Construction emissions of criteria pollutants.	LS	LSM	N	See Impact AQ-2: Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation. The WSIP PEIR identified the requirement for a dust control plan and implementation of dust control measures as part of the SFPUC Construction Measures. The project-level EIR does not assume implementation of SFPUC Construction Measures. The project-level analysis determined that the generation of fugitive dust during construction would result in a significant impact. Implementation of Mitigation Measures M-AQ-2a (BAAQMD Basic Construction Measures) and Mitigation Measure M-AQ-2b (NOx Reduction during Construction of Alternate Sites) would reduce this impact to a less-than-significant level.
Impact 4.9-2: Exposure to diesel particulate matter during construction.	LS	LSM	N	See Impact AQ-3: Project construction would expose sensitive receptors to substantial pollutant concentrations. Also see Impact AQ-6: Project operations would not expose sensitive receptors to substantial pollutant concentrations. The PEIR assumed a determination of less than significant due to the relatively low amount of diesel particulate emissions expected to be generated by haul truck traffic. The project-level analysis determined that under the GSR Project the BAAQMD thresholds utilized as significance thresholds in the EIR would be exceeded for one of the modeling groups evaluated. Implementation of Mitigation Measure M-AQ-3 (Construction Health Risk Mitigation) would reduce this temporary impact to a less-than-significant level. The project-level analysis determined that operational impacts would be less than significant.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling.	PSM	N/A	N	The PEIR analysis was based on a project design that could require tunneling using jack-and-bore construction at roadway crossings. Updated Project design information indicates that tunneling is not included in the GSR Project. Thus, the significance criterion related to exposure to emissions in tunnels is not applicable.
Impact 4.9-4: Air pollutant emissions during project operation.	LS	LS	Y	See Impact AQ-5: Project operations would not violate air quality standards or contribute substantially to an existing air quality violation. There is no difference in the impact determination.
Impact 4.9-5: Odors generated during project operation.	LS	LS	Y	See Impact AQ-7: Project operations would not create objectionable odors affecting a substantial number of people. There is no difference in the impact determination.
Impact 4.9-6: Secondary emissions at power plants.	LS	LS	Y	See Impact ME-2: The Project would not encourage activities that result in the use of large amounts of fuel and energy in a wasteful manner during operation. For all WSIP facility improvement projects, the PEIR analysis assumed any incremental increase in power demand would not result in significant secondary air quality impacts. The project-level analysis is consistent with the PEIR analysis and determined that the GSR Project would not increase energy demands. Thus, this PEIR impact was not specifically called out in the project-level analysis.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing emissions.	LS	LS	Y	See Impact AQ-1: Construction of the Project would not conflict with or obstruct implementation of applicable air quality plans. There is no difference in the impact determination.
Impact 4.17-7: Cumulative increases in construction and/or operational emissions in the region.	PSU	LSM	N	See Impact C-AQ-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to air quality. The PEIR determined that cumulative impacts due to emissions of criteria pollutants would be PSU because the WSIP projects in combination with the cumulative projects would result in regionwide cumulative increases in air emissions during project operations and the residual contribution from each project would contribute to the region's nonattainment status for ozone and particulate matter. Cumulative impacts related to exposure to diesel particulate matter would also be potentially significant and unavoidable because of the lack of certainty about the timing of many of the cumulative projects that might use common haul routes. The project-level analysis identified the potential under the GSR Project for cumulative impacts to NOx emissions if all sites, including alternate sites, were constructed. Implementation of Mitigation Measure M-AQ-2b (NOx Reduction during Construction of Alternate Sites) would reduce NOx emissions to less-than-cumulatively considerable (less than significant) levels by requiring construction contractors to use newer equipment or retrofitted equipment that would create fewer emissions of NOx.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Noise and Vibration				
Impact 4.10-1: Disturbance from temporary construction-related noise increases.	PSU	SUM	Y	See Impact NO-1: Project construction would result in noise levels in excess of local standards. Also see Impact NO-3: Project construction would result in a substantial temporary increase in ambient noise levels. There is no difference in the impact determination.
Impact 4.10-2: Temporary noise disturbance along construction haul routes.	PSU	LS	N	See Impact NO-4: Project construction would not result in a substantial temporary increase in ambient noise levels along construction haul routes. The PEIR assumed that any nighttime truck operations greater than 1 truck per hour could exceed the sleep interference criterion during construction of the PEIR Regional Groundwater Projects. Implementation Mitigation Measures 4.10-2a (limiting hourly truck volumes during the day) and 4.10-2b (restricting of nighttime truck operations) could reduce the impact, but even with implementation of this measure, the PEIR determined that the impact would be potentially significant and unavoidable. The project-level analysis for the GSR Project determined that truck deliveries would not occur at nighttime, and estimated noise levels would fall below the daytime construction threshold. Therefore, the impacts from noise along construction haul routes would be less than significant.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.10-3: Disturbance due to construction-related vibration.	PSU	LSM	N	See Impact NO-2: Project construction would result in excessive groundborne vibration. The PEIR assumed that potentially significant vibration effects could result if there are any sensitive receptors located within 100 feet of proposed facilities but implementation of vibration controls (Measures 4.10-31 and 4.10-3b) would help reduce impacts. The analysis conservatively assumed that construction could occur during nighttime hours; therefore, the impact was considered potentially significant and unavoidable. The project-level analysis determined that construction-related vibration at some GSR sites could result in significant impacts on adjacent structures. Implementation of Mitigation Measure M-NO-2 (Reduce Vibration Levels during Construction of Pipelines) would reduce the Project impact to a less-than-significant level.
Impact 4.10-4: Disturbance due to long-term noise increases.	LS	LSM	N	See Impact NO-5: Operation of the Project would result in exposure of people to noise levels in excess of local noise standards or result in a substantial permanent increase in ambient noise levels in the Project vicinity. The PEIR evaluation of long-term noise increases concluded that noise associated with standby power would be less than significant. The evaluation in the PEIR for other operational noise noted that the project-specific evaluations would define design measures needed to ensure that operational noise levels are maintained at acceptable levels. The project-level analysis determined that under the GSR Project operational noise levels at some sites would exceed established sleep interference thresholds. Implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce the Project impact to a less-than-significant level.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.17-8: Cumulative increases in construction-related and operational noise.	PSU	SUM	Y	See Impact C-NO-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise. There is no difference in the impact determination.
Public Services and Utilities				
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities.	PSM	LSM	Y	See Impact UT-1: Project construction could result in potential damage to or temporary disruption of existing utilities during construction. There is no difference in the impact determination.
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity.	PSM	LS	N	See Impact UT-3: Project construction would not result in adverse effects on solid waste landfill capacity. The WSIP PEIR determined that solid waste could impact permitted landfill capacity and noted that potential impacts from individual WSIP projects would be evaluated in more detail in a separate project-level CEQA review. The project-level analysis determined that there is sufficient landfill capacity for GSR Project spoils and the impact would be less than significant with no mitigation required.
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste.	PSM	LSM	Y	See Impact UT-4: Project construction could result in a substantial adverse effect related to compliance with federal, State, and local statutes and regulations pertaining to solid waste. There is no difference in the impact determination.
Impact 4.11-4: Impacts related to the relocation of utilities.	PSM	LSM	Y	See Impact UT-1: Project construction could result in potential damage to or temporary disruption of existing utilities during construction. There is no difference in the impact determination.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.17-9: Cumulative impacts related to disruption of utility service or relocation of utilities.	LS	LSM	N	See Impact C-UT-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to utilities and service systems. The PEIR determined that construction of the WSIP projects could disrupt utility services or require temporary or permanent relocation of utilities. However, the PEIR determined that these potential impacts would be site-specific rather than additive and would be mitigated on a site-specific basis and, thus, this cumulative impact was considered less than significant. The project-level analysis identified the potential under the GSR Project for cumulative impacts from multiple construction projects in the same geographic region. The analysis determined that implementation of mitigation would reduce the impact such that the GSR Project's contribution to cumulative impacts would not be considerable.
	N/A	LS	N	See Impact UT-2: Project construction would not exceed the capacity of wastewater treatment facilities, exceed wastewater treatment requirements, require or result in the construction of new or expansion of existing wastewater treatment facilities or stormwater drainage facilities, the construction of which could cause significant environmental effects. Also see Impact UT-5: Project operation would not exceed the capacity of wastewater treatment facilities, exceed wastewater treatment requirements, require or result in the construction of new or expansion of existing wastewater treatment facilities or stormwater drainage facilities, the construction of which could cause significant environmental effects. The WSIP PEIR did not evaluate impacts related to the potential exceedance of wastewater treatment facilities, wastewater treatment requirements, or the construction of new wastewater or storm drainage facilities.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Recreational Resources				
Impact 4.12-1: Temporary conflicts with established recreational uses during construction.	PSM	LSM	Y	See Impacts RE-1 through RE-3 for a discussion of temporary conflicts with recreational uses during construction. There is no difference in the impact determination.
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation.	PSM	LS	N	See Impact RE-4: The Project would not damage recreational resources during operation. Also see Impact RE-5: The Project would not deteriorate the quality of the recreational experience during operation. The PEIR analysis assumed that operation of groundwater facilities constructed in City-owned parks and recreational facilities would result in potentially significant impacts on recreational resources but implementation of architectural design, landscaping, and tree removal measures (Measures 4.3-4a, 4.3-4b, 4.3-4c, and 4.3-4d), as well as appropriate siting of proposed facilities (Measure 4.12-2), would reduce potential impacts to a less-than-significant level. The project-level analysis concluded that no significant recreational conflicts would occur from GSR Project operation, and that the Project impact would be less than significant.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.17-10: Cumulative effects on recreational resources during construction.	LS	LS	Y	See Impact C-RE-1: Construction and operation of the proposed Project would not result in significant cumulative impacts on recreational resources. There is no difference in the impact determination.
	N/A	LS	N	Impact RE-6 evaluates potential Project impacts on recreational resources at Lake Merced. The PEIR did not directly evaluate the potential for adverse effects on recreational resources at Lake Merced related to GSR Project operation. The PEIR did evaluate changes in water levels in Lake Merced due to proposed pumping under the Local Groundwater Projects (SF-2), and determined that while direct effects on lake levels are not expected, indirect effects could occur. The PEIR analysis included implementation of Measures 5.6-1 and 5.6-2, and noted that a more detailed analysis of the lake-aquifer relationship would be required as part of project-level CEQA reviews. The project-level analysis determined that the GSR Project would result in minor changes in lake depth and surface area that would have a negligible effect on the scenic quality of the lake and which would not encroach on trails or access areas. In addition, the Project would be consistent with the *Western Shoreline Area Plan* policies for Lake Merced. Therefore, the Project impact on recreational resources was found to be less than significant.
Agricultural Resources				
Impact 4.13-1: Temporary conflicts with established agricultural resources.	N/A	NI	Y	See GSR Section 5.19 (Agriculture and Forest Resources).

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Impact 4.13-2: Conversion of farmlands to nonagricultural uses.	N/A	NI	Y	See GSR Section 5.19 (Agriculture and Forest Resources).
Hazards				
Impact 4.14-1: Potential to encounter hazardous materials in soil or and groundwater.	PSM	LSM	Y	See Impact HZ-2: The Project would result in a substantial adverse effect related to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment during construction. There is no difference in the impact determination.
Impact 4.14-2: Exposure to naturally occurring asbestos during construction.	LS	NI	N	See GSR Section 5.17.1.4 (Potential Presence of Naturally Occurring Asbestos). The PEIR found that the PEIR Regional Groundwater Projects would have a low likelihood of encountering asbestos because there is not ultramafic rock units mapped in the area. The project-level analysis determined that under the GSR Project no ultramafic rock units occur in the areas of the proposed facility sites, therefore, naturally occurring asbestos is not likely to be encountered.

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Impact 4.14-3: Risk of fires during construction.	LS	LS	N	See GSR Section 5.17.1.5 (Fire Hazards). Also see Impact HZ-7: The Project would not expose people or structures to a significant risk of loss, injury, or death involving fires At the time the WSIP PEIR was prepared, the locations of specific PEIR Regional Groundwater Project components had not been determined. Therefore, the PEIR conservatively assumed that the projects could be located within high fire hazard zones in San Francisco. As described in GSR Section 5.17.1.5 (Fire Hazards) of the project-level EIR, the facility sites are located on urban land in non-fire hazard severity zones. The project-level analysis also determined that impacts on the exposure of people or structures to fire risk due to changes in Lake Merced water levels would be less than significant.
Impact 4.14-4: Gassy conditions in tunnels.	LS	N/A	N	The PEIR analysis was based on a project design that could require tunneling using jack-and-bore construction at roadway crossings. Updated Project design information indicates that tunneling is not included in the GSR Project. Thus, the significance criterion related to gassy conditions in tunnels is not applicable.
Impact 4.14-5: Exposure to hazardous building materials.	PSM	LSM	Y	See Impact HZ-2: The Project would result in a substantial adverse effect related to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment during construction. There is no difference in the impact determination.

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PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.14-6: Accidental hazardous materials release from construction equipment.	LS	LSM	N	See Impact HZ-2: The Project would result in a substantial adverse effect related to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment during construction. The PEIR assumed that impacts related to accidental releases of hazardous materials from construction equipment would be less than significant with implementation of SFPUC Construction Measure #7 (Hazardous Materials). The project-level EIR does not assume implementation of SFPUC Construction Measure #10. The project-level analysis identified potential significant impacts, and includes implementation of mitigation that would reduce the GSR Project impact to a less-than-significant level.
Impact 4.14-7: Increased use of hazardous materials during operation.	LS	LS	Y	See Impact HZ-4: The Project would not create a hazard to the public or environment from the routine transport, use, or disposal of hazardous materials or accidental release of hazardous materials during operation. There is no difference in the impact determination.
Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school.	LS	LSM	N	See Impact HZ-3: The Project would result in impacts from the emission or use of hazardous materials within 0.25 mile of a school during construction. Also see Impact HZ-5: The Project would not result in impacts from the emission or use of hazardous materials within 0.25 mile of a school during operation. The WSIP PEIR assumed that impacts related to accidental release of hazardous materials from construction equipment would be less than significant with implementation of SFPUC Construction Measure #7 (Hazardous Materials). The project-level analysis concluded that under the GSR Project significant impacts could occur during construction at sites on or immediately adjacent to schools, and operational impacts would be less than significant. Implementation of mitigation would reduce the construction-related Project impact to a less-than-significant level.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.17-12: Cumulative effects related to hazardous conditions and exposure to or release of hazardous materials.	LS	LSM	N	See Impact C-HZ-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to hazards and hazardous materials. The PEIR determined that due to the site-specific nature of hazardous materials impacts and mitigation measures, there would be no potential for cumulative effects from construction of WSIP projects in conjunction with other cumulative developments. The PEIR determined that compliance with applicable laws and regulations and with implementation of SFPUC construction measures, this cumulative impact would be less than significant. The project-level analysis identified the potential for cumulative impacts from multiple construction projects in the same geographic region. Implementation of mitigation would reduce the impact such that the GSR Project's contribution to cumulative impacts would not be cumulatively considerable.
Minerals and Energy Resources				
Impact 4.15-1: Construction-related energy use.	PSM	LS	Y	See Impact ME-1: The Project would not encourage activities that result in the use of large amounts of fuel and energy in a wasteful manner during construction. The PEIR identified a potentially significant impact related to energy use during construction. Because the GSR Project would not use large amounts of fuel and energy in a wasteful manner, the project-level analysis identified a less-than-significant impact.

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.15-2: Long-term energy use during operation.	PSM	LS	N	See Impact ME-2: The Project would not encourage activities that result in the use of large amounts of fuel and energy in a wasteful manner during operation. The PEIR estimated that the PEIR Regional Groundwater Projects would require up to 5,100,000 kWh for operation. The PEIR determined that implementation in addition to other WSIP projects in the San Francisco region (e.g., San Andreas Pipeline 3 Installation and Recycled Water Project) would increase energy use in the San Francisco region by approximately 87 percent, a potentially significant impact. The project-level analysis determined that the collective change in energy demand of the new well facilities and Westlake Pump Station, the Partner Agencies' wells, and the regional water system would be negligible, and the GSR Project would not cause a substantial increase in energy use on a long-term basis. The impact was determined to be less than significant.
Impact 4.17-13: Cumulative increases in the use of nonrenewable energy resources.	LS	LS	N	See Impact C-ME-1: Construction and operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to mineral and energy resources. The PEIR determined that the WSIP's contribution to cumulative increases in long-term energy demand would not be considerable. The PEIR also determined that with implementation of exhaust control measures required in the Air Quality Section of the PEIR, the WSIP's contribution to the regionwide cumulative increase in construction-related energy consumption would not be considerable. The project-level analysis identified the potential for cumulative impacts from multiple construction projects in the same geographic region. The GSR Project's contribution to cumulative impacts would not be cumulatively considerable, as large amounts of fuel and energy would not be used in a wasteful manner during construction (less than significant).

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Collective Facilities Impacts (Consider these to be potential cumulative impacts)				
Impact 4.16-1a: Collective temporary and permanent impacts on existing land uses in the vicinity of proposed facility sites.	N/A	N/A	N/A	
Impact 4.16-1b: Collective temporary and permanent impacts on the visual character of the surrounding area.	LSM	N/A	N/A	
Impact 4.16-2: Collective exposure of people or structures to geologic and seismic hazards.	N/A	N/A	N/A	
Impact 4.16-3: Collective WSIP impacts related to flooding hazards and the degradation of surface waters.	LSM	N/A	N/A	
Impact 4.16-4: Collective loss of sensitive biological resources.	N/A	N/A	N/A	

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.16-5: Collective increase in impacts related to archaeological, paleontological, and historic resources.	N/A	N/A	N/A	
Impact 4.16-6: Collective traffic increases on local and regional roads.	PSM	N/A	N/A	
Impact 4.16-7: Collective increases in construction and operational emissions in the region.	LS	N/A	N/A	
Impact 4.16-8: Collective increases in construction-related and operational noise.	PSU	N/A	N/A	
Impact 4.16-9: Collective impacts on utilities and landfill capacity.	N/A	N/A	N/A	
Impact 4.16-10: Collective effects on recreational resources during construction.	LSM	N/A	N/A	

TABLE D-2
WSIP PEIR Impacts Consistency

PEIR Impact	PEIR Significance Determination for San Francisco Region Groundwater Project SF-2	GSR Project-level Significance Determination	Same Rationale for Significance Determination as PEIR? (Y/N)	Notes: (Explain difference in significance determinations and/or rationale for determinations)
Impact 4.16-11: Collective conversion of farmland to nonagricultural uses.	N/A	N/A	N/A	

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Land Use		
Measure 4.3-2, Facility Siting Studies: Conduct project-specific facility siting studies for non-SFPUC land and implement these studies' recommendations to avoid or minimize impacts on existing land uses.	Y	This measure has been implemented. The SFPUC completed project-specific siting studies in the Final Alternatives Analysis Report to determine the most appropriate location of the 16 proposed and 3 alternate well facility sites. Wells would be located both on lands owned by the SFPUC or owned by others. Land use criteria used in the Alternatives Analysis Report included ownership and compatibility with local zoning were used to avoid or minimize impacts to existing nearby land uses.
Measure 4.3-4a, Architectural Design: Design permanent new, aboveground facilities to be compatible with existing visual character of the site and surrounding area.	Y	The proposed aboveground facilities would have a similar appearance as other SFPUC water supply facilities. Most well facilities are not visible from scenic resources and would not alter the visual character of the surrounding areas. Further, existing topography and vegetation would provide partial screening of many proposed aboveground facilities. Additional mitigation measures are included in the GSR EIR to reduce potential impacts to scenic resources and visual character. These measures include Mitigation Measures M-AE-1b (Tree Protection Measures), M-AE-1c (Develop and Implement at Tree Replanting Plan), M-AE-3a (Implement Landscape Screening), M-CR-5a (Minimize Facilities Siting Impacts on Elements of the Historical Resource at Site 14), and M-CR-5b (Minimize Facilities Siting Impacts on Elements of the Historical Resource at Site 15). These measures provide site-specific requirements in accordance with the PEIR mitigation measure.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.3-4b, Landscaping Plans: Prepare and implement landscaping plans to restore (recontour, revegetate, landscape) sites to preconstruction conditions. Monitor landscape plantings.	Y	This measure is implemented as part of the GSR Project for all proposed well facility sites. After construction is complete, well facility sites would be restored to their general pre-construction conditions, but in accordance with the SFPUC's Vegetation Management Policy (SFPUC 2007), they may be revegetated with alternate plantings. This approach replaces the requirement for preparation and implementation of a landscaping plan in accordance with the PEIR mitigation measure, except for Sites 4, 7, and 18 (Alternate) which require implementation of Mitigation Measure M-AE-3a (Implement Landscape Screening) to reduce impacts to less than significant levels. The Project Description for Sites 10 and 13 includes landscape plan requirements.
Measure 4.3-4c, Landscape Screens: Include new plantings and landscape berms to screen views of new structures and equipment from scenic roads.	Y	The proposed aboveground facilities would be similar in appearance as other SFPUC water infrastructure facilities in San Francisco and San Mateo counties. Most well facility sites would not be visible from scenic resources or from scenic roadways. Existing topography and vegetation would provide partial screening of many proposed aboveground facilities. The well facility at Site 15 (in Golden Gate National Cemetery) would be located along Sneath Lane which is designated as a scenic roadway by the City of San Bruno. Mitigation Measure M-AE-1d (Construction Area Screening) would screen the construction activities from views along Sneath Lane. Likewise, M-AE-3a (Implement Landscape Screening) would screen views of these sites from adjacent residences or cemeteries.
Measure 4.3-4d, Minimize Tree Removal: Minimize or avoid the removal of trees that screen existing and proposed WSIP facility sites; implement tree replacement plan.	Y	See GSR Mitigation Measures M-BR-4a (Identify Protected Trees) and BR-4b (Protected Tree Replacement). Additionally, M-AE-1b (Tree Protection Measures) and M-AE-1c (Develop and Implement a Tree Replanting Plan) would minimize tree removal along El Camino Real during construction of the pipeline for Site 12.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.3-5, Reduce Lighting Effects: Use cut-off shields and nonglare fixture design, direct lighting onsite and downward, prevent use of highly reflective building materials or finishes.	Y	As part of the GSR Project Description nighttime lighting during construction would be placed away from surrounding residences and light sensitive land uses. The Project includes the development of a site-specific construction lighting plan for sites where nighttime construction lighting would be needed. The site-specific lighting plans would include elements that would be in accordance with the PEIR mitigation measure.
Geology		
Measure 4.4-1, Quantified Landslide Analysis: Avoid sites with landslide hazards; where they cannot be avoided, conduct site-specific slope stability analyses and implement recommendations.	Y	Site-specific geotechnical evaluations were completed for most sites during conceptual design of the GSR Project. Mitigation Measure M-GE-3 (Conduct Site-Specific Geotechnical Investigations and Implement Recommendations) requires that the SFPUC conduct a site-specific design-level geotechnical study for all sites selected for construction as described in Impact GE-3 and GE-4. The measure requires that facilities be designed and constructed in conformance with the specific recommendations contained in the design-level geotechnical studies. This mitigation measure meets the requirement for preparation and implementation of an individual landslide analysis in accordance with the PEIR mitigation measure.
Measure 4.4-4, Subsidence Monitoring Program: Monitor subsidence and implement corrective actions as warranted.	N	The PEIR mitigation applies to ground subsidence related to tunneling. Although the GSR Project does not include tunneling, the Project EIR included an evaluation of the potential impacts from subsidence associated with groundwater pumping. GSR Project operations would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin, and no mitigation would be needed to address subsidence impacts, as evaluated in Impact HY-7.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.4-9, Characterize Extent of Expansive and Corrosive Soil: Characterize the presence of expansive/corrosive soils; implement recommendations.	N	The presence of expansive and corrosive soils was evaluated as part of the site-specific geotechnical reports. The GSR Project would be constructed and designed in accordance with the recommendations of the site-specific geotechnical investigations to minimize the effects of any expansive soils. With incorporation of these design features, impacts related to expansive and corrosive soils would be less than significant and no mitigation is required. See Impact GE-5, The Project would not create significant risks to life or property due to expansive or corrosive soil; no mitigation would be required based on the site-specific geotechnical evaluations.
Hydrology and Water Quality		
Measure 4.5-2, Site-Specific Groundwater Analysis and Identified Measures: Conduct project-specific analysis of dewatering and implement measures to ensure that groundwater resources and the beneficial uses of groundwater are not adversely affected.	Y	See Impact HY-2. Mitigation Measure M-HY-2 (Management of Well Development and Pump Testing Discharges) would be necessary to address potential impacts to receiving waters from the discharge of dewatering effluent from well testing, including groundwater protection.
Measure 4.5-4a, Flood Flow Protection Measures: Preclude exposure of stockpiled soils, hazardous materials, and construction materials to flood flows.	Y	The proposed GSR Project construction staging areas are located outside of the designated 100-year FEMA flood hazard zone. Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would require that the construction contractor implement site-specific BMPs to protect water quality during project construction activities. No additional mitigation is necessary.
Measure 4.5-4b, Site-Specific Flooding Analysis and Identified Measures: Implement design measures to preclude projects from causing flooding or damage from redirected flood flows.	Y	GSR Project construction would not result in flooding impacts associated with impeding or redirecting flood flows as the Project would be located outside of the designated 100-year FEMA flood hazard zone, as analyzed in the evaluation of impacts under Impact HY-3.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.5-5, **Stormwater Treatment and Groundwater Monitoring:** If treated stormwater is used to maintain Lake Merced water levels, monitor surface water and groundwater quality in the vicinity of Lake Merced. Identify and implement corrective actions (e.g., treatment).	Y	The GSR Project would not discharge treated stormwater into a lake directly, however implementation of Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) would require the SFPUC to implement a lake level management program, including lake level and water quality monitoring and groundwater level elevations. The measures would require the addition of supplemental water to augment lake levels if available; and alter pumping as necessary to avoid adverse effects on Lake Merced should a supplemental water source be unavailable. Supplemental water may include treated stormwater. Mitigation Measure M-HY-9a requires monitoring for both surface water and groundwater quality at Lake Merced.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.5-6, Appropriate Source Controls and Site Design Measures: For projects located in areas not covered by a municipal stormwater permit and disturbing less than one acre of land during construction, implement appropriate source control and site design measures. These measures will ensure compliance with applicable water quality criteria and goals and protect the beneficial uses of the receiving water.	Y	Earthmoving activities associated with GSR Project construction would temporarily alter existing drainage patterns at well facility sites, including vegetation removal, grading, excavation and soil stockpiling. Construction activities could also result in the accidental release of hazardous construction chemicals, such as adhesives, solvents and fuels. If not managed appropriately, these chemicals could adhere to soil particles, become mobilized by rain or runoff, or infiltrate into groundwater, degrading water quality. Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would reduce water quality impacts during Project construction activities. Consistent with the requirements of the NPDES General Permit for Storm Water Discharges Associated with Construction Activity, at sites where more than one acre of land disturbance would occur (Sites 3, 4, 5, 6, 7, 12, 13, and 14), the SFPUC or its contractor(s) would develop a Storm Water Pollution Prevention Plan (SWPPP), submit a notice of intent to the SWRCB's Division of Water Quality and implement site-specific BMPs to prevent discharges of nonpoint-source pollutants in construction-related stormwater runoff into downstream water bodies. At sites where less than one acre of land disturbance would occur (Sites 1, 2, 8, 9, 10, 11, 15, 16, 17 Alternate, 18 Alternate, and 19 Alternate), the SFPUC or its contractor(s) would prepare and implement Erosion and Sediment Control Plans (ESCPs). The ESCP would include measures to address the overall construction of the Project and to minimize any adverse effects on water quality. This mitigation measure meets the requirement for compliance with water quality standards and to protect the beneficial uses of receiving waters in accordance with the PEIR mitigation measure.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield: The SFPUC will continue ongoing studies, including the existing groundwater and lake level monitoring programs, to determine the safe yield of the North Westside Groundwater Basin in order to avoid overdraft and associated effects including adverse effects on surface water features and seawater intrusion. Using this data, the SFPUC will develop and implement a plan identifying appropriate pumping patterns to avoid overdraft and the undesirable effects associated with overdraft. The plan will establish both a regular (average annual) and an intermittent (dry year or emergency) yield as well as a strategy for modifying pumping patterns such that the pumping levels can be sustained as an ongoing reliable water supply without depletion of groundwater storage or degradation of water quality.	N	This mitigation measure only applies to projects in the North Westside Groundwater Basin. The GSR Project would be in the South Westside Groundwater Basin. Nevertheless, the GSR Project may cause significant impacts relative to groundwater depletion, which would be reduced to less than significant through implementation of Mitigation Measures M-HY-14 (Prevent Groundwater Depletion). The mitigation measure includes provisions that GSR wells shall only be pumped when there is a positive balance in the SFPUC Storage Account, which will be adjusted for losses from the Basin due to leakage caused as a result of the Project.
Measure 5.6-2, Implementation of a Lake Level Management Plan: The SFPUC will develop and implement a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range should monitoring conducted under Measure 5.6-1 indicate the potential for adverse effects on lake levels due to groundwater pumping. The SFPUC will coordinate the implementation of this measure with Measure 5.6-1.	N	This mitigation measure is only applicable to projects in the North Westside Groundwater Basin. The GSR Project would be in the South Westside Groundwater Basin. Nevertheless, the GSR Project may cause significant impacts on Lake Merced water levels, which would be reduced to less than significant through implementation of Mitigation Measures M-BR-7 (Lake Level Management for Water Levels Increases for Lake Merced), M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced). These mitigation measures include monitoring and provisions to manage both increasing and decreasing Lake Merced lake levels to the extent such lake level changes are caused by the Project.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 5.6-5, Drinking Water Source Assessments for Groundwater Wells: As required by the California Department of Health Services and incorporated as part of the WSIP, the SFPUC will prepare drinking water source assessments for groundwater wells constructed under the Local and Regional Groundwater Projects (SF-2) and will update these assessments every five years. If the assessment indicates no potential for contamination, then no mitigation is required. However, for wells that are considered vulnerable to contamination on the basis of the drinking water source assessment, the SFPUC will develop and implement a source water protection program specifying actions and a program to be implemented to prevent contamination of the drinking water source. The source water protection program could include nonregulatory components such as watershed restoration, stormwater monitoring, groundwater monitoring, and public education to protect drinking water quality. Land use planning, permitting, and possibly more restrictive regulatory methods may also be implemented by the local municipality where a threat to drinking water quality is indicated, and management of potential sources of microbiological or direct chemical contamination to eliminate or reduce the risk of contamination of the water supply may be considered. The SFPUC will encourage public participation in the development of the program and will update the program every five years along with the drinking water source assessments.	Y	Preliminary Drinking Water Source Assessment and Protection Program (DWSAP) reports for most well sites were prepared by the SFPUC as part of the conceptual design of the GSR Project. The preliminary DWSAPs indicate that groundwater at these sites may be vulnerable to contamination from nearby land use activities. However, the analysis of the site-specific conditions in Impact HY-12 concluded that, in the South Westside Groundwater Basin, known contamination is located near the ground surface, the GSR wells would be screened from 240 feet to 700 feet below ground surface, and the Primary Production Aquifer where the GSR wells would be pumping from is generally disconnected hydraulically from most occurrences of shallow groundwater zones. In addition, the GSR Project would decrease the downward gradient over the long term, therefore decreasing the risk of contamination. Therefore, the analysis concludes that impacts relative to contamination of the drinking water source would be less than significant, and no mitigation would be required.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Biology		
Measure 4.6-1a, Wetlands Assessment: Wetland scientist will determine whether wetlands could be affected by the project, and, if so, perform a wetland delineation and develop mitigation.	N	See Impacts BR-3 and BR-8. A wetlands assessment was performed in support of the Project-level analysis, which included an evaluation of potential effects on wetland habitats at Lake Merced. Although no wetlands or open waters regulated under federal or State law would be directly impacted by the Project, Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would be implemented to protect surrounding waterways from construction-related runoff and sedimentation, reducing potential indirect impacts to less than significant. Implementation of Mitigation Measures M-BR-8 (Lake Level Management for No-Net-Loss of Wetlands for Lake Merced), and Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) would reduce potential Project impacts on wetlands at Lake Merced to less-than-significant levels.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources: If a WSIP project will affect jurisdictional wetlands, implement avoidance measures, restoration procedures, and compensatory creation or enhancement to ensure no net loss of wetland extent or function. Compensate for sensitive riparian and upland habitats supporting key special-status species. Obtain permits for each project and comply with applicable regulations addressing sensitive habitats and species. The Habitat Reserve Program is an alternative for implementing offsite habitat compensation.	Y	No wetlands or open waters regulated under federal or State law would be directly impacted by the GSR Project; however, Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would be implemented to protect surrounding waterways from construction-related runoff and sedimentation, reducing potential indirect impacts to less than significant. Implementation of Mitigation Measures M-BR-8 (Lake Level Management for No-Net-Loss of Wetlands for Lake Merced), and Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) would reduce potential Project impacts on wetlands at Lake Merced to less-than-significant levels. See also Mitigation Measure M-BR-2 (Avoid Disturbance to Riparian Habitat), which would require the avoidance of riparian habitat. The mitigation measure requires installation of temporary fencing to demarcate the boundary for construction at these sites. This mitigation measure is consistent with the PEIR mitigation measure and is specific to the Project requirements. Therefore, no wetland impacts would require compensatory mitigation.
Measure 4.6-2, Habitat Restoration/Tree Replacement: Restore temporarily affected sensitive habitats. Replace trees designated as heritage trees (or similar local designation) consistent with requirements of local ordinances. Minimize loss of sensitive habitats by coordinating WSIP projects.	Y	See Mitigation Measures M-BR-4a (Identify Protected Trees) Mitigation Measure M-AE-1b (Tree Protection Measures), and Mitigation Measure M-BR-4b (Protected Tree Replacement). The project-level mitigation measures require implementation of protective measures to avoid or minimize impacts on mature native trees during construction, and if removal is necessary, to plant replacement trees at or in close proximity to the removal sites to the extent feasible. If replanting trees on the same location is not feasible or could result in damage to the proposed improvements, the SFPUC shall designate a suitable planting site elsewhere in the Project area. These mitigation measures are consistent with the PEIR mitigation measure and are specific to the GSR Project requirements.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)		Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern: Where key special-status species and other species of concern are potentially present, implement general practice measures (preconstruction surveys, worker awareness program, environmental inspector, minimization of habitat loss).		Y	See Mitigation Measures M-BR-1a (Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors), M-BR-1b (Protection Measures for Special-status Bats during Tree Removal or Trimming), and M-BR-1d (Monarch Butterfly Protection Measures). The project-level measures are consistent with the PEIR measure and provide additional site- and project-specific details where key special-status species and other species of concern are potentially present. These mitigation measures are consistent with the PEIR mitigation measure and are specific to the GSR Project requirements.
Measure 4.6-3b, Standard Mitigation Measures for Key Special-Status Plants and Animals: Implement measures to reduce impacts on key special-status species. *See below for specific species and corresponding sub-PEIR mitigation number.*			
Invertebrates			
Valley Elderberry Longhorn Beetle	I.1	N	Species not identified in GSR Project vicinity.
Vernal Pool Crustaceans (Vernal Pool Fairy Shrimp; Conservancy Fairy Shrimp; Vernal Pool Tadpole Shrimp)	I.2	N	Species not identified in GSR Project vicinity.
Bay Checkerspot Butterfly; Callippe Silverspot Butterfly	I.3	N	Species not identified in GSR Project vicinity.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)		Applicable to Proposed Project (Y/N)?	Discussion
Fish			
Central Valley Fall- and Late-Fall-Run DPS Chinook Salmon; Central Valley DPS Steelhead; Green Sturgeon Southern District DPS; Central Coast DPS Steelhead; Rainbow Trout	F.1	N	Species not identified in GSR Project vicinity.
Reptiles and Amphibians			
California Red-Legged Frog; Foothill Yellow-Legged Frog	RA.1	N	Species not identified in GSR Project vicinity.
California Tiger Salamander	RA.2	N	Species not identified in GSR Project vicinity.
San Francisco Garter Snake	RA.3	N	Species not identified in GSR Project vicinity.
Alameda Whipsnake	RA.4	N	Species not identified in GSR Project vicinity.
Birds			
Swainson's Hawk	B.1	N	Species not identified in GSR Project vicinity.
Western Burrowing Owl	B.2 and B.3	N	Species not identified in GSR Project vicinity.
Raptors (including Bald Eagle)	B.4	Y	See Mitigation Measure M-BR-1a (Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors).
Least Bell's Vireo	B.5	N	Species not identified in GSR Project vicinity.
California Black Rail, California Clapper Rail	B.6	N	Species not identified in GSR Project vicinity.
Western Snowy Plover	B.7	N	Species not identified in GSR Project vicinity.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)		Applicable to Proposed Project (Y/N)?	Discussion
Mammals			
Salt Marsh Harvest Mouse	M.1	N	Species not identified in GSR Project vicinity.
San Joaquin Kit Fox	M.2	N	Species not identified in GSR Project vicinity.
Riparian Woodrat	M.3	N	Species not identified in GSR Project vicinity.
Vernal Pool Plants			
Succulent Owl's Clover; Hoover's Spurge; Colusa Grass; San Joaquin Valley Orcutt Grass; Greene's Tuctoria; Hairy Orcutt Grass)	P.1	N	Species not identified in GSR Project vicinity.
Riparian Plants			
Delta Button-Celery	P.2	N	Species not identified in GSR Project vicinity.
Large-Flowered Fiddleneck	P.3	N	Species not identified in GSR Project vicinity.
San Francisco Woolly Sunflower; Marin Western Flax; Fountain Thistle	P.4	N	Species not identified in GSR Project vicinity.
Measure 4.6-4, Pipeline and Water Treatment Plant Treated Water Discharge Restrictions: Design planned discharges from the WSIP pipelines and water treatment plants to natural water bodies to minimize impacts on riparian and aquatic resources and to avoid or minimize temperature effects on aquatic resources.		N	The project-level analysis determined that mandatory compliance with the Waste Discharge Requirements for the SFPUC Drinking Water Transmission System and SFPUC Standard Operating Protocols would ensure that water quality impacts due to discharges of treated water from existing and newly installed pipelines during construction would be less than significant. Planned discharges of groundwater during well maintenance activities would be sent to either the local sanitary sewer system or the storm drain system. Planned discharges to the storm drain system would be dechlorinated and pH adjusted prior to discharge, so that eventual discharge to a surface water from the storm drain would not impact riparian and aquatic resources.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Cultural		
Measure 4.7-1, Suspend Construction Work if Paleontological Resource Is Identified: Suspend work and notify a qualified paleontologist when a paleontological resource is discovered at any of the project sites. The paleontologist will document the discovery as needed, evaluate the potential resource, and assess the significance of the find under CEQA criteria. Temporarily halt or divert excavation within 50 feet of a fossil find until the discovery is examined by a paleontologist. If avoidance is not feasible, the paleontologist will prepare an excavation plan.	Y	The project-level measures specify more stringent requirements than the PEIR measure due to the high potential to encounter paleontological resources during construction. Specific requirements include a paleontological resources training for construction workers, a paleontological resources monitoring program, and assessment and salvage of fossil finds, as applicable. See Mitigation Measure M-CR-3 (Suspend Construction Work if a Paleontological Resource is Identified).
Measure 4.7-2a, Archaeological Testing, Monitoring, and Treatment of Human Remains: Determine if implementation of an archaeological testing or archaeological monitoring program or both is the appropriate strategy for avoidance of potential adverse effects on significant archaeological resources. Review any requirements approved by the State Historic Preservation Officer. Prepare an archaeological testing plan, archaeological monitoring plan, final archeological resources report and, if applicable, an archaeological data recovery plan. The treatment of human remains and of associated or unassociated funerary objects discovered during any soil-disturbing activity will comply with applicable state laws.	Y	Although no known human burial locations have been identified within the GSR Project area, the EIR measure addresses the possibility of discovery during construction activities. See Mitigation Measure M-CR-4 (Accidental Discovery of Human Remains).

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.7-2b, Accidental Discovery Measures: Distribute archaeological resource "ALERT" sheet to contractors. If an archaeological resource may be present within the project site, an archaeological consultant will evaluate it and make a recommendation as to what action (e.g., preservation in situ) is warranted. The SFPUC will implement appropriate measures.	Y	No archaeological sites were identified within any of the GSR Project construction areas. However, at Site 11, there is some potential that remnants of a known archaeological site may still exist. See Mitigation Measure M-CR-2 (Discovery of Archaeological Resources). This mitigation measure requires the SFPUC and its contractors to adhere to appropriate procedures and protocols for minimizing impacts on any previously unrecorded and buried (or otherwise obscured) archaeological deposits, in the event that a possible archaeological resource is discovered during construction activities. This mitigation measure is consistent with the PEIR mitigation measure and is specific to the Project requirements.
Measure 4.7-3, Protection of Historic Districts: A qualified historian will assess the city's water system facilities affected by WSIP facility projects for their potential contribution to a historic district. If a historic district would be affected by one or more proposed WSIP facility project(s), develop and implement mitigation measures for effects with attention to the potential district as a whole. If a historic district is identified at the project level, it should be recorded as such, using National/California Register criteria of significance. Document the district by completing the State of California Department of Parks and Recreation Form 523 and submit to the State Historic Preservation Officer.	N	The GSR Project would not affect any portion of the City's water system facilities, except connection to underground pipelines, which would have no adverse effect on any potential historic district associated with the City's water system facilities.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.7-4a, Alternatives Identification and Resource Relocation: Identify feasible project alternatives to eliminate or reduce the need for demolition or removal of a historic resource to the greatest extent possible. If preservation of the affected historical resource at the current site is determined to be infeasible, the structure will be stabilized and relocated to other appropriate nearby sites, if feasible. After relocation, the resource will be treated according to the Secretary of the Interior's *Standards for the Treatment of Historic Properties.* If the affected historic resource is to be demolished, consult with local historical societies and governmental agencies regarding salvage of materials for public information or reuse in other locations.	N	The project-level measures are consistent with the PEIR measure and provide additional site- and project-specific details to protect historic resources at Sites 14 and 15. No other proposed GSR well facility sites would have significant impacts on historic resources. These mitigation measures are consistent with the PEIR mitigation measure and are specific to the Project requirements. See Mitigation Measure M-CR-5a (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 14) and Mitigation Measure M-CR-5b (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 15).
Measure 4.7-4b, Historical Resources Documentation: Prepare documentation of historic resources prior to any construction work associated with demolition or removal. The appropriate level of documentation will be selected by a qualified professional who meets the standards for history, architectural history, and/or architecture (as appropriate) set forth by the Secretary of the Interior's *Professional Qualification Standards* (36 CFR 61) in consultation with a preservation specialist assigned by the San Francisco Planning Department and the local jurisdiction, if deemed appropriate by the Planning Department.	N	As part of the GSR EIR analysis, an architectural historian, who meets the standards set for by the Secretary of Interior's Standards, was retained to evaluate impacts to historic resources. The evaluation identified significant impacts only at Sites 14 and 15. See Mitigation Measure M-CR-5a (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 14) and Mitigation Measure M-CR-5b (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 15).

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.7-4c, Secretary of the Interior's Standards for the Treatment of Historic Properties: Prepare materials describing and depicting the proposed project. Review the proposed project for compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. If a project is determined to be inconsistent with the *Standards for the Treatment of Historic Properties*, pursue and implement redesign of the project such that consistency with the standards is achieved.	Y	The project-level measures are consistent with the PEIR measure and provide additional site- and project-specific details to protect historic resources at Sites 14 and 15. No other proposed GSR well facility sites would have significant impacts on historic resources. These mitigation measures are consistent with the PEIR mitigation measure, are specific to the Project requirements, and reduce impacts to less than significant under CEQA. See Mitigation Measure M-CR-5a (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 14) and Mitigation Measure M-CR-5b (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 15).
Measure 4.7-4d, Historic Resources Survey and Redesign: Undertake a historic resources survey to identify and evaluate potential historic resources that may exist in the project's area of potential effect. If a survey identifies one or more historical resources, assess the impact the project may have on those historical resources. If the project will cause a substantial adverse change to a historic resource, assign a preservation specialist to review the proposed project for compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. If the project is determined to be inconsistent with those standards, pursue and implement redesign of the project such that consistency with the standards is achieved.	Y	As part of the GSR EIR analysis, a historic resources survey was undertaken within the Project's area of potential effect. The resources that were identified were evaluated, and significant impacts were identified at Sites 14 and 15. These mitigation measures are consistent with the PEIR mitigation measure, are specific to the Project requirements, and reduce impacts to less than significant under CEQA. See Mitigation Measure M-CR-5a (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 14) and Mitigation Measure M-CR-5b (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 15).

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.7-4e, Historic Resources Protection Plan: A qualified historian will prepare a plan that specifies procedures for protecting and monitoring historic resources during construction.	Y	The project-level measures are consistent with the PEIR measure and provide additional site- and project-specific details to protect historic resources at Sites 14 and 15. No other proposed GSR well facility sites would have significant impacts on historic resources. These mitigation measures are consistent with the PEIR mitigation measure and are specific to the Project requirements. See Mitigation Measure M-CR-5a (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 14) and Mitigation Measure M-CR-5b (Minimize Facilities Siting Impacts on Elements of the Historical Resources at Site 15), which include monitoring of potential impacts on historic resources during construction.
Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring: Include geotechnical investigations if vibration-related impacts could affect historic resources. Follow recommendations of the final geotechnical reports. Conduct a preconstruction survey of existing conditions and monitor the adjacent buildings for damage during construction, if recommended.	Y	See Impact NO-2. The project-level analysis determined that construction-related groundborne vibration would be below the significance thresholds, except at Site 15, which is located within a potential historic district, because of nearby pipeline construction. See Mitigation Measure M-NO-2 (Reduce Vibration Levels during Construction of Pipelines).

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Traffic		
Measure 4.8-1a, Traffic Control Plan Measures: Elements of the traffic control plan could include: circulation and detour plans, designated truck routes, sufficient staging area, access to driveways, use of standard construction specifications for controlling construction vehicle movements, restrictions on truck trips during peak morning and evening commute hours, lane closure restrictions, maintenance of alternate one-way traffic flow, detour signing, pedestrian and bicycle access and circulation, equipment and materials storage, construction worker parking, roadside safety protocols, considerations for sensitive land uses, coordination with local transit service providers, roadway repair, and conformance with the state's *Manual of Traffic Controls for Construction and Maintenance Work Areas*.	Y	See Mitigation Measure M-TR-1 (Traffic Control Plan). The project-level mitigation measure has been tailored to specify those elements appropriate to the proposed Project. The mitigation measure specifies that traffic control plans conform to the applicable provisions of the state's *Manual of Traffic Controls for Construction and Maintenance Work Areas.*
Measure 4.8-1b, Coordination of Individual Traffic Control Plans: In the event that more than one construction contract is issued for work along existing or new pipelines, and where construction could occur within and/or across multiple streets in the same vicinity, coordinate the traffic control plans in order to mitigate the impact of traffic disruption by including measures that address overlapping construction schedules and activities, truck arrivals and departures, lane closures and detours, and the adequacy of on-street staging requirements.	Y	See Mitigation Measure M-C-TR-1 (Coordinate Traffic Control Plan with other SFPUC Construction Projects). The mitigation measure specifies that the SFPUC and its construction contractors shall coordinate traffic control plans for overlapping construction.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.8-4, Accommodation of Displaced Public Parking Supply for Recreational Visitors: Include an additional measure in the traffic control plans to accommodate any anticipated visitor parking demand that would be displaced by proposed projects at public recreational facilities.	N	No recreational parking would be displaced under the GSR Project.
Air Quality		
Measure 4.9-1a, SJVAPCD Dust Control Measures: Include San Joaquin Valley Air Pollution Control District (SJVAPCD) Basic Control Measures in contract specifications for all construction sites. Include SJVAPCD Enhanced Control Measures in contract specifications when required to mitigate significant PM10 impacts. Include SJVAPCD Additional Control Measures in contract specifications for construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions. Include SJVAPCD Rule 9510, Indirect Source Review, Section 6.1, Construction Equipment Emissions in contract specifications for any project subject to discretionary approval by a public agency that ultimately results in the construction of a new building, facility, or structure or reconstruction of a building, facility, or structure for the purpose of increasing capacity or activity and also involving 9,000 square feet of space.	N	The GSR Project would not be located within the jurisdiction of the SJVAPCD.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.9-1b, SJVAPCD Exhaust Control Measures: Include SJVAPCD Exhaust Control Measures in contract specifications, where applicable, for heavy-duty equipment to limit exhaust emissions within the San Joaquin Region.	N	The GSR Project would not be located within the jurisdiction of the SJVAPCD.
Measure 4.9-1c, BAAQMD Dust Control Measures: For projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, include Bay Area Air Quality Management District (BAAQMD) Basic Control Measures in contract specifications for all construction sites. Include BAAQMD Enhanced Control Measures in contract specifications for sites over four acres. Include BAAQMD Optional Control Measures in contract specifications for sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions.	Y	See Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures [All Sites]). The project-level mitigation is consistent with the BAAQMD guidelines and significance thresholds utilized in the GSR Project EIR for assessing and mitigating air quality impacts.
Measure 4.9-1d, BAAQMD Exhaust Control Measures: For projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, include BAAQMD Exhaust Control Measures to limit exhaust emissions, where applicable.	Y	See Mitigation Measure M-AQ-2b (NOx Reduction during Construction of Alternate Sites). The project-level mitigation is consistent with the BAAQMD guidelines and the significance thresholds utilized in the GSR Project EIR for assessing and mitigating air quality impacts.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.9-2a, Health Risk Screening or Use of Soot Filters: Complete a health risk screening if truck volumes associated with a particular project along a particular haul route exceed 40,000 truck trips over the entire construction period. If a potentially significant impact is indicated, complete a site-specific health risk assessment. Consider diesel particulate matter (DPM) emission rates in separate project-level analysis at the time of construction. Develop a mitigation program based on the site-specific health risk assessment implementing methods of reducing DPM emission or exposure to a less-than-significant level.	Y	The health risk assessment conducted as part of the GSR EIR analysis determined that DPM exposure exceeded the BAAQMD's cancer and non-cancer risk thresholds, utilized as significance in the GSR EIR, at Group 3 for Sites 5, 6, and 7 (On-site Treatment). Mitigation Measure M-AQ-3 (Construction Health Risk Mitigation) would be implemented to reduce construction emissions to less-than-significant levels, as discussed in GSR Section 5.8, Air Quality under Impact AQ-3.
Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley: Vacate the two SFPUC Land Managers' residences in the Sunol Valley during construction of the Calaveras Dam or SVWTP – Treated Water Reservoirs projects or complete a health risk screening (and, if warranted, a health risk assessment) to determine health risks at these residences from either of these two projects.	N	The GSR Project would not be located in Sunol Valley.
Measure 4.9-3, Tunnel Gas Odor Control: Add water scrubbers and appropriate chemicals to tunnel ventilation systems if odorous gases become a nuisance odor problem (i.e., odor complaints are received).	N	The GSR Project would not include tunneling.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Noise/Vibration		
Measure 4.10-1a, Noise Controls: For all WSIP projects located within 500 feet of any noise-sensitive receptors, implement appropriate noise controls to reduce daytime construction noise levels to meet the 70-dBA daytime speech interference criterion to the extent feasible. For all WSIP projects involving nighttime construction and located within 3,000 feet of any noise-sensitive receptors, implement appropriate noise controls to maintain noise levels at or below any applicable ordinance nighttime noise limits or the 50-dBA nighttime sleep interference criterion to the extent feasible.	Y	See Impact NO-1. Mitigation Measure M-NO-1 (Noise Control Plan) requires the SFPUC to retain a qualified noise consultant to prepare a Noise Control Plan and the SFPUC will approve the Noise Control Plan and ensure that it is implemented to ensure compliance with local noise ordinances to the extent feasible. However, under the GSR Project, even with implementation of this mitigation measure, the conflict with a local ordinance from required daytime construction and nighttime drilling and pump-testing at some well sites would be significant and unavoidable. See also Impact NO-3. Mitigation Measure M-NO-3 (Expanded Noise Control Plan) requires the SFPUC to retain a qualified noise consultant to prepare a Noise Control Plan and the SFPUC will approve the Noise Control Plan and ensure that it is implemented to reduce construction noise levels at nearby noise-sensitive land uses to meet the 70-dBA daytime and 50-dBA nighttime criteria to the extent feasible. However, even with implementation of this mitigation measure, the impact from required daytime construction and nighttime drilling and pump-testing at some well sites would be significant and unavoidable.
Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal: Vacate caretaker's residence at Tesla Portal during construction of the Advanced Disinfection and Tesla Portal Disinfection Station projects as well as those portions of the San Joaquin Pipeline System and Rehabilitation of Existing San Joaquin Pipelines projects located at Tesla Portal.	N	The GSR Project would not be located at the Tesla Portal.
Measure 4.10-2a, Limit Hourly Truck Volumes: Haul and delivery truck routes for all WSIP projects will, to the extent feasible, avoid local residential streets and follow local designated truck routes. Total project-related haul and delivery truck volumes on any particular haul truck route will be limited to 80 trucks per hour.	N	See Impact NO-4. Construction-related vehicle trips would not result in substantial temporary increases in ambient noise levels along construction access routes. Although the GSR Project requires construction in residential areas and along residential streets, anticipated hourly truck volumes would not result in a significant impact, and no mitigation would be needed.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.10-2b, Restrict Truck Operations: Prohibit haul and delivery trucks from operating within 200 feet of any residential uses during the nighttime hours. For receptors beyond 200 feet from a haul route, limit noise levels to the 50-dBA sleep interference criterion at the closest receptor.	N	See Impact NO-4. Although there are residential uses within 200 feet of several proposed GSR sites, construction-related vehicle trips would not result in substantial temporary increases in ambient noise levels along construction access routes, because haul and delivery trucks would not be used during nighttime hours.
Measure 4.10-2c, Vacate SFPUC Land Manager's Residence: Vacate Land Manager's residence adjacent to Alameda East Portal during offsite truck operations associated with the New Irvington Tunnel project, if truck operations occur during the nighttime hours (10 p.m. to 7 a.m.) and are estimated to exceed the 50-dBA sleep interference criterion at this residence.	N	The GSR Project would not be located near the SFPUC Land Manager's Residence.
Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage: Incorporate restrictions into all contract specifications (primarily for sheetpile driving, pile driving, or tunnel construction activities), whereby surface vibration will be limited to 0.2 inch/second peak particle velocity (PPV) for continuous vibration (e.g., vibratory equipment and impact pile drivers) and 0.5 inch/second PPV for controlled detonations at the closest receptors to ensure that cosmetic or structural damage does not occur.	Y	See Impact NO-2. The project-level analysis determined that construction-related groundborne vibration would be below the significance thresholds except for Sites 3, 4, 12, 15, and 18 (Alternate). Mitigation Measure M-NO-2 (Reduce Vibration Levels during Construction of Pipelines) would apply to these sites.
Measure 4.10-3b, Limit Vibration Levels At or Below Vibration Perception Threshold: Maintain vibration levels at or below the vibration perception threshold at adjacent properties to the extent feasible during nighttime. If vibration complaints are received, operational adjustments will be made to reduce vibration annoyance effects.	Y	See Impact NO-2. The project-level analysis determined that construction-related groundborne vibration would be below the significance thresholds except for Sites 3, 4, 12, 15, and 18 (Alternate). Mitigation Measure M-NO-2 (Reduce Vibration Levels during Construction of Pipelines) would apply to these sites.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.10-3c, Limit Tunnel-Related Detonation to Daylight Hours: Limit controlled detonation associated with tunnel construction to daylight hours, Monday through Saturday.	N	The GSR Project would not include tunneling.
Services/Utilities		
Measure 4.11-1a, Notify Neighbors of Potential Utility Service Disruption: Notify residents and businesses in project area of potential utility service disruption two to four days in advance of construction.	Y	See Impact UT-1. GSR Project construction may result in temporary utility service disruption for residences or businesses. Mitigation Measure M-UT-1e (Advance Notification) requires two- to four-day advanced notice for all disruptions.
Measure 4.11-1b, Locate Utility Lines Prior to Excavation: Locate overhead and underground utility lines prior to excavation work.	Y	See Mitigation Measures M-UT-1a (Confirm Utility Line Information) and M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities).
Measure 4.11-1c, Confirmation of Utility Line Information: Find the exact location of underground utilities by safe and acceptable means. Confirm information regarding the size, color, and location of existing utilities before construction activities commence.	Y	See Mitigation Measures M-UT-1a (Confirm Utility Line Information) and M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities).
Measure 4.11-1d, Safeguard Employees from Potential Accidents Related to Underground Utilities: While any excavation is open, protect, support, or remove underground utilities as necessary to safeguard employees.	Y	See Mitigation Measures M-UT-1a (Confirm Utility Line Information) and M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities).
Measure 4.11-1e, Notify Local Fire Departments: Notify local fire departments any time damage to a gas utility results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety.	Y	See Mitigation Measure M-UT-1d (Emergency Response Plan).

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.11-1f, Emergency Response Plan: Develop an emergency response plan in the event of a leak or explosion prior to commencing construction activities.	Y	See Mitigation Measure M-UT-1d (Emergency Response Plan).
Measure 4.11-1g, Prompt Reconnection of Utilities: Promptly reconnect any disconnected utility lines.	Y	See Mitigation Measures M-UT-1a (Confirm Utility Line Information) and M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities).
Measure 4.11-1h, Coordinate Final Construction Plans with Affected Utilities: Coordinate final construction plans and specifications with affected utilities.	Y	See Mitigation Measures M-UT-1a (Confirm Utility Line Information) and M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities).
Measure 4.11-2, Waste Reduction Measures: Incorporate into contract specifications for each WSIP project the requirement to obtain any necessary waste management permits prior to construction and to comply with conditions of approval attached to project implementation.	N	See Mitigation Measure M-UT-4 (Waste Management Plan).
Recreation		
Measure 4.12-1, Coordination with Golf Course/Recreational Facility Managers: Coordinate with managers of golf courses or other recreational facilities directly affected by pipeline construction to minimize adverse impacts on golfers and other recreational users.	N	The GSR Project Description includes notification of the Jefferson Elementary School District (which includes athletic fields used for recreation) a minimum of nine months prior to construction at school sites. The Project also includes obtaining easements from the Lake Merced Golf Club for placement of a well facility at Site 1. The facility at Site 1 would not be located within the area of play, and construction would not substantially damage this recreational resource.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.12-2, Appropriate Siting of Proposed Facilities: Locate WSIP project facilities on park and recreation properties in consultation with park planning staff to minimize the direct loss of recreation and play space and to minimize inconvenience to park and recreation users.	N	This PEIR mitigation measure was implemented during conceptual design of the GSR Project. Several proposed well facility sites would be located at or near a recreational facility, including construction in athletic fields at local schools and at the Lake Merced Golf Club. As part of Project implementation, construction schedules would be altered to avoid construction during the school year to minimize loss of play space. The Project Description commits the SFPUC to repairing or replacing the existing baseball backstop at Site 3; temporarily removing and then replacing the baseball backstop at Site 4; returning the athletic fields to pre-project conditions; and financially compensating the Lake Merced Golf Club for the loss of a restroom. The site to be located at the Lake Merced Golf Club would not be within the area of play, and construction would not substantially damage this recreational resource. Implementation of mitigation measures to control construction noise and construction dust would reduce the impact on the quality of the recreational experience at the golf club and athletic fields to a less-than-significant level.
Agriculture		
Measure 4.13-1a, Supplemental Noticing and Soil Stockpiling: For the San Joaquin Pipeline projects (San Joaquin System and Rehabilitation of Existing San Joaquin Pipeline), stockpile and replace topsoil in mapped areas of Prime and Unique Farmland and Farmland of Statewide Importance that would be temporarily disturbed by pipeline construction, unless other actions are required under specific agreements with individual landowners.	N	The GSR Project would not be located in the San Joaquin Region.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.13-1b, Avoidance or Soil Stockpiling: Minimize any potential impacts on agricultural lands in the Sunol Valley by avoiding these resources wherever possible. Where this is not possible, stockpile, replace, and hydroseed topsoil to prevent erosion, unless other actions are required as a result of contracts affecting use of the property or under specific agreements with individual landowners.	N	The GSR Project would not be located in the Sunol Valley.
Measure 4.13-2, Siting Facilities to Avoid Prime Farmland: Avoid areas identified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. If avoidance is not feasible, adopt a permanent set-aside for an equivalent acreage of similarly valued farmland in the area.	N	No impacts to agricultural resources would occur from GSR Project construction.
Hazards		
Measure 4.14-1a, Site Health and Safety Plan: For all projects where the site assessment indicates the potential to encounter hazardous materials, prepare a site health and safety plan identifying the chemicals present, potential health and safety hazards, monitoring, soil-handling methods, appropriate personnel protective equipment, and emergency response procedures.	Y	See Mitigation Measure M-HZ-2b (Health and Safety Plan) and M-HZ-2c (Hazardous Materials Management Plan). The project-level mitigation measures combines the requirements for a site health and safety plan and materials disposal plan required in PEIR Measures 4.14-1a and 4.14-1b.
Measure 4.14-1b, Materials Disposal Plan: For all projects where the site assessment indicates the potential to encounter hazardous materials in the soil, prepare a materials disposal plan that specifies the disposal method and approved disposal site for the soil.	Y	See Mitigation Measure M-HZ-2b (Health and Safety Plan) and Mitigation Measure M-HZ-2c (Hazardous Materials Management Plan). The project-level mitigation measures combines the requirements for a site health and safety plan and materials disposal plan required in PEIR Measures 4.14-1a and 4.14-1b.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.14-1c, Coordination with Property Owners and Regulatory Agencies: Based on regulatory agency file reviews, assess the potential to encounter unacceptable levels of hazardous materials at known environmental cases, for construction activities to cause groundwater plume migration or interfere with ongoing remediations at known environmental cases, and for increased water levels in reservoirs or lakes to inundate known environmental cases. Modify construction or remediation activities.	Y	The project-level analysis evaluated the potential for encountering contaminated soils and groundwater during GSR Project construction. Mitigation Measure M-HZ-2a (Preconstruction Hazardous Materials Assessment) is included to require a preconstruction hazardous materials assessment within three months of construction to identify new hazardous materials sites or substantial changes in the extent of contamination at known groundwater contamination sites that could affect subsurface conditions at proposed well facility sites. The Project-specific analysis concludes that construction activities would not cause groundwater plume migration or interfere with remediation activities during construction. The Project does not include construction activities that would cause increase water levels at reservoirs or lakes. Operation of the Project may cause increased water levels at Lake Merced, as described in Impact BR-7. This significant impact would be mitigated to less-than-significant levels through implementation of Mitigation Measure M-BR-7 (Lake Level Management for Water Levels).
Measure 4.14-2, Health Risk Screening and Airborne Asbestos Monitoring Plan: For tunneling projects where soil or rock may contain naturally occurring asbestos, conduct a health risk screening assessment to identify acceptable levels of asbestos in tunnel emissions. Prepare an airborne asbestos monitoring plan for approval by the BAAQMD.	N	The GSR Project would not include tunneling and would not disturb a rock unit or soil that contains naturally occurring asbestos. See GSR Section 5.15.1 (Setting) in Section 5.15, Geology and Soils.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.14-5, Hazardous Building Materials Surveys and Abatement: For all WSIP projects involving demolition or renovation of existing facilities, perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, implement adequate abatement practices prior to demolition or renovation.	N	The SFPUC would be required to assess and abate hazardous building materials from demolition of the restroom at Site 1 and well with structure at Site 14 in accordance with applicable laws and regulations. Therefore, since the impact was determined to be less than significant, implementation of PEIR Mitigation Measure 4.14-5 is not required.
Energy		
Measure 4.15-2, Incorporation of Energy Efficiency Measures: Consistent with the Energy Action Plan II priorities for reducing energy usage, ensure that energy-efficient equipment is used in all WSIP projects. Prepare a repair and maintenance plan for each facility to minimize power use. Evaluate the potential for use of renewable energy resources.	N	See Impact ME-2. The collective energy demand of the GSR Project well facilities, the Partner Agencies' well facilities, and the SFPUC regional water system would remain at approximately 61 million kW, and the proposed Project would not cause an increase in energy use. Therefore, no mitigation is needed. However, the SFPUC would incorporate all applicable energy efficiency measures into the project design. Projects with building components will attempt to maximize energy efficiency by exceeding Title 24 minimum requirements by at least 20 percent and meet or exceed LEED Silver certification.
Collective Impacts		
Measure 4.16-1a, Construction Coordination at Irvington Portal: If construction schedules of multiple WSIP projects occurring at and near Irvington Portal coincide or overlap, the SFPUC will coordinate with construction contractor(s) and neighbors to minimize disturbance of residents in the adjacent neighborhood to the extent practicable. Such coordination will need to balance the duration of construction with the magnitude of construction-related impacts on the same sensitive receptors.	N	The GSR Project would not be located at the Irvington Portal.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Collective Impacts (cont.)		
Measure 4.16-4a, Bioregional Habitat Restoration Measures: Address the following bioregional effects and implement conservation principles when implementing habitat compensation mitigation required for individual WSIP facility projects: compound impacts on functional units of habitat as WSIP projects simplify vegetation structure and increase "edge" (the boundary between two different habitats); increased habitat impacts due to the spread of weedy, non-native plant species; genetic diversity impacts on small populations; impacts on wildlife movement due to habitat fragmentation; suppression of natural disturbance regimes; and reduced population recovery opportunities from stochastic events.	N	The GSR Project's contribution to cumulative effects on biological resources would be mitigated with project-specific mitigation measures and therefore would not require implementation of bioregional habitat restoration measures.
Measure 4.16-4b, Coordination of Construction Staging and Access: Coordinate construction contractor(s) to minimize surface disturbance when construction schedules for WSIP projects affecting the same areas overlap.	N	The only overlap in construction staging areas would occur at Site 8. At Site 8, the construction area for the Peninsula Pipelines Seismic Upgrade Project would overlap with the construction area for the well facility at Site 8. No significant biological impacts are projected to occur at Site 8, and therefore there is no need for mitigation no coordinate staging and access areas.
Measure 4.16-6a, SFPUC WSIP Projects Construction Coordinator: Identify a qualified construction coordinator to coordinate project-specific traffic control plans; develop a public information campaign to inform the public of construction activities, detour routes, and alternate routes; and work with local and regional agencies to pursue additional traffic mitigation measures and incorporate such measures into the project-specific traffic control plans.	Y	See Mitigation Measure M-C-TR-1 (Coordinate Traffic Control Plan with other SFPUC Construction Projects). The PEIR measure for a SFPUC WSIP project construction coordinator is incorporated into the Project-level measure for cumulative impacts.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Collective Impacts (cont.)		
Measure 4.16-6b, Combined San Joaquin Traffic Control Plan: Develop a San Joaquin Traffic Control Plan that coordinates the project-specific traffic control plans and identifies additional measures (consistent with the standards of San Joaquin County, Stanislaus County, and Caltrans) to minimize the combined impacts of multiple WSIP project construction traffic on I-580, Chrisman Road, and Vernalis Road.		The GSR Project would not be located in San Joaquin County.
Measure 4.16-6c, Combined Sunol Valley Traffic Control Plan: Develop a Sunol Valley Traffic Control Plan that coordinates the project-specific traffic control plans and identifies additional measures (consistent with the standards of Alameda County and Caltrans) to minimize the impacts of construction traffic on Calaveras Road and I-680.	N	The GSR Project would not be located in Sunol Valley.
Measure 4.16-7a, Dust and Exhaust Control Measures for All WSIP Projects: Require implementation of Air Quality Measures 4.9-1a thru 4.9-1d for all WSIP projects to address collective construction-related air quality impacts.	Y	Specified air quality measures are required under project-level Mitigation Measures M-AQ-2a (BAAQMD Basic Construction Measures) and M-AQ-2b (NOx Reduction during Construction of Alternate Sites). The project-level measures are consistent with the PEIR measure.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Collective Impacts (cont.)		
Measure 4.16-7b, Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions: Require Measure 4.9-2a for all WSIP projects in the San Joaquin and Sunol Valley Regions to address collective DPM impacts. When this requirement is applied to the New Irvington Tunnel project, it will be applied to both the Sunol Valley and Fremont tunnel portals, taking into account truck traffic from other WSIP projects in the vicinity of both portals.	N	The GSR Project would not be located in either the San Joaquin or Sunol Valley region.
Measure 4.16-7c, Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region: Require Measure 4.9-2b for all WSIP projects in the Sunol Valley Region to address collective DPM impacts.	N	The GSR Project would not be located in Sunol Valley.
Measure 4.16-8a, Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects: Apply Measures 4.10-2a and 4.10-2b to total haul and delivery truck volumes attributable to all WSIP projects on any particular haul truck route (including haul routes in the Tesla Portal, Irvington Portal, and Lower Crystal Springs Dam vicinities as well as haul routes in the San Francisco Region) to address collective truck-related noise impacts.	N	See Impact NO-4. The project-level analysis determined that noise levels from truck trips would fall below the daytime speech interference thresholds and within the range of existing baseline noise levels along roadways serving the sites. Therefore, PEIR Mitigation Measure 4.16-8a was determined not to be applicable to the GSR Project.

TABLE D-3
WSIP PEIR Mitigation Measure Consistency

PEIR Mitigation Measure(s)	Applicable to Proposed Project (Y/N)?	Discussion
Measure 4.16-8b, Vacate Land Manager's Residence for All Projects in Sunol Valley Region: To address collective noise impacts, vacate Land Manager's residence adjacent to Alameda East Portal during construction truck operations associated with all WSIP projects in this region if collective daytime truck volumes exceed the 70-dBA speech interference criterion or nighttime truck volumes exceed the 50-dBA sleep interference criterion.	N	The GSR Project would not be located in Sunol Valley.
Cumulative Effects		
Measure 4.17-6, SFPUC WSIP Projects Construction Coordinator – Other Agencies: The SFPUC WSIP construction coordinator designated in accordance with Measure 4.16-6a will also consider the effects of any traffic generated by SFPUC maintenance activities and other SFPUC projects; and coordinate with Caltrans, other county agencies, and local jurisdictions regarding construction of other private and public development projects so as to minimize traffic impacts on local access roads.	Y	See Mitigation Measure M-C-TR-1 (Coordinate Traffic Control Plan with other SFPUC Construction Projects). The project-level measure is consistent with the PEIR measure and requires construction coordination with other agencies and other WSIP projects.
Measure 4.17-8, Coordination of Truck Traffic on Local Streets: The SFPUC WSIP construction coordinator designated in Measure 4.17-6 will also be responsible for coordinating truck traffic generated on these same streets by SFPUC maintenance activities and other SFPUC projects so that SFPUC-related truck noise increases are maintained at or below threshold levels specified in Measures 4.10-2a and 4.10-2b to the extent feasible.	Y	See Mitigation Measure M-C-TR-1 (Coordinate Traffic Control Plan with other SFPUC Construction Projects). The project-level measure is consistent with the PEIR measure and requires construction coordination with other agencies and other WSIP projects, however, the Mitigation Measure is intended to reduce congestion and safety concerns, not reduce significant noise impacts from construction truck traffic

REFERENCES

San Francisco Planning Department. 2010. *Final Environmental Impact Report for the San Francisco Public Utilities Commission's Lower Crystal Springs Dam Improvements Project, San Francisco Planning Department File No. 2005.0161E, State Clearinghouse No. 2007012002*. Certified October 7, 2010.

San Francisco Planning Department. 2011. *Final Environmental Impact Report for the San Francisco Public Utilities Commission Calaveras Dam Replacement Project, San Francisco Planning Department File No. 2005.0161E, State Clearinghouse No. 2005102102*. Certified January 27, 2011.

Appendix E

Air Quality Technical Report

Final
Air Quality Technical Report

Regional Groundwater Storage and Recovery Project

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Report Date:

July 25, 2012

Project: 08-139

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Appendix 1 - GSR Air Quality Scope of Work, dated June 24, 2011 and Revised October 28, 2011

Appendix 2 - Site Maps Showing Construction Area and Sensitive Receptors

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Appendix 6 - Communications with BAAQMD

Appendix 7 - Site Specific Facility Characteristics

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Introduction

Illingworth & Rodkin, Inc., under subcontract to GHD, has prepared this air quality emissions analysis and health risk assessment that evaluates the impacts associated with the San Francisco Public Utilities Commission's (SFPUC's) Regional Groundwater Storage and Recovery Project (the project), which includes installation and operation of up to 16 new groundwater production well facilities within the South Westside Groundwater Basin, consideration of three alternate sites for the well facilities, and a pump station upgrade. This analysis was prepared following the scope of work submitted to San Francisco Planning Department's Environmental Planning Division (EP), dated October 28, 2011, and included in this report as *Appendix 1*. The scope of work was developed in consideration of the Bay Area Air Quality Management District (BAAQMD) CEQA Air Quality Guidelines[1]. These guidelines include thresholds for construction emissions and community risk.

Based on a writ mandated by the Alameda Superior Court, these thresholds have currently been set aside and the BAAQMD has to cease dissemination of them until the BAAQMD complies with CEQA for the adoption of the thresholds. As a result, the BAAQMD is no longer recommending the 2011 thresholds be used to measure a project's significant air quality impacts. Instead, the BAAQMD suggests that lead agencies use the 1999 CEQA thresholds to make determinations regarding the significance of an individual project's air quality impacts. However, the Planning Department has determined that Appendix D of the 2011 BAAQMD CEQA Air Quality Guidelines, in combination with BAAQMD's Revised Draft Options and Justification Report, provide substantial evidence to support the BAAQMD recommended thresholds and, therefore, has determined they are appropriate for use in CEQA analyses[2].

In accordance with the 2011 BAAQMD CEQA Air Quality Guidelines and thresholds, this air quality technical report addresses the significance of:

- Construction-period emissions; and
- Construction-period health risk, including cumulative risk.

Operational emissions from the Project are considered to be negligible, since there would be no direct emissions expected from the facilities and maintenance or worker travel would be infrequent. Worker maintenance trips would produce very small emissions. Indirect emissions from use of electricity for the pumps would decrease, because existing Partner Agency wells would pump less over the long-term, and new wells would use green electricity from the SFPUC Power Enterprise.

Project Description

The proposed project would increase water supply reliability during dry years or in emergencies, by increasing water storage in the Westside Groundwater Basin during wet and normal years for subsequent recapture during dry years. The proposed Project is located in San Mateo County and is sponsored by the SFPUC in coordination with its partner agencies, which include the cities of Daly City and San Bruno, and the California Water Company (Cal Water) in its South San Francisco service area (collectively referred to as Partner Agencies).

The SFPUC currently supplies surface water to the Partner Agencies from its regional water system. The Partner Agencies supply potable water to their retail customers through a combination of groundwater from the South Westside Groundwater Basin and purchase of SFPUC surface water. The proposed project would provide supplemental SFPUC surface water to the Partner Agencies during normal and wet years. During these

[1] BAAQMD. *CEQA Air Quality Guidelines*. May, 2011.

[2] BAAQMD. *Revised Draft Options and Justification Report California Environmental Quality Act Thresholds of Significance*. October, 2009.

years, the Partner Agencies would reduce their groundwater pumping by a comparable amount to increase the amount of groundwater in storage through natural (in-lieu) recharge. During normal and wet years, the volume of groundwater in the South Westside Groundwater Basin would increase due to natural recharge and reduced groundwater pumping by the Partner Agencies. During dry years, the Partner Agencies and the SFPUC would pump the stored groundwater using 16 new well facilities, as needed to supplement other supplies. This new dry-year water supply would be blended with water from the SFPUC regional water system, and would thereby increase the available water supply to all regional water system customers.

The proposed project consists of the construction and operation of up to 16 new well facilities within the South Westside Groundwater Basin and an upgrade to the existing Westlake Pump Station. The EIR includes the evaluation of three additional well facilities (19 wells in total) in the instance where one of the 16 preferred well facilities cannot be successfully constructed or operated. The calculation of emissions is presented for both the preferred 16 well sites and an "alternate scenario" of 16 well sites that include the three alternate sites.

Each well facility would contain a well pump station, distribution piping, and utility connections. Most well facilities would also have disinfection units designed to eliminate bacteria in the groundwater using chlorine and ammonia. At certain sites, additional treatment (i.e., pH adjustment, fluoridation, and/or iron/manganese removal) has been incorporated into the design of the facility to meet both regulatory and water quality targets in the finished water for all agencies.

Site-specific well facility characteristics for the 19 potential well facility sites are listed in *Appendix 7*. These characteristics include the proposed well facility (i.e., building) type, pump type and pumping capacity, water distribution system connection point and alternate connection point (if any), groundwater disinfection location, and the method that would be used to achieve water quality goals. Water treatment may occur at the well site or at off-site treatment areas. For the purpose of calculating emissions, the connection point is assumed to be the one which would require a longer pipeline for connection, as this would represent the maximum emissions.

Groundwater from Sites 2, 3, and 4 would be conveyed to the Westlake Pump Station for treatment prior to addition to the Daly City distribution system. Sites 5, 6, and 7 include two treatment options: Consolidated Treatment at Site 6 and On-site Treatment. Under the consolidated treatment option, groundwater from Sites 5 and 7 would be conveyed to Site 6 for treatment before addition to the SFPUC regional water system. The consolidated treatment option requires pipelines to convey water from Sites 5 and 7 to Site 6. Under the on-site treatment option, groundwater would be treated at each of the sites, and water treated on-site would be added directly to the SFPUC regional water system. For the purpose of calculating emissions, only the On-site Treatment option is evaluated for criteria air pollutants, because construction of three separate buildings with treatment systems would generate more emissions than the Consolidated Treatment at Site 6 option which only has one building at Site 6. However, both options are evaluated for health risk impacts.

The proposed well facilities have been designed and sited so that wells are close to treatment systems and close to existing distribution systems (the SFPUC regional water system and the local distribution systems of the Partner Agencies), resulting in a more energy efficient system. Of the 16 well facility sites evaluated for the Project, four well facilities would connect to Daly City's distribution system; three to San Bruno's distribution system; two to Cal Water's distribution system; and seven to the SFPUC regional water system.

Well facility types would be either a:

- Well with a fenced enclosure which would include fencing, the wellhead, pump, piping and associated electrical controls; or
- Well with a building which would house the wellhead, pump, piping, treatment system, and associated electrical controls.

Where a building is proposed, the building size would vary between 20 feet x 35 feet to 23 feet by 103 feet. For the purpose of calculating emissions, all buildings were assumed to be the largest building size.

Each site would require underground piping to connect the new well to the local water distribution system or to the SFPUC regional water system, or to connect the well to a neighboring facility for treatment. Underground piping would connect well facilities to the local storm drain system and/or the sanitary sewer system to allow discharge of overboard well water, chloraminated water, or filter backwash. The total pipe length required for all 19 well facility sites, including either of the distribution system connections (whichever one is longer), would be approximately 19,000 feet of 6-inch and 8-inch pipe.

Project Construction Schedule

The SFPUC proposes to construct the project starting in June 2014, with completion targeted for May 2016 (an additional three months is provided in the event of a schedule delay, however construction would occur over 21 months as indicated in Table 1). Construction would occur in clusters of four well facilities, plus an alternate site, grouped together as shown in Table 1. Within each construction cluster, well construction would occur during the first month, followed by approximately three months of construction at the sites without a building or approximately 16 months of construction for sites with a building.

TABLE 1
Facility Construction Clusters and Construction Sequencing

Facility Sites	Well Drilling		Well Facilities	
	Estimated Construction Start date	Estimated Construction Finish date	Estimated Construction Start date	Estimated Construction Finish date
Construction Cluster A				
Sites 1, 3, 4, 7	June 2014	July 2014	July 2014	October 2015
Construction Cluster B				
Sites 12, 14, 15, 16, 19 (Alternate)	August 2014	September 2014	September 2014	December 2015
Construction Cluster C				
Sites 9, 11, 18 (Alternate)	October 2014	November 2014	November 2014	February 2016
Sites 10, 13	No well drilling needed	No well drilling needed	November 2014	February 2016
Construction Cluster D				
Sites 2, 5, 6, 8, Westlake Pump Station	No well drilling needed	No well drilling needed	June 2014	September 2015
Site 17 (Alternate)	July 2014	August 2014	August 2014	November 2015

Project Construction Methods

Wells

To install a production well on a site with no existing test well, the site would first be cleared of vegetation, if present, which would be temporarily stockpiled on-site. Then an area would be graded (as needed) and covered with gravel base rock, to create a level pad for supporting the drill rig and other equipment. A 30-inch steel conductor casing would be installed to a depth of 50 feet and cemented in place. A minimum 22-inch diameter production borehole would be drilled to a depth of approximately 500 to 750 feet, the approximate depth of the aquifer that is proposed for production. Drilling and other drilling related activities (e.g., equipment and material delivery to support drilling) would extend for about a week both during the day and night. The well casing, consisting of a 12-inch diameter stainless steel well casing and well screen would be installed in the borehole. A 2-inch diameter steel pipe would be welded to the well casing and installed to a depth of approximately 350 to 400 feet. Finally, an impervious seal consisting of sand/cement grout would be placed in the well annular space above the filter pack.

Various well pumping tests would be performed after final well development. These tests would include: (a) pumping for durations of two hours each at different discharge rates ("step-drawdown test"); and (b) continuous pumping for 12 to 48 hours at the final design capacity of the well ("constant-discharge aquifer test").

After construction is complete, well sites would be restored to their general pre-construction conditions, and all disturbed areas would be hydroseeded and receive erosion control measures as necessary.

Well Facilities

Construction of facilities at the well sites may require additional site clearing and grubbing beyond that conducted for the well drilling. Most of the proposed facility sites are located within developed urban areas, many on existing rights-of-way where large SFPUC transmission pipes have previously been installed. Accordingly, large portions of many of the sites have already been disturbed. Site excavation and grading would be minor, with grading to a maximum depth of five feet for the building foundation (if the well facility is intended to have a building) and utilities underneath the building. After the foundation and utilities connections are constructed, the remainder of the building would be constructed and the well pump and other equipment installed, as needed.

Water Distribution and Utility Pipeline Installation

New pipelines would be installed below ground using standard open-trench construction methods. Open-trench construction involves the following steps:

1. vegetation removal and grading or pavement cutting depending on the location,
2. trench excavation and shoring to stabilize the sides of the trench if necessary,
3. pipeline installation,
4. trench backfilling and compacting, and
5. surface restoration.

Project Operation

The SFPUC and Partner Agencies would operate 16 new well facilities with an annual average pumping capacity of 7.2 million gallons per day (equivalent to 8,100 acre-feet per year) to provide a supplemental dry-year water supply. During dry-year conditions, Partner Agencies would also pump from their own existing wells up to annual average rates consistent with the pumping limitations expressed in the project’s Operating Agreement. During wet or normal years, weekly or monthly exercising of the production wells for one- to four-hour periods would be required to ensure that the facilities remain operational. Operators may fine-tune the exercise schedule according to the characteristics of individual wells.

The well facilities would be powered by electricity. All well facilities would have provisions for a drive-up portable generator connection, so that in the event of a power failure the well pumps could continue to run in a dry year or be used as a temporary alternate water supply (in a normal or wet year). The portable diesel generators would be trailer-mounted models with built-in sound reduction and spill containment features. SFPUC or the Partner Agencies would utilize existing generators and would not acquire new generators for this project.

Operation and maintenance activities would result in less than one vehicle trip to each site per day during a dry year and less than one vehicle trip per week during a wet or normal year. As a result, vehicle emissions associated with operation of the project would be negligible.

Project Setting

Appendix 2 includes aerial maps that show each facility site (including the planned construction footprint) and sensitive receptors located within 1,000 feet of each facility site. Also shown on those maps are cumulative sources of toxic air contaminants (TACs). These sources include freeways, highways, high volume roadways, and stationary sources listed by BAAQMD. Sensitive receptor locations include residential dwellings, schools, daycare facilities, senior care facilities, and medical facilities, as defined in the BAAQMD CEQA Air Quality Guidelines.

Project Significance Thresholds

Table 2 summarizes the air quality thresholds of significance used in this analysis. These thresholds are based on an evaluation by EP of thresholds identified by BAAQMD in May 2011[3].

TABLE 2
Air Quality Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	**Average Daily Emissions (lbs./day)**	**Annual Average Emissions (tons/year)**
Criteria Air Pollutants			
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82	82	15
$PM_{2.5}$	54	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for New Sources			
Excess Cancer Risk	10 per one million	10 per one million	
Chronic or Acute Hazard Index	1.0	1.0	
Incremental annual average $PM_{2.5}$	0.3 $\mu g/m^3$	0.3 $\mu g/m^3$	

[3] BAAQMD. *California Environmental Quality Act Guidelines*. May, 2011.

TABLE 2
Air Quality Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
Health Risks and Hazards for Sensitive Receptors (Cumulative from all sources within 1,000 foot zone of influence) and Cumulative Thresholds for New Sources			
Excess Cancer Risk	100 per one million		
Chronic Hazard Index	10.0		
Annual Average $PM_{2.5}$	0.8 μg/m^3		

Note: ROG = reactive organic gases, NOx = nitrogen oxides, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (μm) or less, and $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5μm or less.

Project Emissions Modeling

On-site construction-period air pollutants were modeled using the latest version of the California Emissions Estimator Model, CalEEMod (Version 2011.1.1). The mobile emissions during construction, which include haul truck trips, vendor or delivery truck trips, and worker trips, were computed using the EMFAC2011 model developed by the California Air Resources Board (CARB). Both models also provide greenhouse gas emissions that were utilized as part of the project environmental impact analysis. The on-site modeling was based on the construction equipment inventories and schedule provided by SFPUC. A production well would be installed at each site, except for the Westlake Pump Station and Sites 2, 5, 6, 8, 10, and 13 where test wells currently exist. Either a well facility building or a fenced enclosure would be constructed at each site. In addition, pipelines would be installed to connect the well facilities to the existing distribution system. Interior upgrades at the Westlake Pump Station were not modeled because there would be very little use of diesel-powered equipment, so health risk impacts would be negligible. Emissions associated with each component of the construction activities were computed as follows:

- Well Drilling/Well Construction anticipated to last 30 working days
- Construction of Well Facility Building anticipated to last 240 working days
- Construction of Fenced Enclosure (for sites that would not have buildings) anticipated to last 40 working days
- Construction of pipeline anticipated to be constructed at a rate of 120 feet per day

For sites with well facility buildings, the largest building construction scenario was assumed and applied to each site on which a building is proposed, because this phase of construction would have the highest emissions. For Sites 5, 6 and 7, a well facility building was assumed at each site, because this configuration would have the highest emissions. Pipeline construction was based on an assumption that 120 feet of pipeline could be constructed in an average work day, because the majority of the pipeline is in soil where minimal obstructions are anticipated.

Model input assumptions are based on the type and quantity of equipment, projected average daily usage (in hours) and size (in terms of horsepower). Where horsepower was unknown, the CalEEMod default value for that type of equipment was assumed. CalEEMod only computes annual emissions in tons per year or maximum daily emissions in pounds per day. Since some of the construction phases would have relatively low emissions, predicting annual emissions was found to be problematic, because CalEEMod only predicts emission in tons with accuracy to one significant decimal point. For $PM_{2.5}$ emissions, which are used for the health risk analysis, this would introduce a large error in the predicted emissions. To avoid this type of error, average daily emissions for an entire construction phase (e.g., Construction of Well Facility Building) were predicted by inputting the usage of each piece of construction equipment with average hours per day based on the entire construction duration. For example, a grader would be operated for approximately 4 hours on one day during the Site Preparation sub-phase of Production Well Installation, but was modeled as operating for 0.1 hours per Phase Day (4 hours divided by 30 days) to account for the average amount of time it would be operated over the course of the entire 30-day phase. As a result, average daily construction period emissions from the off-road equipment operating at each site were computed in terms of pounds per day.

Construction equipment assumptions in CalEEMod were adjusted to account for the CARB overestimation of emissions, because the model is based on older load factor assumptions. CARB adjusted construction fleet emissions by reducing the load factors used in their OFFROAD model by 33 percent. Since CalEEMod is also based on the same OFFROAD model, the load factors in the model for this project were also reduced by 33 percent.

Mobile-source emissions were computed using the CARB EMFAC2011 model that computes emissions from on-road vehicles. The emissions from haul truck tips were assumed to be all heavy heavy-duty trucks. Vendor and delivery truck trips were computed assuming a mix of 50 percent heavy-duty trucks and 50 percent medium-duty trucks. Worker trips were assumed to be 50 percent light-duty automobiles and 50 percent light-duty trucks. Vehicle trips were assumed to be the default trip lengths used in CalEEMod, which are 12.4 miles for worker trips, 7.3 miles for vendor truck trips and 20 miles for heavy-duty and heavy heavy-duty truck trips. Emissions for 10 minutes of idling were applied to each haul truck roundtrip, which would include 5 minutes for each trip.

Table 3 shows criteria air pollutant emissions associated with construction of each site. It is possible that alternate sites (Sites 17, 18 and 19) may need to be constructed. As an "alternate scenario", it is assumed that Site 1 through 19 plus the Westlake Pump Station modification would be developed, because these sites would represent the construction of all 19 possible sites. This would result in the maximum emissions.

The emissions are reported as total emissions for each site in pounds and average daily emissions are computed for the entire project construction period, assumed to be 420 days. Construction days were calculated based on 20 construction days over 21 months. Average daily emissions are compared against the daily criteria air pollutant emission significance thresholds and found to be below the significance thresholds, both for Sites 1-16 and the alternate scenario. However, NO_x emissions would exceed the significance thresholds under the Alternate Scenario where all 19 sites plus the Westlake Pump Station modification are constructed. Detailed emissions computations and assumptions along with CalEEMod modeling output are contained in *Appendix 3*.

Note that the computed emissions do not include fugitive dust, which is treated separately under the BAAQMD CEQA Air Quality Guidelines. Application of Best Management Practices for minimizing dust emissions that are identified in the BAAQMD CEQA Air Quality Guidelines would minimize those impacts to a less than significant level.

Mitigation of Project Construction NO_x Emissions for Construction of Alternate Sites

If one to three wells at Sites 1-16 are constructed but found to be unusable for any reason, and one to three wells are therefore constructed at alternate sites, the SFPUC shall reduce modeled NO_x emissions by 20% at the alternate sites. To meet this performance standard, the SFPUC shall develop and implement a plan demonstrating that the off-road equipment (i.e., equipment rated at more than 50 horsepower that is owned or leased by the contractor or subcontractors) to be used in constructing the wells and facilities at the alternate sites would achieve a fleet-wide average 20-percent NO_x reduction compared to the most recent CARB fleet average.

Acceptable options for reducing emissions include the use of late model engines (i.e., meeting U.S. EPA Tier 3 standards or later), low emission diesel products, alternative fuels that have lower NO_x emissions, engine retrofit technology, after-treatment products, add-on devices, and/or other options that may become available.

Construction NOx emissions for construction of all sites were recomputed assuming that all on-site off-road construction equipment used in constructing the wells and facilities at the alternate sites would have emissions that are 20 percent lower than the current fleet-wide average assumed in the CalEEMod model. With this mitigation measure, construction of all 19 sites plus the Westlake Pump Station modifications would result in daily NO_x emissions of 53.7 pounds per day on average over the 420-day construction period, which is below the threshold of 54 pounds per day.

TABLE 3
Estimated Criteria Air Pollutant Construction Emissions (in pounds)

Facility Site	ROG	NO_x	PM_{10}	$PM_{2.5}$
Site 1	205	1,511	81	73
Site 2	15	107	7	6
Site 3	57	419	22	20
Site 4	62	434	23	21
Westlake Pump Station	5	26	4	1
Site 5 (On-site Treatment)	176	1,291	77	66
Site 6 (On-site Treatment)	172	1,266	76	65
Site 7 (On-site Treatment)	220	1,593	88	79
Site 8	165	1,228	73	62
Site 9	207	1,522	82	74
Site 10	165	1,229	73	62
Site 11	212	1,549	85	76
Site 12	214	1,564	86	77
Site 13	179	1,308	79	68
Site 14	223	1,616	90	81
Site 15	209	1,534	83	75
Site 16	211	1,540	84	75
Site 17 (Alternate)	204	1,506	81	73
Site 18 (Alternate)	206	1,516	82	74
Site 19 (Alternate)	66	451	25	22
Sites 1-16 and Westlake Pump Station				
Total (pounds)	2,697	19,738	1,113	981
Average Daily Emissions[a] (pounds per day)	6.4	47.0	2.7	2.3

TABLE 3
Estimated Criteria Air Pollutant Construction Emissions (in pounds)

Facility Site	ROG	NO_x	PM_{10}	$PM_{2.5}$
Alternate Scenario (Sites 1 -19 [Alternate] and Westlake Pump Station)				
Total (pounds)	3,174	23,211	1,301	1,150
Average Daily Emissions[a] (pounds per day)	7.6	55.3	3.1	2.7

Notes: [a] Assumes 420 days of construction for entire project based on 20 construction days per month and 21 months.

Health Risk Analysis

The construction activities will require the use of heavy-duty diesel vehicles and equipment, which emit diesel particulate matter (DPM) as $PM_{2.5}$, which is a toxic air contaminant (TAC) that is identified by CARB as causing cancer. In addition, the organic gas components of diesel exhaust can pose non-cancer hazards. In order to address health risk impacts, emissions from construction activities are input to a dispersion model that computes DPM/$PM_{2.5}$ and organic compound concentrations at receptors. The exposures are computed based on receptor type (i.e., residential infant or adult, school child or daycare child) and the corresponding risks are based on the toxicity of the TAC and the sensitivity of the receptor (e.g., infant, child or adult). The corresponding cancer risk and non-cancer hazards are computed and the receptor with the highest impact is considered the maximum exposed individual (MEI).

BAAQMD Regulation 2, Rule 5 sets cancer risk limits for new and modified sources of TACs at the MEI at 10 chances per million. In addition to cancer risk, some TACs pose non-carcinogenic chronic and acute health hazards. Acute and chronic non-cancer health hazards are expressed in terms of a hazard index, or HI, which is a ratio of the TAC concentration to a reference exposure level (REL), a level below which no adverse health effects are expected, even for sensitive individuals.[4] If the HI is 1.0 or greater, which means that the TAC concentration equals or exceeds the REL, then the exposure is considered significant. In addition, particulate matter, primarily associated with construction equipment and mobile sources (vehicular emissions) is strongly associated with mortality, respiratory diseases, and impairment of lung development in children, and other endpoints such as hospitalization for cardiopulmonary disease. The U.S. Environmental Protection Agency (EPA) has proposed a Significant Impact Level (SIL) for $PM_{2.5}$. For developed urban areas, including much of San Francisco, the EPA has proposed a SIL of between 0.3 $\mu g/m^3$ to 0.8 $\mu g/m^3$. The SIL represents the level of incremental $PM_{2.5}$ emissions that represents a significant contribution to regional non-attainment.[5] The lower range of the EPA-recommended SIL of 0.3 $\mu g/m^3$ is an appropriate threshold for determining the significance of a source's $PM_{2.5}$ impact.

Potential health risks and hazards from project construction activities on existing sensitive receptors are assessed within a 1,000-foot zone of influence through (1) prediction of emissions from project activities; (2) dispersion modeling to identify exposure and (3) computing the resulting risks and hazards based on the type of receptor exposed.

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4 Ibid, p. D-35.

5 BAAQMD. *CEQA Air Quality Guidelines*. May, 2011, available online at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx, p. D-36.

Project Emissions of TACs

Emissions of TACs were based on the project emissions modeling described above using the CalEEMod and EMFAC2011 models. Since all construction equipment was assumed to be diesel powered, all $PM_{2.5}$ emissions computed using CalEEMod were assumed to be DPM. The diesel $PM_{2.5}$ vehicle emissions produced by EMFAC2011 were assumed to represent DPM from on-road mobile sources associated with construction.

For each construction phase, the CalEEMod provided daily emissions of $PM_{2.5}$ exhaust emissions (assumed to be DPM) and emissions of ROG from the off-road construction equipment in pounds per day. These emissions were converted into grams per second per square meter ($g/sec/m^2$) for input into a dispersion model. The construction area was based on the size of the construction footprint for each construction phase (i.e., well construction, building or fenced enclosure construction and pipeline construction). Truck traffic emissions generated by the project were converted into grams per second per cubic meter ($g/sec/m^3$) for on-site truck travel and g/sec for trucks while traveling off-site for input into the dispersion model. Worker traffic was assumed to have a negligible affect on health risk due to the relatively low volume of traffic generated and the small amount of emissions when compared with daily construction equipment and truck activity. Much of the worker travel emissions occur beyond 1,000 feet from the facility sites. So those emissions from worker vehicle trips were not included in the health risk assessment.

Two sets of emissions were computed: (1) emissions based on average daily activity through the course of each construction component used to compute cancer risk and annual $PM_{2.5}$ concentrations and (2) a maximum daily scenario that uses the maximum daily emissions computed by CalEEMod when considering each sub-phase of construction (i.e., site preparation, building construction, or trenching for pipeline work) to compute acute non-cancer health risk. Therefore, the highest hourly concentration modeled using the maximum daily emission scenario was calculated.

For non-cancer health effects of DPM the California Office of Health Hazard Assessment (OEHHA) has established DPM concentration levels for evaluating chronic health effects; however, concentration levels for acute (short-term) health effects have not been identified for DPM as a whole. Thus, in order to evaluate potential acute health effects from exposure to diesel exhaust, the individual chemicals that make up the total organic gas (TOG) portion of diesel exhaust were evaluated for acute health effects. A speciation profile of individual chemicals in the TOG from off-road diesel equipment exhaust provided by the BAQMD was used to identify the compounds for evaluation of acute health effects. It was assumed that the ROG emissions computed using CalEEMod are functionally equivalent to TOG emissions, and, therefore, the ROG emissions from construction activities were used to calculate the emissions and concentrations for the individual chemicals with acute non-cancer health effects. The speciation profiles and the applicable toxicity values, based on acute exposures, are shown in Table 4.

Air Dispersion Modeling

As part of the health risk assessment, the U.S. EPA ISCST3 dispersion model was used to predict concentrations of DPM and ROG at existing residences and other sensitive receptors surrounding the facility sites. The ISCST3 dispersion model is a BAAQMD-recommended model for use in refined modeling analysis of CEQA projects[6]. The model calculates pollutant concentrations at receptors located in areas of flat or complex terrain from a variety of emission source types including point, area, volume and line sources. The model was run using regulatory default dispersion options and urban dispersion coefficients due to the urban nature of the project area.

[6] BAAQMD. *Recommended Methods for Screening and Modeling Local Risks and Hazards*. Version 2.0, May, 2011.

Annual modeled concentrations based on average daily emissions rates were used to compute cancer risk. Modeled worst-hour concentrations were used to compute acute hazards resulting from speciated TAC components of diesel exhaust with acute risks using BAAQMD speciation factors[7].

Emissions from on-site construction equipment were modeled as a series of area sources in the areas associated with construction activities. An emission release height of 6 meters was used for each area source. DPM emissions from truck traffic on-site were included in the on-site area sources and the off-site trucks traveling on the roadways near the facility sites were modeled as line sources (a series of volume sources along a path). Line sources for off-site truck travel were used to simulate the expected travel routes along local roadways within the 1,000-foot zone of influence from the construction sites.

Modeled receptors were placed at sensitive receptors anticipated to have the greatest impacts that are within 1,000 feet of the modeled construction site. For assessing impacts, the receptor with the highest impacts from construction activities within 1,000 feet would be identified as the maximum exposed individual (MEI). All receptors were assumed to be at ground-level with a breathing height of 1.5 meters. Since there is variation in the terrain elevations at some of the facility sites and surrounding areas, terrain elevations were used with the model. Elevations for project emission sources and sensitive receptor locations were obtained from USGS Digital Elevation Model (DEM) data for the project area. Receptor locations and the depiction of the project emission sources are shown in the figures provided in *Appendix 2*.

TABLE 4
Speciation Profile of Off-road Diesel Total Organic Gas Emissions Provided by BAAQMD and Acute Toxicity Values

Chemical	Fraction of TOG[1]	OEHHA Acute Reference Exposure Level (μg/m^3)
acetaldehyde	0.07353	470
acrolein	0.01297 [a]	2.5
benzaldehyde	0.00699	--
benzene	0.02001	1,300
ethanol	0.00009	--
ethylbenzene	0.00305	--
ethylene	0.14377	--
ethylene dibromide (1,2-dibromoethane)	--	--
ethylene dichloride (1,2-dichloroethane)	--	--
ethylene glycol	--	--
ethylene oxide (1,2-epoxyethane)	--	--
ethylene thiourea	--	--
ethylene glycol butyl ether	--	--
ethylene glycol ethyl ether		
ethylene glycol ethyl ether acetate	--	--
ethylene glycol methyl ether	--	--
ethylene glycol methyl ether acetate	--	--
formaldehyde	0.14714	55
isobutane	0.01222	--
isopentane	0.00602	--
methane	0.04084	--

[7] Speciation factors are based on a March 30, 2011 email from Virginia Lau (BAAQMD).

TABLE 4
Speciation Profile of Off-road Diesel Total Organic Gas Emissions Provided by BAAQMD and Acute Toxicity Values

Chemical	Fraction of TOG[1]	OEHHA Acute Reference Exposure Level (μg/m^3)
methyl ethyl ketone (mek) (2-butanone)	0.01477	13,000
methylcyclopentane	0.00149	--
m-xylene	0.00611	--
n-butane	0.00104	--
n-hexane	0.00157	--
n-pentane	0.00175	--
o-xylene	0.00335	--
propionaldehyde	0.0097	
propylene	0.02597	
propylene glycol monomethyl ether		
propylene oxide		
toluene	0.01473	37,000

[a] Note that speciation factor for acrolein only applies to on-road diesel vehicles

BAAQMD collects and records meteorological data at a number of locations throughout the Bay Area. In the vicinity of the facility sites, there are two BAAQMD meteorological monitoring stations for which the BAAQMD has processed the hourly data for use with the ISCST3 model. Based on the locations of the facility sites, BAAQMD recommended that meteorological data collected at the District's Fort Funston station be used for sites 1 through 7 and data collected at San Francisco International Airport and processed by the District be used for the remaining sites[8]. BAAQMD provided the ISCST3 formatted data for both sites.

Emissions, computed for the project using CalEEMod as described above, were modeled as occurring between 7 am - 7 pm. For each site, these emissions would occur in 2014 and 2015. Annual concentrations were predicted for each year along with the maximum hourly concentration. For most sites, worst day emissions occurred during well installation. Well Facility Building construction had the highest emissions for those sites that did not include well construction.

The health risk associated with 19 facility sites was analyzed to capture potential health risks, even though only 16 facility sites would be constructed. Health risk was estimated by calculating risk at groups of geographically close sites. Some facility sites are separated sufficiently that they would not have additive effects with other sites. However, effects from some facility sites overlap with the effects from other sites ; therefore, those facility sites that had overlapping 1,000-foot zone of influences were grouped and modeled together, with an MEI for each group of modeled sites identified. Nine modeling groups were evaluated as follows, with Group 3 modeled under two different scenarios:

Group 1: Facility Site 1
Group 2: Facility Sites 2, 3 and 4
Group 3: Facility Sites 5, 6 and 7 (On-site Treatment)
Group 3: Facility Sites 5, 6, and 7 (Consolidated Treatment at Site 6)
Group 4: Facility Site 8 and Site 17 (Alternate)
Group 5: Facility Sites 9 and 10 and Site 18 (Alternate)
Group 6: Facility Sites 11 and 12 and Site 19 (Alternate)

[8] Based on email from James Cordova (BAAQMD) to Bill Popenuck (Illingworth & Rodkin, Inc.), dated April 16, 2012.

Group 7: Facility Site 13
Group 8: Facility Sites 14 and 15
Group 9: Facility Site 16
Note: Westlake Pump Station Upgrade was not included in health risk analysis, as noted under project Emissions Modeling above.

Excess Lifetime Cancer Risk and $PM_{2.5}$ Prediction

The dispersion modeling provided the annual $PM_{2.5}$ concentration predicted at each receptor. As discussed previously, $PM_{2.5}$ emissions from the project are conservatively assumed to be all DPM. The annual DPM concentrations are used to compute increased cancer risk caused by the project.

Increased cancer risks at each of the sites were calculated using the modeled annual average concentrations and using the most recent methods recommended by BAAQMD[9] and the California Office of Environmental Health Hazard Assessment (OEHHA)[10]. The factors used to compute cancer risk are highly dependent on modeled concentrations, exposure period or duration, and the type of receptor. The exposure level is determined by the modeled concentration; however, it has to be averaged over a representative exposure period. The averaging period is dependent on many factors, but primarily the type of sensitive receptor that would reside at a site. OEHHA has developed exposure assumptions for typical types of sensitive receptors. These include nearly continuous exposures for residences.

It should be noted that the cancer risk calculations for residential exposures reflect use of BAAQMD's most recent cancer risk calculation method, adopted in January 2010[11]. The cancer risk calculations were based on applying the BAAQMD recommended age sensitivity factors to TAC concentrations. Age sensitivity factors reflect the greater sensitivity of infants and children to cancer causing TACs. This analysis assumed that residential and daycare receptors represented infant exposures and applied a sensitivity factor of 10 to the cancer risk calculations. Where exposures were assumed to be school children, an age sensitivity factor of 3 was applied. An age sensitivity factor of 1 was applied to adult exposures. This analysis, therefore, presents the most conservative cancer risk for various types of exposures.

The cancer risk calculations incorporate breathing rates of 581 liters per kilogram day (L/kg-day) for infants and children and 302 L/kg-day for adults. Since the modeling was conducted assuming emissions occurred 365 days per year, a default OEHHA exposure period of 350 days per year was used. For school and daycare child exposure, they were assumed to be exposed to the construction emissions for 10 hours per day out of the 12 hours of daily construction emissions.

MEIs were identified for each geographic group of sites and are shown on Figures 1 through 10 in *Appendix 2*. The MEI for Group 3 is shown for the On-site Treatment configuration, because it represents a higher health risk than Group 3 with Consolidated Treatment at Site 6. The MEI for the group with the highest risk is the MEI for the project as a whole.

Table 5 summarizes the excess lifetime cancer risk and $PM_{2.5}$ concentrations for each group of sites at the MEIs. Cancer risk computations for each facility site, along with the assumptions used, are presented in *Appendix 4.* The figures contained in *Appendix 2* show model receptors and sources. Results were compared to the excess lifetime cancer risk threshold of 10 per million (evaluated as 10.0 per million) and an annual $PM_{2.5}$ concentration thresholds of 0.3 $\mu g/m^3$.

9 BAAQMD, *Air Toxics NSR Program Health Risk Screening Analysis (HSRA) Guidelines*. January, 2010.

10 OEHHA 2003. Air Toxics Hot Spots Program Risk Assessment Guid*elines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. Office of Environmental Health Hazard Assessment. August, 2003.

11 BAAQMD. *Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines.* January, 2010.

Non-Cancer Hazard Index

Table 5 also includes the predicted chronic or acute hazards at the MEIs for each geographic group of sites, expressed as the hazard index (HI). Potential non-cancer health effects due to chronic exposure to DPM were estimated using the modeled $PM_{2.5}$ concentration and the chronic inhalation REL for DPM of 5 μg/m^3. There is no REL for acute exposures associated with DPM. Therefore, speciated total organic gas components of diesel exhaust that have acute toxicity values assigned were used to evaluate hazards due to acute exposures. For this assessment, ROG emissions were considered to be equivalent to total organic gas emissions from construction activities. Emissions were modeled using CalEEMOD, which provides ROG emissions. Modeled worst-hour concentrations were used to compute acute hazards resulting from speciated TAC components of DPM with acute risks using BAAQMD speciation factors[12]. BAAQMD risk management policy does not recommend including acrolein in health risk assessments due to the lack of reliable emissions data[13]. EP recommends that acrolein be included for truck traffic, but not off-road construction emissions. Since the project would generate very little hourly truck traffic during construction, the effects of acrolein were not evaluated. Table 4 includes the speciation profiles and acute toxicity values for organic DPM compounds.

Discussion of Excess Cancer Risks, Hazard Indices, and $PM_{2.5}$ Concentrations

The excess cancer risk, hazard index for acute or chronic exposures (whichever is highest) and the highest $PM_{2.5}$ concentrations for each of the geographic groups of sites are shown in Table 5. The results shown in Table 5 apply to the MEI for each group. Results that exceed the applicable thresholds are highlighted in Table 5.

As indicated in Table 5, the excess cancer risk at the MEI for each geographic group caused by construction of the project would range from 1.05 to 10.74. The highest value would be 10.74, which exceeds the BAAQMD threshold of 10 in a million, at Group 3 for Sites 5, 6, and 7 for the On-site Treatment option. Because construction of Group 3 with On-site Treatment would have the highest risk, the MEI for Group 3 would also be the MEI for the project as a whole.

The Hazard Index, which evaluates non-cancer health risks, would range from 0.11 to 0.72, which is less than the BAAMQD project impact threshold of 1.00. The annual $PM_{2.5}$ concentrations would range from 0.01 to 0.07 μg/m^{3,} which would be less than the BAAMQD project impact threshold of 0.3 μg/m^3.

TABLE 5

Project and Cumulative Cancer Risks, Non-Cancer Hazard Indices and $PM_{2.5}$ Concentrations

Site Modeling Group	Cumulative TAC Source Analyzed[a]	Lifetime Excess Cancer Risk (per million)	Non-Cancer Acute or Chronic Hazard Index[c]	$PM_{2.5}$ Concentration (μg/m^3)
Project Thresholds		**10**	**1.00**	**0.3**
Cumulative Thresholds		**100**	**10.00**	**0.8**
Group 1: Site 1				
PROJECT RISK		**2.41**	**0.48**	**0.02**
Cumulative	I-280	9.85	0.04	0.15
Cumulative	John Daly Blvd.	1.14	0.02	0.03
Cumulative	G11629	0.91	0.00	0.00

[12] Speciation factors are based on a March 30, 2011 email from Virginia Lau (BAAQMD).

[13] BAAQMD. *BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines*. January, 2010.

TABLE 5
Project and Cumulative Cancer Risks, Non-Cancer Hazard Indices and $PM_{2.5}$ Concentrations

Site Modeling Group	Cumulative TAC Source Analyzed[a]	Lifetime Excess Cancer Risk (per million)	Non-Cancer Acute or Chronic Hazard Index[c]	$PM_{2.5}$ Concentration ($\mu g/m^3$)
Cumulative	14852	1.18	0.00	0.00
Cumulative	13420	0.42	0.00	0.00
Cumulative	13221	0.67	0.00	0.00
	CUMULATIVE RISK AT GROUP 1 MEI	**16.58**	**0.54**	**0.21**
Group 2: Sites 2, 3 and 4				
PROJECT RISK		**1.51**	**0.72**	**0.02**
Cumulative	S. Park Plaza Drive	3.34	0.02	0.098
Cumulative	87th St.	1.68	0.02	0.059
Cumulative	16794	4.08	0.00	0.00
Cumulative	G10657	0.48	0.00	0.00
Cumulative	12568	5.03	0.00	0.00
Cumulative	12876	2.05	0.00	0.00
	CUMULATIVE RISK AT GROUP 2 MEI	**18.18**	**0.76**	**0.18**
Group 3: Sites 5, 6 and 7 (Consolidated Treatment at Site 6)				
PROJECT RISK		**1.31**	**0.11**	**0.01**
Cumulative	I-280	7.74	0.01	0.13
Cumulative	Junipero Serra Blvd.	1.84	0.02	0.05
Cumulative	San Pedro Rd.	1.04	0.02	0.05
Cumulative	Washington St	0.96	0.02	0.02
Cumulative	G9309	0.29	0.00	0.00
Cumulative	14102	6.32	0.00	0.00
	CUMULATIVE RISK AT GROUP 3 MEI	**19.50**	**0.18**	**0.26**
Group 3: Sites 5, 6 and 7 (On-site Treatment)				
PROJECT RISK		**10.74**	**0.22**	**0.08**
Cumulative	I-280	7.74	0.01	0.13
Cumulative	Junipero Serra Blvd.	1.84	0.02	0.05
Cumulative	San Pedro Rd.	1.04	0.02	0.05

TABLE 5
Project and Cumulative Cancer Risks, Non-Cancer Hazard Indices and $PM_{2.5}$ Concentrations

Site Modeling Group	Cumulative TAC Source Analyzed[a]	Lifetime Excess Cancer Risk (per million)	Non-Cancer Acute or Chronic Hazard Index[c]	$PM_{2.5}$ Concentration ($\mu g/m^3$)
Cumulative	Washington St	0.96	0.02	0.02
Cumulative	G9309	0.29	0.00	0.00
Cumulative	14102	6.32	0.00	0.00
	CUMULATIVE RISK AT GROUP 3 MEI	**28.93**	**0.29**	**0.33**
Group 4: Facility Site 8 and Site 17 (Alternate)				
PROJECT RISK		**1.05**	**0.18**	**0.01**
Cumulative	Mission Rd. (SR 82)	4.28	0.01	0.06
Cumulative	Serramonte Blvd.	2.64	0.02	0.08
Cumulative	1364	0.45	0.02	0.26
Cumulative	G11198	0.14	0.00	0.00
	CUMULATIVE RISK AT GROUP 4 MEI	**8.56**	**0.23**	**0.41**
Group 5: Facility Sites 9 and 10				
PROJECT RISK		**5.87**	**0.33**	**0.05**
Cumulative	El Camino Real (SR 82)	1.73	0.00	0.02
Cumulative	Hickey Blvd	0.61	0.02	0.02
Cumulative	G3305	1.43	0.00	0.00
	CUMULATIVE RISK AT GROUP 5 MEI	**9.64**	**0.35**	**0.07**
Group 5: Sites 9 and 10 and Site 18 (Alternate)				
PROJECT RISK		**9.55**	**0.53**	**0.08**
Cumulative	No sources within 1,000 feet			
	CUMULATIVE RISK AT GROUP 5 MEI	**9.55**	**0.53**	**0.08**
Group 6: Sites 11 and 12 and Site 19 (Alternate)				
PROJECT RISK		**7.88**	**0.46**	**0.07**
Cumulative	El Camino Real (SR 82)	2.28	0.00	0.03
Cumulative	Westborough Blvd.	1.50	0.02	0.05

TABLE 5
Project and Cumulative Cancer Risks, Non-Cancer Hazard Indices and $PM_{2.5}$ Concentrations

Site Modeling Group	Cumulative TAC Source Analyzed[a]	Lifetime Excess Cancer Risk (per million)	Non-Cancer Acute or Chronic Hazard Index[c]	$PM_{2.5}$ Concentration ($\mu g/m^3$)
Cumulative	G11428	0.73	0.00	0.00
	CUMULATIVE RISK AT GROUP 6 MEI	**12.39**	**0.48**	**0.15**
Group 7: Site 13				
PROJECT RISK		**1.34**	**0.14**	**0.01**
Cumulative	South Spruce Ave.	5.62	0.02	0.20
Cumulative	G12073	0.17	0.00	0.00
Cumulative	2483	0.19	0.00	14.30
	CUMULATIVE RISK AT GROUP 7 MEI	**7.32**	**0.16**	**14.53**
Group 8: Sites 14 and 15				
PROJECT RISK		**3.37**	**0.54**	**0.03**
Cumulative	Sneath Lane	0.75	0.02	0.02
	CUMULATIVE RISK AT GROUP 8 MEI	**4.12**	**0.56**	**0.05**
Group 9: Site 16				
PROJECT RISK		**7.60**	**0.37**	**0.06**
Cumulative	CalTrain	5.70	0.01	0.03
Cumulative	El Camino Real (SR 82)	1.66	0.00	0.02
Cumulative	19283	2.35	0.00	0.00
Cumulative	19194	2.21	0.00	0.01
Cumulative	G6250	0.02	0.00	0.00
Cumulative	G2970	2.25	0.00	0.00
Cumulative	19561	7.30	0.00	0.02
	CUMULATIVE RISK AT GROUP 9 MEI	**29.09**	**0.38**	**0.14**

Notes:
[a] Stationary sources are identified by their BAAQMD Plant ID.
[b] There are no cumulative sources for the MEI at Group 5.
[c] The acute or chronic hazard index is reported, whichever is higher.

Mitigation of Project Construction Health Risks for Group 3 with On-site Treatment

During the construction of Site 5 (On-site Treatment), the SFPUC shall utilize off-road equipment (more than 50 horsepower) with late model engines meeting U.S. EPA Tier 4 (Interim), or utilize a combination of Tier 2 or Tier 3 engines with add-on devices that consist of level 3 diesel particulate filters.

Construction emissions for Group 3, which includes Site 5 (On-site Treatment), Site 6 (On-site Treatment), and Site 7 (On-site Treatment), were recomputed in CalEEMod assuming that all on-site off-road construction equipment larger than 50 horsepower for construction of the well facility building would have diesel engines that meet the minimum mitigation requirements. This would reduce $PM_{2.5}$ emissions by greater than 50 percent. As a result, excess cancer risks were computed to be less than 5.39 per million. The resulting cancer risks with mitigation would be below the significance thresholds.

Cumulative Health Risk Analysis

Potential health risks and hazards were assessed from TAC sources that are located within 1,000 feet of the MEIs for each geographic group of sites. Note that the MEI refers to the receptor that has the greatest impact with respect to health risks caused only by the project. Cumulative sources were then identified for each group of facility sites and the impact of those sources upon the MEI for each group was evaluated. For those sources that were more than 1,000 feet from the MEI for each group, the contribution to the cumulative impact was considered to be negligible (i.e., the sources beyond the 1,000-feet radius had a negligible contribution to the MEI cancer risk, non-cancer hazards or $PM_{2.5}$ concentrations). For each group of sites, cumulative health risks were predicted at the MEI for that group.

These cumulative health risks are presented in Table 5. The cumulative risk analysis included the aggregate effects of past, present and foreseeable TAC sources within 1,000 feet of the MEI for the group; these sources included the project, highways, local roads (with average daily volume above 10,000 vehicles), and stationary sources identified using BAAQMD's database. Cumulative TAC source data are included in Appendix 5.

Roadways

Busy roadways are a source of TAC emissions that could affect sensitive receptors near the facility site. The BAAQMD provides screening tables that indicate predicted community risk impacts that roadways pose[14]. These tables were used to develop screening levels of cancer risk and $PM_{2.5}$ concentrations. Note that the screening tables published by BAAQMD indicate that non-cancer chronic and acute hazards from traffic would be well below the BAAQMD thresholds. BAAQMD reports the chronic and acute Hazard Index for local roadways as less than 0.02. The traffic level on each roadway was estimated and rounded upward to the traffic volumes analyzed by the BAAQMD screening tables. Traffic volumes were estimated by assuming the peak-hour traffic volumes reported in the traffic section (1st Administrative Draft EIR, Transportation and Circulation Section Table 5.6-3) was about 8 to 10 percent of the average daily traffic volume. The distance between the roadway and the MEI for each geographic group was measured and the screening levels cancer risk and $PM_{2.5}$ levels were identified in the BAAQMD screening tables.

BAAQMD provides a Highway Screening Analysis Google Earth Map tool to identify estimated risk and hazard impacts from highways throughout the Bay Area. Cumulative risk, hazard and $PM_{2.5}$ impacts at various distances from the highway are estimated for different segments of the highways. The tool uses the average annual daily traffic (AADT) count, fleet mix and other modeling parameters specific to that segment of the highway. Impacts from Interstate 280 and State Route 82 were assessed using this tool.

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[14] BAAQMD. Roadway Analysis Tables can be accessed from BAAQMD's website at: *http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx*. Note that these tables are used to determine whether additional refined analyses are necessary.

Stationary Sources

The risk, hazard and $PM_{2.5}$ impacts from stationary sources were assessed using the BAAQMD Stationary Source Screening Analysis Google Earth Map tool. This tool was used to identify sources within 1,000 feet of the MEI locations. BAAQMD provided screening risk data for each of the identified sources. BAAQMD also provided distances multipliers to adjust the risk and $PM_{2.5}$ concentrations of gasoline station and diesel engine sources from the screening distance of 50 feet to the actual measured distance. In the case where screening risk data were not available, a source health risk screening assessment (HRSA) was requested from BAAQMD through the Stationary Source Information Request process.

CalTrain Rail Line at Group 9 (Site 16)

Trains using the CalTrain rail line are a source of DPM emissions. The CalTrain rail line near Group 9 was modeled to assess cancer risk, hazards and $PM_{2.5}$ concentrations at the group MEI location affected by Group 9. The rail line within the 1,000 ft buffer area of Site 16 was modeled using ISCST2 with hourly historical meteorological data from San Francisco International Airport.

Annual DPM/$PM_{2.5}$ emissions were computed based on the current schedule that includes 62 CalTrain passenger trains and 4 freight trains. Travel speed was assumed at 30 mph. CalTrain is planning to electrify the line, so DPM emissions may not occur in the future, however no definitive date for implementation has been established. DPM emissions from CalTrain were assumed to occur through the year 2025. For acute impacts, maximum short-term emissions were calculated assuming there would be a maximum of 3 trains (2 Caltrain and 1 freight train) during a one-hour period passing the MEI location.

Based on this modeling, the child exposure cancer risk was 4.5 per million at a DPM/$PM_{2.5}$ concentration of 0.03 $\mu g/m^3$. The chronic DPM HI was 0.005. The maximum 1-hour volatile organic compound concentration was 1.09 $\mu g/m^3$. TAC concentrations with acute health effects were calculated using the U.S. EPA Speciation Profile 4674 for Medium Duty Trucks. The acute total Hazard Index is 0.01 from rail traffic.

Discussion of Cumulative Excess Cancer Risks, Hazard Indices, and $PM_{2.5}$ Concentrations

Table 5 shows the cumulative risk, hazard indices and annual $PM_{2.5}$ concentrations for construction at each group of sites. Results that exceed the applicable thresholds are highlighted in Table 5.

The cumulative excess cancer risk at the MEIs for the groups would range from 4.12 to 29.09. The project MEI would be at Group 3 (Sites 5, 6, 7 with On-site Treatment). The cumulative excess cancer risk to the project MEI would be 28.93 in one million, which is below the cumulative significance threshold of 100 in one million.

The cumulative non-cancer Hazard Index at the MEIs for the groups would range from 0.16 to 0.76. The cumulative Hazard Index for the project MEI would be at Group 2 (Sites 2, 3, and 4) and is predicted to be 0.76, which is below the cumulative significance threshold of 10.0.

The cumulative annual $PM_{2.5}$ concentration at the MEIs for the groups would range from 0.05 $\mu g/m^3$ to 14.53 $\mu g/m^3$. The highest value for the cumulative annual $PM_{2.5}$ concentration occurs at Group 7 (Site 13) and is due primarily to a stationary source in South San Francisco, Bimbo Bakery. Much of this concentration appears to be caused by fugitive emissions of flour from the flour holding tanks, reported only as PM or total particulate matter and assumed to be all $PM_{2.5}$. The cumulative $PM_{2.5}$ concentration from construction at Group 7 would exceed the BAAQMD threshold of 0.8 $\mu g/m^3$, however the project contribution to this cumulative impact is only 0.01 $\mu g/m^3$. The cumulative annual $PM_{2.5}$ concentration for the project MEI at Group 3 is predicted to be 0.33 $\mu g/m^3$, which is below the cumulative significance threshold of 0.8 $\mu g/m^3$.

Health Risk Uncertainties

The resulting health risks reported are based on a series of assumptions related to predicted emissions, concentrations, exposures, and chemical toxicity. The assumptions used in the analysis are generally conservative and meant to provide upper-bound estimates of risk. Emissions from the project are based on the best available estimates of project activity and emissions factors from models recommended by BAAQMD. The uncertainty of the emissions is unknown. Dispersion modeling to predict resulting concentrations was conducted using a model recommended by BAAQMD that used meteorological data recommended by the District's meteorologist. The exposure periods are assumed to be almost continuous for the type of receptors modeled (i.e., the receptors will be present almost continuously during the period that activity occurs). In addition, the most sensitive receptors that could be present were assumed. For example, an infant was assumed to be continuously present at all residential receptors. Infants were considered to be ten times more susceptible to carcinogenic TACs. In general, the methods used in this risk assessment are meant to be conservative, so that the real risks from the source would be lower than the risks predicted in this assessment.

Appendix 1
GSR Air Quality Scope of Work, dated June 24, 2011 and Revised October 28, 2011

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

Memo

To: Kristine Gaspar, *Winzler & Kelly*

Date: June 24, 2011, Revised October 28, 2011

From: James A. Reyff

Subject: Regional Groundwater Storage and Recovery (GSR) Project EIR Air Quality Analysis

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As you are aware, Illingworth & Rodkin, Inc. (I&R) prepared a draft air quality analysis of GSR Project environmental impacts. That air quality analysis was conducted in 2009 and used the URBEMIS2007 model to conservatively analyze air pollutant emissions from construction of the project. Operational emissions were considered to be negligible, since there were no emissions expected from the facilities and maintenance or worker travel would be minor.

Since that analysis was conducted, the Bay Area Air Quality Management District (BAAQMD) adopted new CEQA Air Quality Guidelines. These guidelines include adopted thresholds for construction emissions and community risk. GSR emissions are difficult to compare against thresholds, because construction activities at each well facility site are quite small, but there are 20 potential construction sites. The construction schedule (see attached) indicates that construction of all sites may overlap to some extent.

A new CEQA air quality issue that has come up is community health risk associated with construction activities. In May 2010, BAAQMD made construction screening tables available that indicate the distances from construction activities to where health risk for $PM_{2.5}$ levels would be at less-than-significant levels. These tables are quite conservative and indicate that minimal setbacks would be around 300 feet. District staff admittedly believes these are quite conservative and expect to issue more refined guidance in 2011.

In response to the new BAAQMD CEQA Air Quality Guidelines, the San Francisco Planning Department's Environmental Planning (EP) division has developed new guidance for reviewing environmental documents. Where there are substantial or significant air quality issues, the guidance requires an air quality technical report. As a result, there are several air quality issues that need to be addressed for this project:

1. Significance of construction period emissions as compared to the new BAAQMD CEQA thresholds;
2. Prediction of construction period health risk impacts; and
3. Preparation of an Air Quality Technical Report per EP guidelines.

Below is the proposed scope of work to prepare a Focused Air Quality Technical Report for the GSR Project. This scope addresses the three items listed above.

Project Description

The purpose of the proposed Project is to further the use of the South Westside Groundwater Basin as an underground storage reservoir by storing water in the basin during wet periods for subsequent recapture during dry periods. The San Francisco Public Utilities Commission (SFPUC) proposes to provide surface water to the cities of Daly City and San Bruno, and the California Water Company (Cal Water) in its South San Francisco service area (collectively designated as Partner Agencies) to be used by these agencies in lieu of pumping groundwater during normal and wet rainfall years. As part of the Project, SFPUC would install new groundwater well facilities, which would be operated by SFPUC and the Partner Agencies for pumping groundwater during dry years as part of the regional water supply.

The proposed Project consists of installation and operation of up to 16 new groundwater production well facilities within the South Westside Groundwater Basin. Nineteen well facility sites are currently being evaluated; however, a maximum of 16 well facilities would be developed and operated as part of the Project. In addition, an existing pump station site may be upgraded.

The new project sites are located in San Mateo County overlying the South Westside Groundwater Basin. Four well facilities would connect to Daly City's distribution system; three well facilities would connect to San Bruno's distribution system; three well facilities would connect to Cal Water's distribution system; and nine well facilities would connect to the SFPUC distribution system. Most of the proposed project sites are located within developed urban areas, many on existing rights-of-way where large SFPUC transmission pipes have previously been installed. Accordingly, large portions of many of the sites have already been disturbed.

Each groundwater well facility site would contain a pump or a well facility to house above-ground pumps, and pipeline and utility trenches to connect the site to water mains, sanitary sewer, storm drains, and the electrical grid. In some cases monitoring wells and geotechnical borings may be installed. In addition, the Westlake Pump Station may require upgrades.

The SFPUC proposes to construct the proposed Project starting in February 2013 through approximately November 2015. The well facility sites would be constructed in groups of four and phased during this time period. Not all construction activities include traditional air-emitting activities such as ground disturbance and running of heavy equipment. Following is a list of the activities and estimated duration associated with construction of a single well facility and its associated features.

- Monitoring well (if needed): approximately 3 weeks each.
- Geotechnical boring (as needed): 1 day each.
- Production well: 45 days each.
- Well station building: 14 months total for each building
    - Clearing and grubbing and other site preparation activity: 1 month
    - Foundation and utility connections: 2 months
    - Building and equipment: 9 months
    - Start-up and testing: 2 months

- Well facilities at Sites 2, 3, and 4: These facilities would be constructed only during the summer months (when school is not in session).
- Pipelines: 300 to 600 feet per week (approximately one to two blocks per week).
- 16 months total.

All construction activities would occur during the daytime hours, from 7 AM to 7 PM, Monday through Friday except for construction of wells, which would require nighttime construction during drilling and other drilling-related activities (for seven consecutive days/nights) and a pump test (for one continuous 48-hour period) at each site.

Focused Air Quality Technical Report

The Air Quality Technical Report would focus on construction period impacts and explain why operational impacts are not quantified (the only operational emissions identified are, at maximum, from one maintenance vehicle visit per day and eight supply deliveries per month to a well site with full treatment).

The Focused Air Quality Technical Report for the project will include the following sections:

<u>Project Description</u>

A brief project description would be prepared, focusing on those elements of the GSR Project that relate to air quality. Since the project includes 20 project sites, a reference to the detailed project description would be included to keep the report to a reasonable size. The attached figures will be used in the Report.

<u>Project Setting</u>

Construction activities that would generate emissions of TACs will be described for each kind of project site. Maps showing the construction sites and the surrounding sensitive receptors would be shown. A table listing the distance from the nearest sensitive receptor to the construction area boundary will be included. In addition, other sources of TAC emissions identified using BAAQMD's stationary source screening tool would be identified on these maps.

<u>Impact of Criteria Air Pollutants</u>

Construction period criteria air pollutants would be modeled using the latest version of the CalEEMod . Construction equipment assumptions in the model would be adjusted to account for the California Air Resources Board (CARB) overestimation of emissions. These adjustments would be verified with City staff or CARB. Model input in terms of equipment quantity, daily usage, size, and number of days used at the site will be developed in consultation with SFPUC. Average daily construction period emissions would be computed. Average daily emissions would be compared against the BAAQMD significance thresholds. Mitigation measures to reduce fugitive dust, and if necessary, exhaust emissions would be identified. Emissions of on-site (construction site) diesel exhaust fine particulate matter emissions developed in this task would be used in the health risk assessment tasks described below.

<u>Single-Source Health Risk Construction Analysis</u>

Where sensitive receptors are located within 1,000 feet of a construction site, the potential for health effects in terms of community risk would be addressed. I&R would conduct a health risk assessment that would model emissions from each of the construction project sites (i.e., construction of a well or pump facility, including chemical treatment and filtration). The pipeline construction associated with these sites would be included. Even though pipeline construction is expected to have very small impacts due to the short duration, the pipeline construction within 1,000 feet of the well facility construction sites would be included.

This modeling would be conducted by computing construction period emissions of toxic air contaminants (TACs) and $PM_{2.5}$ and using dispersion models to predict the received concentrations. The health risks associated with the received concentrations would be assessed by applying BAAQMD risk calculation methods that include age-sensitivity factors. Health risk would be predicted per BAAQMD Risk Management policy. Details of this analysis include:

- Construction Emissions would be computed using the CalEEMod model as described above. If construction equipment is known or SFPUC commits to certain construction equipment fleet emissions requirements, then CARB's OFFROAD2007 and EMFAC2007 model would be used. As described above, construction equipment activity levels would be determined using the CalEEMod model, unless specific information is provided by SFPUC. All $PM_{2.5}$ exhaust emissions from on-site off-road and on-road equipment will be considered as diesel particulate matter. The latest off-road equipment load factors recommended by CARB would be applied to the CalEEMod modeling.

- EPA's ISCST3 model would be used to model emissions from the construction activities. The first approach would be to identify appropriate hourly meteorological data that could be used in this task. This would be done by consulting with BAAQMD's meteorologist in consultation with City staff. Otherwise, screening meteorological conditions would be used to model a worst-hour concentration. The worst-hour concentration would be converted to an annual concentration to address cancer, non-cancer chronic health risk impacts and annual $PM_{2.5}$ concentrations. Modeled worst-hour concentrations would be used to compute acute hazards resulting from acrolein and all other speciated TAC components of DPM with acute risks using BAAQMD speciation factors[1]. Annual concentrations would be adjusted from worst-hour concentrations by applying a 0.1 persistence factor. Screening meteorological conditions would be based on the meteorological conditions used by the SCREEN3 model[2]. Receptors would be placed at sensitive receptors anticipated to have the greatest impacts that are within 1,000 feet from the modeled construction site. For assessing impacts, the receptor with the highest impacts from construction activities within 1,000 feet would be identified. This analysis would also take into account the situations where some receptors would be within 1,000 feet of more than one construction site. A draft receptor grid will be provided to EP for review prior to modeling and revised per EP comments.

- Health risks and $PM_{2.5}$ concentrations would be predicted based on BAAQMD guidance for sensitive receptor exposures. We would confirm the exposure assumptions and speciation factors for emissions with the City EP Division and BAAQMD to ensure risks are not under or over predicted. The analysis would incorporate the appropriate breathing rates (for adults and children), hours of operation and the number of days per year that emissions would occur.

<u>Cumulative Health Risks</u>

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[1] Speciation factors would be based on a 3/30/2011 email from Virginia Lau (BAAQMD). The City EP Division and/or BAAQMD would be consulted to identify the acute reference exposure levels.
[2] The SCREEN3 meteorological data is a set of 54 discrete combinations of wind speed, wind direction and atmospheric stability.

Screening tables and screening analysis tools provided by BAAQMD along with the database on stationary sources would be used to identify community risk impacts from other nearby sources. The impact from project construction combined with published impacts from roadways or stationary sources within 1,000 feet of each project site would be compared against the BAAQMD thresholds. At this point, modeling of cumulative sources that are not part of the project is not proposed. It is assumed, at this time, that cumulative impacts from non-project sources would not contribute to a significant cumulative health risk. If cumulative risk would exceed the BAAQMD thresholds, then additional refined modeling, which is not included in this scope of work, may be necessary.

For each site, a table would be developed for the maximally exposed individual (MEI), based on exposure to the project construction sites. This table would report the cancer risk, chronic and acute non-cancer risk and $PM_{2.5}$ concentration associated with the project (including the combination of multiple project sites that are within 1,000 feet). This would be the maximum project impact and compared to the BAAQMD community risk thresholds for a single source (e.g., cancer risk of 10 in one million).

In addition, the table would list the impacts from other sources using BAAQMD screening tables for roadways and BAAQMD's stationary source database. The impacts from roadways would be looked up in the screening tables based on the receptor distance from the roadway. Impacts from stationary sources would be based on a search using BAAQMD's Google Earth Stationary Source tool to initially identify the nearby sources. For each site that has identified stationary sources within 1,000 feet, a request would be made to BAAQMD to provide the screening level risk and $PM_{2.5}$ data that would be used as screening level. BAAQMD distance adjustment factors for any diesel engines would be applied. These data would be entered into the table and combined with the project impacts to assess cumulative risk. The risk from each source would be added and the total would be compared against BAAQMD's community risk thresholds for cumulative sources (e.g., cancer risk of 100 in one million).

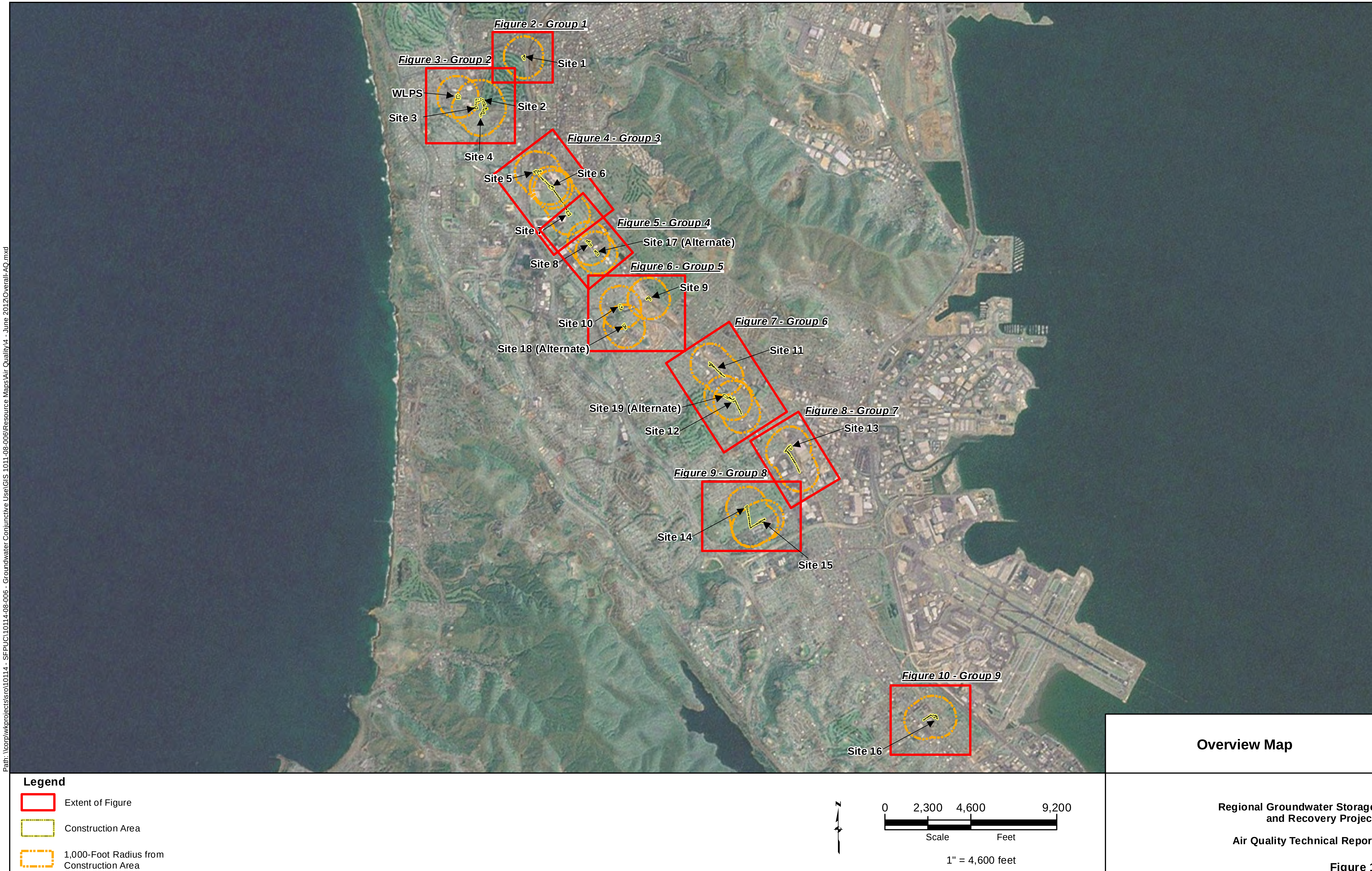
<u>Appendices</u>

The model print outs, speciation tables, emission factors, and this scope of work will be included in the appendices. In addition, correspondence with any agency, such as BAAQMD or CARB, which was used in developing the technical report, will be included.

Attachments: Proposed GSR Construction Schedule

08-139

Appendix 2
Site Maps Showing Construction Area and Sensitive Receptors



Overview Map

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 1

Group 1 - Site 1

Legend

Well

Construction Area

1,000-Foot Radius from Construction Area

Sources

Roadways with over 10,000 ADT

Stationary Sources from BAAQMD

Sensitive Receptor Grid

Residential

Daycare Facilities

Maximum Exposed Individual

Acute Hazard

Cancer Risk and Chronic Hazard

0 75 150 300
Scale Feet
1" = 300'

N

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 2

Path: \\corp\wkprojects\sro\10114 - SFPUC\10114-08-006 - Groundwater Conjunctive Use\GIS 1011-08-006\Resource Maps\Air Quality\4 - June 2012\Site_01-AQ.mxd

Group 2 - Site 2, Site 3, Site 4, and Westlake Pump Station (WLPS) Upgrades

Legend

- Well
- Construction Area
- 1,000-Foot Radius from Construction Area

Sources

- Roadways with over 10,000 ADT
- Stationary Sources from BAAQMD

Sensitive Receptor Grid

- Residential
- Schools

Maximum Exposed Individual

- Acute Hazard
- Cancer Risk and Chronic Hazard

0 112.5 225 450
Scale Feet
1" = 450'

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 3

Path: \\corp\wkprojects\sro\10114 - SFPUC\10114-08-006 - Groundwater Conjunctive Use\GIS 1011-08-006\Resource Maps\Air Quality\4 - June 2012\Site_2,3,4-AQ.mxd

Group 3 -
Site 5 (On-Site Treatment),
Site 6 (On-Site Treatment)
and Site 7 (On-Site Treatment)

Legend

- Well
- Construction Area
- 1,000-Foot Radius from Construction Area

Sources

- Roadways with over 10,000 ADT
- Stationary Sources from BAAQMD

Sensitive Receptor Grid

- Residential
- Daycare Facilities

Maximum Exposed Individual

- Acute Hazard
- Cancer Risk and Chronic Hazard

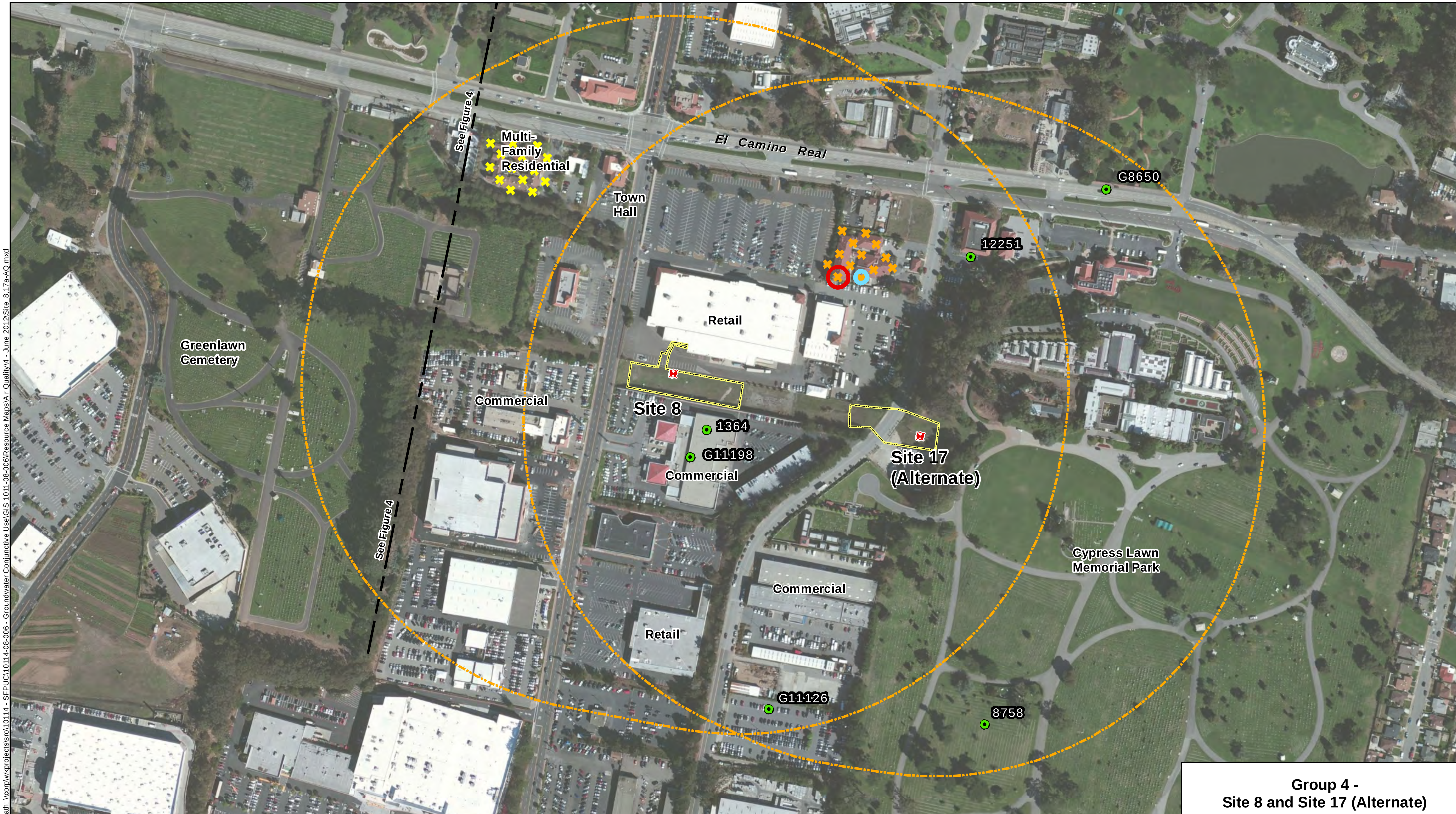
0 100 200 400
Scale Feet
1" = 400'

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 4

Path: \\corp\wkprojects\sro10114\10114 - SFPUC\10114-08-006 - Groundwater Conjunctive Use\GIS 1011-08-006\Resource Maps\Air Quality\4 - June 2012\Site 5,6,7,8-AQ.mxd



Legend

Well

Construction Area

1,000-Foot Radius from Construction Area

Sources

Roadways with over 10,000 ADT

Stationary Sources from BAAQMD

Sensitive Receptor Grid

Residential

Senior Facilities

Maximum Exposed Individual

Acute Hazard

Cancer Risk and Chronic Hazard

0 70 140 280

Scale Feet

1" = 280'

Group 4 -
Site 8 and Site 17 (Alternate)

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 5

Legend

- Well
- Construction Area
- 1,000-Foot Radius from Construction Area

Sources

- Roadways with over 10,000 ADT
- Stationary Sources from BAAQMD

Sensitive Receptor Grid

- Residential
- Schools
- Daycare Facilities

Maximum Exposed Individual

- Acute Hazard
- Cancer Risk and Chronic Hazard

0 105 210 420
Scale Feet
1" = 420'

Group 5 -
Site 9, Site 10,
and Site 18 (Alternate)

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 6

Path: \\corp\wkprojects\sro\10114 - SFPUC\10114-08-006 - Groundwater Conjunctive Use\GIS 1011-08-006\Resource Maps\Air Quality\4 - June 2012\Site 11,12,19-AQ.mxd

Group 6 -
Site 11, Site 12, and Site 19 (Alternate)

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 7

Group 7 - Site 13

Legend

Well

Construction Area

1,000-Foot Radius from Construction Area

Sources

Roadways with over 10,000 ADT

Stationary Sources from BAAQMD

Sensitive Receptor Grid

Residential

Schools

Maximum Exposed Individual

Acute Hazard

Cancer Risk and Chronic Hazard

0 80 160 320

Scale Feet

1" = 320'

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 8

Path: \\corp\wkprojects\sro\10114 - SFPUC\10114-08-006 - Groundwater Conjunctive Use\GIS 1011-08-006\Resource Maps\Air Quality\4 - June 2012\Site 13-AQ.mxd

Group 8 -
Site 14 and Site 15

Legend

- Well
- Construction Area
- 1,000-Foot Radius from Construction Area

Sources

- Roadways with over 10,000 ADT
- Stationary Sources from BAAQMD

Sensitive Receptor Grid

- Residential

Maximum Exposed Individual

- Acute Hazard
- Cancer Risk and Chronic Hazard

0 100 200 400
Scale Feet
1" = 400'

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 9

Path: \\corp\wkprojects\sro\10114 - SFPUC\10114-08-006 - Groundwater Conjunctive Use\GIS 1011-08-006\Resource Maps\Air Quality\4 - June 2012\Site 14,15-AQ.mxd

Group 9 - Site 16

Regional Groundwater Storage and Recovery Project

Air Quality Technical Report

Figure 10

Appendix 3
Detailed Emissions Computations and CalEEMod Modeling Output Files

Regional Groundwater Storage and Recovery Project

Summary of Criteria Air Pollutant Emissions

Construction Schedule: June 2014 to February 2016 = 21 Months of Construction

Site ID	Pipeline Length	Vehicle Trips: Haul Truck	Vehicle Trips: Vendor/ Worker Trips	Vehicle Trips: Estimated Worker Trips (b)	Vehicle Trips: Estimated Vendor Trips (c)	Construction Type: Well	Construction Type: Fence	Construction Type: WF & Treatment	Emissions in total pounds: ROG	Emissions in total pounds: NOx	Emissions in total pounds: PM_{10}	Emissions in total pounds: $PM_{2.5}$	Emissions in total pounds: CO_2	Mitigated NOx	Mitigated $PM_{2.5}$
Site 1	295	9	1435	952	482	x		x	205	1511	81	73	275967	1511	73
Site 2[(b)]	440	2	125	81	44		x		15	107	7	6	16685	107	6
Site 3[(b)]	845	10	353	266	87	x	x		57	419	22	20	99645	419	20
Site 4[(b)]	1000	27	358	270	88	x	x		62	434	23	21	102559	434	21
Westlake Pump Station	0	0	440	280	160				5	26	4	1	10585	26	1
Site 5 (assume worst case) [(a)]	2135	7	1370	877	492			x	176	1291	77	66	211294	1291	30
Site 6 (assume worst case) [(a)]	1530	4	1346	859	486			x	172	1266	76	65	206707	1266	65
Site 7 (assume worst case) [(a)]	2435	17	1484	990	495	x		x	220	1593	88	79	291094	1593	79
Site 8	450	5	1335	851	484			x	165	1228	73	62	199948	1228	62
Site 9	600	8	1445	960	485	x		x	207	1522	82	74	277961	1522	74
Site 10	455	7	1335	851	484			x	165	1229	73	62	200199	1229	62
Site 11	1315	9	1469	978	491	x		x	212	1549	85	76	282999	1549	76
Site 12	1635	15	1480	986	494	x		x	214	1564	86	77	285856	1564	77
Site 13	2475	14	1403	902	501			x	179	1308	79	68	214884	1308	32
Site 14	2895	25	1522	1017	504	x		x	223	1616	90	81	295628	1616	81
Site 15	935	8	1456	968	488	x		x	209	1534	83	75	280271	1534	75
Site 16	1095	8	1462	972	489	x		x	211	1540	84	75	281374	1540	75
Site 17 (Alternate)	140	10	1430	949	481	x		x	204	1506	81	73	275015	1221	73
Site 18 (Alternate)	425	10	1438	955	483	x		x	206	1516	82	74	276950	1230	74
Site 19 (Alternate)	1640	15	380	286	94	x	x		66	451	25	22	105668	366	22
Total (Sites 1 - 16):									2,697	19,738	1,113	981	3,533,657		
Average Daily Emissions (Sites 1 - 16): ***assuming 420 construction days***									**6.42**	**46.99**	**2.65**	**2.34**			
Total + Alternative Sites:									3174	23211	1301	1150		22555	
assuming 420 construction days									**7.56**	**55.26**	**3.10**	**2.74**		**53.70**	

(a) Worst-case assumes chemical treatment, longest pipeline and hightest trip generation.

(b) Based on dfference between Worker/Vendor trips and computed vendor trips

(c) Calculated based on Worker/Vendor trips and worker trips.

Regional Groundwater Storage and Recovery Project

GSR Construction Phasing and Equipment List for Air Quality Modeling
Preliminary - Subject to Change
Revised May 31, 2012

Well Drilling/Well Construction

Phase	Working Days[3]	Equipment Type[1]	hp (if known)	Fuel Type	Quantity of Equipment[2]	No. of Days	Hours per Day	Average Hours per Sub-Phase Day	Average Hours per Phase Day
Site Preparation	3	Grader			1	1	4	1.3	0.1
Pilot Hole	2	Mounted Drill Rig			1	2	8	8.0	0.5
		Cement Truck			2	1	1	0.5	0.0
Bore Hole, Drilling	9	Mounted Drill Rig	330	diesel	1	5	24	13.3	4.0
Well Development	6	Mounted Drill Rig	330	diesel	1	6	12	12.0	2.4
		Cement Truck			3	1	1	0.2	0.0
		Air Compressor	300	diesel	1	6	12	12.0	2.4
		Pump Truck			1	1	8	1.3	0.3
Pump Testing, Water Sampling	8	Diesel pump - submersible	100		1	4	12	6.0	1.6
Continuous 48-hour pumping	2	Diesel pump - submersible	100		1	2	24	24.0	1.6
	Total Days								
	30								

	ROG	NOx	PM_{10}	$PM_{2.5}$	CO_2
Max Day					
2014	5.69	46.35	1.58	1.58	9204
during Well Development					
Average Day					
2014	1.34	9.5	0.39	0.39	2487
Total per Phase			30 days		
	40.20	285.00	11.70	11.70	74610.00
Mitigated Average day					
	0.68	6.57	0.10	0.10	2487
Total per Phase			30 days		
	20.40	197.10	3.00	3.00	74610.00

Construction for WF & Treatment Building (5 rooms)

Phase	Working Days[3]	Equipment Type[1]	hp (if known)	Fuel Type	Quantity of Equipment[2]	No. of Days	Hours per Day	Average Hours per Sub-Phase Day	Average Hours per Phase Day
Site Preparation	18	Frontend Loaders			1	14	6	4.67	0.4
		Graders/Roller Compactor			1	4	8	1.78	0.1
		Generator			1	18	1	1.00	0.1
Building Foundation	32	Cement Trucks			14	1	1	0.03	0.0
		Pump Truck			1	1	4	0.13	0.0
		Generator			1	32	1	1.00	0.1
		Forklift			1	32	2	2.00	0.3
Building Construction	180	Forklift			1	180	2	2.00	1.5
		Cement Trucks			9	3	1	0.02	0.0
		Pump Truck			1	3	4	0.07	0.1
		Crane	200		1	45	8	2.00	1.5
		Generator			1	180	1	1.00	0.8
Pipeline (onsite)	8	Loader Backhoe			1	8	8	8.00	0.3
		Roller compactor or wacker			1	8	2	2.00	0.1
Paving	2	Cement Trucks			1	1	1	0.50	0.0
		Rollers			1	1	2	1.00	0.0
		Asphalt Truck			1	1	2	1.00	0.0
~~Well &~~ Pump Install**	NA	Accounted for Under Building Construction							
Landscaping	NA	None							
	Total Days								
	240								

	ROG	NOx	PM_{10}	$PM_{2.5}$	CO_2
Max Day					
2014	2.47	15.77	1.07	1.07	2475
during Site Preperation					
Average Day					
2014	0.61	4.66	0.23	0.23	678
2015	0.57	4.21	0.2	0.2	678
Total per Phase			240 days		
	146.40	1118.40	55.20	55.20	162720.00
Mitigated Average Day					
2014	0.34	3.22	0.08	0.08	678
2015	0.33	3.00	0.07	0.07	678
Total per Phase			240 days		
	81.60	772.80	19.20	19.20	162720.00

Construction for Fenced Enclosure

Phase	Working Days[3]	Equipment Type[1]	hp (if known)	Fuel Tupe	Quantity of Equipment[2]	No. of Days	Hours per Day	Average Hours per Sub-Phase Day	Average Hours per Phase Day
Site Preparation	5	Skid Steer Loaders			1	1	6	1.20	0.2
		Graders/Roller Compactor			1	1	8	1.60	0.20
		Generator			1	2	1	0.40	0.05
Foundation	10	Cement Trucks			4	1	1	0.10	0.03
		Generator			1	10	1	1.00	0.25
		Forklift			1	10	2	2.00	0.50
Pipeline (onsite)	5	Loader Backhoe			1	5	8	8.00	1.00
		Roller compactor or wacker			1	5	2	2.00	0.25
Paving	4	Cement Trucks			1	1	1	0.25	0.03
		Rollers			1	1	2	0.50	0.05
		Asphalt Truck			1	1	2	0.50	0.05
Pump Install	1	Small Crane	200		1	1	2	2.00	0.05
Mechanical Pump	5	None							
Landscaping	NA	None							
Fencing	5	None							
Electrical	5	None							
	Total Days								
	40								

	ROG	NOx	PM_{10}	$PM_{2.5}$	CO_2
	Max Day				
2014	1.07	7.43	0.44	0.44	823
	during Site Preperation				
	Average Day				
2014	0.24	1.75	0.10	0.10	224
	Total per Phase			40 days	
	9.60	70.00	4.00	4.00	8960.00

Construction of Pipeline (per 120 feet)*

Phase	~~Working Days~~[3]	Equipment Type[1]	hp (if known)	Fuel Type	Quantity of Equipment[2]	No. of Days	Hours per Day	Average Hours per Sub-Phase Day	Average Hours per Phase Day
Vegetation Removal	1	None						0.00	0.0
Trenching	1	Loader Backhoe			1	1	4	4.00	4.00
Pipeline	1	Tractors/Loaders/Backhoes			1	1	2	2.00	2.00
		Generator			1	1	1	1.00	1.00
Backfill	1	Loader Backhow			1	1	2	2.00	2.00
		Small Roller Compactor or wacker			1	1	2	2.00	2.00
Surface Restoration***	1	Cement Trucks			2	1	1	1.00	1.00
		Rollers			1	1	8	8.00	8.00
		Asphalt Truck			1	1	8	8.00	8.00
	Total Days								
	NA								

	ROG	NOx	PM_{10}	$PM_{2.5}$	CO_2
	Max Day (street work)				
2014	2.47	17.73	0.96	0.96	2564.77
	Average Day (no street work)				
2014	0.76	4.26	0.33	0.33	736.74
	Total per Phase			1 days	
	0.76	4.26	0.33	0.33	736.74
	Mitigated Average Day (no street work)				
	0.54	2.64	0.24	0.24	736.74
	Total per Phase			1 days	
	0.54	2.64	0.24	0.24	736.74

1. Revise equipment type, except "On Highway Trucks," as appropriate for this project. Provide hp if known.
2. For "On Highway Trucks" (which includes vendors, haul trucks,& deliveries) the "quantity of equipment" should be reported as round trip truck trips.
3. Working days are counted as 20 days within a calendar month.

* Typically we use an average of 60 - 120 ft/day pipeline construction, depending on conditions. Majority of the pipeline in this project is in soil where we would anticipate minimal obstructions, so we can assume a higher production rate.
** Assume pump, tanks, and other equipment installed during building construction, while fork lift and crane are avaialble. The 40 days includes testing
*** Needed for pipeline work in the street.

Regional Groundwater Storage and Recovery Project

On-Road Vehicle Emissions

Air Pollutant and GHG Emissions using EMFAC2011 for 2014

	Round	Vehicle Emissions per Construction Period (pounds)								
Site ID	**Trips**	**ROG**	**NOx**	**PM10**	**PM2.5**	**PM2.5**	**PM2.5**	**CO2**	**CO2**	**CO2**
Site 1					Running	Idle		Running	Idle	
Employee Traffic	952	8.77	12.30	8.48	2.55	0.00	2.55	18539	0	18,539
Vendor/Equipment Trips	482	5.95	66.52	4.36	2.04	0.09	2.13	14175	1308	15,482
Heavy-Heavy Duty Trucks	9	0.32	4.83	0.30	0.17	0.00	0.17	954	23	977
Total	**1444**	**15.05**	**83.65**	**13.14**	**4.8**	**0.1**	**4.85**	**33,667**	**1,331**	**34,998**
Site 2										
Employee Traffic	81	0.75	1.05	0.72	0.22	0.00	0.22	1577	0	1,577
Vendor/Equipment Trips	44	0.54	6.02	0.39	0.18	0.01	0.19	1283	118	1,401
Heavy-Heavy Duty Trucks	2	0.07	1.07	0.07	0.04	0.00	0.04	212	5	217
Total	**127**	**1.36**	**8.14**	**1.18**	**0.4**	**0.0**	**0.45**	**3072**	**124**	**3,195**
Site 3										
Employee Traffic	266		3.44	2.37	0.71	0.00	0.71	5180	0	5,180
Vendor/Equipment Trips	87		12.00	0.79	0.37	0.02	0.38	2557	236	2,793
Heavy-Heavy Duty Trucks	10		5.37	0.34	0.18	0.00	0.19	1060	26	1,086
Total	**363**		**20.81**	**3.49**	**1.3**	**0.0**	**1.28**	**8798**	**262**	**9,059**
Site 4										
Employee Traffic	270	2.49	3.49	2.40	0.72	0.00	0.72	5256	0	5,256
Vendor/Equipment Trips	88	1.09	12.18	0.80	0.37	0.02	0.39	2595	239	2,835
Heavy-Heavy Duty Trucks	27	0.97	14.49	0.91	0.50	0.00	0.50	2862	70	2,931
Total	**385**	**4.54**	**30.16**	**4.11**	**1.6**	**0.0**	**1.62**	**10713**	**309**	**11,022**
Westlake Pump Station										
Employee Traffic	280	2.58	3.62	2.49	0.75	0.00	0.75	5450	0	5,450
Vendor/Equipment Trips	160	1.97	22.06	1.44	0.68	0.03	0.71	4701	434	5,134
Heavy-Heavy Duty Trucks	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0
Total	**440**	**4.55**	**25.68**	**3.94**	**1.4**	**0.0**	**1.46**	**10151**	**434**	**10,585**
Site 5 (assume worst case)										
Employee Traffic	877	8.08	11.33	7.81	2.35	0.00	2.35	17077	0	17,077
Vendor/Equipment Trips	492	6.08	67.89	4.45	2.08	0.09	2.18	14467	1335	15,802
Heavy-Heavy Duty Trucks	7	0.25	3.76	0.23	0.13	0.00	0.13	742	18	760
Total	**1377**	**14.41**	**82.98**	**12.49**	**4.6**	**0.1**	**4.66**	**32286**	**1,353**	**33,638**
Site 6 (assume worst case)										
Employee Traffic	859	7.92	11.10	7.65	2.30	0.00	2.30	16724	0	16,724
Vendor/Equipment Trips	486	6.00	67.06	4.39	2.06	0.09	2.15	14290	1318	15,608
Heavy-Heavy Duty Trucks	4	0.14	2.15	0.13	0.07	0.00	0.07	424	10	434
Total	**1350**	**14.06**	**80.31**	**12.18**	**4.4**	**0.1**	**4.53**	**31437**	**1,329**	**32,766**
Site 7 (assume worst case)										
Employee Traffic	990	9.12	12.78	8.81	2.65	0.00	2.65	19262	0	19,262
Vendor/Equipment Trips	495	6.11	68.23	4.47	2.09	0.10	2.19	14538	1341	15,879
Heavy-Heavy Duty Trucks	17	0.61	9.12	0.57	0.31	0.00	0.32	1802	44	1,846
Total	**1501**	**15.83**	**90.13**	**13.85**	**5.1**	**0.1**	**5.16**	**35602**	**1,385**	**36,987**
Site 8										
Employee Traffic	851	7.84	11.00	7.58	2.28	0.00	2.28	16570	0	16,570
Vendor/Equipment Trips	484	5.97	66.70	4.37	2.05	0.09	2.14	14213	1311	15,524
Heavy-Heavy Duty Trucks	5	0.18	2.68	0.17	0.09	0.00	0.09	530	13	543
Total	**1340**	**13.99**	**80.38**	**12.12**	**4.4**	**0.1**	**4.51**	**31313**	**1,324**	**32,637**
Site 9										
Employee Traffic	960	8.84	12.40	8.55	2.57	0.00	2.57	18687	0	18,687
Vendor/Equipment Trips	485	5.99	66.87	4.38	2.05	0.09	2.14	14249	1314	15,564
Heavy-Heavy Duty Trucks	8	0.29	4.29	0.27	0.15	0.00	0.15	848	21	869
Total	**1453**	**15.12**	**83.57**	**13.20**	**4.8**	**0.1**	**4.87**	**33785**	**1,335**	**35,120**

Site ID	Round Trips	Vehicle Emissions per Construction Period (pounds) ROG	NOx	PM10	PM2.5	PM2.5	PM2.5	CO2	CO2	CO2
Site 10										
Employee Traffic	851	7.84	11.00	7.58	2.28	0.00	2.28	16573	0	16,573
Vendor/Equipment Trips	484	5.97	66.71	4.37	2.05	0.09	2.14	14214	1311	15,525
Heavy-Heavy Duty Trucks	7	0.25	3.76	0.23	0.13	0.00	0.13	742	18	760
Total	**1342**	**14.06**	**81.46**	**12.18**	**4.5**	**0.1**	**4.55**	**31529**	**1,329**	**32,858**
Site 11										
Employee Traffic	978	9.01	12.63	8.71	2.62	0.00	2.62	19035	0	19,035
Vendor/Equipment Trips	491	6.06	67.69	4.43	2.08	0.09	2.17	14424	1331	15,755
Heavy-Heavy Duty Trucks	9	0.32	4.83	0.30	0.17	0.00	0.17	954	23	977
Total	**1478**	**15.39**	**85.15**	**13.44**	**4.9**	**0.1**	**4.96**	**34414**	**1,354**	**35,767**
Site 12										
Employee Traffic	986	9.08	12.73	8.78	2.64	0.00	2.64	19191	0	19,191
Vendor/Equipment Trips	494	6.09	68.06	4.46	2.09	0.09	2.18	14503	1338	15,841
Heavy-Heavy Duty Trucks	15	0.54	8.05	0.50	0.28	0.00	0.28	1590	39	1,628
Total	**1495**	**15.71**	**88.85**	**13.74**	**5.0**	**0.1**	**5.11**	**35284**	**1,377**	**36,660**
Site 13										
Employee Traffic	902	8.31	11.65	8.03	2.42	0.00	2.42	17556	0	17,556
Vendor/Equipment Trips	501	6.18	69.03	4.52	2.12	0.10	2.21	14708	1357	16,065
Heavy-Heavy Duty Trucks	14	0.50	7.51	0.47	0.26	0.00	0.26	1484	36	1,520
Total	**1417**	**14.99**	**88.19**	**13.02**	**4.8**	**0.1**	**4.89**	**33748**	**1,393**	**35,141**
Site 14										
Employee Traffic	1017	9.37	13.14	9.06	2.73	0.00	2.73	19804	0	19,804
Vendor/Equipment Trips	504	6.22	69.51	4.55	2.13	0.10	2.23	14811	1366	16,178
Heavy-Heavy Duty Trucks	25	0.89	13.42	0.84	0.46	0.00	0.46	2650	64	2,714
Total	**1547**	**16.49**	**96.07**	**14.45**	**5.3**	**0.1**	**5.42**	**37265**	**1,431**	**38,696**
Site 15										
Employee Traffic	968	8.92	12.51	8.62	2.60	0.00	2.60	18850	0	18,850
Vendor/Equipment Trips	488	6.02	67.26	4.40	2.06	0.09	2.16	14331	1322	15,653
Heavy-Heavy Duty Trucks	8	0.29	4.29	0.27	0.15	0.00	0.15	848	21	869
Total	**1464**	**15.23**	**84.06**	**13.30**	**4.8**	**0.1**	**4.90**	**34030**	**1,343**	**35,372**
Site 16										
Employee Traffic	972	8.96	12.56	8.66	2.61	0.00	2.61	18928	0	18,928
Vendor/Equipment Trips	489	6.04	67.44	4.42	2.07	0.09	2.16	14371	1326	15,696
Heavy-Heavy Duty Trucks	8	0.29	4.29	0.27	0.15	0.00	0.15	848	21	869
Total	**1470**	**15.28**	**84.29**	**13.34**	**4.8**	**0.1**	**4.92**	**34147**	**1,346**	**35,493**
Site 17 (Alternate)										
Employee Traffic	949	8.74	12.25	8.45	2.54	0.00	2.54	18468	0	18,468
Vendor/Equipment Trips	481	5.94	66.36	4.35	2.04	0.09	2.13	14139	1304	15,443
Heavy-Heavy Duty Trucks	10	0.36	5.37	0.34	0.18	0.00	0.19	1060	26	1,086
Total	**1440**	**15.04**	**83.98**	**13.13**	**4.8**	**0.1**	**4.86**	**33667**	**1,330**	**34,997**
Site 18 (Alternate)										
Employee Traffic	955	8.80	12.33	8.50	2.56	0.00	2.56	18588	0	18,588
Vendor/Equipment Trips	483	5.96	66.64	4.36	2.04	0.09	2.14	14199	1310	15,509
Heavy-Heavy Duty Trucks	10	0.36	5.37	0.34	0.18	0.00	0.19	1060	26	1,086
Total	**1448**	**15.12**	**84.34**	**13.20**	**4.8**	**0.1**	**4.88**	**33847**	**1,336**	**35,182**
Site 19 (Alternate)										
Employee Traffic	286	2.63	3.69	2.55	0.77	0.00	0.77	5567	0	5,567
Vendor/Equipment Trips	94	1.16	12.91	0.85	0.40	0.02	0.41	2752	254	3,006
Heavy-Heavy Duty Trucks	15	0.54	8.05	0.50	0.28	0.00	0.28	1590	39	1,628
Total	**395**	**4.33**	**24.66**	**3.90**	**1.4**	**0.0**	**1.46**	**9909**	**293**	**10,202**

Vehicle & Trip Information

Description	Trip Length*	% LDA	%LDT	%MDT	%HDT	%HHDT
Employee Vehicles	**12.4**	50%	50%			
Vendor/Equipment Trips	**7.3**			50%	50%	
Heavy Duty Trucks	**20**				100%	
Heavy-Heavy Duty Trucks	**20**					100%

* Trip length is one way distance in miles

Composite Running Emission Factors, gm/mi

						Entrained Dust	
Description	**ROG**	**NOx**	**PM10**	**PM2.5**	**CO2**	**PM10**	**PM2.5**
Employee Vehicles	0.144	0.213	0.047	0.020	350.06	0.116	0.029
Vendor/Equipment Trips	0.294	3.216	0.158	0.102	906.02	0.116	0.029
Heavy Duty Trucks	0.363	5.768	0.263	0.180	1202.52	0.116	0.029
Heavy-Heavy Duty Trucks	0.418	8.488	0.241	0.170	1646.48	0.116	0.029

Emission factors based on EMFAC2011

Trip Emissions, gm/trip

Description	ROG	NOx	PM10	PM2.5	CO2
Employee Vehicles	0.311	0.289	0.003	0.003	78.09
Vendor/Equipment Trips	0.450	0.635	0.002	0.002	55.31
Heavy Duty Trucks	0.317	0.460	0.001	0.001	8.56
Heavy-Heavy Duty Trucks	0.323	0.397	0.000	0.000	5.29

Emission factors based on EMFAC2011

Idle Emissions, gm/hr-veh

Description	ROG	NOx	PM10	PM2.5	CO2
Employee Vehicles[a]	-	-	-	-	-
Vendor/Equipment Trips[b]	2.489	86.283	0.569	0.524	7382.69
Heavy Duty Trucks[c]	6.357	72.190	0.384	0.3536	7022.55
Heavy-Heavy Duty Trucks[c]	6.357	72.190	0.384	0.354	7022.55

Emision rates from CARB Idling Emission Rates for EMFAC2011-HD Vehicle Categories, Feb. 8, 2012

Idle time per vehicle round trip assumet to be = 10 minutes

[a] Idle emissions from employee vehicles assumed to be negligible

[b] Idle emissions from Vendor/Equipment vehicles assumed to be same as for MHDT vehicle category

[c] Idle emissions from Heavy Duty Trucks and Heavy-Heavy Duty trucks assumed to be same as for HHDT vehicle category

Entrained Roadway Dust (PM10)
gm/mi

Vehicle	PM10	PM2.5
All	0.116	0.029

EPA AP-42 Section 13.2.1

$E = k(sL)^{0.91} \times (W)^{1.02}$ EPA AP-42 Section 13

Where:

k (PM2.5) = 0.25

k (PM10) = 1.00

sL = 0.035 g/m2 for major & colle

W = 2.4 tons

4/8/2012
From Table 3-4

Site ID	Proposed Water Connection Pipeline	Alternate Water Connection Pipeline	Sanitary Sewer Pipeline	Storm Drain Pipeline	Total	Total Days
	Approximate Pipeline Lengths (feet)					
Site 1	125	175	55	65	295	2.5
Site 2[b]	315	None	None	125	440	3.7
Site 3[b]	375	None	None	470	845	7.0
Site 4[b]	670	None	None	330	1000	8.3
Westlake Pump Station	None	None	None	None	0	0.0
Site 5 (Consolidated Treatment at Site 6) [c]	1,120	None	None	370	1490	12.4
Site 6 (Consolidated Treatment at Site 6) [c]	115	525	130	110	765	6.4
Site 7 (Consolidated Treatment at Site 6) [c]	1,780	None	None	170	1950	16.3
Site 5 (On-Site Treatment)	145	165	110	370	645	5.4
Site 6 (On-Site Treatment)	115	525	130	110	765	6.4
Site 7 (On-Site Treatment)	75	145	170	170	485	4.0
Site 8	145	125	85	220	450	3.8
Site 9	245	None	185	170	600	5.0
Site 10	200	100	145	110	455	3.8
Site 11	205	160	965	145	1315	11.0
Site 12	925	90	355	355	1635	13.6
Site 13	1,835	185	495	145	2,475	20.6
Site 14	1,785	None	None	1,110	2895	24.1
Site 15	670	680	100	155	935	7.8
Site 16	40	700	290	105	1095	9.1
Site 17 (Alternate)	105	20	70	75	140	1.2
Site 18 (Alternate)	130	120	140	155	425	3.5
Site 19 (Alternate)[d]	1450	150	None	190	1640	13.7
				Total	22740	

a. Pipelines listed in the table are illustrated on site plans for each site – Figures 3-12 through Figure 3-39.

b. The water connection pipeline for Sites 2, 3, and 4 includes the length of pipeline needed to connect to the existing Daly City pipeline for conveyance to the Westlake Pump Station.

c. Water connection pipelines for Site 5 (Consolidated Treatment at Site 6) and Site 7 (Consolidated Treatment at Site 6) include the pipeline length necessary to deliver water to Site 6 for treatment.

Regional Groundwater Storage and Recovery Project
Vehilce Trips Breakdown

5/31/2012
Taken from Sheet 1, PD Table 3-10, andPD Table 3-11

					Round-trips											
					Worker, Equipment, and Delivery Trips				Vendor Trips (Equipment & Delivery)				Haul Trips (Soil Import/Export)			
	Well Drilling	**Building or Fenced-only**	**Pipeline Length**	**Haul Truck Trips**	**Well**	**Facility**	**Pipeline**	**Total**	**Well**	**Facility**	**Pipeline**	**Total**	**Well**	**Facility**	**Pipeline**	**Total**
Cluster A																
Site 1	Yes	Building	295	9	105	1,320	10	1,435	0	480	2	482	5.0	2.0	2.0	9
Site 3[b]	Yes	Fenced-only	845	10	105	220	28	353	0	80	7	87	6.0	4.0	0.0	10
Site 4[b]	Yes	Fenced-only	1,000	27	105	220	33	358	0	80	8	88	6.0	5.0	16.0	27
Site 7 (on-site is worse)	Yes	Building	1,780	17	105	1,320	59	1,484	0	480	15	495	6.0	10.0	1.0	17
Subtotal			**3,920**	**63**	**420**	**3,080**	**131**	**3,631**								
Cluster B																
Site 12	Yes	Building	1,635	15	105	1,320	55	1,480	0	480	14	494	5.0	8.0	2.0	15
Site 14	Yes	Building	2,895	25	105	1,320	97	1,522	0	480	24	504	5.0	18.0	2.0	25
Site 15	Yes	Building	935	8	105	1,320	31	1,456	0	480	8	488	5.0	3.0	0.0	8
Site 16 (alternate water connection, which is longer)	Yes	Building	1,095	8	105	1,320	37	1,462	0	480	9	489	4.0	4.0	0.0	8
Site 19 (Alternate)[d]	Yes	Fenced-only	1,640	15	105	220	55	380	0	80	14	94	6.0	5.0	4.0	15
Subtotal			**8,200**	**71**	**525**	**5,500**	**273**	**6,298**								
Cluster C																
Site 9	Yes	Building	600	8	105	1,320	20	1,445	0	480	5	485	5.0	3.0	0.0	8
Site 10	No	Building	455	7	-	1,320	15	1,335	0	480	4	484	-	3.0	4.0	7
Site 11	Yes	Building	1,315	9	105	1,320	44	1,469	0	480	11	491	6.0	3.0	0.0	9
Site 13	No	Building	2,475	14	-	1,320	83	1,403	0	480	21	501	-	14.0	0.0	14
Site 18 (Alternate)	Yes	Building	395	10	105	1,320	13	1,438	0	480	3	483	6.0	2.0	2.0	10
Subtotal			**5,240**	**48**	**315**	**6,600**	**175**	**7,090**								
Cluster D																
Site 2[b]	No	Fenced-only	440	2	-	110	15	125	0	40	4	44	-	1.0	1.0	2
Site 5 (on-site is worse)	No	Building	1,490	7	-	1,320	50	1,370	0	480	12	492	-	7.0	0.0	7
Site 6	No	Building	765	4	-	1,320	26	1,346	0	480	6	486	-	2.0	2.0	4
Site 8	No	Building	450	5	-	1,320	15	1,335	0	480	4	484	-	2.5	2.5	5
Site 17 (Alternate)	Yes	Building	150	10	105	1,320	5	1,430	0	480	1	481	6.0	2.0	2.0	10
Westlake Pump Station		Pumps and treatment only	-	-	-	440	-	440	0	160	-	160	0.0	0.0	0.0	0
Subtotal			**3,295**	**28**	**105**	**5,830**	**110**	**6,045**								
Total			**20,655**	**210**	**1,365**	**21,010**	**689**	**23,064**								

F & G column is calculated:
(average typical workers + Delivery and Equipment trips from PD Table 3-8)*days per month

Regional Groundwater Storage and Recovery Project

EMFAC2011 - Average Emission Rates
2014 Estimated Annual Emission Rates
San Mateo COUNTY

		Fraction	Total	Fraction	Fraction	ROG		TOG		NOx		PM10		PM2.5		CO2 (Pavley + LCFS)		PM2.5	
	Population (Vehicles)	of Total Vehicles	VMT (Miles/day)	of Total VMT	Diesel VMT of Class	Running* (gms/mile)	Starting (gms/trip)	Running* (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	Running** (gms/mile)	Starting (gms/trip)	Running** (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	All Fuels Exh (gms/mile)	Diesel Exhaust (gms/mile)
LDA	343,898	0.594	12,487,933	0.5778	0.00408	0.10856	0.24873	0.12358	0.26590	0.1386	0.19463	0.04686	0.00291	0.01967	0.00265	296.431	66.676	0.001919	0.03488
LDT1	34,964	0.060	1,358,386	0.0628	0.00145	0.28812	0.51092	0.32047	0.54600	0.3757	0.34515	0.04948	0.00518	0.02206	0.00474	352.419	78.181	0.004309	0.07284
LDT2	95,611	0.165	3,813,529	0.1764	0.00049	0.13961	0.32404	0.16051	0.34613	0.2565	0.39596	0.04680	0.00276	0.01962	0.00254	421.942	93.528	0.001874	0.04868
LHD1	15,491	0.027	647,808	0.0300	0.24450	0.41367	0.55407	0.45085	0.59171	1.4979	1.47038	0.07207	0.00153	0.03747	0.00140	850.143	42.628	0.015318	0.05247
LHD2	2,193	0.004	91,310	0.0042	0.49494	0.35807	0.37110	0.39197	0.39661	2.2474	0.96805	0.10041	0.00111	0.05487	0.00100	739.945	29.065	0.025508	0.04821
MCY	13,488	0.023	139,857	0.0065	0.00000	3.29148	2.42327	3.55540	2.60691	1.2899	0.31959	0.00088	0.00270	0.00070	0.00211	149.04149	46.07064	0.000700	0.00070
MDV	63,894	0.110	2,504,597	0.1159	0.00129	0.17007	0.59812	0.20208	0.63877	0.3898	0.63374	0.04697	0.00351	0.01980	0.00323	542.530	120.102	0.002046	0.03151
MH	1,610	0.003	21,240	0.0010	0.15298	0.32416	0.87092	0.37225	0.93327	2.1618	1.05938	0.09653	0.00252	0.05785	0.00214	745.812	34.264	0.033810	0.20342
OBUS	764	0.001	55,083	0.0025	0.66381	0.35810	0.33224	0.40035	0.35531	6.4430	0.69446	0.22055	0.00045	0.14718	0.00039	1192.688	12.715	0.102139	0.15339
SBUS	116	0.000	5,038	0.0002	0.53149	0.94070	1.63654	1.03104	1.74911	7.0771	1.85677	0.48737	0.00405	0.23856	0.00364	1023.027	60.379	0.058997	0.10401
MHDT (T6)	5,781	0.010	327,966	0.0152	0.84516	0.34975	0.31584	0.39314	0.33814	5.0933	0.47505	0.26905	0.00069	0.18296	0.00059	1092.459	9.367	0.130469	0.15401
HHDT (T7)	591	0.001	81,307	0.0038	0.92420	0.41831	0.32252	0.47369	0.34606	8.4884	0.39745	0.24058	0.00047	0.17035	0.00038	1646.479	5.294	0.136975	0.14814
UBUS	508	0.001	80,455	0.0037	0.91903	0.83005	0.49309	0.92853	0.52691	14.8226	0.74147	1.05012	0.00043	0.57908	0.00038	2385.570	12.178	0.244245	0.26538
Total	578,910	1.00	21,614,508	1.00															

* ROG running includes evaporative running loss

** PM10 & PM2.5 running includes tire & brake wear

Average Weekday Emisions Factors

	Fraction	Fraction	Fraction	ROG		TOG		NOx		PM10		PM2.5		CO2		All Fuels	Diesel
Vehicle Class	of Total Vehicles	of Total VMT	Diesel VMT of Class	Running (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	Running (gms/mile)	Starting (gms/trip)	PM2.5 (gms/mile)	PM2.5 (gms/mile)
LDA	0.594	0.5778	0.00408	0.10856	0.24873	0.12358	0.26590	0.13858	0.19463	0.04686	0.00291	0.01967	0.00265	296.431	66.676	0.00192	0.03488
LDT	0.226	0.2393	0.00074	0.17862	0.37312	0.20252	0.39863	0.28778	0.38262	0.04750	0.00340	0.02026	0.00312	403.682	89.497	0.00251	0.05503
MDT	0.141	0.1501	0.06376	0.22401	0.58293	0.25710	0.62255	0.66340	0.81023	0.05349	0.00304	0.02431	0.00281	609.521	102.067	0.00536	0.03617
HDT*	0.015	0.0227	0.80471	0.36337	0.31717	0.40914	0.33971	5.76778	0.45964	0.26339	0.00065	0.18046	0.00055	1202.521	8.558	0.13176	0.15284

* HDT includes emissions from MHDT and HHDT, but not from any buses

Average Daily Emissions

CalEEMod Version: CalEEMod.2011.1.1 Date: 6/14/2012

GSR - Well Drilling/Well Construction

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Heavy Industry	0	1000sqft

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Utility Company**

Climate Zone 5 **Precipitation Freq (Days)** 70

1.3 User Entered Comments

Project Characteristics -

Land Use - Small Area for Well

Construction Phase - Project-specific schedule using 2/1/2014 as earliest start date and 20-day construction period.

Off-road Equipment - Project-specific equipment & LF adjustment (-33%)

Off-road Equipment - Project-specific equipment list averaged to daily use over 30 construction days
Adjusted load factors by -33%

Trips and VMT - Worker trips computed seperately using EMFAC2011

Construction Off-road Equipment Mitigation -

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	1.34	9.50	6.93	0.02	0.49	0.39	0.89	0.02	0.39	0.41	0.00	2,484.03	0.00	0.12	0.00	2,486.56
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	0.78	6.57	83.78	0.02	0.02	0.10	0.11	0.02	0.10	0.11	0.00	2,484.03	0.00	0.12	0.00	2,486.56
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

3.2 Well Drilling/WellConstruction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.15	9.32	4.88	0.02		0.38	0.38		0.38	0.38		2,103.12		0.10		2,105.24
Total	**1.15**	**9.32**	**4.88**	**0.02**		**0.38**	**0.38**		**0.38**	**0.38**		**2,103.12**		**0.10**		**2,105.24**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.19	0.19	2.05	0.00	0.49	0.01	0.51	0.02	0.01	0.03		380.90		0.02		381.32
Total	**0.19**	**0.19**	**2.05**	**0.00**	**0.49**	**0.01**	**0.51**	**0.02**	**0.01**	**0.03**		**380.90**		**0.02**		**381.32**

3.2 Well Drilling/WellConstruction - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.59	6.38	81.73	0.02		0.08	0.08		0.08	0.08	0.00	2,103.12		0.10		2,105.24
Total	**0.59**	**6.38**	**81.73**	**0.02**		**0.08**	**0.08**		**0.08**	**0.08**	**0.00**	**2,103.12**		**0.10**		**2,105.24**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.19	0.19	2.05	0.00	0.02	0.01	0.03	0.02	0.01	0.03		380.90		0.02		381.32
Total	**0.19**	**0.19**	**2.05**	**0.00**	**0.02**	**0.01**	**0.03**	**0.02**	**0.01**	**0.03**		**380.90**		**0.02**		**381.32**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

Average Daily Emissions

CalEEMod Version: CalEEMod.2011.1.1 Date: 6/14/2012

GSR - Construction WF & Treatment Building Avg Day

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Light Industry	2	1000sqft

1.2 Other Project Characteristics

Urbanization Urban

Wind Speed (m/s) 2.2

Utility Company Pacific Gas & Electric Company

Climate Zone 5

Precipitation Freq (Days) 70

1.3 User Entered Comments

Project Characteristics -

Land Use -

Construction Phase - Based on project information - total Building Phase

Off-road Equipment - Equipment list and load factor adjustment -33%

Off-road Equipment - Equipment list averaged over entire 240-day period and adjusted load factors down by 33%

Trips and VMT - All trips modeled using EMFAC2011

Construction Off-road Equipment Mitigation -

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	0.61	4.66	2.46	0.01	0.01	0.23	0.24	0.00	0.23	0.23	0.00	677.03	0.00	0.05	0.00	678.17
2015	0.57	4.21	2.41	0.01	0.01	0.20	0.22	0.00	0.20	0.20	0.00	676.80	0.00	0.05	0.00	677.86
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	0.34	3.22	2.75	0.01	0.00	0.08	0.08	0.00	0.08	0.08	0.00	677.03	0.00	0.05	0.00	678.17
2015	0.33	3.00	2.72	0.01	0.00	0.07	0.07	0.00	0.07	0.07	0.00	676.80	0.00	0.05	0.00	677.86
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

3.2 WF & Treatment Building - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.60	4.66	2.40	0.01		0.23	0.23		0.23	0.23		665.49		0.05		666.62
Total	**0.60**	**4.66**	**2.40**	**0.01**		**0.23**	**0.23**		**0.23**	**0.23**		**665.49**		**0.05**		**666.62**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.01	0.00	0.02	0.00	0.00	0.00		11.54		0.00		11.56
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.01**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**		**11.54**		**0.00**		**11.56**

3.2 WF & Treatment Building - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.34	3.22	2.69	0.01		0.08	0.08		0.08	0.08	0.00	665.49		0.05		666.62
Total	**0.34**	**3.22**	**2.69**	**0.01**		**0.08**	**0.08**		**0.08**	**0.08**	**0.00**	**665.49**		**0.05**		**666.62**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00		11.54		0.00		11.56
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**11.54**		**0.00**		**11.56**

3.2 WF & Treatment Building - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.56	4.20	2.36	0.01		0.20	0.20		0.20	0.20		665.49		0.05		666.54
Total	**0.56**	**4.20**	**2.36**	**0.01**		**0.20**	**0.20**		**0.20**	**0.20**		**665.49**		**0.05**		**666.54**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.01	0.00	0.02	0.00	0.00	0.00		11.31		0.00		11.32
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.01**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**		**11.31**		**0.00**		**11.32**

3.2 WF & Treatment Building - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.32	3.00	2.66	0.01		0.07	0.07		0.07	0.07	0.00	665.49		0.05		666.54
Total	**0.32**	**3.00**	**2.66**	**0.01**		**0.07**	**0.07**		**0.07**	**0.07**	**0.00**	**665.49**		**0.05**		**666.54**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00		11.31		0.00		11.32
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**11.31**		**0.00**		**11.32**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

GSR - Fenced Enclosure Construction

San Mateo County, Summer

Average Daily Emissions

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Heavy Industry	1	1000sqft

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Utility Company**
Climate Zone	5	**Precipitation Freq (Days)**	70	

1.3 User Entered Comments

Project Characteristics -

Land Use - Small Area for Fenced Enclosure around Well

Construction Phase - Project-specific schedule using 3/4/2014 as earliest start date and 20-day construction period.

Off-road Equipment - Project-specific equipment & LF adjustment (-33%)

Off-road Equipment - Project-specific equipment list with hours adjusted for entire phase duration of 40 construction days Adjusted load factors by -33%

Trips and VMT - Worker trips computed seperately using EMFAC2011

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2013	0.24	1.75	0.97	0.00	0.00	0.10	0.10	0.00	0.10	0.10	0.00	222.95	0.00	0.02	0.00	223.39
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2013	0.24	1.75	0.97	0.00	0.00	0.10	0.10	0.00	0.10	0.10	0.00	222.95	0.00	0.02	0.00	223.39
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Fenced Enclosure Construction - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.24	1.75	0.97	0.00		0.10	0.10		0.10	0.10		222.95		0.02		223.39
Total	**0.24**	**1.75**	**0.97**	**0.00**		**0.10**	**0.10**		**0.10**	**0.10**		**222.95**		**0.02**		**223.39**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**		**0.00**		**0.00**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.24	1.75	0.97	0.00		0.10	0.10		0.10	0.10	0.00	222.95		0.02		223.39
Total	**0.24**	**1.75**	**0.97**	**0.00**		**0.10**	**0.10**		**0.10**	**0.10**	**0.00**	**222.95**		**0.02**		**223.39**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**		**0.00**		**0.00**

GSR - Pipeline Per Day Construction

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Heavy Industry	1	1000sqft

1.2 Other Project Characteristics

Urbanization Urban

Climate Zone 5

Wind Speed (m/s) 2.2

Precipitation Freq (Days) 70

Utility Company

1.3 User Entered Comments

Project Characteristics -

Land Use - Small Area for pipeline

Construction Phase - These are per-day estimates of activity that would construct 120-linear feet of pipeline

Off-road Equipment - Project-specific equipment & LF adjustment (-33%)

Off-road Equipment - Max. Avg Day equipment activity based on one day of pipline construction

Adjusted load factors by -33%

Trips and VMT - Worker trips computed seperately using EMFAC2011

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	0.76	4.26	4.39	0.01	0.34	0.33	0.68	0.01	0.33	0.34	0.00	735.26	0.00	0.07	0.00	736.74
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	0.76	4.26	4.39	0.01	0.01	0.33	0.34	0.01	0.33	0.34	0.00	735.26	0.00	0.07	0.00	736.74
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Pipeline Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.63	4.13	2.95	0.00		0.32	0.32		0.32	0.32		469.78		0.06		470.96
Total	**0.63**	**4.13**	**2.95**	**0.00**		**0.32**	**0.32**		**0.32**	**0.32**		**469.78**		**0.06**		**470.96**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.13	0.13	1.43	0.00	0.34	0.01	0.35	0.01	0.01	0.02		265.48		0.01		265.77
Total	**0.13**	**0.13**	**1.43**	**0.00**	**0.34**	**0.01**	**0.35**	**0.01**	**0.01**	**0.02**		**265.48**		**0.01**		**265.77**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.63	4.13	2.95	0.00		0.32	0.32		0.32	0.32	0.00	469.78		0.06		470.96
Total	**0.63**	**4.13**	**2.95**	**0.00**		**0.32**	**0.32**		**0.32**	**0.32**	**0.00**	**469.78**		**0.06**		**470.96**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.13	0.13	1.43	0.00	0.01	0.01	0.02	0.01	0.01	0.02		265.48		0.01		265.77
Total	**0.13**	**0.13**	**1.43**	**0.00**	**0.01**	**0.01**	**0.02**	**0.01**	**0.01**	**0.02**		**265.48**		**0.01**		**265.77**

Maximum Daily Emissions

CalEEMod Version: CalEEMod.2011.1.1

Date: 6/5/2012

GSR - Well Drilling/Well Construction

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Heavy Industry	0	1000sqft

1.2 Other Project Characteristics

Urbanization Urban

Climate Zone 5

Wind Speed (m/s) 2.2

Precipitation Freq (Days) 70

Utility Company

1.3 User Entered Comments

Project Characteristics -

Land Use - Small Area for Well

Construction Phase - Project-specific schedule using 2/1/2014 as earliest start date and 20-day construction period.

Off-road Equipment - Project-specific equipment & LF adjustment (-33%)

Off-road Equipment - Project-specific equipment list averaged to daily use over 30 construction days

Trips and VMT - Worker trips computed seperately using EMFAC2011

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	5.79	46.35	20.62	0.08	0.49	1.58	2.07	0.02	1.58	1.60	0.00	9,193.47	0.00	0.51	0.00	9,204.23
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	5.79	46.35	20.62	0.08	0.02	1.58	1.60	0.02	1.58	1.60	0.00	9,193.47	0.00	0.51	0.00	9,204.23
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Well Drilling/WellConstruction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	5.60	46.16	18.57	0.08		1.57	1.57		1.57	1.57		8,812.57		0.49		8,822.90
Total	**5.60**	**46.16**	**18.57**	**0.08**		**1.57**	**1.57**		**1.57**	**1.57**		**8,812.57**		**0.49**		**8,822.90**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.19	0.19	2.05	0.00	0.49	0.01	0.51	0.02	0.01	0.03		380.90		0.02		381.32
Total	**0.19**	**0.19**	**2.05**	**0.00**	**0.49**	**0.01**	**0.51**	**0.02**	**0.01**	**0.03**		**380.90**		**0.02**		**381.32**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	5.60	46.16	18.57	0.08		1.57	1.57		1.57	1.57	0.00	8,812.57		0.49		8,822.90
Total	**5.60**	**46.16**	**18.57**	**0.08**		**1.57**	**1.57**		**1.57**	**1.57**	**0.00**	**8,812.57**		**0.49**		**8,822.90**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.19	0.19	2.05	0.00	0.02	0.01	0.03	0.02	0.01	0.03		380.90		0.02		381.32
Total	**0.19**	**0.19**	**2.05**	**0.00**	**0.02**	**0.01**	**0.03**	**0.02**	**0.01**	**0.03**		**380.90**		**0.02**		**381.32**

Maximum Daily Emissions

CalEEMod Version: CalEEMod.2011.1.1

Date: 6/5/2012

GSR - Construction WF & Treatment Building

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Light Industry	2	1000sqft

1.2 Other Project Characteristics

Urbanization Urban

Climate Zone 5

Wind Speed (m/s) 2.2

Precipitation Freq (Days) 70

Utility Company Pacific Gas & Electric Company

1.3 User Entered Comments

Project Characteristics -

Land Use -

Construction Phase - Based on project information

Off-road Equipment - Equipment list and load factor adjustment -33%

Off-road Equipment - Equipment list and load factor adjustment -33%

Off-road Equipment - Per project information, no demolition planned

Off-road Equipment - Equipment list and load factor adjustment -33%

Off-road Equipment - Equipment list and load factor adjustment -33%

Off-road Equipment - Equipment list and load factor adjustments -33%

Trips and VMT - All trips modeled using EMFAC2011

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	2.47	15.77	13.95	0.03	1.55	1.07	2.62	0.44	1.07	1.51	0.00	2,470.28	0.00	0.23	0.00	2,475.02
2015	1.66	10.21	7.80	0.01	0.22	0.75	0.98	0.01	0.75	0.76	0.00	1,407.44	0.00	0.15	0.00	1,410.59
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	2.47	15.77	13.95	0.03	0.78	1.07	1.85	0.44	1.07	1.51	0.00	2,470.28	0.00	0.23	0.00	2,475.02
2015	1.66	10.21	7.80	0.01	0.01	0.75	0.76	0.01	0.75	0.76	0.00	1,407.44	0.00	0.15	0.00	1,410.59
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00		0.00		0.00		0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**		**0.00**		**0.00**		**0.00**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.06	0.06	0.62	0.00	0.15	0.00	0.15	0.01	0.00	0.01		115.43		0.01		115.55
Total	**0.06**	**0.06**	**0.62**	**0.00**	**0.15**	**0.00**	**0.15**	**0.01**	**0.00**	**0.01**		**115.43**		**0.01**		**115.55**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Off-Road	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00		0.00		0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**0.00**		**0.00**		**0.00**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.06	0.06	0.62	0.00	0.01	0.00	0.01	0.01	0.00	0.01		115.43		0.01		115.55
Total	**0.06**	**0.06**	**0.62**	**0.00**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**0.01**		**115.43**		**0.01**		**115.55**

3.3 Site Preparation - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.03	0.00	0.03	0.00	0.00	0.00						0.00
Off-Road	0.94	6.80	5.03	0.01		0.44	0.44		0.44	0.44		807.67		0.08		809.44
Total	**0.94**	**6.80**	**5.03**	**0.01**	**0.03**	**0.44**	**0.47**	**0.00**	**0.44**	**0.44**		**807.67**		**0.08**		**809.44**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.05	0.05	0.50	0.00	0.12	0.00	0.12	0.00	0.00	0.01		92.34		0.00		92.44
Total	**0.05**	**0.05**	**0.50**	**0.00**	**0.12**	**0.00**	**0.12**	**0.00**	**0.00**	**0.01**		**92.34**		**0.00**		**92.44**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.03	0.00	0.03	0.00	0.00	0.00						0.00
Off-Road	0.94	6.80	5.03	0.01		0.44	0.44		0.44	0.44	0.00	807.67		0.08		809.44
Total	**0.94**	**6.80**	**5.03**	**0.01**	**0.03**	**0.44**	**0.47**	**0.00**	**0.44**	**0.44**	**0.00**	**807.67**		**0.08**		**809.44**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.05	0.05	0.50	0.00	0.00	0.00	0.01	0.00	0.00	0.01		92.34		0.00		92.44
Total	**0.05**	**0.05**	**0.50**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**		**92.34**		**0.00**		**92.44**

3.4 Building Foundation - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.75	0.00	0.75	0.41	0.00	0.41						0.00
Off-Road	2.17	15.48	10.66	0.02		1.05	1.05		1.05	1.05		1,858.52		0.19		1,862.59
Total	**2.17**	**15.48**	**10.66**	**0.02**	**0.75**	**1.05**	**1.80**	**0.41**	**1.05**	**1.46**		**1,858.52**		**0.19**		**1,862.59**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.30	0.30	3.30	0.01	0.79	0.02	0.82	0.03	0.02	0.05		611.76		0.03		612.43
Total	**0.30**	**0.30**	**3.30**	**0.01**	**0.79**	**0.02**	**0.82**	**0.03**	**0.02**	**0.05**		**611.76**		**0.03**		**612.43**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.75	0.00	0.75	0.41	0.00	0.41						0.00

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	2.17	15.48	10.66	0.02		1.05	1.05		1.05	1.05	0.00	1,858.52		0.19		1,862.59
Total	**2.17**	**15.48**	**10.66**	**0.02**	**0.75**	**1.05**	**1.80**	**0.41**	**1.05**	**1.46**	**0.00**	**1,858.52**		**0.19**		**1,862.59**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.30	0.30	3.30	0.01	0.03	0.02	0.05	0.03	0.02	0.05		611.76		0.03		612.43
Total	**0.30**	**0.30**	**3.30**	**0.01**	**0.03**	**0.02**	**0.05**	**0.03**	**0.02**	**0.05**		**611.76**		**0.03**		**612.43**

3.5 Building Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.35	9.59	6.82	0.01		0.64	0.64		0.64	0.64		1,232.98		0.12		1,235.51
Total	**1.35**	**9.59**	**6.82**	**0.01**		**0.64**	**0.64**		**0.64**	**0.64**		**1,232.98**		**0.12**		**1,235.51**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.01	0.00	0.02	0.00	0.00	0.00		11.54		0.00		11.56
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.01**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**		**11.54**		**0.00**		**11.56**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.35	9.59	6.82	0.01		0.64	0.64		0.64	0.64	0.00	1,232.98		0.12		1,235.51
Total	**1.35**	**9.59**	**6.82**	**0.01**		**0.64**	**0.64**		**0.64**	**0.64**	**0.00**	**1,232.98**		**0.12**		**1,235.51**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00		11.54		0.00		11.56
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**11.54**		**0.00**		**11.56**

3.5 Building Construction - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.24	8.69	6.76	0.01		0.56	0.56		0.56	0.56		1,232.98		0.11		1,235.32
Total	**1.24**	**8.69**	**6.76**	**0.01**		**0.56**	**0.56**		**0.56**	**0.56**		**1,232.98**		**0.11**		**1,235.32**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.01	0.00	0.02	0.00	0.00	0.00		11.31		0.00		11.32
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.01**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**		**11.31**		**0.00**		**11.32**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.24	8.69	6.76	0.01		0.56	0.56		0.56	0.56	0.00	1,232.98		0.11		1,235.32
Total	**1.24**	**8.69**	**6.76**	**0.01**		**0.56**	**0.56**		**0.56**	**0.56**	**0.00**	**1,232.98**		**0.11**		**1,235.32**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.01	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00		11.31		0.00		11.32
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**11.31**		**0.00**		**11.32**

3.6 On-site Pipeline - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.51	3.36	2.77	0.00		0.26	0.26		0.26	0.26		408.87		0.05		409.84
Total	**0.51**	**3.36**	**2.77**	**0.00**		**0.26**	**0.26**		**0.26**	**0.26**		**408.87**		**0.05**		**409.84**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00

Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.05	0.05	0.57	0.00	0.15	0.00	0.15	0.01	0.00	0.01		113.09		0.01		113.21
Total	**0.05**	**0.05**	**0.57**	**0.00**	**0.15**	**0.00**	**0.15**	**0.01**	**0.00**	**0.01**		**113.09**		**0.01**		**113.21**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.51	3.36	2.77	0.00		0.26	0.26		0.26	0.26	0.00	408.87		0.05		409.84
Total	**0.51**	**3.36**	**2.77**	**0.00**		**0.26**	**0.26**		**0.26**	**0.26**	**0.00**	**408.87**		**0.05**		**409.84**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.05	0.05	0.57	0.00	0.01	0.00	0.01	0.01	0.00	0.01		113.09		0.01		113.21
Total	**0.05**	**0.05**	**0.57**	**0.00**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**0.01**		**113.09**		**0.01**		**113.21**

3.7 Paving - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.58	10.14	6.94	0.01		0.74	0.74		0.74	0.74		1,237.80		0.14		1,240.77
Paving	0.00					0.00	0.00		0.00	0.00						0.00
Total	**1.58**	**10.14**	**6.94**	**0.01**		**0.74**	**0.74**		**0.74**	**0.74**		**1,237.80**		**0.14**		**1,240.77**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.08	0.08	0.86	0.00	0.22	0.01	0.23	0.01	0.01	0.01		169.64		0.01		169.82
Total	**0.08**	**0.08**	**0.86**	**0.00**	**0.22**	**0.01**	**0.23**	**0.01**	**0.01**	**0.01**		**169.64**		**0.01**		**169.82**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.58	10.14	6.94	0.01		0.74	0.74		0.74	0.74	0.00	1,237.80		0.14		1,240.77
Paving	0.00					0.00	0.00		0.00	0.00						0.00
Total	**1.58**	**10.14**	**6.94**	**0.01**		**0.74**	**0.74**		**0.74**	**0.74**	**0.00**	**1,237.80**		**0.14**		**1,240.77**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.08	0.08	0.86	0.00	0.01	0.01	0.01	0.01	0.01	0.01		169.64		0.01		169.82
Total	**0.08**	**0.08**	**0.86**	**0.00**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**		**169.64**		**0.01**		**169.82**

Maximum Daily Emissions

CalEEMod Version: CalEEMod.2011.1.1

Date: 4/19/2012

GSR - Pipeline Per Day Construction

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
General Heavy Industry	1	1000sqft

1.2 Other Project Characteristics

Urbanization Urban

Climate Zone 5

Wind Speed (m/s) 2.2

Precipitation Freq (Days) 70

Utility Company

1.3 User Entered Comments

Project Characteristics -

Land Use - Small Area for pipeline

Construction Phase - These are per-day estimates of activity that would construct 120-linear feet of pipeline

Off-road Equipment - Project-specific equipment & LF adjustment (-33%)

Off-road Equipment - Max. Worst Day equipment activity based on one day of pipline construction

Trips and VMT - Worker trips computed seperately using EMFAC2011

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	2.47	17.73	9.17	0.02	0.00	0.96	0.96	0.00	0.96	0.96	0.00	2,560.15	0.00	0.22	0.00	2,564.77
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	2.47	17.73	9.17	0.02	0.00	0.96	0.96	0.00	0.96	0.96	0.00	2,560.15	0.00	0.22	0.00	2,564.77
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Pipeline Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.47	17.73	9.17	0.02		0.96	0.96		0.96	0.96		2,560.15		0.22		2,564.77
Total	**2.47**	**17.73**	**9.17**	**0.02**		**0.96**	**0.96**		**0.96**	**0.96**		**2,560.15**		**0.22**		**2,564.77**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**		**0.00**		**0.00**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.47	17.73	9.17	0.02		0.96	0.96		0.96	0.96	0.00	2,560.15		0.22		2,564.77
Total	**2.47**	**17.73**	**9.17**	**0.02**		**0.96**	**0.96**		**0.96**	**0.96**	**0.00**	**2,560.15**		**0.22**		**2,564.77**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**		**0.00**		**0.00**

Appendix 4
Dispersion Modeling Inputs and Health Risk Calculations

SFPUC GSR - Construction Impacts
Maximum DPM Cancer Risk & Hazard Index Calculations From Construction
at Sensitive Receptors

	Residential Child Exposure						Residential Adult Exposure						School Child Exposure						Day Care Child Exposure					
	Location of Maximum (m)		Maximum Concentration (ug/m3)		Cancer Risk	Chronic Hazard	Location of Maximum (m)		Maximum Concentra (ug/m3)		Cancer Risk	Chronic Hazard	Location of Maximum (m)		Maximum Concentration (ug/m3)		Cancer Risk	Chronic Hazard	Location of Maximum (m)		Maximum Concentration (ug/m3)		Cancer Risk	Chronic Hazard
Site	UTMx (m)	UTMy (m)	2014	2015	(in a million)	Index	UTMx (m)	UTMy (m)	2014	2015	(in a million)	Index	UTMx (m)	UTMy (m)	2014	2015	(in a million)	Index	UTMx (m)	UTMy (m)	2014	2015	(in a million)	Index
Site 1	546492.6	4172909.3	0.01984	0.00774	2.41	0.0040	546492.6	4172909.3	0.01984	0.00774	0.13	0.0040	-	-	-	-	-	-	546785.6	4172896.3	0.00444	0.00176	0.45	0.0009
Sites 2	545838.6	4172219.9	0.00051	0.00000	0.04	0.0001	545838.6	4172219.9	0.00051	0.00000	0.00	0.0001	545840.1	4172114.0	0.00377	0.00000	0.08	0.0008	-	-	-	-	-	-
Sites 3	545672.3	4172025.2	0.00807	0.00000	0.71	0.0016	545672.3	4172025.2	0.00807	0.00000	0.04	0.0016	545765.9	4172051.9	0.05397	0.00000	1.18	0.0108	-	-	-	-	-	-
Sites 4	545889.6	4171962.2	0.01542	0.00000	1.35	0.0031	545889.6	4171962.2	0.01542	0.00000	0.07	0.0031	545889.6	4171962.2	0.05877	0.00000	1.29	0.0118	-	-	-	-	-	-
Sites 2, 3, and 4	545887.7	4171925.1	0.01721	0.00000	1.51	0.0034	545887.7	4171925.1	0.01721	0.00000	0.08	0.0034	545889.6	4171962.2	0.06168	0.00000	1.35	0.0123	-	-	-	-	-	-
Site 5 - On-Site Treatment	546797.1	4171010.2	0.07866	0.04335	10.68	0.0157	546797.1	4171010.2	0.07866	0.04335	0.56	0.0157	-	-	-	-	-	-	547278.8	4170750.6	0.00053	0.00028	0.06	0.0001
Site 6 - On-Site Treatment	547188.0	4170823.7	0.00921	0.00471	1.22	0.0018	547188.0	4170823.7	0.00921	0.00471	0.06	0.0018	-	-	-	-	-	-	547278.8	4170750.6	0.00327	0.00167	0.36	0.0007
Site 7 - On-Site Treatment	547280.7	4170734.4	0.00055	0.00022	0.07	0.0001	547280.7	4170734.4	0.00055	0.00022	0.00	0.0001	-	-	-	-	-	-	547280.7	4170734.4	0.00055	0.00022	0.06	0.0001
Sites 5, 6,and 7 - On-Site Treatment	546797.1	4171010.2	0.07911	0.04356	10.74	0.0158	546797.1	4171010.2	0.07911	0.04356	0.56	0.0158	-	-	-	-	-	-	547278.8	4170750.6	0.00430	0.00215	0.47	0.0009
Sites 5- Consolidated Treatment	546797.1	4171010.2	0.01428	0.00000	1.25	0.0029	546797.1	4171010.2	0.01428	0.00000	0.06	0.0029	-	-	-	-	-	-	547278.8	4170750.6	0.00037	0.00000	0.03	0.0001
Sites 6- Consolidated Treatment	547188.0	4170823.7	0.00928	0.00507	1.26	0.0019	547188.0	4170823.7	0.00928	0.00507	0.07	0.0019	-	-	-	-	-	-	547278.8	4170750.6	0.00328	0.00180	0.37	0.0007
Sites 7- Consolidated Treatment	547188.5	4170733.4	0.00119	0.00000	0.10	0.0002	547188.5	4170733.4	0.00119	0.00000	0.01	0.0002	-	-	-	-	-	-	547280.7	4170734.4	0.00089	0.00000	0.06	0.0002
Sites 5, 6, and 7 - Consolidated Treatme	546797.1	4171010.2	0.01471	0.00020	1.31	0.0029	546797.1	4171010.2	0.01471	0.00020	0.07	0.0029	-	-	-	-	-	-	547278.8	4170750.6	0.00447	0.00180	0.46	0.0009
Site 8	547821.3	4169865.4	0.00514	0.00266	0.68	0.0010	547821.3	4169865.4	0.00514	0.00266	0.04	0.0010	-	-	-	-	-	-	-	-	-	-	-	-
Site 17 (Alternate)	547866.6	4169840.3	0.00329	0.00136	0.41	0.0007	547866.6	4169840.3	0.00329	0.00136	0.02	0.0007	-	-	-	-	-	-	-	-	-	-	-	-
Sites 8 & 17 (Alternate)	547821.3	4169865.4	0.00808	0.00388	1.05	0.0016	547821.3	4169865.4	0.00808	0.00388	0.05	0.0016	-	-	-	-	-	-	-	-	-	-	-	-
Site 9	548717.3	4168997.6	0.04847	0.01860	5.87	0.0097	548717.3	4168997.6	0.04847	0.01860	0.31	0.0097	548509.4	4168634.5	0.00108	0.00042	0.03	0.0002	548348.4	4168416.7	0.00040	0.00015	0.04	0.0001
Site 10	548129.0	4168779.0	0.01271	0.00662	1.69	0.0025	548129.0	4168779.0	0.01271	0.00662	0.09	0.0025	548496.6	4168632.5	0.00179	0.00091	0.06	0.0004	548348.4	4168416.7	0.00036	0.00019	0.04	0.0001
Site 18 (Alternate)	548240.8	4168525.7	0.07916	0.02810	9.39	0.0158	548240.8	4168525.7	0.07916	0.02810	0.49	0.0158	548407.3	4168526.2	0.01023	0.00426	0.32	0.0020	548348.4	4168416.7	0.00607	0.00231	0.61	0.0012
Sites 9, 10 & 18 (Alternate)	548240.8	4168525.7	0.08036	0.02867	9.55	0.0161	548240.8	4168525.7	0.08036	0.02867	0.50	0.0161	548407.3	4168526.2	0.01157	0.00488	0.36	0.0023	548348.4	4168416.7	0.00682	0.00265	0.69	0.0014
Site 11	549597.5	4167859.8	0.00982	0.00393	1.20	0.0020	549597.5	4167859.8	0.00982	0.00393	0.06	0.0020	550464.3	4167276.2	0.00033	0.00013	0.01	0.0001	549957.7	4167477.6	0.00048	0.00018	0.05	0.0001
Site 12	550052.8	4167342.1	0.05927	0.02449	7.33	0.0119	550052.8	4167342.1	0.05927	0.02449	0.38	0.0119	550464.3	4167276.2	0.00205	0.00072	0.06	0.0004	549957.0	4167460.9	0.00594	0.00184	0.57	0.0012
Site 19	549913.2	4167413.3	0.02302	0.00000	2.02	0.0046	549913.2	4167413.3	0.02302	0.00000	0.10	0.0046	550464.3	4167276.2	0.00048	0.00000	0.01	0.0001	549957.0	4167460.9	0.01401	0.00000	1.02	0.0028
Sites 11, 12 & 19 (Alternate)	550052.8	4167342.1	0.06545	0.02460	7.88	0.0131	550052.8	4167342.1	0.06545	0.02460	0.41	0.0131	550464.3	4167276.2	0.00286	0.00084	0.08	0.0006	549957.0	4167460.9	0.02038	0.00200	1.63	0.0041
Site 13	550947.2	4166668.7	0.01101	0.00432	1.34	0.0022	550947.2	4166668.7	0.01101	0.00432	0.07	0.0022	550812.5	4166835.3	0.00134	0.00054	0.04	0.0003	-	-	-	-	-	-
Site14	550305.3	4165663.4	0.02693	0.01006	3.24	0.0054	550305.3	4165663.4	0.02693	0.01006	0.17	0.0054	-	-	-	-	-	-	-	-	-	-	-	-
Site 15	550384.1	4165224.3	0.00576	0.00093	0.59	0.0012	550384.1	4165224.3	0.00576	0.00093	0.03	0.0012	-	-	-	-	-	-	-	-	-	-	-	-
Sites 14 & 15	550305.3	4165663.4	0.02813	0.0104	3.37	0.0056	550305.3	4165663.4	0.02813	0.0104	0.18	0.0056	-	-	-	-	-	-	-	-	-	-	-	-
Site 16	553511.1	4162274.6	0.06411	0.02275	7.60	0.0128	553511.1	4162274.6	0.06411	0.02275	0.40	0.0128	-	-	-	-	-	-	-	-	-	-	-	-

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

Inhalation Dose = C_{air} x DBR x A x EF x ED x 10^{-6} / AT

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
AT = Averaging time period over which exposure is averaged.
10^{-6} = Conversion factor

		Exposure Type			
		Residential		School	Day Care
Exposure Parameter	Units	Child	Adult	Child	Child
Breathing Rate (DBR)	(L/kg-day)	581	302	581	581
Exposure period					
Daily	(hours/day)	24	24	10	10
Annual (EF)	(days/year)	350	350	180	245
Exposure Duration (ED)	(years)	2	2	2	2
Exposure Period	(years)	70	70	70	70
Averaging Time (AT)	(days)	25,550	25,550	25,550	25,550
Age Adjustment Factor (ASF)	-	10	1	3	10

Site Construction Activities
Daily (hours/day) = 12
Weekly (days/week) = 5
Annual (days/year) = varies by site
Modeling Time Periods
Days used in Model (days/year) = 365
Hours used in Model (hours/day) = 12 (7am - 7 pm)
DPM Health Risk Factors
DPM Cancer Potency Factor (mg/kg-day)-1 = 1.10E+00
DPM Reference Exposure Level (ug/m^3) = 5

GSR - Construction Impacts
Summary of Maximum Acute Health Hazard Index (HI) at Sensitive Receptors
from Construction Equipment Diesel Exhaust at each Project Site Location

Site	Acute Hazard Index MEI Location		Total Hazard Index
	UTM- X (m)	UTM-Y (m)	
Site 1	***546492.6***	***4172909.3***	***0.48***
Site 2	545902.4	4172053.9	0.12
Site 3	545720.0	4172035.7	0.56
Site 4	545889.6	4171962.2	0.58
Sites 2, 3, and 4	***545903.7***	***4171924.5***	***0.72***
Site 5 - On-Site Treatment	546797.1	4171010.2	0.22
Site 6 - On-Site Treatment	547188.7	4170748.5	0.10
Site 7 - On-Site Treatment	547219.4	4170734.0	0.22
Sites 5, 6, and 7 - On-Site Treatment	***546797.1***	***4171010.2***	***0.22***
Sites 5- Consolidated Treatment	546797.1	4171010.2	0.11
Sites 6- Consolidated Treatment	547188.7	4170748.5	0.10
Sites 7- Consolidated Treatment	547219.4	4170734.0	0.03
Sites 5, 6, and 7 - Consolidated Treatment at 6	***546797.1***	***4171010.2***	***0.11***
Site 8	547821.3	4169865.4	0.05
Site 17 (Alternate)	547837.8	4169850.8	0.10
Sites 8 & 17 (Alternate)	***547837.8***	***4169850.8***	***0.18***
Site 9	548635.6	4169049.6	0.33
Site 10	548167.8	4168971.0	0.13
Site 18 (Alternate)	548240.8	4168525.7	0.40
Sites 9, 10 & 18 (Alternate)	***548620.7***	***4169049.6***	***0.53***
Site 11	549597.5	4167859.8	0.13
Site 12	550052.8	4167342.1	0.32
Site 19	549940.8	4167476.8	0.38
Sites 11, 12 & 19 (Alternate)	***550073.6***	***4167327.8***	***0.46***
Site 13	***550947.2***	***4166668.7***	***0.14***
Site14	550305.3	4165663.4	0.32
Site 15	550538.9	4165182.4	0.05
Sites 14 & 15	***550313.4***	***4165695.5***	***0.54***
Site 16	***553497.0***	***4162273.9***	***0.37***

Acute Health Effects Hazard Index (HI) by Chemical and Total HI for all Chemicals at Maximum Exposed Individual (MEI) Location for Each Project Site

			Site 1		Site 2		Site 3		Site 4		Site 2, 3, and 4 (all souces at same time)	
Chemical	**Fraction of TOG**	**Acute REL (ug/m3)**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**
Acetaldehyde	0.07353	470	12.471	0.027	3.000	0.006	14.566	0.031	14.846	0.032	18.566	0.040
Benzene	0.02001	1,300	3.394	0.003	0.816	0.001	3.964	0.003	4.040	0.003	5.053	0.004
Formaldehyde	0.14714	55	24.955	0.454	6.003	0.109	29.148	0.530	29.708	0.540	37.153	0.676
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	2.505	0.0002	0.603	0.0000	2.926	0.0002	2.982	0.0002	3.729	0.0003
Toluene	0.01473	37,000	2.498	0.0001	0.601	0.0000	2.918	0.0001	2.974	0.0001	3.719	0.0001
		Total Hazard Index		**0.48**		**0.12**		**0.56**		**0.58**		**0.72**

Acute Health Effects Hazard Index (HI) by Chemical and Tota

Chemical	Fraction of TOG	Acute REL (ug/m3)	Site 5 (Onsite Treatment) Chemical Concentration (ug/m^3)	Site 5 Hazard Index	Site 6 (Onsite Treatment) Chemical Concentration (ug/m^3)	Site 6 Hazard Index	Site 7 (Onsite Treatment) Chemical Concentration (ug/m^3)	Site 7 Hazard Index	Site 5, 6, and 7 (Onsite Treatment) (all souces at same time) Chemical Concentration (ug/m^3)	Site 5, 6, and 7 Hazard Index
Acetaldehyde	0.07353	470	5.625	0.012	2.551	0.005	0.890	0.002	5.552	0.012
Benzene	0.02001	1,300	1.531	0.001	0.694	0.001	0.242	0.000	1.511	0.001
Formaldehyde	0.14714	55	11.256	0.205	5.106	0.093	1.780	0.032	11.109	0.202
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	1.130	0.0001	0.513	0.0000	0.179	0.0000	1.115	0.0001
Toluene	0.01473	37,000	1.127	0.0000	0.511	0.0000	0.178	0.0000	1.112	0.0000
Total Hazard Index				**0.22**		**0.10**		**0.03**		**0.22**

Acute Health Effects Hazard Index (HI) by Chemical and Tota

Chemical	Fraction of TOG	Acute REL (ug/m3)	Site 5 (Treatment at Site 6) Chemical Concentration (ug/m^3)	Site 5 Hazard Index	Site 6 (Treatment at Site 6) Chemical Concentration (ug/m^3)	Site 6 Hazard Index	Site 7 (Treatment at Site 6) Chemical Concentration (ug/m^3)	Site 7 Hazard Index	Site 5, 6, and 7 (Treatment at Site 6) (all souces at same time) Chemical Concentration (ug/m^3)	Site 5, 6, and 7 Hazard Index
Acetaldehyde	0.07353	470	2.735	0.006	2.551	0.005	0.890	0.002	2.735	0.006
Benzene	0.02001	1,300	0.744	0.001	0.694	0.001	0.242	0.000	0.744	0.001
Formaldehyde	0.14714	55	5.474	0.100	5.106	0.093	1.780	0.032	5.474	0.100
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	0.549	0.0000	0.513	0.0000	0.179	0.0000	0.549	0.0000
Toluene	0.01473	37,000	0.548	0.0000	0.511	0.0000	0.178	0.0000	0.548	0.0000
Total Hazard Index				**0.11**		**0.10**		**0.03**		**0.11**

Acute Health Effects Hazard Index (HI) by Chemical and Tota

Chemical	Fraction of TOG	Acute REL (ug/m3)	Site 8 Chemical Concentration (ug/m^3)	Site 8 Hazard Index	Site 17 Chemical Concentration (ug/m^3)	Site 17 Hazard Index	Site 8 and 17 (Alternate) (all souces at same time) Chemical Concentration (ug/m^3)	Site 8 and 17 (Alternate) (all souces at same time) Hazard Index
Acetaldehyde	0.07353	470	1.412	0.003	2.625	0.006	4.581	0.010
Benzene	0.02001	1,300	0.384	0.000	0.714	0.001	1.247	0.001
Formaldehyde	0.14714	55	2.825	0.051	5.253	0.096	9.167	0.167
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	0.284	0.0000	0.527	0.0000	0.920	0.0001
Toluene	0.01473	37,000	0.283	0.0000	0.526	0.0000	0.918	0.0000
		Total Hazard Index		**0.05**		**0.10**		**0.18**

Acute Health Effects Hazard Index (HI) by Chemical and Tota

			Site 9		Site 10		Site 18		Site 9, 10 and 18 (Alternate) (all souces at same time)	
Chemical	**Fraction of TOG**	**Acute REL (ug/m3)**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**	**Chemical Concentration (ug/m^3)**	**Hazard Index**
Acetaldehyde	0.07353	470	8.581	0.018	3.301	0.007	10.434	0.022	13.625	0.029
Benzene	0.02001	1,300	2.335	0.002	0.898	0.001	2.839	0.002	3.708	0.003
Formaldehyde	0.14714	55	17.171	0.312	6.607	0.120	20.879	0.380	27.265	0.496
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	1.724	0.0001	0.663	0.0001	2.096	0.0002	2.737	0.0002
Toluene	0.01473	37,000	1.719	0.0000	0.661	0.0000	2.090	0.0001	2.729	0.0001
		Total Hazard Index		**0.33**		**0.13**		**0.40**		**0.53**

Acute Health Effects Hazard Index (HI) by Chemical and Tota

Chemical	Fraction of TOG	Acute REL (ug/m3)	Site 11 Chemical Concentration (ug/m^3)	Site 11 Hazard Index	Site 12 Chemical Concentration (ug/m^3)	Site 12 Hazard Index	Site 19 (Alternate) (all souces at same time) Chemical Concentration (ug/m^3)	Site 19 (Alternate) Hazard Index	Site 11, 12 and 19 (Alternate) (all souces at same time) Chemical Concentration (ug/m^3)	Site 11, 12 and 19 (Alternate) Hazard Index
Acetaldehyde	0.07353	470	3.280	0.007	8.154	0.017	9.831	0.021	11.765	0.025
Benzene	0.02001	1,300	0.893	0.001	2.219	0.002	2.675	0.002	3.202	0.002
Formaldehyde	0.14714	55	6.564	0.119	16.318	0.297	19.673	0.358	23.542	0.428
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	0.659	0.0001	1.638	0.0001	1.975	0.0002	2.363	0.0002
Toluene	0.01473	37,000	0.657	0.0000	1.634	0.0000	1.969	0.0001	2.357	0.0001
Total Hazard Index				**0.13**		**0.32**		**0.38**		**0.46**

Acute Health Effects Hazard Index (HI) by Chemical and Tota

Chemical	Fraction of TOG	Acute REL (ug/m3)	Site 13 Chemical Concentration (ug/m^3)	Site 13 Hazard Index	Site 14 Chemical oncentrati (ug/m^3)	Site 14 Hazard Index	Site 15 Chemical oncentrati (ug/m^3)	Site 15 Hazard Index	Site 14 and 15 (all souces at same time) Chemical Concentration (ug/m^3)	Site 14 and 15 Hazard Index	Site 16 Chemical Concentration (ug/m^3)	Site 16 Hazard Index
Acetaldehyde	0.07353	470	3.677	0.008	8.382	0.018	1.404	0.003	13.875	0.030	9.522	0.020
Benzene	0.02001	1,300	1.001	0.001	2.281	0.002	0.382	0.000	3.776	0.003	2.591	0.002
Formaldehyde	0.14714	55	7.357	0.134	16.774	0.305	2.810	0.051	27.765	0.505	19.055	0.346
Methyl Ethyl Ketone (2-butanone)	0.01477	13,000	0.739	0.0001	1.684	0.0001	0.282	0.0000	2.787	0.0002	1.913	0.0001
Toluene	0.01473	37,000	0.737	0.0000	1.679	0.0000	0.281	0.0000	2.780	0.0001	1.908	0.0001
Total Hazard Index				**0.14**		**0.32**		**0.05**		**0.54**		**0.37**

Appendix 5
Cumulative TAC Data

Maximum Modeled 1-Hour ROG Concentrations at Each Project Site Location

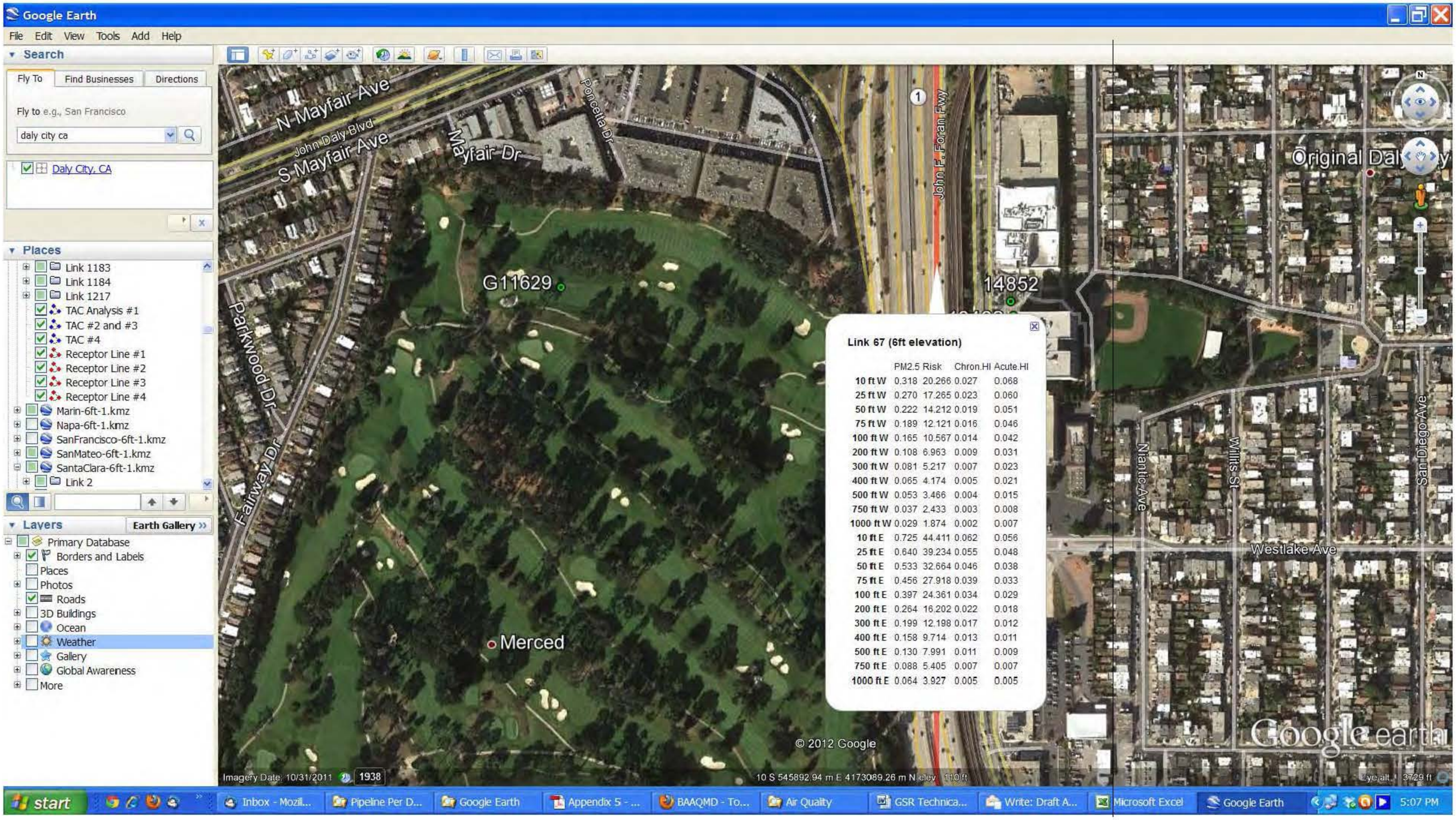
Site	UTM x (m)	UTM y (m)	Maximum ROG Concentration (ug/m3)	Max Conc From	
1	546492.59	4172909.31	109.1	Treatment Facility	
1	546492.59	4172909.31	169.6	Well	
2	545902.4	4172053.87	40.8	Fence Construction	
3	545719.97	4172035.68	198.1	Well	in field adjacent to well construction site
4	545889.63	4171962.19	201.9	Well	in field adjacent to well construction site
2, 3, and 4	545903.72	4171924.54	252.5	from all sources at all sites at the same time	
5 (Onsite Treatment)	546797.12	4171010.2	76.5	Treatment Facility	
6 (Onsite Treatment)	547188.71	4170748.51	34.7	Treatment Facility	
7 (Onsite Treatment)	547219.39	4170733.95	12.1	Well	
5, 6, 7 (Onsite Treatment)	546797.12	4171010.2	75.5	from all sources at all sites at the same time	
5 (Treatment at 6)	546797.12	4171010.2	37.2	Fence Construction	
6 (Treatment at 6)	547188.71	4170748.51	34.7	Treatment Facility	
7 (Treatment at 6)	547219.39	4170733.95	12.1	Well	
5, 6, and 7 (Treatment at 6)	546797.12	4171010.2	37.2	from all sources at all sites at the same time	
8	547821.3	4169865.44	19.2	Treatment Facility	
17 (Alternate)	547837.83	4169850.81	35.7	Well	
8 and 17 (Alternate)	547837.83	4169850.81	62.3	from all sources at all sites at the same time	
9	548635.55	4169049.56	116.7	Well	
10	548167.79	4168970.99	44.9	Treatment Facility	
18 (Alternate)	548240.75	4168525.69	141.9	Well	
9, 10, and 18 (Alternate)	548620.74	4169049.56	185.3	from all sources at all sites at the same time	
11	549597.51	4167859.77	44.61	Well	
12	550052.75	4167342.12	110.9	Well	
19 (Alternate)	549940.83	4167476.79	133.7	Well	
11, 12, and 19 (Alternate)	550073.61	4167327.84	160.0	from all sources at all sites at the same time	
13	550947.2	4166668.67	50.0	Treatment Facility	
14	550305.3	4165663.44	114.0	Well	
15	550538.85	4165182.35	19.1	Well	
14 and 15	550313.39	4165695.45	188.7	from all sources at all sites at the same time	
16	553496.99	4162273.85	129.5	Well	

Regional Groundwater Storage and Recovery Project

Cumulative TAC Impacts

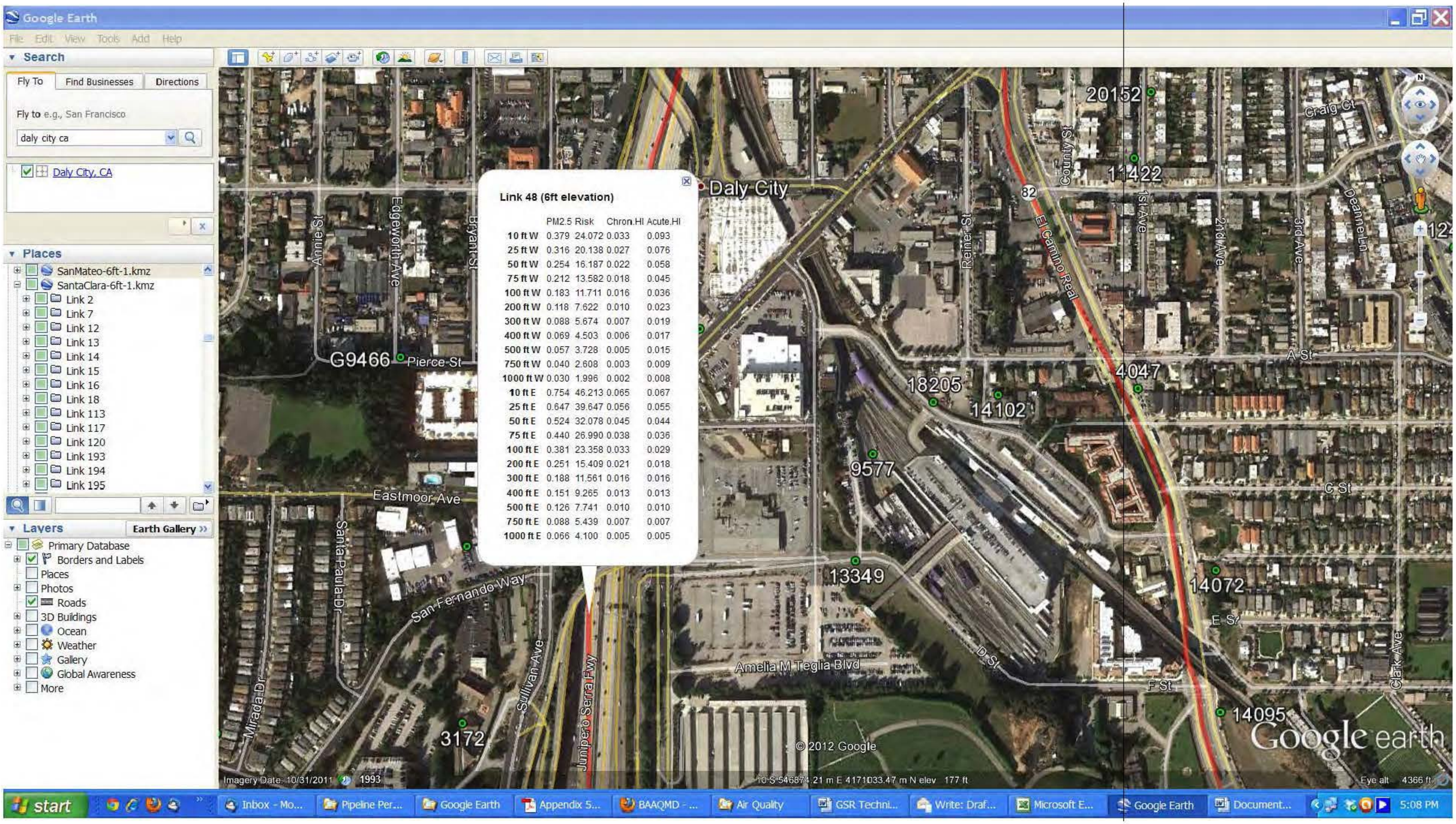
MEI Source	Distance (feet)	Cancer Risk (per million)	Hazard HI	$PM_{2.5}$ $\mu g/m^3$	Source
Site 1					
I-280	120	9.85	0.04	0.15	BAAQMD Google Earth Highway Screening Analysis Tool
John Daly Blvd (estimated 35,000 ADT)	900	1.14	0.02	0.03	BAAQMD Roadway Screening Analysis Tables (east-west road, 40,000 ADT)
G11629	900	0.91	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
14852	700	1.18	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
13420	700	0.42	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
13221	1000	0.67	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
		14.17	0.06	0.19	
Site 2, 3, 4					
S.Park Plaza Drive (estimated <10,000 ADT)	50	3.34	0.02	0.098	BAAQMD Roadway Screening Analysis Tables (north-south road, 10,000 ADT)
87th St. (unknown ADT)	360	1.68	0.02	0.059	BAAQMD Roadway Screening Analysis Tables (east-west road, 20,000 ADT)
16794	730	4.08	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
G10657	900	0.48	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
12568	590	5.03	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
12876	1000	2.05	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
		16.67	0.04	0.16	
Site 5,6,7					
I-280	560	7.74	0.01	0.13	BAAQMD Google Earth Highway Screening Analysis Tool
Junipero Serra Blvd (estimated 20,000 ADT)	350	1.84	0.02	0.05	BAAQMD Roadway Screening Analysis Tables (north-south road, 20,000 ADT)
San Pedro Rd (estimated 20,000 ADT)	500	1.04	0.02	0.05	BAAQMD Roadway Screening Analysis Tables (north-south road, 20,000 ADT)
Washington St (estimated 15,000 ADT)	500	0.96	0.02	0.02	BAAQMD Roadway Screening Analysis Tables (east-west road, 20,000 ADT)
G9309	580	0.29	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
14102	660	6.32	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
		18.19	0.07	0.25	
Sites 8 and 17 (alternate)					
Mission Rd (SR 82)	100	4.28	0.01	0.06	BAAQMD Google Earth Highway Screening Analysis Tool
Serramonte Blvd (estimated 20,000 ADT)	>200	2.64	0.02	0.08	BAAQMD Roadway Screening Analysis Tables (north-south road, 20,000 ADT)
1364	900	0.45	0.02	0.26	BAAQMD Stationary Source data with diesel engine multiplier
G11198	950	0.14	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
		7.51	0.05	0.40	
Sites 9, 10, 18 (alternate)	MEI at Site 18, no cumulative sources within 1,000 feet				
Site 9 and 10					
El Camino Real (SR 82)	>500	1.73	0.00	0.02	BAAQMD Google Earth Highway Screening Analysis Tool
Hickey Blvd (estimated 25,000 ADT)	1000	0.61	0.02	0.02	BAAQMD Roadway Screening Analysis Tables (east-west road, 30,000 ADT)
G3305	870	1.43	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
		3.77	0.02	0.04	
Site 11, 12 and 19 (alternate)					
El Camino Real (SR 82)	300	2.28	0.00	0.03	
Westborough Blvd (estimated 30,000 ADT)	500	1.50	0.02	0.05	BAAQMD Roadway Screening Analysis Tables (east-west road, 40,000 ADT)
G11428	600	0.73	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
		4.51	0.02	0.08	
Site 13					

South SpruceAve (estimated 30,000 ADT)	70	5.62	0.02	0.20	BAAQMD Roadway Screening Analysis Tables (north-south road, 30,000 ADT)
G12073	700	0.17	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
2483	400	0.19	0.00	14.00	Bimbos Bakery
		5.98	0.02	14.20	
Site 14 and 15					
Sneath Lane (estimated 20,000 ADT)	700	0.75	0.02	0.02	BAAQMD Roadway Screening Analysis Tables (east-west road, 20,000 ADT)
Site 16					
CalTrain	150	5.70	0.01	0.03	Dispersion Modeling of CalTrain
19283	130	2.35	0.00	0.00	BAAQMD Stationary Source data with diesel engine multiplier
19194	500	2.21	0.00	0.01	BAAQMD HRSA obtained from Public Records Request
G6250	500	0.02	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
G2970	950	2.25	0.00	0.00	BAAQMD Stationary Source data with gasoline station multiplier
19561	700	7.30	0.00	0.02	BAAQMD HRSA obtained from Public Records Request
		19.82	0.02	0.06	



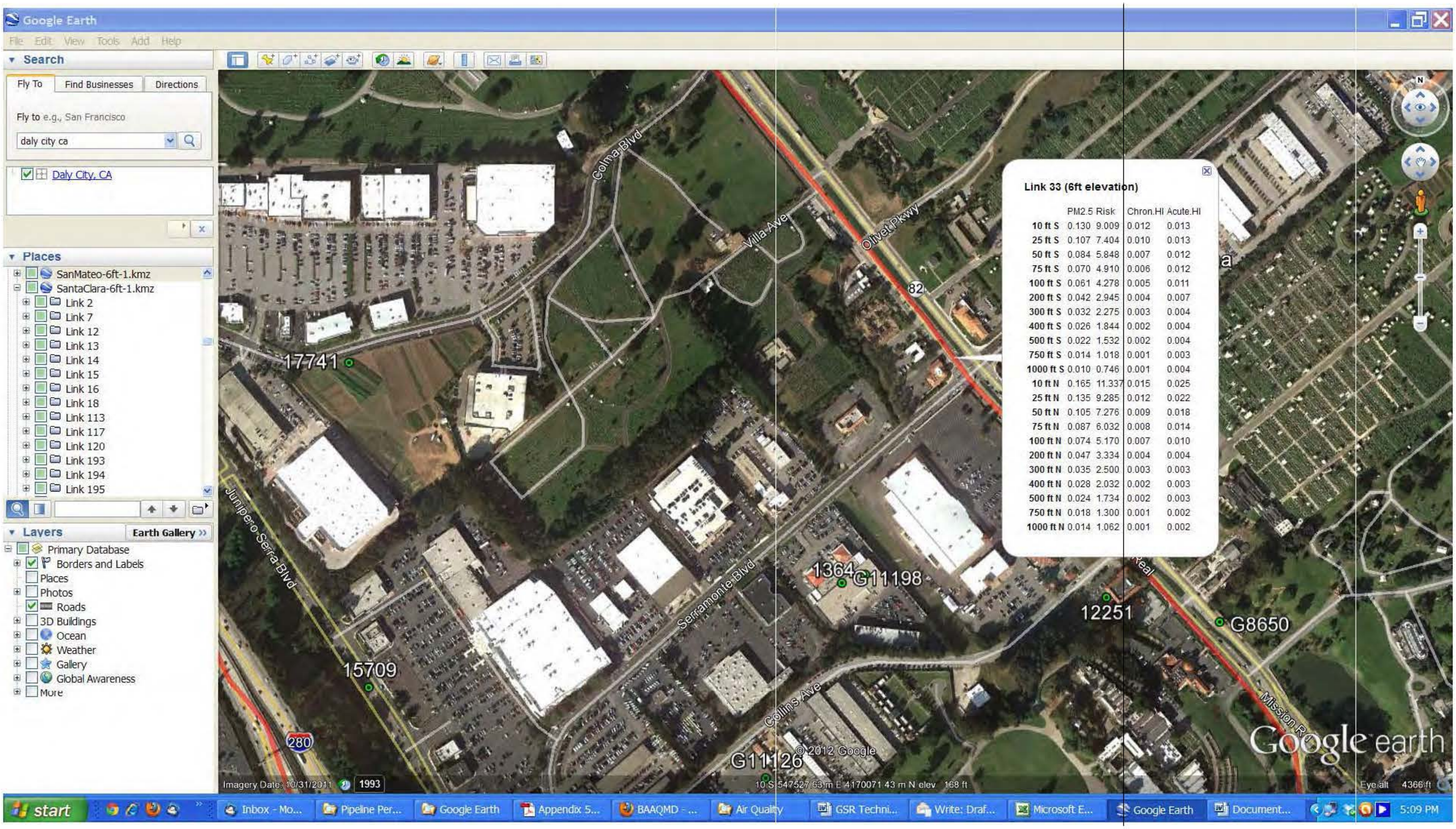
Link 67 (6ft elevation)

	PM2.5	Risk	Chron.HI	Acute.HI
10 ft W	0.318	20.266	0.027	0.068
25 ft W	0.270	17.265	0.023	0.060
50 ft W	0.222	14.212	0.019	0.051
75 ft W	0.189	12.121	0.016	0.046
100 ft W	0.165	10.567	0.014	0.042
200 ft W	0.108	6.963	0.009	0.031
300 ft W	0.081	5.217	0.007	0.023
400 ft W	0.065	4.174	0.005	0.021
500 ft W	0.053	3.466	0.004	0.015
750 ft W	0.037	2.433	0.003	0.008
1000 ft W	0.029	1.874	0.002	0.007
10 ft E	0.725	44.411	0.062	0.056
25 ft E	0.640	39.234	0.055	0.048
50 ft E	0.533	32.664	0.046	0.038
75 ft E	0.456	27.918	0.039	0.033
100 ft E	0.397	24.361	0.034	0.029
200 ft E	0.264	16.202	0.022	0.018
300 ft E	0.199	12.198	0.017	0.012
400 ft E	0.158	9.714	0.013	0.011
500 ft E	0.130	7.991	0.011	0.009
750 ft E	0.088	5.405	0.007	0.007
1000 ft E	0.064	3.927	0.005	0.005



Link 48 (6ft elevation)

	PM2.5	Risk	Chron.HI	Acute.HI
10 ft W	0.379	24.072	0.033	0.093
25 ft W	0.316	20.138	0.027	0.076
50 ft W	0.254	16.187	0.022	0.058
75 ft W	0.212	13.582	0.018	0.045
100 ft W	0.183	11.711	0.016	0.036
200 ft W	0.118	7.622	0.010	0.023
300 ft W	0.088	5.674	0.007	0.019
400 ft W	0.069	4.503	0.006	0.017
500 ft W	0.057	3.728	0.005	0.015
750 ft W	0.040	2.608	0.003	0.009
1000 ft W	0.030	1.996	0.002	0.008
10 ft E	0.754	46.213	0.065	0.067
25 ft E	0.647	39.647	0.056	0.055
50 ft E	0.524	32.078	0.045	0.044
75 ft E	0.440	26.990	0.038	0.036
100 ft E	0.381	23.358	0.033	0.029
200 ft E	0.251	15.409	0.021	0.018
300 ft E	0.188	11.561	0.016	0.016
400 ft E	0.151	9.265	0.013	0.013
500 ft E	0.126	7.741	0.010	0.010
750 ft E	0.088	5.439	0.007	0.007
1000 ft E	0.066	4.100	0.005	0.005


Google Earth
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Places
SanMateo-6ft-1.kmz
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Link 2
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Link 12
Link 13
Link 14
Link 15
Link 16
Link 18
Link 113
Link 117
Link 120
Link 193
Link 194
Link 195
Layers
Earth Gallery
Primary Database
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Global Awareness
More
Link 33 (6ft elevation)
PM2.5 Risk Chron.HI Acute.HI
10 ft S 0.130 9.009 0.012 0.013
25 ft S 0.107 7.404 0.010 0.013
50 ft S 0.084 5.848 0.007 0.012
75 ft S 0.070 4.910 0.006 0.012
100 ft S 0.061 4.278 0.005 0.011
200 ft S 0.042 2.945 0.004 0.007
300 ft S 0.032 2.275 0.003 0.004
400 ft S 0.026 1.844 0.002 0.004
500 ft S 0.022 1.532 0.002 0.004
750 ft S 0.014 1.018 0.001 0.003
1000 ft S 0.010 0.746 0.001 0.004
10 ft N 0.165 11.337 0.015 0.025
25 ft N 0.135 9.285 0.012 0.022
50 ft N 0.105 7.276 0.009 0.018
75 ft N 0.087 6.032 0.008 0.014
100 ft N 0.074 5.170 0.007 0.010
200 ft N 0.047 3.334 0.004 0.004
300 ft N 0.035 2.500 0.003 0.003
400 ft N 0.028 2.032 0.002 0.003
500 ft N 0.024 1.734 0.002 0.003
750 ft N 0.018 1.300 0.001 0.002
1000 ft N 0.014 1.062 0.001 0.002
Colma Blvd
Villa Ave
Olivet Pkwy
82
17741
Junipero Serra Blvd
Serramonte Blvd
Collins Ave
Mission Rd
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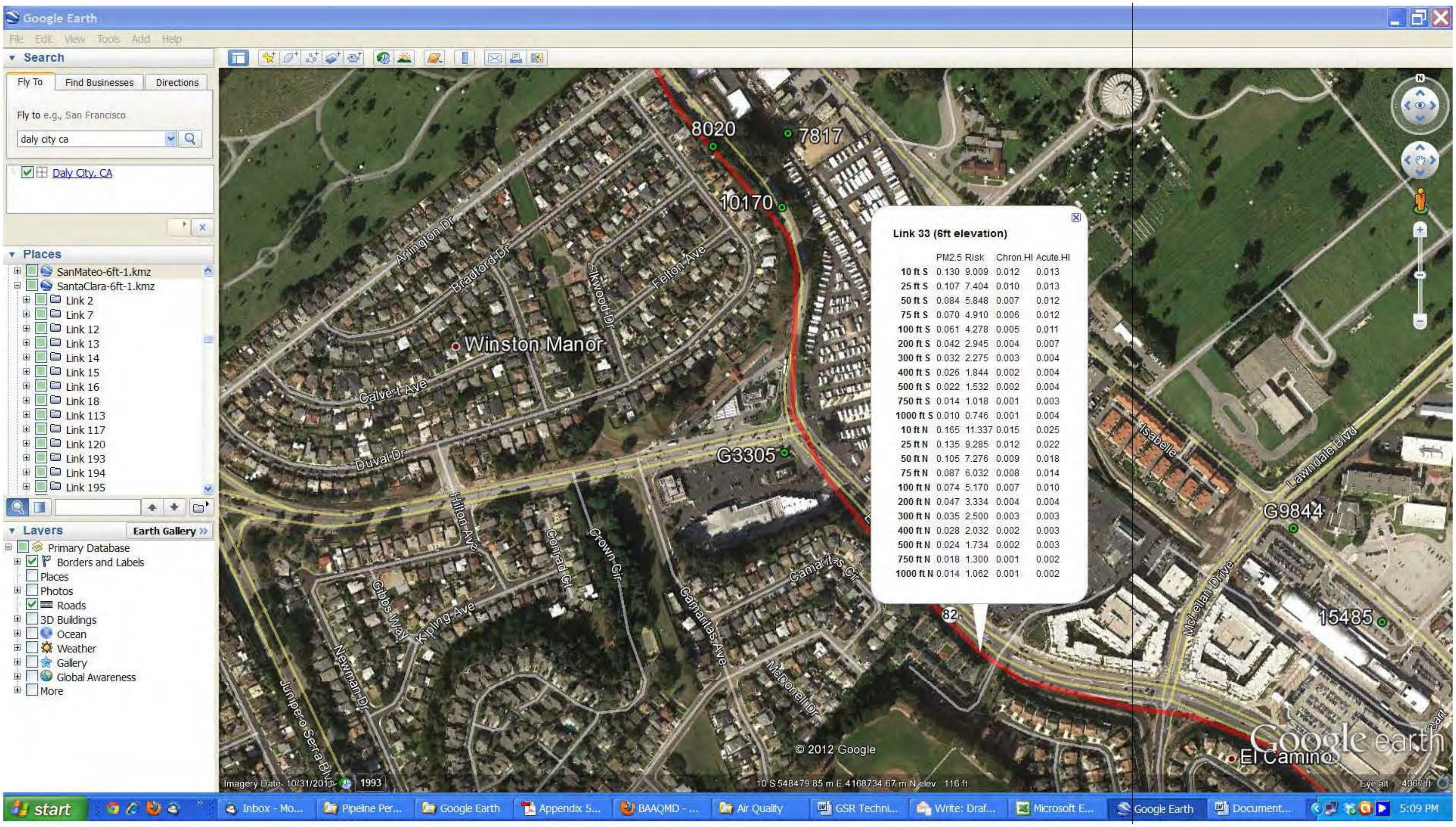
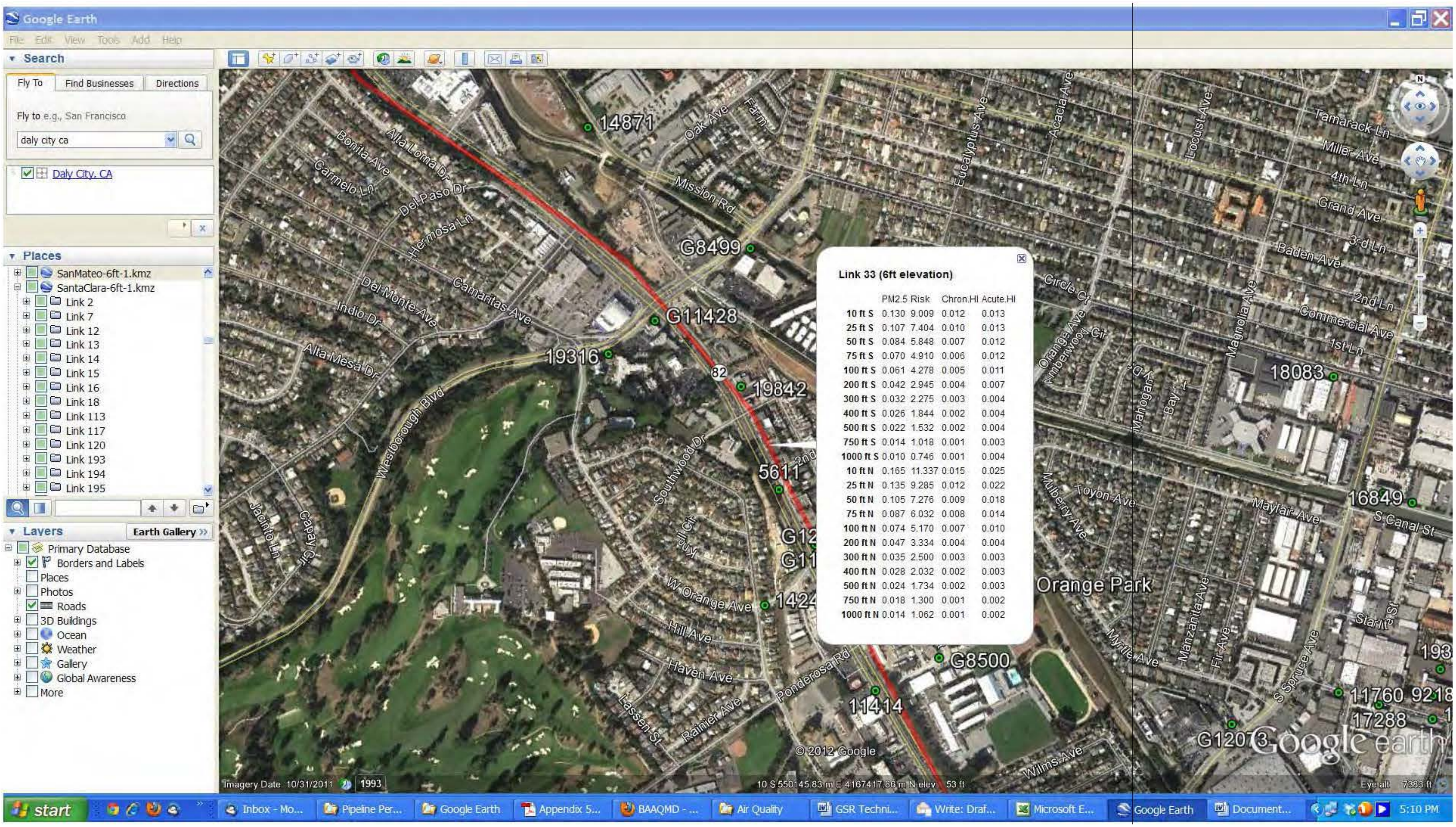
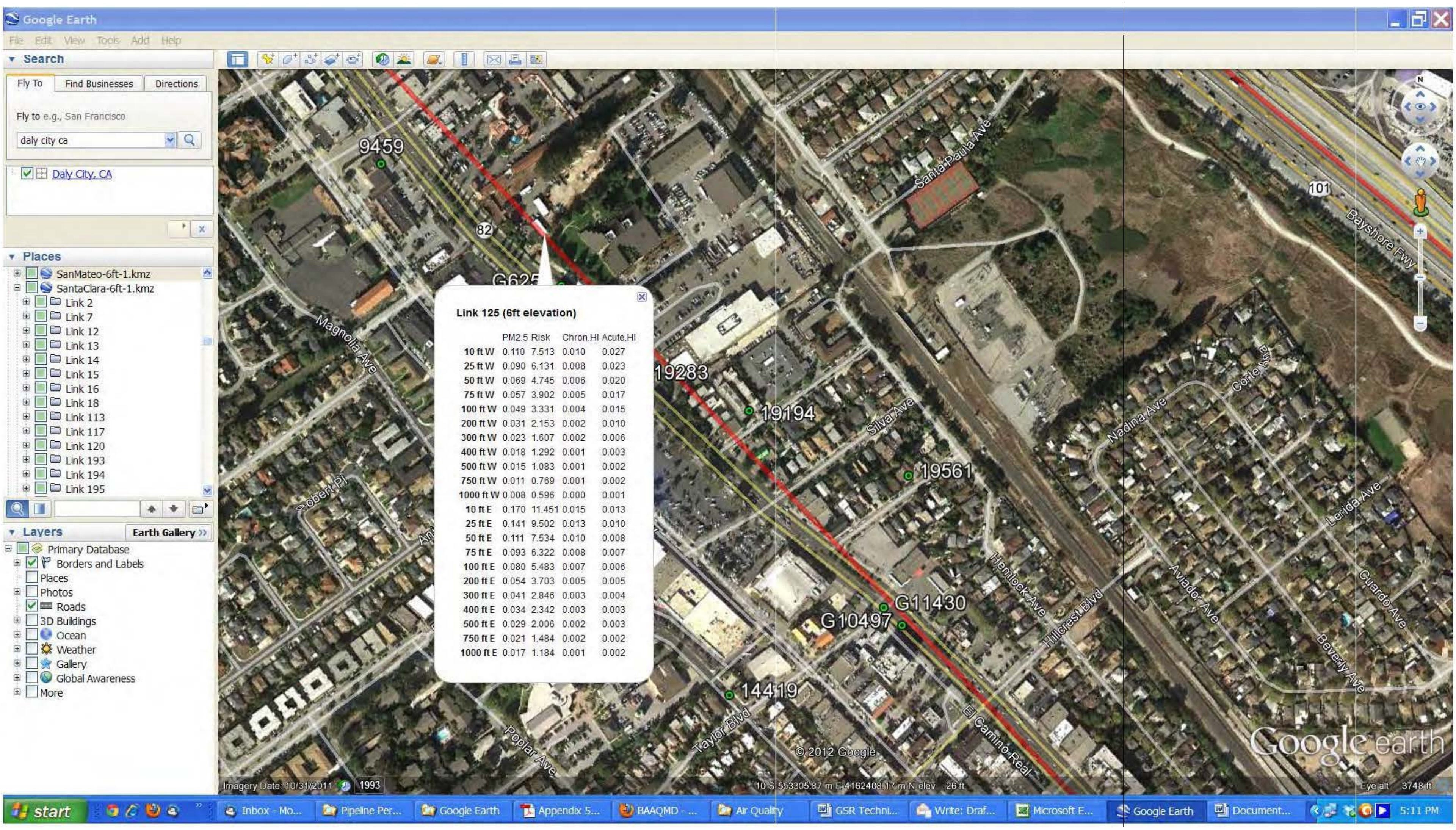


	PM2.5	Risk	Chron.HI	Acute.HI
10 ft S	0.130	9.009	0.012	0.013
25 ft S	0.107	7.404	0.010	0.013
50 ft S	0.084	5.848	0.007	0.012
75 ft S	0.070	4.910	0.006	0.012
100 ft S	0.061	4.278	0.005	0.011
200 ft S	0.042	2.945	0.004	0.007
300 ft S	0.032	2.275	0.003	0.004
400 ft S	0.026	1.844	0.002	0.004
500 ft S	0.022	1.532	0.002	0.004
750 ft S	0.014	1.018	0.001	0.003
1000 ft S	0.010	0.746	0.001	0.004
10 ft N	0.165	11.337	0.015	0.025
25 ft N	0.135	9.285	0.012	0.022
50 ft N	0.105	7.276	0.009	0.018
75 ft N	0.087	6.032	0.008	0.014
100 ft N	0.074	5.170	0.007	0.010
200 ft N	0.047	3.334	0.004	0.004
300 ft N	0.035	2.500	0.003	0.003
400 ft N	0.028	2.032	0.002	0.003
500 ft N	0.024	1.734	0.002	0.003
750 ft N	0.018	1.300	0.001	0.002
1000 ft N	0.014	1.062	0.001	0.002



	PM2.5	Risk	Chron.HI	Acute.HI
10 ft S	0.130	9.009	0.012	0.013
25 ft S	0.107	7.404	0.010	0.013
50 ft S	0.084	5.848	0.007	0.012
75 ft S	0.070	4.910	0.006	0.012
100 ft S	0.061	4.278	0.005	0.011
200 ft S	0.042	2.945	0.004	0.007
300 ft S	0.032	2.275	0.003	0.004
400 ft S	0.026	1.844	0.002	0.004
500 ft S	0.022	1.532	0.002	0.004
750 ft S	0.014	1.018	0.001	0.003
1000 ft S	0.010	0.746	0.001	0.004
10 ft N	0.165	11.337	0.015	0.025
25 ft N	0.135	9.285	0.012	0.022
50 ft N	0.105	7.276	0.009	0.018
75 ft N	0.087	6.032	0.008	0.014
100 ft N	0.074	5.170	0.007	0.010
200 ft N	0.047	3.334	0.004	0.004
300 ft N	0.035	2.500	0.003	0.003
400 ft N	0.028	2.032	0.002	0.003
500 ft N	0.024	1.734	0.002	0.003
750 ft N	0.018	1.300	0.001	0.002
1000 ft N	0.014	1.062	0.001	0.002



Link 125 (6ft elevation)

	PM2.5	Risk	Chron.HI	Acute.HI
10 ft W	0.110	7.513	0.010	0.027
25 ft W	0.090	6.131	0.008	0.023
50 ft W	0.069	4.745	0.006	0.020
75 ft W	0.057	3.902	0.005	0.017
100 ft W	0.049	3.331	0.004	0.015
200 ft W	0.031	2.153	0.002	0.010
300 ft W	0.023	1.607	0.002	0.006
400 ft W	0.018	1.292	0.001	0.003
500 ft W	0.015	1.083	0.001	0.002
750 ft W	0.011	0.769	0.001	0.002
1000 ft W	0.008	0.596	0.000	0.001
10 ft E	0.170	11.451	0.015	0.013
25 ft E	0.141	9.502	0.013	0.010
50 ft E	0.111	7.534	0.010	0.008
75 ft E	0.093	6.322	0.008	0.007
100 ft E	0.080	5.483	0.007	0.006
200 ft E	0.054	3.703	0.005	0.005
300 ft E	0.041	2.846	0.003	0.004
400 ft E	0.034	2.342	0.003	0.003
500 ft E	0.029	2.006	0.002	0.003
750 ft E	0.021	1.484	0.002	0.002
1000 ft E	0.017	1.184	0.001	0.002

San Mateo County
PM2.5 Concentrations and Cancer Risks Generated from Surface Streets

How to use the screening tables:

- Distance is from the edge of the nearest travel lane of a street to the facility or development
- When two or more streets are within the influence area, sum the contribution from each street

$PM_{2.5}$ CONCENTRATIONS (UG/M^3)

NORTH-SOUTH DIRECTIONAL ROADWAY

Annual Average Daily Traffic	Distance East or West of Surface Street - PM2.5 Concentration (ug/m^3)						
	10 feet	50 feet	100 feet	200 feet	500 feet	700 feet	1,000 feet
1,000	No analysis required						
5,000							
10,000	0.117	0.098	0.068	0.029	0.014	0.012	0.000
20,000	0.147	0.137	0.117	0.078	0.022	0.018	0.014
30,000	0.215	0.205	0.186	0.127	0.047	0.027	0.018
40,000	0.264	0.254	0.245	0.166	0.059	0.047	0.031
50,000	0.372	0.362	0.323	0.215	0.078	0.056	0.040
60,000	0.499	0.489	0.411	0.269	0.098	0.069	0.047
70,000	0.626	0.616	0.499	0.323	0.117	0.083	0.055
80,000	0.716	0.704	0.570	0.369	0.134	0.095	0.063
90,000	0.805	0.792	0.641	0.415	0.151	0.107	0.070
100,000	0.894	0.880	0.713	0.461	0.168	0.119	0.078

EAST-WEST DIRECTIONAL ROADWAY

Annual Average Daily Traffic	Distance North or South of Surface Street - PM2.5 Concentration (ug/m^3)						
	10 feet	50 feet	100 feet	200 feet	500 feet	700 feet	1,000 feet
1,000	No analysis required						
5,000							
10,000	0.098	0.088	0.064	0.020	0.014	0.012	0.000
20,000	0.186	0.166	0.117	0.059	0.022	0.018	0.010
30,000	0.205	0.176	0.147	0.088	0.034	0.023	0.017
40,000	0.323	0.313	0.235	0.108	0.047	0.032	0.023
50,000	0.558	0.489	0.382	0.176	0.063	0.042	0.032
60,000	0.597	0.523	0.421	0.201	0.072	0.049	0.038
70,000	0.636	0.558	0.460	0.225	0.081	0.057	0.043
80,000	0.727	0.637	0.525	0.257	0.093	0.065	0.049
90,000	0.818	0.717	0.591	0.289	0.104	0.073	0.055
100,000	0.908	0.797	0.657	0.321	0.116	0.081	0.061

LIFETIME CANCER RISK

NORTH-SOUTH DIRECTIONAL ROADWAY

Annual Average Daily Traffic	Distance East or West of Surface Street - Cancer Risk (per million)						
	10 feet	50 feet	100 feet	200 feet	500 feet	700 feet	1,000 feet
1,000	No analysis required						
5,000							
10,000	3.79	3.34	2.46	1.05	0.57	0.44	0.32
20,000	4.33	4.24	3.70	2.64	1.04	0.78	0.55
30,000	6.03	5.93	5.31	3.72	1.50	1.09	0.74
40,000	7.61	7.52	7.00	5.12	2.02	1.50	1.06
50,000	10.80	10.70	9.29	6.45	2.38	1.85	1.32
60,000	14.30	14.20	11.73	7.66	2.96	2.20	1.58
70,000	17.80	17.71	14.17	8.87	3.53	2.56	1.85
80,000	20.35	20.24	16.20	10.14	4.04	2.93	2.11
90,000	22.89	22.77	18.22	11.40	4.54	3.29	2.38
100,000	25.43	25.29	20.25	12.67	5.05	3.66	2.64

EAST-WEST DIRECTIONAL ROADWAY

Annual Average Daily Traffic	Distance North or South of Surface Street - Cancer Risk (per million)						
	10 feet	50 feet	100 feet	200 feet	500 feet	700 feet	1,000 feet
1,000	No analysis required						
5,000							
10,000	2.75	2.48	1.86	0.96	0.53	0.42	0.33
20,000	4.91	4.78	3.79	1.68	0.96	0.75	0.56
30,000	4.97	4.88	4.25	2.57	1.14	0.87	0.61
40,000	9.04	8.94	6.81	3.18	1.50	1.14	0.83
50,000	16.19	13.91	10.64	5.13	1.94	1.41	1.06
60,000	17.09	14.92	11.96	6.09	2.29	1.67	1.23
70,000	17.98	15.94	13.28	7.06	2.64	1.93	1.41
80,000	20.55	18.22	15.17	8.07	3.02	2.21	1.61
90,000	23.12	20.49	17.07	9.07	3.40	2.49	1.81
100,000	25.69	22.77	18.97	10.08	3.78	2.76	2.01

- Screening tables based on meteorological data collected from San Mateo Sewage Treatment Plant in 2005.
- The maximum acute and chronic hazard index for the distances and AADT shown in the table will be less than 0.02.
- Cancer risk were estimated based on exposure from 2014 through 2084. PM2.5 concentrations were based on emissions in 2014.

Bay Area Air Quality Management District

Risk & Hazard Stationary Source Inquiry Form

This form is required when users request stationary source data from BAAQMD. This form is to be used with the BAAQMD's Google Earth stationary source screening tables.

For guidance on conducting a risk & hazard screening, including for roadways & freeways, refer to the District's Risk & Hazard Analysis flow chart.

Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:

Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.

Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx. The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.

Find the project site in Google Earth by inputting the site's address in the Google Earth search box.

Using the Google Earth ruler function, measure the distance in feet between the project's fenceline and the stationary source's fenceline for all the sources that are within 1,000 feet of the project's fenceline. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm that the source is within 1,000 feet of the project. Please report any mapping errors to the District (District contact information in Step 9).

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Note that a small percentage of the stationary sources have Health Risk Screening Assessment (HRSA) data INSTEAD of screening level data. These sources will be noted by an asterisk next to the Plant Name (Map B on right). If HRSA values are presented, these values have already been modeled and cannot be adjusted further.

Email this completed form to District staff (Step 9). District staff will provide the most recent risk, hazard, and PM2.5 data that are available for the source(s). If this information or data are not available, source emissions data will be provided. Staff will respond to inquiries within three weeks.

Note that a public records request received for the same stationary source information will cancel the processing of your SSIF request.

Submit forms, maps, and questions to Alison Kirk at 415-749-5169, or akirk@baaqmd.gov.

Map A: Snapshot of Google Earth with Plant 20248 Information Table Selected

Table B: Stationary Sources within 1,000 feet of Receptor that say "Contact District Staff"

Table B Section 1: Requestor fills out these columns based on Google Earth data				Table B Section 2: BAAQMD returns form with additional information in these columns as needed																				
Distance from Receptor (feet)	**Plant # or Gas Dispensary #**	**Facility Name**	**Street Address**	**Screening Level Cancer Risk (1)**	**Screening Level Hazard Index (1)**	**Screening Level PM2.5 (1)**	**Adjusted Screening Risk**	**Adjusted Screening Hazard**	**Adjusted Screening PM2.5**	**Type**	**Permit #s (2)**	**Source #s (2)**	**Fuel Code (3)**	**Type of Source(s) (4)**	**HRSA Ap # (5)**	**HRSA Date (6)**	**HRSA Engineer (7)**	**HRSA Cancer Risk in a million**	**Age Sensitivity Factor (8)**	**HRSA Adjusted Cancer Risk**	**HRSA Chronic Health (9)**	**HRSA PM2.5 Risk**	**Status/Comments**
900	G11629	Mayfair 76	101 So Mayfair Avenue Daly City	50.814	0.084	na	**0.91**	**0.00**	**0.00**	Gas Station												0	
1000	13221	DB Real Estate Pacific Plaza Partners LP	2001 Juniperro Serra Blvd Daly City	16.68	0.006	0.004	**0.67**	**0.00**	**0.00**	Generator												0	
700	13420	Digidesign	2001 Juniperro Serra Blvd Daly City	5.27	0.002	0.001	**0.42**	**0.00**	**0.00**	Generator												0	
700	14852	Genesys Telecommunications Laboratories	JUNIPERO SERRA BLVD, SUITE 700 Daly City	14.7	0.005	0.026	**1.18**	**0.00**	**0.00**	Generator												0	
																						0	
																						0	
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2. Each plant may have multiple permits and sources.

3. Fuel codes: 98 = diesel, 189 = Natural Gas.

4. Permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc.

5. If a Health Risk Screening Assessment (HRSA) was completed for the source, the application number will be listed here.

6. The date that the HRSA was completed.

7. Engineer who completed the HRSA. For District purposes only.

8. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.

9. The HRSA "Chronic Health" number represents the Hazard Index.

10. Further information about common sources:

a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.

b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i

c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010.
Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.

d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t

e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.

f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.

g. This spray booth is considered to be insignificant.

Date last updated:
3/12/12

Bay Area Air Quality Management District

Risk & Hazard Stationary Source Inquiry Form

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For guidance on conducting a risk & hazard screening, including for roadways & freeways, refer to the District's Risk & Hazard Analysis flow chart.

Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:

Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.

Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx. The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.

Find the project site in Google Earth by inputting the site's address in the Google Earth search box.

Using the Google Earth ruler function, measure the distance in feet between the project's fenceline and the stationary source's fenceline for all the sources that are within 1,000 feet of the project's fenceline. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm that the source is within 1,000 feet of the project. Please report any mapping errors to the District (District contact information in Step 9).

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Note that a small percentage of the stationary sources have Health Risk Screening Assessment (HRSA) data INSTEAD of screening level data. These sources will be noted by an asterisk next to the Plant Name (Map B on right). If HRSA values are presented, these values have already been modeled and cannot be adjusted further.

Email this completed form to District staff (Step 9). District staff will provide the most recent risk, hazard, and PM2.5 data that are available for the source(s). If this information or data are not available, source emissions data will be provided. Staff will respond to inquiries within three weeks.

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Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Adjusted Screening Risk	Adjusted Screening Hazard	Adjusted Screening PM2.5	Type	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
Site 2																							
730	16794	The Home Depot (Store# 1092	303 E LAKE MERCED BLVD Daly City	50.99	0.018	0.012	**4.08**	**0.00**	**0.00**	Generator												0	
900	G10657	Arco Facility #00465 - MICHAEL J MONTE	151 Southgate Avenue Daly City	26.878	0.044	na	**0.48**	**0.00**	**0.00**	Gasoline Station												0	
590	12568	Calclean Inc	151 SOUTHGATE AVENUE Daly City	5.03	0.002	0.00	**5.03**	**0.00**	**0.00**	Cleaners (no Adjustment)												0	
1000	12876	City of Daly City	295 CORONADO AVENUE Daly City	51.32	0.018	0.012	**2.05**	**0.00**	**0.00**	Generator												0	
Site 3																						0	
590	12568	Calclean Inc	151 SOUTHGATE AVENUE Daly City	5.03	0.002	0.00	**5.03**	**0.00**	**0.00**	Cleaners (no Adjustment)												0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
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Footnotes:

1. These Cancer Risk, Hazard Index, and PM2.5 columns represent the rows in the Google Earth Plant Information Table that say "Contact District Staff" (Map A above). BAAQMD will return this form to you with this screening level information entered in thes
2. Each plant may have multiple permits and sources.
3. Fuel codes: 98 = diesel, 189 = Natural Gas.
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5. If a Health Risk Screening Assessment (HRSA) was completed for the source, the application number will be listed here.
6. The date that the HRSA was completed.
7. Engineer who completed the HRSA. For District purposes only.
8. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.
9. The HRSA "Chronic Health" number represents the Hazard Index.
10. Further information about common sources:
    a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
    b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i
    c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010. Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
    d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t
    e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
    f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
    g. This spray booth is considered to be insignificant.

Date last updated:
3/12/12

Bay Area Air Quality Management District
Risk & Hazard Stationary Source Inquiry Form
This form is required when users request stationary source data from BAAQMD. This form is to be used with the BAAQMD's Google Earth stationary source screening tables.
For guidance on conducting a risk & hazard screening, including for roadways & freeways, refer to the District's Risk & Hazard Analysis flow chart
Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:
Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.
Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.
The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.
Find the project site in Google Earth by inputting the site's address in the Google Earth search box.
Using the Google Earth ruler function, measure the distance in feet between the project's fenceline and the stationary source's fenceline for all the sources that are within 1,000 feet of the project's fenceline. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm that the source is within 1,000 feet of the project. Please report any mapping errors to the District (District contact information in Step 9).
If the stationary source is within 1,000 feet of the project's fenceline and the stationary source's information table does not list the cancer risk, hazard index, and PM2.5 concentration, and instead says to "Contact District Staff", list the stationary source information in Table B Section 1 below.
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Map A: Snapshot of Google Earth with Plant 20248 Information Table Selected

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Table B Section 1: Requestor fills out these columns based on Google Earth data				Table B Section 2: BAAQMD returns form with additional information in these columns as needed																			
Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Adjusted Screening Risk	Adjusted Screening Hazard	Adjusted Screening PM2.5	Type	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
Site 5																							
>1,000	G2810	ARCO Facility #02090 - COPOWER INC	295 Washington Street Daly City	24.391	0.032	na																0	
580	G9309	R K Chan #2611202	3001 Junipero Serra Daly City	8.009	0.01	na	0.29	0.00	0.00	Gasoline Station												0	
>>1,000	9640	AT&T	359 Washington St Colma	0.27	0.012	0.012																0	
>1,000	G10514	Sullivan Valero	1690 Sullivan Avenue Daly City	13.931	0.023	na																0	
~200	9577	D'Garcis Auto Body	254 SAN PEDRO ROAD Daly City	0.00	0.009	0.00																0	
600	18205	Collision Specialists Auto Center(CST Co	250 SAN PEDRO ROAD Daly City	0.00	0.00	0.00																0	
660	14102	City of Daly City	280 A STREET Daly City	79.01	0.028	0.018	6.32	0.00	0.00	Generator													
>1000	G6665	Pacific Gas and Electric Company	450 Eastmoor Avenue Daly City	0.098	0.00	na																0	
>1000	18205	Collision Specialists Auto Center(CST Co	250 SAN PEDRO ROAD Daly City	0.00	0.00	0.00																0	
>1000	9577	D'Garcis Auto Body	254 SAN PEDRO ROAD Daly City	0.00	0.009	0.00																0	
>1000	13349	S F Bay Area Rapid Transit District	255 D STREET Colma	0.00	0.00	0.015																0	
>1000	14072	S F Bay Area Rapid Transit District	365 D STREET Colma	20.46	0.007	0.005																0	
>1000	14095	North San Mateo County Sanitation Distri	300 F STREET Daly City	33.77	0.012	0.008																0	
>1000	G9706	Woodlawn Memorial Park	1000 El Camino Colma	0.05	0.00	na																0	
																						0	
																						0	

Footnotes:
1. These Cancer Risk, Hazard Index, and PM2.5 columns represent the rows in the Google Earth Plant Information Table that say "Contact District Staff" (Map A above). BAAQMD will return this form to you with this screening level information entered in thes
2. Each plant may have multiple permits and sources.
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10. Further information about common sources:
   a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
   b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i

   c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010.
   Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
   d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t

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Date last updated:
3/12/12

Bay Area Air Quality Management District

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Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:

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Find the project site in Google Earth by inputting the site's address in the Google Earth search box.

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Table B Section 1: Requestor fills out these columns based on Google Earth data; Table B Section 2: BAAQMD returns form with additional information in these columns as needed

Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Adjusted Screening Risk	Adjusted Screening Hazard	Adjusted Screening PM2.5	Type
900	1364	Cypress Amloc Land Co , Inc	1 SAND HILL ROAD	9.08	0.349	5.13	**0.45**	**0.02**	**0.26**	Generator
950	G11198	Lexus of Serramonte - Attn: Ray Chin	700 Serramonte Blvd Colma	8.722	0.012	na	**0.14**	**0.00**		Gasoline Station
	G11126	Christy Vault Company, Inc	1000 Collins Ave Colma	108.802	0.144	na				
	8758	Serramonte Ford Body Shop	500 COLLINS AVE Colma	0.00	0.00	0.018				
	12251	G & M Auto Body	245 COLLINS AVE Colma	0.04	0.00	0.00				
	G8650	Home of Peace Cemetery	1299 El Camino Real Colma	0.222	0.00	na				

Plant # or Gas Dispensary #	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
1364												0	
G11198												0	
G11126												0	
8758												0	
12251												0	
G8650												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	

Footnotes:

1. These Cancer Risk, Hazard Index, and PM2.5 columns represent the rows in the Google Earth Plant Information Table that say "Contact District Staff" (Map A above). BAAQMD will return this form to you with this screening level information entered in thes
2. Each plant may have multiple permits and sources.
3. Fuel codes: 98 = diesel, 189 = Natural Gas.
4. Permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc.
5. If a Health Risk Screening Assessment (HRSA) was completed for the source, the application number will be listed here.
6. The date that the HRSA was completed.
7. Engineer who completed the HRSA. For District purposes only.
8. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.
9. The HRSA "Chronic Health" number represents the Hazard Index.
10. Further information about common sources:
    a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
    b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i

    c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010.
    Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
    d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t

    e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
    f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
    g. This spray booth is considered to be insignificant.

Date last updated:
3/12/12

Bay Area Air Quality Management District

Risk & Hazard Stationary Source Inquiry Form

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For guidance on conducting a risk & hazard screening, including for roadways & freeways, refer to the District's Risk & Hazard Analysis flow chart.

Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:
Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.
Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx. The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.
Find the project site in Google Earth by inputting the site's address in the Google Earth search box.
Using the Google Earth ruler function, measure the distance in feet between the project's fenceline and the stationary source's fenceline for all the sources that are within 1,000 feet of the project's fenceline. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm that the source is within 1,000 feet of the project. Please report any mapping errors to the District (District contact information in Step 9).
If the stationary source is within 1,000 feet of the project's fenceline and the stationary source's information table does not list the cancer risk, hazard index, and PM2.5 concentration, and instead says to "Contact District Staff", list the stationary source information in Table B Section 1 below.
Note that a small percentage of the stationary sources have Health Risk Screening Assessment (HRSA) data INSTEAD of screening level data. These sources will be noted by an asterisk next to the Plant Name (Map B on right). If HRSA values are presented, these values have already been modeled and cannot be adjusted further.
Email this completed form to District staff (Step 9). District staff will provide the most recent risk, hazard, and PM2.5 data that are available for the source(s). If this information or data are not available, source emissions data will be provided. Staff will respond to inquiries within three weeks.
Note that a public records request received for the same stationary source information will cancel the processing of your SSIF request.
Submit forms, maps, and questions to Alison Kirk at 415-749-5169, or akirk@baaqmd.gov .

Map A: Snapshot of Google Earth with Plant 20248 Information Table Selected

Table B: Stationary Sources within 1,000 feet of Receptor that say "Contact District Staff"

Table B Section 1: Requestor fills out these columns based on Google Earth data				Table B Section 2: BAAQMD returns form with additional information in these columns as needed																			
Distance from Receptor (feet)	**Plant # or Gas Dispensary #**	**Facility Name**	**Street Address**	**Screening Level Cancer Risk (1)**	**Screening Level Hazard Index (1)**	**Screening Level PM2.5 (1)**	**Adjusted Screening Risk**	**Adjusted Screening Hazard**	**Adjusted Screening PM2.5**	**Type**	**Permit #s (2)**	**Source #s (2)**	**Fuel Code (3)**	**Type of Source(s) (4)**	**HRSA Ap # (5)**	**HRSA Date (6)**	**HRSA Engineer (7)**	**HRSA Cancer Risk in a million**	**Age Sensitivity Factor (8)**	**HRSA Adjusted Cancer Risk**	**HRSA Chronic Health (9)**	**HRSA PM2.5 Risk**	**Status/Comments**
870	G3305	Xtra Oil Company	110 Hickey Boulevard Soutgh San Francisco	71.457	0.118	na	1.43	0.00		Gasoline Station												0	
20	11016	Image Auto Body	1687 MISSION ROAD South San Francisco	0.00	0.00	0.00																0	
																						0	
																						0	
																						0	
																						0	
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3. Fuel codes: 98 = diesel, 189 = Natural Gas.
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8. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.
9. The HRSA "Chronic Health" number represents the Hazard Index.
10. Further information about common sources:
    a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
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    c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010.
    Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
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Date last updated:
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Bay Area Air Quality Management District

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Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:
Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.
Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.
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Find the project site in Google Earth by inputting the site's address in the Google Earth search box.
Using the Google Earth ruler function, measure the distance in feet between the project's fenceline and thestationary source's fenceline for all the sources that are within 1,000 feet of the project's fenceline. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm that the source is within 1,000 feet of the project. Please report any mapping errors to the District (District contact information in Step 9).
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>1000	G11573	Grand Avenue Olympic	1086 Grand Avenue South San Francisco	na	na	na																0	
>1000	14871	County of San Mateo	1040 OLD MISSION ROAD South San Fransico	18.06	0.006	0.004																0	
>1000	G8499	California Water Service Company	80 Chestnut Avenue South San Francisco	na	na	na																0	
600	G11428	Westborough Chevron	1 Westborough Boulevard South San Fransico	22.056	0.037	na	**0.73**	**0.00**		Gasoline Station												0	
500	19316	Access Properties LLC	91 WESTBOROUGH BOULEVARD South San Francisco	na	na	na																0	
>1000	19842	Chestnut Cleaners	26 CHESTNUT AVENUE South San Francisco	7.49	0.02	0.00																0	
	5611	Daland Body Shop	890 EL CAMINO REAL South San Francisco	0.00	0.00	0.00																0	
>1000	G11391	Camino Petroleum	698 El Camino Real South San Francisco	14.285	0.019	na																0	
>1000	G12394	Orange Avenue Shell	710 El Camino Real South San Francisco	9.902	0.013	na																0	
>1000	14240	SFPUC Water Supply and Treatment Divisio	609 W ORANGE AVENUE South San Francisco	58.80	0.021	0.104																0	
>1000	11414	Holiday Cleaners	675 EL CAMINO REAL South San Francisco	11.20	0.03	0.00																0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	

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(Map A above). BAAQMD will return this form to you with this screening level information entered in thes
2. Each plant may have multiple permits and sources.
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9. The HRSA "Chronic Health" number represents the Hazard Index.
10. Further information about common sources:
   a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
   b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i
   c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010.
   Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
   d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t
   e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
   f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
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Date last updated:
3/12/12

Bay Area Air Quality Management District

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Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:
Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.
Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx. The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.
Find the project site in Google Earth by inputting the site's address in the Google Earth search box.
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If the stationary source is within 1,000 feet of the project's fenceline and the stationary source's information table does not list the cancer risk, hazard index, and PM2.5 concentration, and instead says to "Contact District Staff", list the stationary source information in Table B Section 1 below.
Note that a small percentage of the stationary sources have Health Risk Screening Assessment (HRSA) data INSTEAD of screening level data. These sources will be noted by an asterisk next to the Plant Name (Map B on right). If HRSA values are presented, these values have already been modeled and cannot be adjusted further.
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Map A: Snapshot of Google Earth with Plant 20248 Information Table Selected

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Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Adjusted Screening Risk	Adjusted Screening Hazard	Adjusted Screening PM2.5	Type	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
700	G12073	Spruce Street Car Wash	246 So Spruce Avenue South San Francisco	6.193	0.010	na	0.167211	0.00027		Gasoline Station												0	
400	2483	Bimbo Bakeries USA	264 SO SPRUCE AVENUE South San Francisco	0.19	0.001	14.300																0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
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Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
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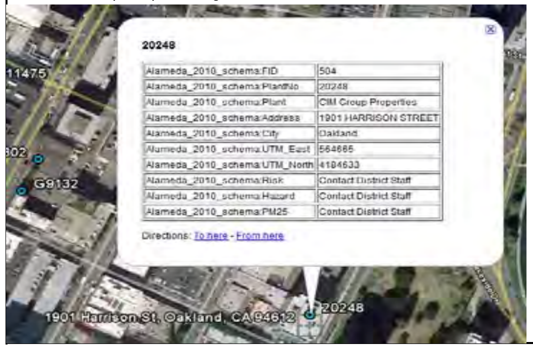

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Table B Section 1: Requestor fills out these columns based on Google Earth data				Table B Section 2: BAAQMD returns form with additional information in these columns as needed															
Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
	19262	DaVita	1178 CHERRY AVENUE San Bruno	4.02	0.001	0.001												0	
																		0	
																		0	
																		0	
																		0	
																		0	
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																		0	
																		0	
																		0	
																		0	
																		0	
																		0	
																		0	

Footnotes:

1. These Cancer Risk, Hazard Index, and PM2.5 columns represent the rows in the Google Earth Plant Information Table that say "Contact District Staff" (Map A above). BAAQMD will return this form to you with this screening level information entered in thes
2. Each plant may have multiple permits and sources.
3. Fuel codes: 98 = diesel, 189 = Natural Gas.
4. Permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc.
5. If a Health Risk Screening Assessment (HRSA) was completed for the source, the application number will be listed here.
6. The date that the HRSA was completed.
7. Engineer who completed the HRSA. For District purposes only.
8. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.
9. The HRSA "Chronic Health" number represents the Hazard Index.
10. Further information about common sources:
    a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
    b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i
    c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010. Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
    d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t
    e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
    f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
    g. This spray booth is considered to be insignificant.

Date last updated:
3/12/12

Bay Area Air Quality Management District

Risk & Hazard Stationary Source Inquiry Form

This form is required when users request stationary source data from BAAQMD. This form is to be used with the BAAQMD's Google Earth stationary source screening tables.

For guidance on conducting a risk & hazard screening, including for roadways & freeways, refer to the District's Risk & Hazard Analysis flow chart.

Also see the District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requestor Contact Information	
Contact Name:	James A. Reyff
Affiliation:	Illingworth & Rodkin, Inc.
Phone:	707-766-7700
Email:	jreyff@illingworthrodkin.com
Date of Request	4/9/2012
Project Name:	Regional Groundwater Storage and
Address:	various
City:	
County:	
Type (residential, commercial, mixed use, industrial, etc.):	Public Works - Pump Stations
Project size (# of units, or building square feet):	<3,000 sf
Comments:	

For Air District assistance, the following steps must be completed:
Complete all the contact and project information requested in Table A. Incomplete forms will not be processed. Please include a project site map.
Download and install the free program Google Earth, http://www.google.com/earth/download/ge/, and then download the county specific Google Earth stationary source application files from the District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx. The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.
Find the project site in Google Earth by inputting the site's address in the Google Earth search box.
Using the Google Earth ruler function, measure the distance in feet between the project's fenceline and the stationary source's fenceline for all the sources that are within 1,000 feet of the project's fenceline. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm that the source is within 1,000 feet of the project. Please report any mapping errors to the District (District contact information in Step 9).
If the stationary source is within 1,000 feet of the project's fenceline and the stationary source's information table does not list the cancer risk, hazard index, and PM2.5 concentration, and instead says to "Contact District Staff", list the stationary source information in Table B Section 1 below.
Note that a small percentage of the stationary sources have Health Risk Screening Assessment (HRSA) data INSTEAD of screening level data. These sources will be noted by an asterisk next to the Plant Name (Map B on right). If HRSA values are presented, these values have already been modeled and cannot be adjusted further.
Email this completed form to District staff (Step 9). District staff will provide the most recent risk, hazard, and PM2.5 data that are available for the source(s). If this information or data are not available, source emissions data will be provided. Staff will respond to inquiries within three weeks.
Note that a public records request received for the same stationary source information will cancel the processing of your SSIF request.
Submit forms, maps, and questions to Alison Kirk at 415-749-5169, or akirk@baaqmd.gov.

Map A: Snapshot of Google Earth with Plant 20248 Information Table Selected

Table B: Stationary Sources within 1,000 feet of Receptor that say "Contact District Staff"

Table B Section 1: Requestor fills out these columns based on Google Earth data				Table B Section 2: BAAQMD returns form with additional information in these columns as needed																			
Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Adjusted Screening Risk	Adjusted Screening Hazard	Adjusted Screening PM2.5	Type	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
500	G6250	San Francisco Water Department	1000 El Camino Real Millbrae	0.361	0.001	na	0.02	0.00		Gasoline Station												0	
950	G2970	Olympic	1009 El Camino Real Millbrae	83.15	0.138	na	**2.25**	**0.00**		Gasoline Station												0	
130	19283	Orchard Supply Hardware	900 EL CAMINO REAL Millbrae	4.05	0.001	0.001	**2.35**	**0.00**	**0.00**	Generator												0	
	4998	Holiday Cleaners of America	1050 BROADWAY Millbrae	0.00	0.00	0.00																0	
500	19194	San Francisco Public Utilities Commissio	1000 EL CAMINO REAL Millbrae	No data	No data	No data																0	
700	19561	Verizon Wireless (SFO West)	1009A HEMLOCK DRIVE Millbrae	No data	No data	No data																0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
																						0	
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Footnotes:
1. These Cancer Risk, Hazard Index, and PM2.5 columns represent the rows in the Google Earth Plant Information Table that say "Contact District Staff" (Map A above). BAAQMD will return this form to you with this screening level information entered in thes
2. Each plant may have multiple permits and sources.
3. Fuel codes: 98 = diesel, 189 = Natural Gas.
4. Permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc.
5. If a Health Risk Screening Assessment (HRSA) was completed for the source, the application number will be listed here.
6. The date that the HRSA was completed.
7. Engineer who completed the HRSA. For District purposes only.
8. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.
9. The HRSA "Chronic Health" number represents the Hazard Index.
10. Further information about common sources:
   a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
   b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i
   c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010. Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
   d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but instead should reflect the number of years perc use will continue after t
   e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
   f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
   g. This spray booth is considered to be insignificant.

Date last updated:
3/12/12

Cancer Risk and Chronic Hazard Index Distance Adjustment Multiplier for Diesel IC Engines			
Meters	Feet		Multiplier
25	83		0.85
30	99		0.73
35	116		0.64
40	132		0.58
50	165		0.5
60	198		0.41
70	231		0.31
80	264		0.28
90	297		0.25
100	330		0.22
110	363		0.18
120	396		0.16
130	429		0.15
140	462		0.14
150	495		0.12
160	528		0.1
180	594		0.09
200	661		0.08
220	727		0.07
240	793		0.06
260	859		0.05
280	925		0.04

Cancer Risk and Chronic Hazard Index Distance Adjustment Multiplier for Gasoline Dispensing Facilities						
Meters	Feet	Multiplier		Meters	Feet	Multiplier
20	66	1		140	459	0.052
25	82	0.728		145	476	0.049
30	98	0.559		150	492	0.046
35	115	0.445		155	509	0.044
40	131	0.365		160	525	0.042
45	148	0.305		165	541	0.04
50	164	0.26		170	558	0.038
55	180	0.225		175	574	0.036
60	197	0.197		180	591	0.034
65	213	0.174		185	607	0.033
70	230	0.155		190	623	0.031
75	246	0.139		195	640	0.03
80	262	0.126		200	656	0.029
85	279	0.114		205	673	0.028
90	295	0.104		210	689	0.027
95	312	0.096		220	722	0.025
100	328	0.088		230	755	0.023
110	361	0.076		250	820	0.02
120	394	0.066		270	886	0.018
130	427	0.058		290	951	0.016

Table B: Stationary Sources within 1,000 feet of Receptor that say "Contact District Staff"																			
Table B Section 1: Requestor fills out these columns based on Google Earth data				Table B Section 2: BAAQMD returns form with additional information in these columns as needed															
Distance from Receptor (feet)	Plant # or Gas Dispensary #	Facility Name	Street Address	Screening Level Cancer Risk (1)	Screening Level Hazard Index (1)	Screening Level PM2.5 (1)	Permit #s (2)	Source #s (2)	Fuel Code (3)	Type of Source(s) (4)	HRSA Ap # (5)	HRSA Date (6)	HRSA Engineer (7)	HRSA Cancer Risk in a million	Age Sensitivity Factor (8)	HRSA Adjusted Cancer Risk	HRSA Chronic Health (9)	HRSA PM2.5 Risk	Status/Comments
Site 13																			
700	G12073	Spruce Street Car Wash	246 So Spruce Avenue South San Francisco	6.193	0.010	na												0	
400	2483	Bimbo Bakeries USA	264 SO SPRUCE AVENUE South San Francisco	0.19	0.001	14.300		various baking things										0	use screening level or see emissions data on next spreadsheet in workbook
Site 16																		0	
500	19194	San Francisco Public Utilities Commissio	1000 EL CAMINO REAL Millbrae	No data	No data	No data				1 Diesel engine -	18529	8/11/2008	ICS	1.3	1.7	2.21	7.8 E-4	0.0069279	use HRSA values
700	19561	Verizon Wireless (SFO West)	1009A HEMLOCK DRIVE Millbrae	No data	No data	No data				1 Diesel engine - generator	20184	4/15/2009	JAC	5.6	1.7	7.3	3.4 E-03	0.022884013	use HRSA values
																		0	
																		0	
																		0	
																		0	
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																		0	
																		0	
																		0	

Footnotes:

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10. Further information about common sources:
    a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
    b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index of 0.003 or less. To be conservative, requestor should assume the cancer risk is 1 i
    c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010. Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
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    e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
    f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
    g. This spray booth is considered to be insignificant.

Date last updated:
3/12/12

Bimbo Bakeries USA (P# 2483)

S# SOURCE NAME
MATERIAL   SOURCE CODE
THROUGHPUT   DATE POLLUTANT   CODE LBS/DAY
----

1 Peterson 100 Foot Tunnel Oven
C6250189
Benzene   41 7.01E-06
Formaldehyde   124 8.24E-05
Toluene   293 3.74E-06
Organics (part not spec el   990 6.29E-03
Particulates (portion of t 1990 6.59E-02
Nitrous Oxide (N2O)   2030 5.08E-03
Nitrogen Oxides (part not   2990 3.08E+00
Sulfur Dioxide (SO2)   3990 1.25E-02
Carbon Monoxide (CO) pollu 4990 7.69E-01
Carbon Dioxide, non-biogen 6960 2.69E+03
Methane (CH4)   6970 6.26E-03
G1025109
Organics (part not spec el   990 2.54E-03
Carbon Dioxide, non-biogen 6960 1.21E-01
3 Baking Oven
C6250189
0 0.00E+00
G1025319
0 0.00E+00
4 Johnston Steam Boiler
C1240189
Benzene   41 6.52E-06
Formaldehyde   124 2.33E-04
Toluene   293 1.06E-05
Organics (part not spec el   990 9.07E-03
Particulates (portion of t 1990 9.32E-03
Nitrous Oxide (N2O)   2030 7.18E-04
Nitrogen Oxides (part not   2990 1.09E-01
Sulfur Dioxide (SO2)   3990 1.77E-03
Carbon Monoxide (CO) pollu 4990 1.09E-01
Carbon Dioxide, non-biogen 6960 3.80E+02
Methane (CH4)   6970 5.90E-03
5 Floor Silo Holding Tanks #4
G1999109
Particulates (portion of t 1990 3.72E+00
6 Floor Silo Holding Tanks #3
G1999109
Particulates (portion of t 1990 3.74E+00
7 Floor Silo Holding Tanks #2

G1999350

Particulates (portion of t 1990 9.34E-02

8 Flour Silo Holding Tanks #1

G1999350

Particulates (portion of t 1990 9.34E-02

9 APV Baker Tray Oven

C1650189

Benzene	41	1.23E-05
Formaldehyde	124	1.44E-04
Toluene	293	6.54E-06
Organics (part not spec el	990	1.10E-02
Particulates (portion of t	1990	1.15E-01
Nitrous Oxide (N2O)	2030	8.89E-03
Nitrogen Oxides (part not	2990	5.39E+00
Sulfur Dioxide (SO2)	3990	2.19E-02
Carbon Monoxide (CO) pollu	4990	1.35E+00
Carbon Dioxide, non-biogen	6960	4.71E+03
Methane (CH4)	6970	1.10E-02

-6 Catalytic Oxidation System

C8360189

Benzene	41	6.16E-05
Formaldehyde	124	7.24E-04
Toluene	293	3.28E-05
Organics (part not spec el	990	5.52E-02
Particulates (portion of t	1990	2.90E-02
Nitrous Oxide (N2O)	2030	2.23E-03
Nitrogen Oxides (part not	2990	1.35E+00
Sulfur Dioxide (SO2)	3990	5.49E-03
Carbon Monoxide (CO) pollu	4990	3.38E-01
Carbon Dioxide, non-biogen	6960	1.18E+03
Methane (CH4)	6970	1.83E-02

PLANT TOTAL:

lbs/day	Pollutant
8.74E-05	Benzene (41)
8.97E+03	Carbon Dioxide, non-biogenic CO2 (6960)
2.56E+00	Carbon Monoxide (CO) pollutant (4990)
1.18E-03	Formaldehyde (124)
4.15E-02	Methane (CH4) (6970)
9.93E+00	Nitrogen Oxides (part not spec elsewhere) (2990)
1.69E-02	Nitrous Oxide (N2O) (2030)
8.41E-02	Organics (part not spec elsewhere) -- including Methane (990)
7.86E+00	Particulates (portion of total not spec elsewhere) (1990)
4.16E-02	Sulfur Dioxide (SO2) (3990)
5.37E-05	Toluene (293)

GSR - Site 16 MEI Location
Cumulative Analysis
ISCST3 Railroad DPM Risk Modeling Parameters and Maximum Cancer Risk at MEI

Receptor Information

Number of Receptors	3
Receptor Height =	1.5 m
Receptor distances =	NA

Meteorological Conditions

San Francisco Airport Hourly Met Data	1991 - 1995
Land Use Classification	Urban
Wind speed =	variable
Wind direction =	variable

Cancer Risk Calculation Method

Inhalation Dose = C_{air} x DBR x A x EF x ED x 10^{-6} / AT

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
AT = Averaging time period over which exposure is averaged.
10^{-6} = Conversion factor

Inhalation Dose Factors

	Value[1]							
Exposure Type	**DBR (L/kg BW-day)**	**A (-)**	**Exposure (hr/day)**	**Exposure (days/week)**	**Exposure (week/year)**	**EF (days/yr)**	**ED (Years)**	**AT (days)**
Residential (70-Year)	302	1	24	7	50	350	70	25,550

[1] Default values recommended by OEHHA& Bay Area Air Quality Management District

Cancer Risk (per million) = Inhalation Dose x CRAF x CPF x 10^6
= URF x Cair

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
URF =Unit risk factor (cancer risk per $\mu g/m^3$)

Unit Risk Factors (unadjusted for age sensitivity) for DPM

Exposure Type	**CPF $(mg/kg\text{-}day)^{-1}$**	***DPM***
Residential (70-Yr Exposure)	1.10E+00	318.5

MEI Cancer Risk Calculations

Meteorological Data Year	**Maximum Annual DPM Concentration ($\mu g/m^3$) 2014-2025**		**2025***
1991 - 1995	0.0259		0.0000
Cancer Risk[a]	8.24		0.00
Sensitivity Weighting Factors	0.696		0.993
Contribution to Total Cancer Risk	5.74		0.0
70-yr Cumulative Risk [b]	***5.7***		

Notes:
* DPM concentration expected to be negligible due to train electrification
Receptor Heights = 1.5 m
Maximum DPM & PM2.5 concentrations occur at the residences closest to the rail line
a Cancer risk (per million) calculated assuming a 70-year exposure to concentration for year of analysis.
b Cumulative cancer risk (per million) calculated assuming variable exposure over a 70-year period due to decreased concentrations over time.

Exposure Period Sensitivity Weighting Factors for Modeling Periods

Calendar Year	Exposure Year	Age Sensitivity Factors 10	3	1	Sensitivity Weighting Factor	Emissions Period Weighting Factor
2014	1	1.0	0.0	0.0	0.143	
2015	2	1.0			0.143	
2016	3	0.25	0.75		0.068	
2017	4		1.0		0.043	
2018	5		1.0		0.043	
2019	6		1.0		0.043	
2020	7		1.0		0.043	
2021	8		1.0		0.043	
2022	9		1.0		0.043	
2023	10		1.0		0.043	
2024	11		1.0		0.043	**0.696**
2025	12		1.0		0.043	
2026	13		1.0		0.043	
2027	14		1.0		0.043	
2028	15		1.0		0.043	
2029	16		1.0		0.043	
2030	17		0.25	0.75	0.021	
2031	18			1.0	0.014	
2032	19			1.0	0.014	
2033	20			1.0	0.014	
2034	21			1.0	0.014	
2035	22			1.0	0.014	
2036	23			1.0	0.014	
2037	24			1.0	0.014	
2038	25			1.0	0.014	
2039	26			1.0	0.014	
2040	27			1.0	0.014	
2041	28			1.0	0.014	
2042	29			1.0	0.014	
2043	30			1.0	0.014	
2044	31			1.0	0.014	
2045	32			1.0	0.014	
2046	33			1.0	0.014	
2047	34			1.0	0.014	
2048	35			1.0	0.014	
2049	36			1.0	0.014	
2050	37			1.0	0.014	
2051	38			1.0	0.014	
2052	39			1.0	0.014	
2053	40			1.0	0.014	
2054	41			1.0	0.014	
2055	42			1.0	0.014	
2056	43			1.0	0.014	
2057	44			1.0	0.014	
2058	45			1.0	0.014	

2059	46	1.0	0.014		
2060	47	1.0	0.014		
2061	48	1.0	0.014		
2062	49	1.0	0.014		
2063	50	1.0	0.014		
2064	51	1.0	0.014		
2065	52	1.0	0.014		
2066	53	1.0	0.014		
2067	54	1.0	0.014		
2068	55	1.0	0.014		
2069	56	1.0	0.014		
2070	57	1.0	0.014		
2071	58	1.0	0.014		
2072	59	1.0	0.014		
2073	60	1.0	0.014		
2074	61	1.0	0.014		
2075	62	1.0	0.014		
2076	63	1.0	0.014		
2077	64	1.0	0.014		
2078	65	1.0	0.014		
2079	66	1.0	0.014		
2080	67	1.0	0.014		
2081	68	1.0	0.014		
2082	69	1.0	0.014		
2083	70	1.0	0.014	**0.993**	2025 - 2084
Total			1.689	1.689	

Acute Health Effects from Rail Line Emissions at Site 16 MEI Location

			Site 16 MEI	
Chemical	**Fraction of VOC**	**Acute REL (ug/m3)**	**Chemical Concentration (ug/m^3)**	**Hazard Index**
Acetaldehyde	0.15942	470	0.174	0.0004
Acrolein	0.01297	2.5	0.014	0.0057
Benzene	0.01045	1,300	0.011	0.0000
Formaldehyde	0.08505	55	0.093	0.0017
Methyl Ethyl Ketone (2-butanone)	0.02860	13,000	0.031	0.0000
Toluene	0.01579	37,000	0.017	0.0000
Xylenes	0.012052	2,200	0.013	0.0000
		Total Hazard Index		**0.008**

Note: Speciation fractions from USEPA Speciation Profile 4674 for Medium Duty Trucks

Max 1-hr ROG Conc. (ug/m^3) = 1.09

Appendix 6
Communications with BAAQMD

Subject: FW: Fwd: Public Records Request Number. 2012-06-0072
From: Alison Kirk <AKirk@baaqmd.gov>
Date: 6/20/2012 10:23 AM
To: "jreyff@illingworthrodkin.com" <jreyff@illingworthrodkin.com>

Hello,

Attached please find your completed SSIF request. Please let me know if you have any questions. I'm in until Friday and then out for 2 weeks.

Alison Kirk
415-749-5169

From: Andrea Gordon
Sent: Thursday, June 14, 2012 3:24 PM
To: Alison Kirk
Cc: jreyff@illingworthrodkin.com
Subject: FW: Fwd: Public Records Request Number. 2012-06-0072

Alison,

Here's a SSIF received today from James Reyff, please process as necessary.

Thank you.

Andrea

From: jreyff@illingworthrodkin.com [mailto:jreyff@illingworthrodkin.com]
Sent: Thursday, June 14, 2012 12:19 PM
To: Andrea Gordon
Subject: Fwd: Fwd: Public Records Request Number. 2012-06-0072

Hi Andrea,
Please disregard the previous SSIF form request (sent yesterday) and use this one. I found two other sources that there were no data included in the database, but it appears there are electronic copies of the HRSAs. This should do it.

Thanks.

James A. Reyff
Illingworth Rodkin, Inc.
505 Petaluma Blvd South
Petaluma CA 94952
707-766-7700x24

-------- Original Message --------
Subject: Fwd: Public Records Request Number. 2012-06-0072
Date: Wed, 13 Jun 2012 17:35:07 -0700
From:jreyff@illingworthrodkin.com <jreyff@illingworthrodkin.com>

To: Andrea Gordon <AGordon@baaqmd.gov>

Hi Andrea,
I went through the database of BAAQMD screening stationary sources and found this source to be a potential problem for our project because of the super high PM2.5 concentration = 14 ug/m**3.

Attached is a SSIF form with the source and I am hoping you might find more information. Also, I did a public records request for the site, as you can see from the link below.

Thanks.

James A. Reyff
Illingworth Rodkin, Inc.
505 Petaluma Blvd South
Petaluma CA 94952
707-766-7700x24

-------- Original Message --------
Subject: Public Records Request Number. 2012-06-0072
Date:13 Jun 2012 20:27:03 -0400
From:publicrecords@baaqmd.gov
To:jreyff@illingworthrodkin.com

Dear James Reyff:

We have received your public records request of 6/13/2012 5:27:02 PM PST. We have assigned 2012-06-0072 as your Request Number in order to track your request. You requested the following:

Facility Information
Facility ID: 2483
Facility Name: Bimbo Bakeries USA
Facility Street: 264 SO SPRUCE AVENUE
Facility City: South San Francisco
Facility State: CA
Period Covered: 2009-2012

Print Outs Requested

- Permit Application

Other Requests: Permit evaluation and Permit We are trying to determine the PM2.5 emissions from the facility

Within 10 days we will determine whether you have requested disclosable records. If we need more time to make that determination, we will let you know within 10 days. If your request is unclear we will also contact you within the 10 days.

If you have requested disclosable records, and your request is simple, we may respond within 10 days by providingyou with the records requested or with our finding tht we have no records. If you have requested disclosable records and your request is more complicated, we will notify you promptly of our determination and provide your with our estimate of when the records will be made available.

If you have requested records that are exempt from disclosure, we will explain why the records are being withheld.

You can follow our progress in responding to your request by using the PRA Login webpage.

Username: jreyff@illingworthrodkin.com
Password: b491e68f

Sincerely,
Rochelle Henderson Reed
Public Records Section
BAAQMD

Attachments:

GSR Site 13&16 SSIF Request.xls	630 KB

From: James Cordova [mailto:JCordova@baaqmd.gov]
Sent: Monday, April 23, 2012 12:35 PM
To: Bill Popenuck
Subject: RE:

Hi Bill,

I am finally back in the office after a week off.

Based on the locations of your sites, I would use Ft. Funston for Sites 1 – 7. For sites 8 through 16, I would use KSFO data. I have ISC formatted data for KSFO for the years 1991 through 1995. Just submit a Public Records Request for these data and I will send them to you.

I hope all is going well for you.

Jim

From: Bill Popenuck [mailto:popenuck@starband.net]
Sent: Monday, April 16, 2012 5:44 PM
To: James Cordova
Cc: James Reyff
Subject:

Hi Jim,

I'm working on a CEQA analysis for construction of a series of groundwater pumping facilities that will be constructed in Daly City, Colma, South San Francisco, San Bruno, Millbrae, and unincorporated San Mateo County. I'm evaluating 19 sites (16 proposed sites and 3 alternate sites) in these areas. The locations of these sites are shown in the attached figure, and the approximate UTM coordinates (NAD83) are listed below:

	UTM NAD83	
Site No.	UTM - East	UTM - North
1	546500.00 m E	4172900.00 m N
2	545859.00 m E	4172158.00 m N
3	545742.00 m E	4172027.00 m N
4	545847.00 m E	4171936.00 m N
5	546760.00 m E	4171020.00 m N
6	546986.00 m E	4170786.00 m N
7	547298.00 m E	4170351.00 m N
8	547644.00 m E	4169883.00 m N
8a	547790.00 m E	4169717.00 m N
9	548652.00 m E	4169020.00 m N
10	548188.00 m E	4168872.00 m N
10a	548253.00 m E	4168550.00 m N
11	549682.00 m E	4167979.00 m N
12	550095.00 m E	4167377.00 m N
12a	549948.00 m E	4167438.00 m N
13	551032.00 m E	4166632.00 m N
14	550353.00 m E	4165656.00 m N
15	550579.00 m E	4165422.00 m N
16	553509.00 m E	4162308.00 m N

I will be evaluating potential health risks associated with facility construction at each site. Construction of each site is expected to take a little more than one year. I will be modeling toxic air contaminant (TAC) emissions during construction of each site in order to evaluate cancer and non-cancer health risks to nearby sensitive receptors. Currently, I plan on using the ISCST3 model for the dispersion modeling. However, use of the AERMOD model is also possible depending on available meteorological data for use with this model.

Based on the District's Meteorological Data web page, meteorological data in the project region for use with the ISCST3 model is available for the San Francisco Sewage Treatment Plant (STP), Fort Funston, and the San Mateo STP. In reviewing the District's County Surface Street Screening Tables for computing cancer risk and PM2.5 from traffic for San Francisco and San Mateo County roadways, meteorological data from the San Francisco STP was used in developing the screening table values for San Francisco County roads and meteorological data from the San Mateo STP was used for the screening table values for San Mateo roads.

Given that many of the project sites, in particular Sites 1 - 10a, are closer to Fort Funston than the San Francisco STP, use of the Fort Funston meteorological data appears more appropriate for use in modeling these sites. For the remaining sites, Sites 11 - 16, the San Mateo STP meteorological data would appear to be the most appropriate to use for modeling given the available data.

What meteorological data would the District recommend for use in modeling the project sites? Also, are other meteorological data available from the District (e.g., San Francisco Airport) for use with the ISCST3 model or the AERMOD model that would be more appropriate than the data discussed above.

Thanks,
Bill Popenuck
(707) 488-3935

-------- Original Message --------

Subject: RE: Questions on TACs

Date: Wed, 30 Mar 2011 15:43:30 -0700

From: Virginia Lau <VLau@baaqmd.gov>

To: Sigalle Michael <smichael@baaqmd.gov>, "jreyff@illingworthrodkin.com" <jreyff@illingworthrodkin.com>

Hi Jeff - we do not recommend doing an acute hazard estimation from construction activities. You would need to evaluate TAC emissions from construction activities for cancer and chronic hazard - the speciation table that was used in our construction calculator is attached. When noted with Uk, it is unknown the speciation factor and was not included in the calculation.

TAC Name	Speciation Factor
DPM	NA
PM2.5	NA
acetaldehyde	0.07353
acrolein	0.01297
benzaldehyde	0.00699
benzene	0.02001
ethanol	0.00009
ethylbenzene	0.00305
ethylene	0.14377
ethylene dibromide (1,2-dibromoethane)	Uk
ethylene dichloride (1,2-dichloroethane)	Uk
ethylene glycol	Uk
ethylene oxide (1,2-epoxyethane)	Uk
ethylene thiourea	Uk
ethylene glycol butyl ether	Uk
ethylene glycol ethyl ether	Uk
ethylene glycol ethyl ether acetate	Uk
ethylene glycol methyl ether	Uk
ethylene glycol methyl ether acetate	Uk
formaldehyde	0.14714
isobutane	0.01222
isopentane	0.00602
methane	0.04084
methyl ethyl ketone (mek) (2-butanone)	0.01477
methylcyclopentane	0.00149
m-xylene	0.00611
n-butane	0.00104
n-hexane	0.00157
n-pentane	0.00175
o-xylene	0.00335
propionaldehyde	0.0097
propylene	0.02597
propylene glycol monomethyl ether	uk
propylene oxide	uk
toluene	0.01473

Virginia Lau
Bay Area Air Quality Management District
939 Ellis Street

San Francisco, CA 94109
Phone: (415) 749-4696
Fax: (415) 749-4741
E-mail: vlau@baaqmd.gov

-----Original Message-----
From: Sigalle Michael
Sent: Wednesday, March 30, 2011 12:22 PM
To: jreyff@illingworthrodkin.com
Cc: Virginia Lau
Subject: RE: Questions on TACs

HI James,
We do not yet have screening tables for railroads, but will let you know once they are available. I cc'ed Virginia Lau on this email, she should be able to help you with your acrolein question.
~sigalle

Sigalle Michael
Senior Environmental Planner
smichael@baaqmd.gov | 415-749-4683

-----Original Message-----
From: jreyff@illingworthrodkin.com [mailto:jreyff@illingworthrodkin.com]
Sent: Wednesday, March 30, 2011 11:58 AM
To: Sigalle Michael
Subject: Questions on TACs

Hi Sigalle,
Hope you are getting a chance to enjoy some of this long awaited spring weather. Sorry to bug you with a few questions:

I'm checking in to see if the District has developed any guidance on train impacts. I believe there was some mention of this a while ago.
We have some clients who are wondering if this is an issue for them to develop near tracks. We have modeled some train activity south of San Jose, but have found that train assumptions are difficult to determine (i.e., number of locomotives, types, age, power setting, and speed).
The impacts look pretty substantial. In addition, we are not sure what CalTrain status is for electrifying the line.

Also, the issue of addressing acute exposures associated with acrolein from construction has come up. The District's Jan 2010 Health Risk Analysis Guidelines do not address acrolein, because of the lack of reliable emissions data. The questions is - should we be looking at acolein for construction and if so, what speciation factors should we use for EMFAC diesel emissions?

I appreciate any guidance you can provide.

--
James A. Reyff
Illingworth& Rodkin, Inc.
505 Petaluma Blvd. South
Petaluma, CA 94952
ph 707.766.7700x24
fx 707.766.7790

Appendix 7
Site Specific Facility Characteristics

TABLE 3-3
Site-Specific Facility Characteristics

Site ID	Site Name	Facility Type[(a)]	Pump Type/ Capacity (gpm)[(b)]	Proposed Connection Point	Alternate Connection Point	Proposed On-Site Water Treatment	Disinfection Location	Method for Achieving Water Quality Goals for Iron/Manganese
Site 1	Lake Merced Golf Club	Well plus chemical treatment, 4 rooms	Aboveground Vertical Turbine/ 300-600	SFPUC	Daly City	Disinfection, pH adjustment, (if needed), fluoridation	At site	Treatment not required.
Site 2	Park Plaza Meter	Well with fenced enclosure	Submersible Vertical Turbine/ 300-600	Daly City	None	Treatment not required	Westlake Pump Station	Treatment not required.
Site 3	Ben Franklin Intermediate School	Well with fenced enclosure	Submersible Vertical Turbine/ 300-600	Daly City	None	Treatment not required	Westlake Pump Station	Treatment not required.
Site 4	Garden Village Elementary School	Well with fenced enclosure	Submersible Vertical Turbine/ 300-600	Daly City	None	Treatment not required	Westlake Pump Station	Treatment not required.
Westlake Pump Station	Westlake Pump Station	Pump station and treatment upgrade	Up to 3 new booster pumps	Daly City	None	Disinfection, fluoridation	At site	Treatment not required.
Site 5 (Consolidated Treatment at Site 6)	Right-of-Way at Serra Bowl	Well with fenced enclosure	Submersible Vertical Turbine/ 300-600	SFPUC	None	Treatment not required	At Site 6	Treatment at Site 6
Site 6 (Consolidated Treatment at Site 6)	Right-of-Way at Colma BART	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine/ 300-600	SFPUC	Cal Water	Disinfection, pH adjustment fluoridation, iron/manganese removal	At Site 6	Treatment

TABLE 3-3
Site-Specific Facility Characteristics

Site ID	Site Name	Facility Type[(a)]	Pump Type/ Capacity (gpm)[(b)]	Proposed Connection Point	Alternate Connection Point	Proposed On-Site Water Treatment	Disinfection Location	Method for Achieving Water Quality Goals for Iron/Manganese
Site 7 (Consolidated Treatment at Site 6)	Right-of-Way at Colma Boulevard	Well with fenced enclosure	Submersible Vertical Turbine/ 300-600	SFPUC	None	Treatment not required	At Site 6	Treatment at Site 6
Site 5 (On-Site Treatment)	Right-of-Way at Serra Bowl	Well plus chemical treatment, 5 rooms	Aboveground Vertical Turbine/ 300-600	SFPUC	Daly City	Disinfection, pH adjustment, fluoridation, iron/manganese removal	At site	Treatment not required.
Site 6 (On-Site Treatment)	Right-of-Way at Colma BART	Well plus chemical treatment, 5 rooms	Aboveground Vertical Turbine/ 300-600	SFPUC	Cal Water	Disinfection, pH adjustment, fluoridation, iron/manganese removal	At site	Treatment not required.
Site 7 (On-Site Treatment)	Right-of-Way at Colma Boulevard	Well plus chemical treatment, 5 rooms	Aboveground Vertical Turbine/ 300-600	SFPUC	Cal Water	Disinfection, pH adjustment, fluoridation, iron/manganese removal	At site	Treatment not required.
Site 8	Right-of-Way at Serramonte Boulevard	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine 300-600	Cal Water	SFPUC	Disinfection, pH adjustment (if needed[d]), fluoridation, iron/manganese removal	At site	Treatment

TABLE 3-3
Site-Specific Facility Characteristics

Site ID	Site Name	Facility Type[(a)]	Pump Type/ Capacity (gpm)[(b)]	Proposed Connection Point	Alternate Connection Point	Proposed On-Site Water Treatment	Disinfection Location	Method for Achieving Water Quality Goals for Iron/Manganese
Site 9	Treasure Island Trailer Court	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine/ 200-500	SFPUC	None	Disinfection, pH adjustment fluoridation, iron/manganese removal	At site	Treatment
Site 10	Right-of-Way at Hickey Boulevard	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine/ 200-500	Daly City	SFPUC	Disinfection, pH adjustment (if needed[d]), fluoridation, iron/manganese removal	At site	Treatment
Site 11	South San Francisco Main Area	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine/ 200-500	Cal Water	SFPUC	Disinfection, pH adjustment (if needed[d]) fluoridation, iron/manganese removal	At site	Treatment
Site 12	Garden Chapel Funeral Home	Well plus chemical treatment, 3 rooms	Aboveground Vertical Turbine/ 200-500	SFPUC	Other SFPUC	Disinfection, pH adjustment	At site	Blending[(c)c]
Site 13	South San Francisco Linear Park	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine/ 200-500	San Bruno	Cal Water	Disinfection, fluoridation, iron/manganese removal	At site	Treatment

TABLE 3-3
Site-Specific Facility Characteristics

Site ID	Site Name	Facility Type[(a)]	Pump Type/ Capacity (gpm)[(b)]	Proposed Connection Point	Alternate Connection Point	Proposed On-Site Water Treatment	Disinfection Location	Method for Achieving Water Quality Goals for Iron/Manganese
Site14	Golden Gate National Cemetery	Well with building enclosure	Submersible Vertical Turbine/ 300-600	San Bruno	SFPUC	Treatment not required	At Site 15	Treatment at Site 15
Site 15	Golden Gate National Cemetery	Well plus chemical treatment and filtration, 5 rooms	Aboveground Vertical Turbine/ 300-600	San Bruno	SFPUC	Disinfection, pH adjustment (if needed), fluoridation, iron/manganese removal	At site	Treatment
Site 16	Millbrae Corporation Yard	Well plus chemical treatment, 4 rooms	Aboveground Vertical Turbine/ 100-200	SFPUC	Other SFPUC	Disinfection, pH adjustment, fluoridation	At site	Treatment not required.
Site 17 (Alternate)	Standard Plumbing Supply	Well plus chemical treatment, 3 rooms	Aboveground Vertical Turbine/ 300-600	Cal Water	SFPUC	Disinfection, pH adjustment (if needed[d]) fluoridation	At site	Treatment not required.
Site 18 (Alternate)	Alta Loma Drive	Well plus chemical treatment, 3 rooms	Aboveground Vertical Turbine/ 200-500	SFPUC	Cal Water	Disinfection, pH adjustment (if needed) fluoridation	At site	Treatment not required.
Site 19 (Alternate)	Garden Chapel Funeral Home	Well with fenced enclosure	Submersible Vertical Turbine/ 200-500	SFPUC	Other SFPUC	Treatment not required	At Site 12	Blending[(c)]

a) Well station types are described in the text below and shown on the site plans
b) gpm is gallons per minute
c) Blending is mixing groundwater with other potable supply water
d pH adjustment only needed if alternate connection point is used

Appendix F

Special-status Species Tables

APPENDIX F - SPECIAL-STATUS SPECIES TABLES

The following tables were presented in the biological analysis prepared for the Regional Groundwater Storage and Recovery Project. (Ward 2012). A table of the Special-status Plant and Wildlife Species reported or with potential to occur near Lake Merced is also included. The tables contain federal, State and California Native Plant Society special-status plant and wildlife species recorded for the San Francisco North, San Francisco South, Montara Mountain, and San Mateo U.S. Geological Survey (USGS) 7.5 minute quadrangles. An explanation of all rarity status codes is provided.

Special-status Plants Evaluated for the Regional Groundwater Storage and Recovery Project

Mar 24, 2011

Wood Biological Consulting

FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Alliaceae - Onion Family				
Allium peninsulare var. *franciscanum* Franciscan onion	Federal: none State: none CNPS: 1B.2 Other: DFG: SP	Occurs in cismontane woodland, valley and foothill grassland. Substrate: clay, often serpentinite. Recorded from San Mateo, Santa Clara, Sonoma.	May-Jun Perennial Herb (bulbiferous)	None: no suitable habitat present.
Apiaceae - Carrot Family				
Sanicula maritima adobe sanicle	Federal: none State: SR CNPS: 1B.1 Other: DFG: Special Plant	Occurs in chaparral, coastal prairie, meadows, valley and foothill grassland Substrate: serpentine, Habitats Note: clay. Recorded from Alameda, Monterey, San Francisco, San Luis Obispo.	Feb-May Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Asteraceae - Sunflower Family				
Centromadia parryi ssp. *congdonii* Congdon's tarplant	Federal: none State: none CNPS: 1B.2 Other: DFG: SP	Occurs in valley and foothill grassland. Substrate: alkaline. Recorded from Alameda, Contra Costa, Monterey, San Luis Obispo, Santa Clara, Santa Cruz, Solano.	May-Nov Annual Herb	None: no suitable habitat present.
Centromadia parryi ssp. *parryi* pappose tarplant	Federal: none State: none CNPS: 1B.2 Other:	Occurs in coastal prairie, meadows, seeps, coastal salt marsh, valley and foothill grassland. Moisture: vernally mesic,Substrate: often alkaline, Recorded from Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, Sonoma.	May-Nov Annual Herb	None: no suitable habitat present.

Mar 24, 2011

Special-status Plants Evaluated for the Regional Groundwater Storage and Recovery Project

Wood Biological Consulting

FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Cirsium andrewsii Franciscan thistle	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in broadleafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub, mixed evergreen forest, northern coastal scrub Substrate: serpentine. Recorded from Contra Costa, Marin, San Francisco, San Mateo, Sonoma.	Mar-Jul Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Cirsium fontinale var. *fontinale* fountain thistle	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in chaparral, valley and foothill grassland Substrate: serpentine. Recorded from San Mateo.	Jun-Oct Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Cirsium occidentale var. *compactum* compact cobwebby thistle	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, coastal dunes, coastal prairie, coastal sage scrub, coastal scrub, coastal strand, northern coastal scrub. Recorded from Monterey, San Francisco, San Luis Obispo.	Apr-Jun Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Eriophyllum latilobum San Mateo woolly sunflower	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in cismontane woodland, foothill woodland Substrate: often on serpentine, roadcuts. Recorded from San Mateo.	May-Jun Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Grindelia hirsutula var. *maritima* San Francisco gumplant	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal bluff scrub, coastal sage scrub, coastal scrub, northern coastal scrub, valley and foothill grassland Substrate: serpentine, Habitats Note: sandy. Recorded from Marin, Monterey, San Francisco, San Luis Obispo, San Mateo, Santa Cruz.	Aug-Sep Perennial Herb	None: marginally suitable habitat present. Would have been detectable during present survey.

Wood Biological Consulting

Special-status Plants Evaluated for the Regional Groundwater Storage and Recovery Project

Mar 24, 2011

FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Helianthella castanea Diablo helianthella	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, foothill woodland, northern coastal scrub, riparian woodland, valley and foothill grassland. Recorded from Alameda, Contra Costa, Marin, San Francisco, San Mateo.	Apr-Jun Perennial Herb	None: marginally suitable habitat present. Would have been detectable during present survey.
Hemizonia congesta ssp. *congesta* pale yellow hayfield tarweed	Federal: none State: none CNPS: 1B.2 Other:	Occurs in northern coastal scrub, valley and foothill grassland. Recorded from Mendocino, Marin, San Francisco, San Mateo, Sonoma.	Apr-Nov Annual Herb	None: marginally suitable habitat present. Would have been detectable during present survey.
Hesperevax sparsiflora var. *brevifolia* short-leaved evax	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal bluff scrub, coastal dunes, coastal strand, northern coastal scrub. Recorded from Humboldt, Marin, Mendocino, San Francisco, Santa Cruz, Sonoma.Also recorded from Oregon.	Mar-Jun Annual Herb	None: marginally suitable habitat present. Would have been detectable during present survey.
Layia carnosa beach layia	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal dunes, coastal scrub, coastal strand. Recorded from Humboldt, Marin, Monterey, San Francisco, Santa Barbara.	Mar-Jul Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Lessingia arachnoidea Crystal Springs lessingia	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in cismontane woodland, coastal scrub, foothill woodland, northern coastal scrub, valley and foothill grassland. Substrate: serpentinite. Recorded from San Mateo, Sonoma.	Jul-Oct Annual Herb	None: no suitable habitat present.

Mar 24, 2011

Special-status Plants Evaluated for the Regional Groundwater Storage and Recovery Project

Wood Biological Consulting

FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Lessingia germanorum San Francisco lessingia	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal scrub, northern coastal scrub. Habitats Note: on remnant dunes. Recorded from San Francisco, San Mateo.	Jun-Nov Annual Herb	None: no suitable habitat present.
Lessingia hololeuca woolly-headed lessingia	Federal: none State: none CNPS: 3 Other: DFG: Special Plant	Occurs in broadleafed upland forest, coastal scrub, lower montane coniferous forest, northern coastal scrub, valley and foothill grassland, yellow pine forest. Substrate: serpentinite, clay. Recorded from Alameda, Marin, Monterey, Napa, San Mateo, Santa Clara, Solano, Sonoma, Yolo.	Jun-Oct Annual Herb	None: no suitable habitat present.
Microseris paludosa marsh microseris	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in cismontane woodland, closed-cone coniferous forest, coastal scrub, valley and foothill grassland. Recorded from Marin, Mendocino, Monterey, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Cruz, Sonoma.	Apr-Jul Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Monolopia gracilens woodland woollythreads	Federal: none State: none CNPS: 1B.2 Other:	Occurs in chaparral, broadleafed upland forest, cismontane woodland, North Coast coniferous forest, valley and foothill grassland. Substrate: serpentinite in grasslands, Habitats Note: forest openings. Recorded from Contra Costa, Monterey, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz.	Mar-Jul Annual Herb	None: no suitable habitat present.
Pentachaeta bellidiflora white-rayed pentachaeta	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in valley and foothill grassland. Substrate: serpentinite. Recorded from Marin, San Mateo, Santa Cruz.	Mar-May Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.

Special-status Plants Evaluated for the Regional Groundwater Storage and Recovery Project

Mar 24, 2011

Wood Biological Consulting

FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Stebbinsoseris decipiens Santa Cruz microseris	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in broadleafed upland forest, chaparral, closed-cone coniferous forest, closed-cone pine forest, coastal prairie, coastal scrub, mixed evergreen forest, northern coastal scrub, valley and foothill grassland. Substrate: serpentinite. Recorded from Marin, Monterey, Santa Cruz.	Apr-May Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Boraginaceae - Borage Family				
Amsinckia lunaris bent-flowered fiddleneck	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in cismontane woodland, coastal bluff scrub, foothill woodland, valley and foothill grassland. Recorded from Alameda, Colusa, Contra Costa, Lake, Marin, Napa, San Benito, San Mateo, Santa Clara, Santa Cruz, Yolo.	Mar-Jun Annual Herb	None: marginally suitable habitat present. Would have been detectable during present survey.
Plagiobothrys chorisianus var. *chorisianus* Choris's popcorn-flower	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, coastal prairie, coastal scrub, northern coastal scrub Moisture: moist. Recorded from Alameda, San Francisco, San Mateo, Santa Cruz.	Mar-Jun Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Plagiobothrys diffusus San Francisco popcorn-flower	Federal: none State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal prairie, valley and foothill grassland. Recorded from Alameda, San Francisco, Santa Cruz.	Mar-Jun Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Plagiobothrys glaber hairless popcorn-flower	Federal: none State: none CNPS: 1A * Other: DFG: Special Plant	Occurs in coastal salt marsh, meadows. Substrate: alkaline. Recorded from Alameda, Marin, Merced, San Benito, Santa Clara.	Mar-May Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Caryophyllaceae - Pink Family				
Arenaria paludicola marsh sandwort	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in bogs and fens, freshwater marsh, marshes and swamps. Recorded from Los Angeles, Mendocino, San Bernardino, San Francisco, San Luis Obispo, Santa Cruz.Also recorded from Washington.	May-Aug Perennial Herb (stoloniferous)	None: no suitable habitat present.
Silene verecunda ssp. *verecunda* San Francisco campion	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, coastal bluff scrub, coastal prairie, coastal scrub, northern coastal scrub, valley and foothill grassland. Recorded from San Francisco, San Mateo, Santa Cruz.	Mar-Aug Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Cyperaceae - Sedge Family				
Carex comosa bristly sedge	Federal: none State: none CNPS: 2.1 Other: DFG: Special Plant	Occurs in coastal prairie, freshwater marsh, marshes and swamps, valley and foothill grassland. Recorded from Contra Costa, Lake, Mendocino, San Bernardino, San Francisco, San Joaquin, Santa Cruz, Shasta, Sonoma.Also recorded from Idaho, Oregon, Washington.	May-Sep Perennial Herb (rhizomatous)	None: no suitable habitat present.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Equisetaceae - Horsetail Family				
Equisetum palustre marsh horsetail	Federal: none State: none CNPS: 3 Other: DFG: Special Plant	Occurs in freshwater marsh, marshes and swamps. Recorded from Lake, Napa, San Francisco, San Mateo.Also recorded from Idaho, Oregon, Washington.	Unknown Perennial Herb (rhizomatous)	None: no suitable habitat present. Would have been detectable during present survey.
Ericaceae - Heath Family				
Arctostaphylos andersonii Anderson's manzanita	Federal: none State: none CNPS: 1B.2 Other: DFG: SP	Occurs in broadleafed upland forest, chaparral, mixed evergreen forest, North Coast coniferous forest, redwood forest. Recorded from San Mateo, Santa Clara, Santa Cruz.	Nov-Apr Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.
Arctostaphylos franciscana Franciscan manzanita	Federal: none State: none CNPS: 1B.1 Other: DFG: SP	Occurs in coastal scrub, northern coastal scrub Substrate: serpentine. Recorded from San Francisco.	Feb-Apr Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.
Arctostaphylos imbricata San Bruno Mountain manzanita	Federal: none State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in chaparral, coastal scrub. Recorded from San Mateo.	Feb-May Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Arctostaphylos montana ssp. *ravenii* Presidio manzanita	Federal: FE State: SE CNPS: 1B.1 Other: DFG: SP	Occurs in chaparral, coastal prairie, coastal scrub, northern coastal scrub Substrate: serpentine. Recorded from San Francisco.	Feb-Mar Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.
Arctostaphylos montaraensis Montara manzanita	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, coastal scrub, northern coastal scrub. Recorded from San Mateo.	Jan-Mar Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.
Arctostaphylos pacifica Pacific manzanita	Federal: none State: SE CNPS: 1B.2 Other:	Occurs in chaparral, coastal scrub. Recorded from San Mateo. Additional distribution: known only from San Bruno Mt.	Feb-Apr Evergreen Shrub	None: no suitable habitat present. Would have been detectable during present survey.
Arctostaphylos regismontana Kings Mountain manzanita	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in broadleafed upland forest, chaparral, mixed evergreen forest, North Coast coniferous forest. Substrate: granitic sedimentary sandstone. Recorded from San Mateo, Santa Clara, Santa Cruz.	Jan-Apr Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Fabaceae - Legume Family				
Astragalus nuttallii var. *nuttallii* Nuttall's milk-vetch	Federal: none State: none CNPS: 4.2 Other: DFG: SP	Occurs in coastal bluff scrub, coastal dunes. Recorded from Alameda, Monterey, San Francisco, San Luis Obispo, San Mateo, Santa Barbara.	Jan-Nov Perennial Herb	None: no suitable habitat present.
Astragalus pycnostachyus var. *pycnostachyus* coastal marsh milk-vetch	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal dunes, marshes and swamps. Moisture: mesic, Habitats Note: coastal salt marshes, streamsides. Recorded from Humboldt, Marin, San Mateo.	Apr-Oct Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Astragalus tener var. *tener* alkali milk-vetch	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in alkali sink, playas, valley and foothill grassland, vernal pools. Substrate: adobe clay, alkaline. Recorded from Alameda, Contra Costa, Merced, Monterey, Napa, San Benito, San Francisco, San Joaquin, Santa Clara, Solano, Sonoma, Stanislaus, Yolo.	Mar-Jun Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Lupinus arboreus var. *eximius* San Mateo tree lupine	Federal: none State: none CNPS: 3.2 Other:	Occurs in chaparral, coastal scrub. Recorded from San Mateo, Sonoma (?).	Apr-Jul Evergreen Shrub	None: marginally suitable habitat present. Would have been detectable during present survey.
Trifolium hydrophilum saline clover	Federal: none State: none CNPS: 1B.2 Other: DFG: SP	Occurs in marshes and swamps, valley and foothill grassland, vernal pools. Moisture: mesic,Substrate: alkaline, Recorded from Alameda, Colusa, Monterey, Napa, San Benito, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma.	Apr-Jun Annual Herb	None: no suitable habitat present.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Geraniaceae - Geranium Family				
California macrophylla round-leaved filaree	Federal: none State: none CNPS: 1B.1 Other: DFG: SP	Occurs in cismontane woodland, foothill woodland, valley and foothill grassland. Substrate: clay. Recorded from Alameda, Butte, Colusa, Contra Costa, Fresno, Glenn, Kern, Kings, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, San Benito, San Diego, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Solano, Sonoma, Stanislaus, Tehama, Ventura, Yolo.Santa Cruz Island.Also recorded from Baja California, Oregon, Utah.	Mar-May Annual Herb	None: no suitable habitat present.
Iridaceae - Iris Family				
Iris longipetala long-petaled iris	Federal: none State: none CNPS: 4.2 Other:	Occurs in coastal prairie, mixed evergreen forest. Moisture: mesic. Recorded from Alameda, Contra Costa, Humboldt, Marin, Mendocino, Monterey, San Francisco, San Mateo, Santa Clara, Santa Cruz, Sonoma.	Mar-May Perennial Herb (rhizomatous)	None: no suitable habitat present. Would have been detectable during present survey.
Lamiaceae - Mint Family				
Acanthomintha duttonii San Mateo thorn-mint	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in valley and foothill grassland, chaparral. Substrate: serpentinite. Recorded from San Mateo.	Apr-Jun Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Monardella villosa ssp. *globosa* robust monardella	Federal: none State: none CNPS: 1B.2 Other: DFG: SP	Occurs in broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, foothill woodland, valley and foothill grassland. Recorded from Alameda, Contra Costa, Humboldt, Lake, Marin, Mendocino, Napa, San Mateo, Santa Clara, Santa Cruz, Sonoma.	Jun-Jul Perennial Herb (rhizomatous)	None: no suitable habitat present.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Liliaceae - Lily Family				
Calochortus umbellatus Oakland star-tulip	Federal: none State: none CNPS: 4.2 Other: DFG: SP	Occurs in broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, mixed evergreen forest, valley and foothill grassland, yellow pine forest. Substrate: often serpentinite. Recorded from Alameda, Contra Costa, Marin, San Mateo, Santa Clara, Santa Cruz, Stanislaus.	Mar-May Perennial Herb (bulbiferous)	None: no suitable habitat present.
Fritillaria biflora var. *ineziana* Hillsborough chocolate lily	Federal: none State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in cismontane woodland, foothill woodland, valley and foothill grassland Substrate: serpentine. Recorded from San Mateo.	Mar-Apr Perennial Herb (bulbiferous)	None: no suitable habitat present. Would have been detectable during present survey.
Fritillaria lanceolata var. *tristulis* Marin checker lily	Federal: none State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal bluff scrub, coastal prairie, coastal scrub. Recorded from Marin. Not recorded from San Mateo County..	Feb-Apr Perennial Herb (bulbiferous)	None: no suitable habitat present. Would have been detectable during present survey.
Fritillaria liliacea fragrant fritillary	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in cismontane woodland, coastal prairie, coastal scrub, northern coastal scrub, valley and foothill grassland. Substrate: often serpentinite. Recorded from Alameda, Contra Costa, Marin, Monterey, San Benito, San Francisco, San Mateo, Santa Clara, Solano, Sonoma.	Feb-Apr Perennial Herb (bulbiferous)	None: marginally suitable habitat present. Would have been detectable during present survey.
Lilium maritimum coast lily	Federal: none State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in broadleafed upland forest, closed-cone coniferous forest, closed-cone pine forest, coastal prairie, coastal scrub, marshes and swamps, mixed evergreen forest, North Coast coniferous forest, northern coastal scrub. Recorded from Marin, Mendocino, San Francisco, San Mateo, Sonoma.	May-Jul Perennial Herb (bulbiferous)	None: no suitable habitat present.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Linaceae - Flax Family				
Hesperolinon congestum Marin western flax	Federal: FT State: ST CNPS: 1B.1 Other: DFG: Special Plant	Occurs in chaparral, valley and foothill grassland. Substrate: serpentinite. Recorded from Marin, San Francisco, San Mateo.	Apr-Jul Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Malvaceae - Mallow Family				
Malacothamnus aboriginum Indian Valley bush mallow	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, cismontane woodland, foothill woodland Habitats Note: rocky. Recorded from Fresno, Monterey, San Benito.	Apr-Oct Shrub (deciduous)	None: no suitable habitat present. Would have been detectable during present survey.
Malacothamnus arcuatus arcuate bush mallow	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral. Recorded from San Mateo, Santa Clara, Santa Cruz.	Apr-Sep Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.
Malacothamnus davidsonii Davidson's bush mallow	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, cismontane woodland, coastal sage scrub, coastal scrub, northern coastal scrub, riparian woodland. Recorded from Los Angeles, Monterey, San Luis Obispo, San Mateo, Santa Clara.	Jun-Jan Shrub (deciduous)	None: no suitable habitat present. Would have been detectable during present survey.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Malacothamnus hallii Hall's bush mallow	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in chaparral, coastal scrub. Recorded from Alameda, Contra Costa, Mendocino, Merced, , Santa Clara, Stanislaus.	May-Sep Shrub (evergreen)	None: no suitable habitat present. Would have been detectable during present survey.
Onagraceae - Evening Primrose Family				
Clarkia franciscana Presidio clarkia	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal scrub, northern coastal scrub, valley and foothill grassland Substrate: serpentine. Recorded from Alameda, San Francisco.	May-Jul Annual Herb	None: no suitable habitat present.
Plantaginaceae - Plantain Family				
Collinsia corymbosa round-headed Chinese houses	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal dunes, coastal strand. Recorded from Humboldt, Marin, Mendocino, San Francisco, Sonoma.	Apr-Jun Annual Herb	None: marginally suitable habitat present. Would have been detectable during present survey.
Collinsia multicolor San Francisco collinsia	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in closed-cone coniferous forest, closed-cone pine forest, coastal scrub, northern coastal scrub. Substrate: sometimes serpentinite. Recorded from Monterey, San Francisco, San Mateo, Santa Clara, Santa Cruz.	Mar-May Annual Herb	None: marginally suitable habitat present. Would have been detectable during present survey.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Poaceae - Grass Family				
Elymus californicus California bottle-brush grass	Federal: none State: none CNPS: 4.3 Other: DFG: SP	Occurs in broadleafed upland forest, cismontane woodland, closed-cone pine forest, Douglas-fir forest, foothill woodland, mixed evergreen forest, North Coast coniferous forest, redwood forest, riparian woodland. Recorded from Marin, Monterey, San Mateo, Santa Cruz, Sonoma.	May-Nov Perennial Herb	None: no suitable habitat present.
Polemoniaceae - Phlox Family				
Gilia capitata ssp. *chamissonis* blue coast gilia	Federal: none State: none CNPS: 1B.1 Other: DFG: SP	Occurs in coastal dunes, coastal scrub. Recorded from Marin, San Francisco, Sonoma.	Apr-Jul Annual Herb	None: no suitable habitat present.
Gilia millefoliata dark-eyed gilia	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal dunes, coastal strand. Recorded from Del Norte, Humboldt, Marin, Mendocino, San Francisco, Sonoma.Also recorded from Oregon.	Apr-Jul Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Leptosiphon croceus coast yellow linanthus	Federal: none State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal bluff scrub, coastal prairie. Recorded from Marin, Monterey, San Mateo. Additional distribution: presumed extirpated in Marin County.	Apr-May Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Leptosiphon rosaceus rose leptosiphon	Federal: none State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in coastal bluff scrub. Recorded from Marin, San Francisco, San Mateo, Sonoma. Additional distribution: presumed extirpated from San Francisco and Sonoma.	Apr-Jul Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Polemonium carneum Oregon polemonium	Federal: none State: none CNPS: 2.2 Other:	Occurs in coastal prairie, northern coastal scrub, lower montane coniferous forest. Recorded from Alameda, Del Norte, Humboldt, Marin, San Francisco, San Mateo, Siskiyou, Sonoma.	Apr-Sep Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Polygonaceae - Buckwheat Family				
Chorizanthe cuspidata var. *cuspidata* San Francisco Bay spineflower	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub, coastal strand, northern coastal scrub. Substrate: sandy. Recorded from Alameda, Marin, San Francisco, San Mateo, Santa Clara, Sonoma.	Apr-Aug Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Chorizanthe robusta var. *robusta* robust spineflower	Federal: FE State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in cismontane woodland, coastal dunes, coastal scrub, coastal strand, foothill woodland, northern coastal scrub. Substrate: sandy, gravelly. Recorded from Alameda, Monterey, San Mateo, Santa Clara, Santa Cruz.	Apr-Sep Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Pottiaceae				
Triquetrella californica coastal triquetrella	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal bluff scrub, coastal scrub. Recorded from Contra Costa, Mendocino, San Diego, San Francisco counties.Also recorded from Oregon.	n/a Moss	None: no suitable habitat present.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Rosaceae - Rose Family				
Horkelia cuneata ssp. *sericea* Kellogg's horkelia	Federal: none State: none CNPS: 1B.1 Other: DFG: Special Plant	Occurs in closed-cone coniferous forest, closed-cone pine forest, coastal sage scrub, coastal scrub, northern coastal scrub. Recorded from Alameda, Marin, Monterey, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz.	Apr-Sep Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Horkelia marinensis Point Reyes horkelia	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal dunes, coastal prairie, coastal scrub, coastal strand, northern coastal scrub. Recorded from Marin, Mendocino, San Mateo, Santa Cruz.	May-Sep Perennial Herb	None: no suitable habitat present.
Potentilla hickmanii Hickman's cinquefoil	Federal: FE State: SE CNPS: 1B.1 Other: DFG: Special Plant	Occurs in closed-cone coniferous forest, closed-cone pine forest, coastal bluff scrub, freshwater marsh, marshes and swamps, meadows, northern coastal scrub. Recorded from Monterey, San Mateo, Sonoma.	Apr-Aug Perennial Herb	None: no suitable habitat present. Would have been detectable during present survey.
Scrophulariaceae - Figwort Family				
Cordylanthus maritimus ssp. *palustris* Point Reyes bird's-beak	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal salt marsh, marshes and swamps. Habitats Note: coastal salt marsh. Recorded from Alameda, Humboldt, Marin, San Mateo, Santa Clara, Sonoma. Also recorded from Oregon.	Jun-Oct Annual Herb, Hemiparasitic	None: no suitable habitat present.

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FAMILY *Scientific Name* Common Name	Status	Habitat Affinities and Reported Distribution	Blooming Time Life Form	Potential for Occurrence on Site
Triphysaria floribunda San Francisco owl's-clover	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in coastal prairie, coastal scrub, valley and foothill grassland Substrate: serpentine. Recorded from Marin, San Francisco, San Mateo.	Apr-Jun Annual Herb	None: no suitable habitat present. Would have been detectable during present survey.
Thymelaeaceae - Mezereum Family				
Dirca occidentalis western leatherwood	Federal: none State: none CNPS: 1B.2 Other: DFG: Special Plant	Occurs in broadleafed upland forest, chaparral, cismontane woodland, closed-cone coniferous forest, closed-cone pine forest, foothill woodland, mixed evergreen forest, north coast coniferous forest, riparian forest, riparian woodland. Moisture: moist. Recorded from Alameda, Contra Costa, Marin, San Mateo, Santa Clara, Sonoma.	Jan-Apr Shrub (deciduous)	None: no suitable habitat present. Would have been detectable during present survey.

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Scientific Name / Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Gastropoda - Snails And Slugs			
Vespericola marinensis Marin hesperian	Federal none State none Other DFG: Special Animal	Occurs in moist spots in coastal brush and chaparral. Recorded from beneath cow-parsnip, in springs and seeps, in leaf mold along streams, in alder woods and mixed evergreen forests. Recorded from Marin County. Additional distribution: Point Reyes Peninsula and surrounding region. Type locality: Point Reyes, Bear Valley Trail, Marin County.	None: no suitable habitat present.
Arachnida - Arachnids			
Banksula incredula incredible harvestman	Federal none State none Other DFG: Special Animal	Collected on Franciscan sandstone talus slope at 1100 ft. Recorded from San Mateo County. Additional distribution: San Bruno Mt.	None: no suitable habitat present.
Calicina minor Edgewood blind harvestman	Federal none State none Other DFG: Special Animal	Found on the underside of moist serpentine rocks near permanent springs. Recorded from San Mateo, Santa Clara counties.	None: no suitable habitat present.
Malacostraca			
Caecidotea tomalensis Tomales isopod	Federal none State none Other DFG: Special Animal	Inhabits localized fresh-water ponds or streams with still or near-still water in several bay area counties. Recorded from Marin, San Francisco, San Mateo, Sonoma counties.	None: no suitable habitat present.
Insecta - Insects			
Callophrys mossii bayensis San Bruno elfin butterfly	Federal FE State none Other DFG: Special Animal	Inhabits coastal, mountainous areas with grassy ground cover. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is Sedum spathulifolium. Recorded from San Mateo County. Additional distribution: primary populations are located in the vicinity of San Bruno Mountain.	None: no suitable habitat present.

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Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Cicindela hirticollis gravida sandy beach tiger beetle	Federal none State none Other DFG: Special Animal	Inhabits clean, dry, light-colored sand in the upper tidal zone. Subterranean larvae prefer moist sand not affected by wave action. Occurs in areas adjacent to non-brackish water. Recorded from Los Angeles, San Diego, Santa Barbara, Ventura counties. Additional distribution: occurs along the coast of California from San Francisco Bay to northern Mexico.	None: no suitable habitat present.
Danaus plexippus monarch butterfly	Federal none State none Other DFG: Special Animal (wintering)	Listing refers to wintering sites only. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, Monterey cypress), with nectar and water sources nearby. Recorded from Alameda, Contra Costa, Inyo, Kern, Los Angeles, Marin, Mendocino, Monterey, Orange, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Solano, Sonoma, Ventura counties. Additional distribution: winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico.	Possible: suitable winter roosting habitat present. See text for discussion.
Dufourea stagei Stage's doufourine bee	Federal none State none Other DFG: Special Animal	Ground nesting bee known from a single collection made in 1962. Recorded from San Mateo County. Additional distribution: Recorded from San Bruno Mt..	None: no suitable habitat present.
Euphydryas editha bayensis bay checkerspot butterfly	Federal FT State none Other DFG: Special Animal	Inhabits native grasslands on outcrops of serpentine soil. The primary host plant is Plantago erecta. Secondary host plants include Orthocarpus densiflorus and O. purpurscens. Recorded from Alameda, San Francisco, San Mateo, Santa Clara counties. Additional distribution: occurs in the vicinity of the San Francisco Bay.	None: no suitable habitat present.
Hydrochara rickseckeri Ricksecker's water scavenger beetle	Federal none State none Other DFG: Special Animal	Inhabits slow moving freshwater ponds, streams, marshes and lakes. Recorded from Alameda, Contra Costa, Marin, San Mateo, Solano, Sonoma counties. Additional distribution: known from the San Francisco Bay area.	None: no suitable habitat present.

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Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Hydroporus leechi Leech's skyline diving beetle	Federal none State none Other DFG: Special Animal	Little information is available about the species' life history, habitat requirements and distribution. Initially known from a single location near Pacifica, San Mateo County; recent study has found species to be more widespread. Inhabits freshwater ponds. Recorded from San Mateo County.	None: no suitable habitat present.
Ischnura gemina San Francisco forktail damselfly	Federal none State none Other	Inhabits marshes, ponds and ditches with emergent and/or floating vegetation. Recorded from Marin, San Francisco, San Mateo counties.	None: no suitable habitat present.
Lichnanthe ursina bumblebee scarab beetle	Federal none State none Other DFG: Special Animal	Inhabits coastal sand dunes. Usually flies close to sand surface near the crest of the dunes. Recorded from Marin, San Francisco, San Mateo, Sonoma counties.	None: no suitable habitat present.
Plebejus icarioides missionensis mission blue butterfly	Federal FE State none Other DFG: SA	Inhabits grasslands. Three larval host plants: Lupinus albifrons, L. variicolor, and L. formosus, of which L. albifrons is favored. Primary nectar plants for adults are Eriogonum latifolium, Chrysopsis villosa, Brodiaea pulchella and Brodiaea laxa Recorded from Marin, San Francisco, San Mateo counties. Additional distribution: restricted to the San Francisco Peninsula and Marin headlands.	None: no suitable habitat present.
Speyeria callippe callippe callippe silverspot butterfly	Federal FE State none Other DFG: Special Animal	Inhabits northern coastal scrub. Hostplant is Viola pedunculata. Most adults found on east-facing slopes. Males congregate on hilltops in search of females. Recorded from Alameda, San Mateo, Solano, Sonoma counties.	None: no suitable habitat present.
Speyeria zerene myrtleae Myrtles silverspot	Federal FE State none Other DFG: Special Animal	Restricted to the foggy, coastal dunes and hills Larval foodplant thought to be Viola adunca. Recorded from Marin, San Mateo, Sonoma counties. Additional distribution: Point Reyes Peninsula. Extirpated from coastal San Mateo County.	None: no suitable habitat present.

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Special-status Animals Evaluated for the Regional Groundwater Storage and Recovery Project

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Trachusa gummifera no common name-a leaf cutting bee	Federal none State none Other DFG: Special Animal	Known from two collections made in 1957 and 1962. No specific habitat information is available. Leafcutting bees use cut leaves to construct nests in cavities (mostly in rotting wood). They create multiple cells in the nest, each with a single larva and pollen stored for the larvae to eat. Leafcutting bees are important pollinators of wildflowers, fruits, vegetables and other crops. Recorded from Marin, San Francisco, San Mateo counties.	None: no suitable habitat present.
Actinopterygii - Ray-finned Fishes			
Mylopharodon conocephalus hardhead	Federal none State none Other DFG: SSC FS: S	Inhabits deep pools with sand-gravel-boulder bottoms and slow-moving water. Not found where exotic centrarchids predominate. Freshwater. Occurs in low to mid-elevation streams in the Sacramento-San Joaquin drainage. Recorded from Fresno, Merced, Modoc, Shasta counties.	None: no suitable habitat present.
Oncorhynchus mykiss irideus steelhead - central Calif. coast ESU	Federal FT State none Other DFG: Special Animal	Occurs from the Russian River south to Soquel Creek and to, but not including the Pajarro River. Also occurs in the San Francisco and San Pablo basins. Recorded from Alameda, Marin, Napa, San Mateo, Santa Cruz, Sonoma counties.	None: no suitable habitat present.
Amphibia - Amphibians			
Rana draytonii California red-legged frog	Federal FT State none Other DFG: CSC	Inhabits lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat. Recorded from Alameda, Amador, Butte, Calaveras, Contra Costa, El Dorado, Fresno, Glenn, Lake, Los Angeles, Marin, Mariposa, Mendocino, Merced, Monterey, Napa, Nevada, Placer, Plumas, Riverside, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Sonoma, Stanislaus, Tehama, Tuolumne, Ventura, Yuba counties.	None: no suitable habitat present.

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Special-status Animals Evaluated for the Regional Groundwater Storage and Recovery Project

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SORTED BY CLASS

Scientific Name / Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Reptilia - Reptiles			
Actinemys marmorata western pond turtle	Federal none State none Other DFG: CSC	A thoroughly aquatic turtle inhabiting ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation. Needs basking sites and sandy banks or grassy open fields in upland areas for egg-laying. Recorded from Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Kern, Kings, Lake, Lassen, Los Angeles, Madera, Marin, Mariposa, Mendocino, Merced, Modoc, Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tehama, Trinity, Tulare, Tuolumne, Ventura, Yolo, Yuba counties.	None: no suitable habitat present.
Thamnophis sirtalis tetrataenia San Francisco gartersnake	Federal FE State SE Other DFG: Fully protected	Occurs in the vicinity of freshwater marshes, ponds and slow moving streams. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important. Recorded from San Mateo, Santa Cruz counties.	None: no suitable habitat present.
Aves - Birds			
Athene cunicularia burrowing owl	Federal none State none Other BLM: Sensitive DFG: CSC (burrow sites) FWS: BCC; MBTA	Inhabits open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Nests underground in mammal burrows, especially those of California ground squirrel. Recorded from Alameda, Butte, Colusa, Contra Costa, Fresno, Glenn, Imperial, Inyo, Kern, Kings, Lassen, Los Angeles, Madera, Marin, Merced, Monterey, Napa, Orange, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo counties.	None: no suitable habitat present.

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Special-status Animals Evaluated for the Regional Groundwater Storage and Recovery Project

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Baeolophus inornatus oak titmouse	Federal none State none Other Audubon: Watch List (Yellow) DFG: Special Animal (nesting) USBC: Watch List	The oak titmouse is a common resident in a variety of habitats, but is primarily associated with oaks. Occurs in montane hardwood-conifer, montane hardwood, blue, valley, and coastal oak woodlands, and montane and valley foothill riparian habitats. Range encircles San Joaquin Valley, extending east from the coast through Kern Co. onto the western slope of the Sierra Nevada north to Shasta Co. General distribution:Occurs in cismontane California, from the Mexican border to Humboldt County.	Possible: marginally suitable nesting habitat present. See text for discussion.
Charadrius alexandrinus nivosus western snowy plover	Federal FT State none Other Audubon: Watch List (full species) DFG: CSC (nesting, coastal population) FWS: BCC (full species) FWS: MBTA USBC: Watch List (full species)	Inhabits sandy beaches, salt pond levees and shores of large alkali lakes. Requires sandy, gravelly or friable soils for nesting. Federal listing applies only to the Pacific coastal population. Recorded from Alameda, Del Norte, Humboldt, Inyo, Kern, Kings, Los Angeles, Marin, Mendocino, Modoc, Monterey, Napa, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Siskiyou, Sonoma, Ventura, Yolo counties.	None: no suitable habitat present.
Elanus leucurus white-tailed kite	Federal none State none Other DFG: fully protected FWS: MNBMC, MBTA	Inhabits rolling foothills andvalley margins with scattered oaks and river bottomlands or marshes next to deciduous woodlands. Utilizes open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching. Recorded from Alameda, Colusa, Contra Costa, Del Norte, Marin, Napa, Placer, Riverside, Sacramento, San Diego, San Luis Obispo, San Mateo, Santa Clara, Solano, Sonoma, Tehama, Ventura, Yolo counties.	Possible: suitable nesting and foraging habitat present. See text for discussion.

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Special-status Animals Evaluated for the Regional Groundwater Storage and Recovery Project

Mar 24, 2011

SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Falco columbarius merlin	Federal none State none Other DFG: SA FWS: MBTA	Winters on the seacoast, in tidal estuaries, open woodlands, savannahs, edges of grasslands and deserts, farms and ranches. Clumps of trees or windbreaks are required for roosting in open country. DFG listing covers non-breeding wintering individuals only.	None: no suitable habitat present.
Falco peregrinus anatum American peregrine falcon	Federal Delisted State Delisted Other CDF: S DFG: FP FS: S FWS: BCC, MBTA	Nests near wetlands, lakes, rivers, or other water bodies, on cliffs, banks, dunes, mounds, and human-made structures. Nests consist of a scrape on a depression or ledge in an open site. DFG listing covers nesting individuals only. Recorded from Alameda, Humboldt, Napa, Shasta, Siskiyou, Tehama counties.	None: no suitable habitat present.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	Federal none State none Other DFG: CSC FWS: BCC	Inhabits freshwater and salt marshes. Requires thick, continuous cover down to water surface for foraging. Nests in tall grasses, tule patches and willows. Resident of the San Francisco Bay region. Recorded from Alameda, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma counties.	None: no suitable habitat present.
Lanius ludovicianus loggerhead shrike	Federal none State none Other DFG: CSC (nesting) FWS: BCC; MBTA	A common resident and winter visitor in lowlands and foothills throughout California. Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Highest density occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Recorded from Alameda, Alpine, Amador, Butte, Calaveras, Colusa, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Lassen, Los Angeles, Madera, Marin, Mariposa, Mendocino, Merced, Modoc, Mono, Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Clara, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Ventura, Yolo, Yuba counties.	Possible: marginally suitable nesting habitat present. See text for discussion.

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Special-status Animals Evaluated for the Regional Groundwater Storage and Recovery Project

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Laterallus jamaicensis coturniculus California black rail	Federal none State ST Other Audubon: Watch list (full species) DFG: Fully protected FWS: MBTA FWS: MNBMC (full species) USBC: Watch list (full species)	Mainly inhabits salt-marshes bordering larger bays. Occurs in tidal salt marsh densely vegetated with pickleweed. Also found in freshwater and brackish marshes, near sea level. Recorded from Alameda, Butte, Contra Costa, Imperial, Los Angeles, Marin, Napa, Nevada, Orange, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Cruz, Solano, Sonoma, Yuba counties.	None: no suitable habitat present.
Melospiza melodia pusillula Alameda song sparrow	Federal none State none Other DFG: CSC FWS: BCC; MBTA	Inhabits pickleweed marshes. Nests low in Grindelia bushes (high enough to escape high tides) and in pickleweed. Resident of salt marshes bordering the southern arm of San Francisco Bay.	None: no suitable habitat present.
Melospiza melodia samuelis San Pablo song sparrow	Federal none State none Other DFG: CSC FWS: BCC; MBTA	Inhabits tidal sloughs in pickleweed marshes. Nests in Grindelia bushes bordering slough channels. Resident of salt marshes along the north side of San Francisco and San Pablo bays. Recorded from Solano County.	None: no suitable habitat present.
Phalacrocorax auritus double-crested cormorant	Federal none State none Other DFG: CSC (rookery site) FWS: MBTA	Nests colonially on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins. Recorded from Alameda, Contra Costa, Del Norte, Humboldt, Lake, Lassen, Mariposa, Monterey, Sacramento, San Diego, San Francisco, Santa Barbara, Sonoma, Ventura counties.	None: no suitable habitat present.

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Phalacrocorax auritus double-crested cormorant	Federal none State none Other DFG: SA FWS: MBTA	Nests colonially on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins. DFG listing covers rookeries only. Recorded from Alameda, Contra Costa, Del Norte, Humboldt, Lake, Lassen, Mariposa, Monterey, Sacramento, San Diego, San Francisco, Santa Barbara, Sonoma, Ventura counties.	None: no suitable habitat present.
Rallus longirostris obsoletus California clapper rail	Federal FE State SE Other DFG: Fully protected FWS: MBTA USBC: Watch list (full species)	Inhabits salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs. Recorded from Alameda, Contra Costa, Humboldt, Marin, Monterey, Napa, San Luis Obispo, San Mateo, Santa Clara, Solano, Sonoma counties.	None: no suitable habitat present.
Riparia riparia bank swallow	Federal none State ST Other DFG: Special Animal (nesting) FWS: MBTA	Nests colonially, primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole. Recorded from Alameda, Butte, Colusa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Inyo, Lassen, Modoc, Mono, Monterey, Plumas, Sacramento, San Benito, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Shasta, Siskiyou, Sonoma, Sutter, Tehama, Ventura, Yolo counties.	None: no suitable habitat present.

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Selasphorus sasin Allen's hummingbird	Federal none State none Other Audubon: Watch List (Yellow) DFG: Special Animal (nesting) FWS: MBTA USBC: Watch List	Breeds most commonly in coastal scrub, valley foothill hardwood, and valley foothill riparian habitats, but also are common in closed-cone pine-cypress, urban, and redwood habitats. Occurs in a variety of woodland and scrub habitats as a migrant.	Possible: suitable nesting and foraging habitat present. See text for discussion.
Toxostoma redivivum California thrasher	Federal none State none Other Audubon: Watch List (Yellow) DFG: Special Animal FWS: MBTA USBC: Watch List	A common resident of foothills and lowlands in cismontane California. Occupies moderate to dense chaparral habitats and, less commonly, extensive thickets in young or open valley foothill riparian habitat. In southern California, occurs in montane chaparral up to 1500-2000 m (5000-6600 ft). Avoids dense tree canopy. General distribution:Occurs from the Mexican border north to Shasta, Trinity, and southern Humboldt counties., and into the Shasta Valley of Siskiyou County.	Possible: marginally suitable nesting habitat present. See text for discussion.
Mammalia - Mammals			
Antrozous pallidus pallid bat	Federal none State none Other BLM: Sensitive DFG: CSC FS: Sensitive WBWG: High priority	Inhabits deserts, grasslands, shrublands, woodlands and forests. Most commonly found in open, dry habitats with rocky areas for roosting. Roosts must provide protection from high temperatures. Species is very sensitive to disturbances to roosting sites. Recorded from Calaveras, Imperial, Inyo, Kern, Lake, Marin, Mariposa, Mono, Napa, Orange, Riverside, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Siskiyou, Sonoma, Tuolumne counties. Also from Arizona, Nevada, New Mexico, Oregon, Washington.	Possible: marginally suitable roosting habitat present. See text for discussion.

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Corynorhinus townsendii Townsend's big-eared bat	Federal none State none Other BLM: S DFG: SSC FS: S WBWG: H	Most abundant in mesic habitats. Found in all but subalpine and alpine habitats, and may be found at any season throughout its range. Once considered common, Townsend's big-eared bat now is considered uncommon in California.	Not expected: no suitable habitat present.
Dipodomys venustus venustus Santa Cruz kangaroo rat	Federal none State none Other DFG: Special Animal	Inhabits silverleaf manzanita mixed chaparral in the Zayante Hills ecosystem of the Santa Cruz mountains. Needs soft, well-drained sand. Recorded from San Mateo, Santa Clara, Santa Cruz counties.	None: no suitable habitat present.
Lasiurus blossevillii western red bat	Federal none State none Other DFG: CSC FS: Sensitive WBWG: High priority	The red bat is locally common in some areas of California, occurring from Shasta Co. to the Mexican border, west of the Sierra Nevada/Cascade crest and deserts. The winter range includes western lowlands and coastal regions south of San Francisco Bay. There is migration between summer and winter ranges, and migrants may be found outside the normal range. Roosting habitat includes forests and woodlands from sea level up through mixed conifer forests. Feeds over a wide variety of habitats including grasslands, shrublands, open woodlands and forests, and croplands. Not found in desert areas. During warm months, sexes occupy different portions of the range (Williams and Findley 1979).	Possible: suitable roosting and foraging habitat present. See text for discussion.
Lasiurus cinereus hoary bat	Federal none State none Other DFG: Special Animal	The hoary bat is the most widespread North American bat. May be found at any location in California, although distribution patchy in southeastern deserts. This common, solitary species winters along the coast and in southern California, breeding inland and north of the winter range. During migration, may be found at locations far from the normal range, such as the Channel Islands (Brown 1980) and the Farallon Islands (Tenaza 1966). Habitats suitable for bearing young include all woodlands and forests with medium to large-size trees and dense foliage.	Possible: suitable roosting and foraging habitat present. See text for discussion.

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Myotis thysanodes fringed myotis	Federal none State none Other BLM: Sensitive DFG: Special Animal WBWG: High priority	Occurs in a wide variety of habitats. Optimal habitats include pinyon-juniper, valley foothill hardwood and hardwood-conifer woodlands. Forms maternity colonies and roosts in caves, mines, buildings and crevices. General distribution:occurs throughout California.	None: no suitable habitat present.
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	Federal none State none Other DFG: CSC	Inhabits forested areas with a moderate canopy and a moderate to dense understory. Also occurs chaparral habitats. Constructs nests of shredded grass, leaves and other materials. Population may be limited by availability of nest-building materials. Recorded from Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara counties.	None: no suitable habitat present.
Nyctinomops macrotis big free-tailed bat	Federal none State none Other DFG: CSC WBWG: med.-high priority	Prefers rugged, rocky terrain. Found to 2500 m (8000 ft). Feeds principally on large moths but also takes a variety of other flying insects. Roosts in buildings, caves, and occasionally in holes in trees. Also roosts in crevices in high cliffs or rock outcrops. Recorded from Alameda, Contra Costa, San Diego counties. Additional distribution: rare in California, as fall and winter vagrants. Probably does not breed in California. Alameda and Contra Costa records are suspect. Also from Arizona, New Mexico, Texas.	Not expected: marginally suitable roosting habitat present.
Reithrodontomys raviventris salt-marsh harvest mouse	Federal FE State SE Other DFG: Fully protected	Pickleweed (Salicornia) is the primary habitat. Builds loosely organized nests and does not burrow into the ground. Requires higher areas to escape flooding. Restricted to saline emergent wetlands. Recorded from Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, Sonoma counties. Additional distribution: San Francisco Bay and its tributaries.	None: no suitable habitat present.
Scapanus latimanus insularis Angel Island mole	Federal none State none Other DFG: Special Animal	Needs friable soils for burrowing. Recorded from Marin County. Angel Island.	None: no suitable habitat present.

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SORTED BY CLASS

Scientific Name Common Name	Status	Habitat Affinities and Reported Distribution	Potential for Occurrence on Site
Taxidea taxus American badger	Federal none State none Other DFG: CSC	Most abundant in dry, open stages of most shrub, forest, and herbaceous habitats. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Excavates its own burrows. General distribution: recorded from every California county except Del Norte.	None: no suitable habitat present.
Zapus trinotatus orarius Point Reyes jumping mouse	Federal none State none Other DFG: CSC	Inhabits bunch grass marshes in areas protected from continuous inundation. Eats mainly grass seeds with some insects and fruit taken. Builds grassy nests on ground under vegetation, burrows in winter. Recorded from Marin County. Additional distribution: Point Reyes.	None: no suitable habitat present.

EXPLANATION OF RARITY STATUS CODES

ENDANGERED SPECIES ACT (ESA) LISTING CODES

FE = federally listed as Endangered
FT = federally listed as Threatened
FPE = federally proposed for listing as Endangered
FPT = federally proposed for listing as Threatened
FPD = federally proposed for delisting
FC = federal candidate; former Category 1 candidates
FSC = federal species of concern; receives no legal protection. Use of the term does not necessarily mean that a species will eventually be proposed for listing.

CALIFORNIA ENDANGERED SPECIES ACT (CESA) LISTING CODES

S E = State-listed as Endangered
ST = State-listed as Threatened
SR = State-listed as Rare
SCE = State candidate for listing as Endangered
SCT = State candidate for listing as Threatened

CALIFORNIA NATIVE PLANT SOCIETY DESIGNATIONS (CNPS)

List 1: Plants of highest priority
List 1A: Plants presumed extinct in California
List 1B: Plants rare and endangered in California and elsewhere
List 2: Plants rare and endangered in California but more common elsewhere
List 3: Plants about which additional data are needed
List 4: Plants of limited distribution

CNPS Threat Code Extensions (replaces the RED code)

.1 - Seriously endangered in California

.2 – Fairly endangered in California

.3 – Not very endangered in California

OTHER CODES

AFS: American Fisheries Society categories of risk for marine, estuarine and diadromous fish stocks.

Audubon: Watch List: Bird species facing population declines and/or threats such as loss of breeding and wintering grounds, or species with limited geographic ranges.

BLM: Sensitive: Bureau of Land Management. Includes species under review by FWS or NMFS, species whose numbers are declining so rapidly that federal listing may become necessary, species with small and widely dispersed populations, or species inhabiting refugia or other unique habitats.

CDF: Sensitive: California Department of Forestry and Fire Protection. Includes species that warrant special protection during timber operations.

DFG: CSC: California species of Special Concern.

DFG: Special Animal: Species included by the Department of Fish and Game in their special species lists.

DFG: WL (Watch List): taxa that were previously SSCs but no longer merit CSC status or which do not meet CSC criteria but for which there is concern and a need for additional information to clarify status.

DFG: Fully Protected: Species protected under Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code.

FS: Sensitive: USDA Forest Service. Species identified by a regional forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or in habitat capability that would reduce a species' existing distribution.

FWS: BCC: Birds of Conservation Concern: migratory and non-migratory bird species (beyond listed species) that represent the FWS's highest conservation priorities.

FWS: BEPA: Bald Eagle Protection Act

FWS: MBTA: International Migratory Bird Treat Act

FWS: MNBMC: US Fish and Wildlife Service: Migratory Nongame Birds of Management Concern. Species considered to be of concern in the U.S. due to documented or apparent population declines, small or restricted populations, or dependence on restricted or vulnerable habitats.

NMFS: SC: National Marine Fisheries Service: Species of Concern.

USMC Watch List: US Bird Conservation Watch List.

WBWG: Priority: The Western Bat Working Group. Species imperiled or at high, medium, or low risk of imperilment based on available information on distribution, status, ecology, and known threats.

SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR LAKE MERCED

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur**[(a)]	**Flowering Period**
SPECIES LISTED OR PROPOSED FOR LISTING				
Plants				
San Bruno Mountain manzanita *Arctostaphylos imbricada*	–/CE/1B.1	Chaparral and coastal scrub, usually on sandstone outcrops.	**Low potential.** No suitable habitat present.	February–May
Presidio manzanita *Arctostaphylos montana* ssp. *Ravenii*	FE/CE/1B.1	Open, rocky, serpentine slopes in chaparral, coastal scrub, and coastal prairie.	**Low potential.** No suitable habitat present.	February–April
Pacific manzanita *Arctostaphylos pacifica*	–/CE/1B.1	Coastal scrub and chaparral.	**Low potential.** No suitable habitat present.	February–April
Marsh sandwort *Arenaria paludicola*	FE/CE/1B.1	Freshwater or brackish marshes and swamps.	**Low potential.** Potentially suitable habitat present at Lake Merced, but species not observed there (May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011); species presumed extirpated in San Francisco.	May–August
Robust spineflower *Chorizanthe robusta var. robusta*	FE/–/1B.1	Sandy or gravelly coastal dunes, coastal scrub, cismontane woodland and maritime chaparral.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (San Francisco Planning Department 2011; May and Associates 2009; Nomad Ecology2011); species presumed extirpated in San Francisco.	April–September
Presidio clarkia *Clarkia franciscana*	FE/CE/1B.1	Serpentine outcrops in coastal scrub, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	May–July
Marin western flax *Hesperolinon congestum*	FT/CT/1B.1	Chaparral and grassland, usually on serpentine barrens	**Low potential.** No suitable habitat present.	April–July
Beach layia *Layia carnosa*	FE/CE/1B.1	Sparsely vegetated, semi-stabilized coastal dunes and scrub.	**Low potential.** No suitable habitat present; presumed extirpated in San Francisco.	March–July
San Francisco lessingia *Lessingia germanorum*	FE/CE/1B.1	Open, sandy, coastal dunes and scrub.	**Low potential.** No suitable habitat present.	July–November
White-rayed pentachaeta *Pentachaeta bellidiflora*	FE/CE/1B.1	Open, dry, rocky slopes and grassy areas, usually on serpentine.	**Low potential.** No suitable habitat present.	March–May
San Francisco popcorn-flower *Plagiobothrys diffusus*	–/CE/1B.1	Coastal prairie, and valley and foothill grasslands.	**Low potential.** No suitable habitat present.	March–June

SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR LAKE MERCED

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur**[(a)]	**Flowering Period**
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN				
Bent-flowered fiddleneck *Amsinckia lunaris*	–/–/1B.2	Coastal bluff scrub, cismontane woodland, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	March–June
Franciscan manzanita *Arctostaphylos franciscana*	–/–/1B.1	Open, rocky, serpentine outcrops in chaparral.	**Low potential.** No suitable habitat present. This species was believed to be extinct in the wild (although still extant through cultivation), but was rediscovered in Presidio National Park in late 2009.	February–April
Montara manzanita Arctostaphylos montaraensis	–/–/1B.2	Slopes and ridges in chaparral and coastal scrub.	**Low potential.** No suitable habitat present.	January–March
Alkali milk-vetch *Astragualus tener* var. *tener*	–/–/1B.2	Alkali flats, flooded grassland, playas and vernal pools.	**Low potential.** No suitable habitat present; species presumed extirpated in San Francisco.	March–June
Bristly sedge *Carex comosa*	–/–/2.1	Lake margins, marshes, swamps, coastal prairie, and valley and foothill grasslands.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (San Francisco Planning Department 2011; May and Associates 2009; Nomad Ecology 2011)	May–September
Pappose tarplant *Centromadia parryi* ssp. *parryi*	–/–/1B.2	Chaparral, coastal prairie, meadows, seeps, coastal salt marshes and swamps, and vernally mesic, often alkaline, valley and foothill grasslands.	**Low potential.** No suitable habitat present.	May–November
San Francisco spineflower *Chorizanthe cuspidata* var. *cuspidata*	–/–/1B.2	Coastal bluff scrub, dunes, prairie, and coastal scrub; sandy soils on terraces and slopes.	**High potential.** Species is known to occur at Lake Merced (May & Associates 2009; Nomad Ecology 2011).	April–August
Franciscan thistle *Cirsium andrewsii*	–/–/1B.2	Coastal bluff scrub, coastal prairie, coastal mesic scrub, and broadleaf upland forest; sometimes on serpentine.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (San Francisco Planning Department 2011; May and Associates 2009; Nomad Ecology 2011)	March–July
Compact cobwebby thistle *Cirsium occidentale* var. *compactum*	–/–/1B.2	On dunes or clay in chaparral, coastal dunes, coastal prairie, coastal scrub, and grasslands.	**Low potential.** Suitable habitat present at Lake Merced but species not documented to occur there (May & Associates 2009; Nomad Ecology 2011).	April–June

SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR LAKE MERCED

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur[(a)]**	**Flowering Period**
Round-headed Chinese-houses *Collinsia corymbosa*	–/–/1B.2	Coastal dunes and coastal prairie.	**Low potential.** No suitable habitat present; species has not been seen in San Francisco for more than 100 years.	April–June
San Francisco collinsia *Collinsia multicolor*	–/–/1B.2	On humus-covered soil derived from mudstone in closed-cone coniferous forest and coastal scrub.	**Low potential.** Potentially suitable habitat present in coastal scrub at Lake Merced but species not documented to occur there (May & Associates 2009; Nomad Ecology 2011).	March–May
Pont Reyes bird's-beak *Cordylanthus maritimus* ssp. *palustris*	–/–/1B.2	Coastal salt marshes and swamps.	**Low potential.** No suitable habitat present.	June–October
Fragrant fritillaria *Fritillaria liliacea*	–/–/1B.2	On clay, often serpentine derived soils in coastal scrub, grassland, and coastal prairie.	**Low potential.** No suitable habitat present.	February–April
Blue coast gilia *Gilia capitata* ssp. *chamissonis*	–/–/1B.1	Coastal scrub and coastal dunes.	**High potential.** Species is known to occur in dune scrub habitat at Lake Merced (May & Associates 2009; Nomad Ecology 2011).	April–July
Dark-eyed gilia *Gilia millefoliata*	–/–/1B.2	Coastal dunes.	**Low potential.** No suitable habitat present; species potentially extirpated in San Francisco.	April–July
San Francisco gumplant *Grindelia hirsutula* var. *maritima*	–/–/1B.2	On sandy or serpentine slopes of sea bluffs in coastal scrub, or valley and foothill grasslands.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not documented to occur there (San Francisco Planning Department 2011; May and Associates 2009; Nomad Ecology 2011).	June–September
Diablo helianthella *Helianthella castanea*	–/–/1B.2	On rocky soils in broadleaf upland forest, cismontane woodland, coastal scrub, riparian woodland, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	March–June
Seaside tarplant *Hemizonia congesta* ssp. *congesta*	–/–/1B.2	Grassy valleys and hills, often on fallow fields in coastal scrub.	**Low potential.** No suitable habitat present.	April–November
Short-leaved evax *Hesperevax sparsiflora* var. *brevifolia*	–/–/1B.2	Sandy bluffs and flats in coastal scrub and coastal dunes.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011).	March–June

SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR LAKE MERCED

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur[(a)]**	**Flowering Period**
Kellogg's horkelia *Horkelia cuneata* ssp.*sericea*	–/–/1B.1	Openings in old dunes coastal and sandhill in closed-cone coniferous forest, coastal scrub, and chaparral.	**Low potential.** No suitable habitat present.	April–September
Rose leptosiphon *Leptosiphon rosaceus*	–/–/1B.1	Coastal bluff scrub.	**Low potential.** No suitable habitat present.	April–July
Arcuate bush mallow *Malacothamnus arcuatus*	–/–/1B.2	Gravelly alluvium in chaparral and cismontane woodland.	**Low potential.** No suitable habitat present.	April–September
Marsh microseris *Microserus paludosa*	–/–/1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, and valley and foothill grassland.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011).	April–June (July)
Choris's popcorn-flower *Plagiobothrys chorisianus* var. *chorisianus*	–/–/1B.2	Mesic sites in chaparral, coastal scrub, and coastal prairie.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011).	March–June
Hairless popcorn-flower *Plagiobothrys glaber*	–/–/1A	Coastal salt marshes and alkaline meadows.	**Low potential.** No suitable habitat present.	March–May
Oregon polemonium *Polemonium carneum*	–/–/1B.1	Coastal prairie, coastal scrub, lower montane coniferous forest.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011).	April–September
Adobe sanicle *Sanicula maritima*	–/Rare/1B.1	Moist clay or ultramafic soil in chaparral, coastal prairie, meadows, seeps, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	February–March
San Francisco campion *Silene verecunda* ssp. *verecunda*	–/–/1B.2	Mudstone, shale, or serpentine substrates in coastal scrub, coastal prairie, chaparral and valley and foothill grassland.	**Low potential.** No suitable habitat present.	March–August
Santa Cruz microseris *Stebbinsoseris decipiens*	–/–/1B.2	On sandstone, shale or serpentine derived seaward facing slopes in broadleaf upland forest, closed-cone coniferous forest, chaparral, coastal prairie, and coastal scrub.	**Low potential.** No suitable habitat present.	April–May

SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR LAKE MERCED

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur[(a)]**	**Flowering Period**
San Francisco owl's-clover *Triphysaria floribunda*	–/–/1B.2	Coastal prairie, and valley and foothill grasslands; occasionally on serpentine.	**Low potential.** No suitable habitat present.	April–June
Coastal triquetrella *Triquetrella californica*	–/–/1B.2	On soil in coastal bluff and coastal scrub.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011).	N/A

Sources: May and Associates 2009; Nomad Ecology 2011; San Francisco Planning Department 2011; CDFG 2011; CNPS 2011; USFWS 2011 (San Francisco North and San Francisco South quadrangles)

Notes:

(a) High Potential = Species is expected to occur and habitat meets special requirements.
Moderate Potential = Habitat is only marginally suitable or is suitable but not within species geographic range.
Low Potential = Habitat does not meet species requirements as currently understood in the scientific community. Project site is outside species geographic range.

Federal Categories (USFWS)

FE = Listed as endangered by the federal government

FT = Listed as threatened by the federal government

FPE = Proposed for listing as endangered

FPT = Proposed for listing as threatened

FC = Candidate for federal listing

FSC = Former federal species of concern. Species designated as such in this EIR were listed by the Sacramento USFWS office until 2006, when they stopped maintaining their list. These species are still considered to be at-risk species by other federal and State agencies, as well as various organizations with recognized expertise such as the Audubon Society.

State Categories (CDFW)

CE = Listed as endangered by the State of California

CT = Listed as threatened by the State of California

CR = Listed as rare by the State of California

CNPS

Rare Plant Rank 1A = Plants presumed extinct in California.

Rare Plant Rank 1B = Plants rare, threatened, or endangered in California and elsewhere.

Rare Plant Rank 2 = Plants rare, threatened, or endangered in California, but more common elsewhere.

Rare Plant Rank 3 = Plants about which more information is needed.

Rare Plant Rank 4 = Plants of limited distribution.

SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[(a)]
SPECIES LISTED OR PROPOSED FOR LISTING			
Invertebrates			
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE/–	Coastal scrub on rocky outcrops with broadleaf stonecrop (*Sedum spathulifolium*)	**Low potential.** No suitable habitat present.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/–	Serpentine grasslands.	**Low potential.** No suitable habitat present.
Mission blue butterfly *Plebejus icarioides missionensis*	FE/–	Grassland with *Lupinus albifrons, L. formosa*, and *L. varicolor.*	**Low potential.** No suitable habitat present.
Callippe silverspot butterfly *Speyeria callippe callippe*	FE/–	Found in native grasslands with *Viola pedunculata* as larval food plant.	**Low potential.** No suitable habitat present.
Amphibians			
California red-legged frog *Rana draytonii*	FT/CSC	Freshwater ponds and slow streams with emergent vegetation for egg attachment.	**Low potential.** Historically present at Lake Merced (SFRPD 2006) but currently presumed extirpated from this area (Jones and Stokes 2007; San Francisco Planning Department 2011).
Reptiles			
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE/CE	Freshwater ponds and slow streams with emergent vegetation.	**Low potential.** Potentially suitable habitat present at Lake Merced, but species not documented at this area.
Birds			
Western snowy plover *Charadrius alexandrinus nivosus*	FT/CSC	Nests and forages on sandy beaches on marine and estuarine shores; requires sandy, gravely, or friable soils for nesting.	**Low potential.** No suitable habitat present.
California black rail *Laterallus jamaicensis coturniculus*	–/CT	Tidally influenced, heavily vegetated, high-elevation marshlands.	**Low potential.** No suitable habitat present.
California brown pelican *Pelecanus occidentalis californicus*	Delisted/3511	Nests on coastal islands of small to moderate size that affords protection from predators.	**Low potential.** No suitable habitat present.
California clapper rail *Rallus longirostris obsoletus*	FE/CE	Salt marsh wetlands along the San Francisco Bay.	**Low potential.** No suitable habitat present.
Bank swallow *Riparia riparia*	–/CT	Colony nester on sandy cliffs near water, marshes, lakes, streams, the ocean. Forages in fields.	**Low potential.** No suitable nesting habitat present, although this species nests nearby and occasionally forages at Lake Merced.

SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	Listing Status USFWS/CDFW	Habitat	Potential to Occur[(a)]
California least tern *Sterna antillarum browni*	FE/CE	Colonial breeder on bare or sparsely vegetated flat substrates including sand beaches, alkali flats, landfills, or paved areas.	**Low potential.** No suitable habitat present.
Mammals			
Salt marsh harvest mouse *Reithrodontomys raviventris*	FE/CE	Salt marshes along the San Francisco Bay.	**Low potential.** No suitable habitat present.
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN			
Invertebrates			
Incredible harvestman *Banksula incredula*	–/*	Franciscan sandstone talus slope.	**Low potential.** No suitable habitat present.
Tomales isopod *Caecidotea tomalensis*	FSC/*	Shallow freshwater ponds or streams with still or very slow water. Known only to occur in several Bay Area counties.	**Low potential.**Species was collected in 1971 (one individual) and 1984 (three individuals) from Lake Merced but not more recently (SFRPD 2006).
Sandy beach tiger beetle *Cicindela hirticollis gravida*	FSC/*	Sandy areas around water; larva live in burrows in sand along sea beaches, creeks, seepages, and lake shores.	**Low potential.** Potentially suitable habitat present at Lake Merced, but species not documented to occur there; known population of this species in the project area has been extirpated.
Monarch butterfly *Danaus plexippus*	–/*	Eucalyptus groves (winter sites).	**Moderate potential.**
Stage's dufourine bee *Dufourea stagei*	–/*	Ground-nesting bee in coastal scrub habitat.	**Low potential.** Potentially suitable habitat present at Lake Merced; known species range is south of the project area.
Leech's skyline diving beetle *Hydroporus leechi*	FSC/–	Found in freshwater ponds, shallow water of streams marshes and lakes.	**Low potential.** Potentially suitable habitat at Lake Merced, but there are no known populations of this species in project vicinity.
Bumblebee scarab beetle *Lichnanthe ursina*	FSC/–	Inhabits coastal sand dunes.	**Low potential.** Suitable habitat is not present within the project area; CNDDB records indicate historical presence of this species along Ocean Beach.
A leaf-cutter bee *Trachusa gummifera*	–/*	Unknown	**Low potential.** Known from two historical collections in Marin and San Francisco Counties; no records of this species in the project area.
Marin hesperian *Vespericola marinensis*	–/–	Moist areas in coastal brushfield and chaparral vegetation, in Marin County.	**Low potential.** Known species range is north of the proposed project area.
Reptiles			
Western pond turtle *Actinemys marmorata*	–/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs.	**High potential.** Species is known to occur at Lake Merced (SFRPD 2006; San Francisco Planning Department 2011).

SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[(a)]
Birds			
Cooper's hawk *Accipiter cooperi*	--/3503.5	Typically nests in riparian growths of deciduous trees and live oak woodlands. Becoming more common as an urban breeder.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
Great horned owl *Bubo virginianus*	--/3503.5	Often uses abandoned nests of corvids or squirrels; nests in large oaks, conifers, eucalyptus.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
Red-tailed hawk *Buteo jamaicensis*	--/3503.5	Almost any open habitat, including grassland and urbanized areas.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
Red-shouldered hawk *Buteo lineatus*	--/3503.5	Forages along edges of marshes and grasslands; nests in mature trees in a variety of habitats.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
American kestrel *Falco sparverius*	--/3503.5	Frequents generally open grasslands, pastures, and fields; primarily a cavity nester.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
Salt-marsh common yellowthroat *Geothlypis trichas sinuosa*	FSC/CSC	Inhabits tidal salt and brackish marshes in winter, but breeds in freshwater brackish marshes and riparian woodlands during spring to early summer.	**High potential.** This species is known to breed in the freshwater marshes at Lake Merced.
Alameda song sparrow *Melospiza melodia pusillula*	–/CSC	Salt marshes of eastern and south San Francisco Bay.	**Low potential.** No suitable habitat is present for this species in the project area.
San Pablo song sparrow *Melospiza melodia samuelis*	–/CSC	Salt marshes of eastern and north San Francisco Bay.	**Low potential.** No suitable habitat is present for this species in the project area.
Double-crested cormorant *Phalacrocorax auritus*	–/–	Nests along coast on isolated islands or in trees along lake margins.	**High potential.** There is a colony of double-crested cormorants at Lake Merced (SF Field Ornithologists, 2003).
Mammals			
Pallid bat *Antrozous pallidus*	–/CSC	Roosts in caves, old buildings, and under bark. Forages in open lowland areas, and forms large maternity colonies in the spring.	**Low potential.** Potential roosting habitat is available in buildings and large-diameter trees in Lake Merced, but this species was not detected during recent surveys in San Francisco parks (Krauel 2009). Not expected to breed here but may be present on a transient basis.
Townsend's big-eared bat *Corynorhinus townsendii*	FSC/CSC	Roosts in caves, buildings, bridges, rock crevices, and hollow trees.	**Low potential.** While roosting habitat is available in buildings in Lake Merced, the species was not detected during recent surveys in San Francisco parks (Krauel 2009).

SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur[(a)]**
Western red bat *Lasiurus blossevillii*	–/CSC	Roosts in tree/shrub foliage, particularly in riparian areas.	**Moderate potential.** Roosting habitat is available in tree/shrub foliage at Lake Merced. In recent surveys, this species was one of the most commonly encountered bat species in San Francisco (Krauel 2009) and was found in parks containing water bodies.
Hoary bat *Lasiurus cinereus*	–/*	Roosts in tree/shrub foliage.	**Low potential.** Potential roosting habitat is available in large-diameter trees at Lake Merced, but this species was not detected during recent surveys in San Francisco parks (Krauel 2009). May be present on a transient basis.
Yuma myotis *Myotis yumanensis*	--/*	Open forests and woodlands with sources of water over which to feed.	**Moderate potential.** Roosting habitat is available in tree/shrub foliage at Lake Merced. In recent surveys, this species was one of the most commonly encountered bat species in San Francisco (Krauel 2009), especially in parks with water bodies such as lakes.
American badger *Taxidea taxus*	–/CSC	Open grasslands with loose, friable soils.	**Low potential.** Suitable habitat for this species is no longer present in the project vicinity.
Point Reyes jumping mouse *Zapus trinotatus orarius*	–/CSC	Upland areas of bunch grass marshes in Point Reyes.	**Low potential.** Project area is south of the known range for this species.

Sources: CDFG 2011; USFWS 2011 (San Francisco North and San Francisco South quadrangles); Krauel 2009; SFRPD 2006; SF Field Ornithologists 2003; Nomad Ecology 2011; Jones and Stokes 2007; SF Planning Dept. 2011

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State Categories (CDFW)

CE = Listed as endangered by the State of California

CT = Listed as threatened by the State of California

CSC = California species of special concern

* = California special animal

3511 = A Fully Protected Species

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Appendix G

Geotechnical Reports

APPENDIX G

GEOTECHNICAL REPORTS

REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT

April 2013

INTRODUCTION

This Appendix includes the three geotechnical reports that were prepared for the Regional Groundwater Storage and Recovery (GSR) Project. Due to the length of the appendices for the geotechnical reports, the appendices are not included.

The reports provided in this Appendix include the following:

- *Geotechnical Report – South Westside Groundwater Basin Conjunctive Use Project, April 2009.* This report includes Section 6.3, Densification Improvements, which provides optional construction methodologies for densification of soils. The GSR Project Description does not include use of these optional methodologies and relies instead on appropriate structural design of all structures.

- *Final Geotechnical Report – CUP Well Locations CUP-11A, CUP-23, CUP-36-1, CUP-44-1, and CUP-M-1, South Westside Basin Groundwater Storage and Recovery Project, December 2009*

- *Geotechnical Report – CUP-3A and CUP-7 sites, Regional Groundwater Storage and Recovery Project, November 2011 (Revised January 2012)*

These geotechnical reports utilize a different numbering system for well sites than the EIR. The table below provides the EIR site numbers for each of the site numbers used in the geotechnical reports.

EIR Site Name	Geotechnical Report Site Name
1	3A
2	6
3	5
4	7
5	10A
6	11A
7	18
8	19
9	23
10	22A
11	31
12	36-1
13	41-4
14	44-2
15	44-1
16	M-1
17 (Alternate)	20A
18 (Alternate	22
19 (Alternate)	36-2

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GEOTECHNICAL REPORT – SOUTH WESTSIDE GROUNDWATER BASIN CONJUNCTIVE USE PROJECT, APRIL 2009

GEOTECHNICAL CONSULTANTS, INC.
Geotechnical Engineering • Geology • Hydrogeology

GEOTECHNICAL REPORT
SOUTH WESTSIDE GROUNDWATER BASIN
CONJUNCTIVE USE PROJECT
SAN MATEO COUNTY, CA

April 2009

Prepared for:

Kennedy/Jenks Consultants
303 Second Street, Suite 300 South
San Francisco, CA 94107

Owner:

San Francisco Public Utilities Commission

SF08034

500 Sansome Street, Suite 402 • San Francisco, CA 94111 • (415) 981-9950

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APPENDIX A – SUPPORTING GEOTECHNICAL DATA

INTRODUCTION

This geotechnical report presents the findings, conclusions, and recommendations of our geotechnical study performed for proposed buildings to facilitate groundwater well stations, and chemical treatment and filtration facilities at five designated sites located in the northern part of San Mateo County, California (Figure 1 – Site Location Map). The proposed wells are part of the South Westside Groundwater Basin Conjunctive Use Project (SWGBCUP), a project being developed through the coordination of the San Francisco Public Utilities Commission (SFPUC) and three partner agencies (California Water Service Company [Cal Water], the City of Daly City and the City of San Bruno). This geotechnical report is being prepared for Kennedy/Jenks Consultants as part of their design services contract with the SFPUC.

We anticipate that the proposed station buildings will typically be constructed with concrete masonry units (CMU), although the material selection will depend on the surrounding structures. The building footprint area for proposed station buildings that house a monitoring well only is approximately 640 square feet. The footprint area for a proposed station building expands to approximately 916 square feet when the building includes chemical treatment facilities in addition to the well. A proposed station building measuring approximately 1,742 square feet is anticipated when the building houses a monitoring well and the facilities for chemical treatment and filtration. Geotechnical recommendations for additional improvements such as new pipeline connections and upgrades, which may require additional geotechnical borings, were not part of our scope of work.

WORK PERFORMED

In accordance with our scope of work as documented in the Subcontract Agreement (Amendment No. 3) with Kennedy/Jenks Consultants, Incorporated (KJ) dated November 17, 2008 and subsequent conversations with personnel from KJ, we have completed the scope of work described below:

1. **Exploratory Drilling.** We explored subsurface conditions by means of drilling one hollow-stem auger boring at each of the five sites designated as CUP-10A, -18, -19, -22A and -41-4. To maintain consistency with the site numbering, our borings have been accordingly labeled as GB-10A, -18, -19, -22A and -41-4 for the subject sites. Boring number, date of drilling, surface elevation and depth are presented for each boring and summarized in Table 1 – Summary of Geotechnical Borings. The surface elevations of the borings were evaluated from topographic maps which were prepared by Chaudhary & Associates from their field surveys in March and September of 2008. The surface elevations presented in this report are approximate. All elevations on Table 1, and referred to throughout this report (unless otherwise noted), are with respect to 1988 North American Vertical Datum (NAVD 88).

FIGURE 1
SITE LOCATION MAP

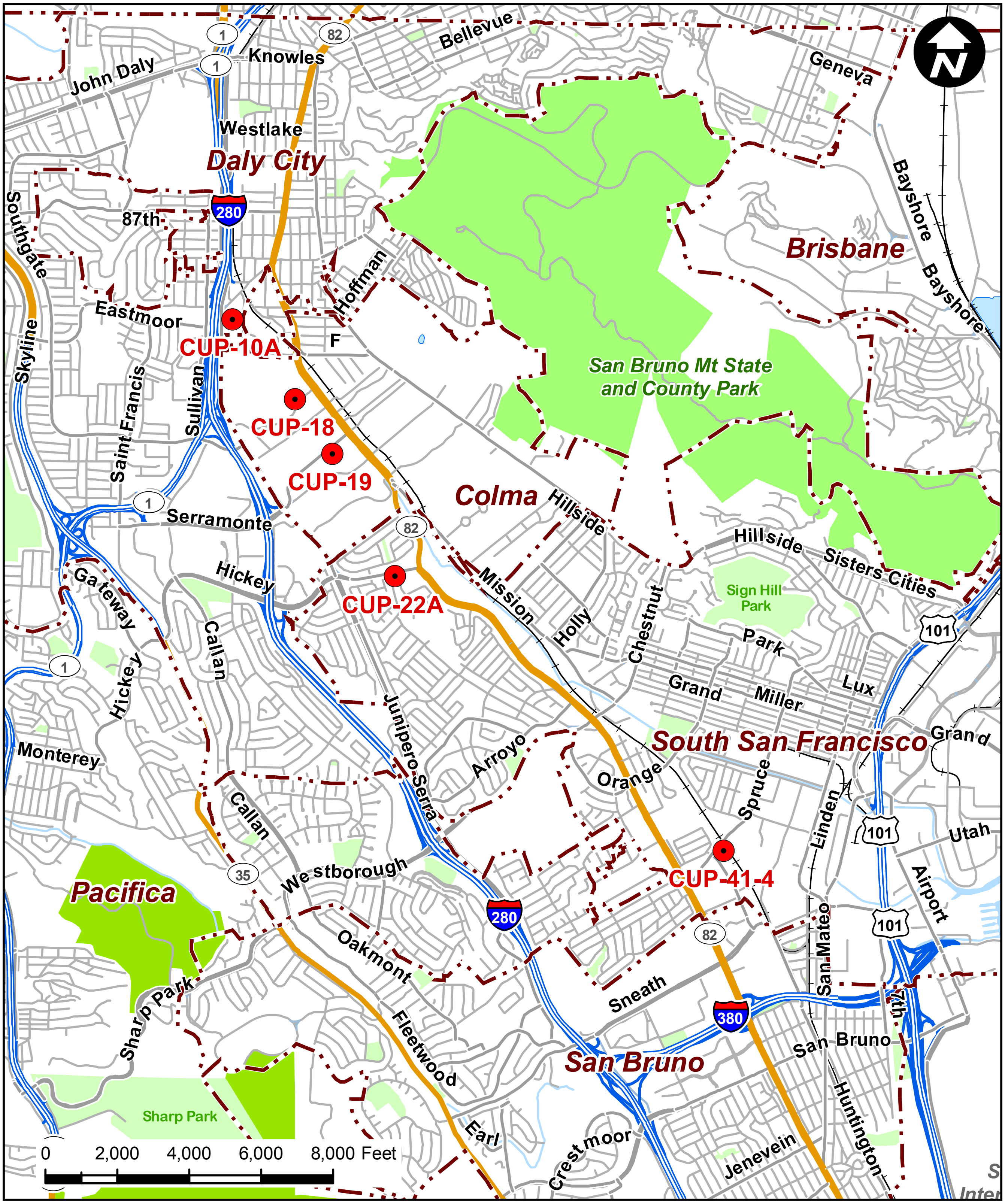


TABLE 1 – SUMMARY OF GEOTECHNICAL BORINGS

Boring	Date Drilled	Approximate Surface Elevation (feet, NAVD 88)	Depth (feet)
GB-10A	12/15/2008	+ 193	30
GB-18	12/15/2008	+ 173	30
GB-19	12/15/2008	+ 112	30.5
GB-22A	12/16/2008	+ 100	30.5
GB-41-4	12/16/2008	(1)	30.5

1. Surface elevation relative to NAVD 88 datum is not available. A preliminary topographic map showing a field survey by Chaudhary & Associates on March 14, 2008 indicates a temporary benchmark was used as a reference.

We visually classified the soil during drilling. We recovered split-spoon (Standard Penetration Test) samples and relatively undisturbed 2 ½ inch diameter sleeve samples using a split-barrel sampler. Selected samples were transferred to a laboratory for testing. The boring locations are shown on Plates 1 through 5 – Boring Location Maps. Boring logs are presented in Appendix A – Supporting Geotechnical Data.

2. **Laboratory Testing.** We performed moisture, density, grain size analysis, Atterberg limits, direct shear and corrosion tests on selected soil samples to measure pertinent index and engineering properties. The laboratory test results are presented on the figures in Appendix A, and on the boring logs on Plates A-1.1 through -1.5.

3. **Engineering Analysis.** We analyzed subsurface conditions and laboratory test results, and reviewed regional and local geology and seismicity. Additionally, we analyzed the following geotechnical parameters:

   - Seismic hazards evaluation including strong ground shaking, liquefaction, seismic and dynamic settlements, and seismically-induced landslides;
   - Seismic design parameters in accordance with the 2006 International Building Code;
   - Bearing capacity (allowable and ultimate) and modulus of subgrade reaction (vertical soil springs) for shallow footings and grade beams, and mat foundations; and
   - Lateral earth pressures (active, passive, at-rest, and seismic increment) and base friction coefficients for restrained and unrestrained walls and/or buried footings.

4. **Report.** We prepared this report presenting our geotechnical findings, conclusions, and recommendations for the proposed improvements at the five subject sites for the SWGBCUP.

FINDINGS

SITE CONDITIONS

The five subject sites are located within the north portion of the South Westside Groundwater Basin in San Mateo County, California. The ground surface along an alignment which roughly transects the five sites, and parallels El Camino Real, generally descends in a northwest-to-southeast direction from elevations of approximately 200 feet to 20 feet above mean sea level for a distance of approximately 4 miles.

The northernmost site CUP-10A is located to the southeast of the intersection between Junipero Serra Boulevard and B Street in Daly City. As indicated on the general layout of the proposed improvements on Plate 1 – Boring Location Map for CUP-10A, the site is located on a relatively flat, abandoned, asphalt paved parking lot. The site is surrounded by parking lots to the south and west, residential/commercial property to the east, and sidewalk abutting B Street to the north. Existing underground water main pipelines (Baden Merced, San Andreas Nos. 2 and 3, Sunset Supply) and proposed connection main and pump-to-waste pipelines are also shown on Plate 1.

Approximately ½ mile to the southeast from CUP-10A, CUP-18 is located to the southwest of the intersection between Colma Boulevard and El Camino Real in the Town of Colma. As indicated on the general layout of the proposed improvements on Plate 2 – Boring Location Map for CUP-18, the site is located on grassy terrain which descends on a mildly sloping (7:1 horizontal to vertical side slope ratio) terrain in a northwest-to-southeast direction. The site is surrounded by a paved turnout for Colma Boulevard to the south, a small maintenance/operations facility building to the west, moderately wooded area to the east, and the Woodlawn Cemetery to the north. Existing underground water main pipelines (Baden Merced, and San Andreas Nos. 2 and 3) and proposed connection main and pump-to-waste pipelines are also shown on Plate 2.

A further 1/3 mile to the southeast from CUP-18, CUP-19 is located to the southwest of the intersection between El Camino Real and Serramonte Boulevard in the Town of Colma. The general layout of the proposed improvements on Plate 3 – Boring Location Map for CUP-19 shows a relatively flat, recently re-graded site which is surrounded to the east by a parking lot for the Kohl's department store, to the west by a concrete retaining wall which retains an automobile dealer parking lot to higher grade, to the north and south by relatively flat, re-graded grounds, and further to the north by Serramonte Boulevard. Existing underground water main pipelines (Baden Merced, and San Andreas Nos. 2 and 3) and proposed connection main and pump-to-waste pipelines are also shown on Plate 3.

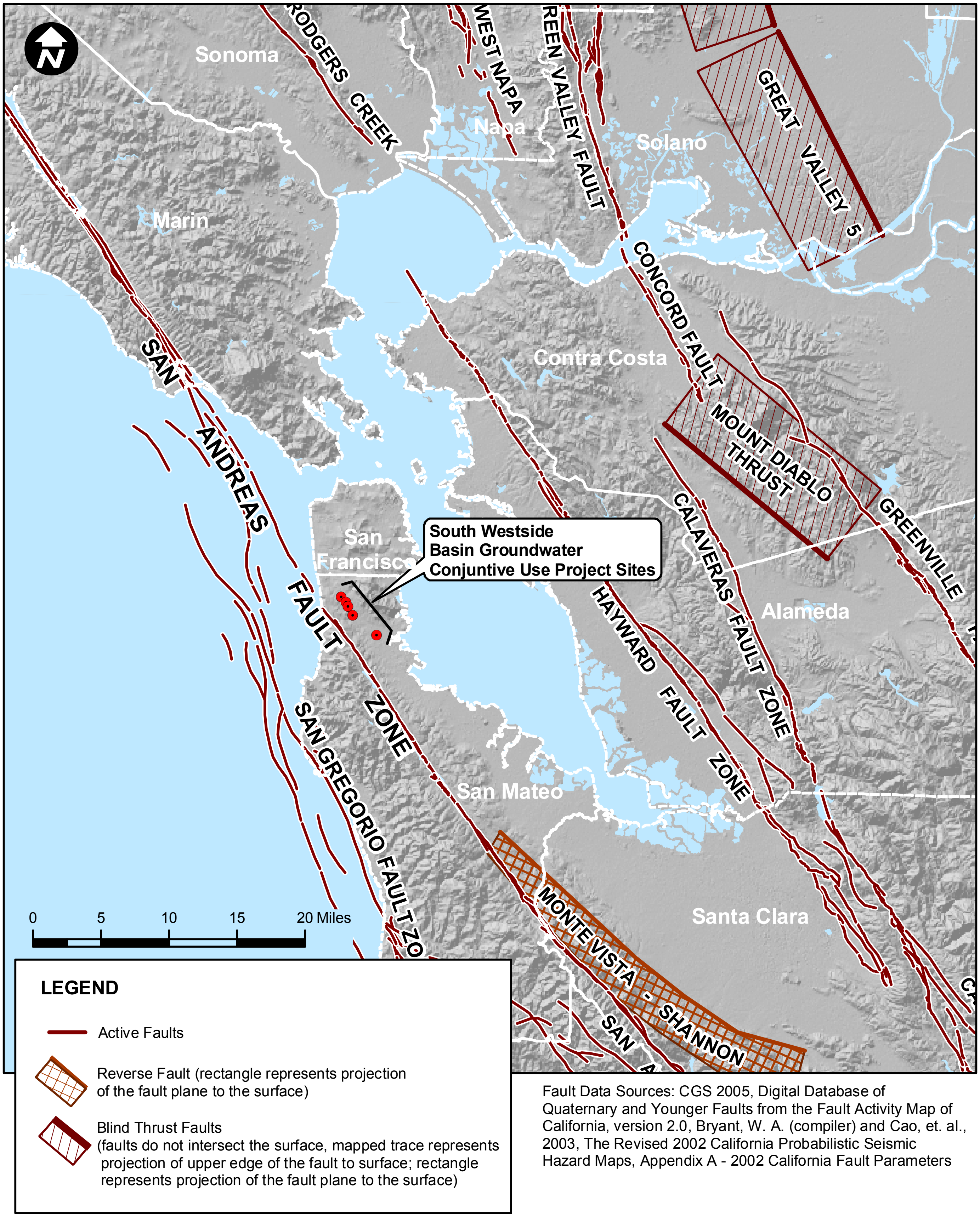
Approximately ¾ mile to the southeast from CUP-19, CUP-22A is located to the southwest of the intersection between Camaritas Avenue and Hickey Boulevard in the City of South San Francisco. The general layout of the proposed improvements on Plate 4 – Boring Location Map for CUP-22A shows a relatively flat, recently re-graded site which is surrounded to the north and east by sidewalks abutting Hickey Boulevard and Camaritas Avenue, to the south and west by relatively flat, recently re-graded grounds, and further to the west by a landscaped slope which ascends to a residential development. Existing underground water main pipelines (Baden Merced, and San Andreas Nos. 2 and 3) and proposed connection main and pump-to-waste pipelines are also shown on Plate 4.

The southernmost site of CUP-41-4 is located approximately 2¼ miles to the southeast from CUP-22A, and is situated to the northeast from the intersection between Huntington Avenue and South Spruce Avenue in South San Francisco. As shown on Plate 5 - Boring Location Map for CUP-41-4, this site is located on relatively flat terrain which is covered with landscaping mulch, lawn and scattered timber logs. The areas surrounding the site are also relatively flat. The site is surrounded to the east by a paved walkway trail which is underlain by the Bay Area Rapid Transit (BART) subway tunnel, to the south by a parking lot for a commercial building, to the west by a two-story commercial office building and its parking lot, and to the north by the sidewalk abutting South Spruce Avenue. Existing underground water main pipelines (Baden Merced, and San Andreas Nos. 2 and 3) and proposed connection main and pump-to-waste pipelines are also shown on Plate 5.

SEISMICITY

The San Francisco Bay Area contains several active faults that could cause strong ground shaking at the project site. Figure 2 – Regional Fault Map shows faults in the vicinity of the subject sites. The San Andreas (1906 Rupture Event and Peninsula Segment) are the nearest active faults and are located within 1.6 miles of the CUP-10A, -18, -19 and -22A sites, and within 2.1 miles of the CUP-41-4 site. The San Andreas is the primary component in a complex system of right-lateral, strike-slip faults; including the San Andreas, San Gregorio-Seal Cove, Hayward, and Calaveras faults; collectively known as the San Andreas fault system. The San Andreas, San Gregorio-Seal Cove, Hayward, and Calaveras faults have produced measurable historic ground motion and movement. The San Andreas fault is capable of producing an earthquake of an estimated maximum magnitude of 7.9. This segment is estimated to have recurrence intervals on the order of 200 years. A summary of nearby faults is presented in Table 2 – Active and Potentially Active Faults.

FIGURE 2
REGIONAL ACTIVE FAULT MAP



Fault Data Sources: CGS 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0, Bryant, W. A. (compiler) and Cao, et. al., 2003, The Revised 2002 California Probabilistic Seismic Hazard Maps, Appendix A - 2002 California Fault Parameters

TABLE 2 – ACTIVE AND POTENTIALLY ACTIVE FAULTS

Fault (Segment or Event)	Distance to Fault (miles)					Estimated Maximum Earthquake Magnitude [1]	Historic Earthquakes [2]	
	CUP-10A	CUP-18	CUP-19	CUP-22A	CUP-41-4		Year	Magnitude
San Andreas							1838	6.8
(1906 rupture)	1.6 [3]	1.6 [3]	1.6 [3]	1.6 [3]	2.1 [3]	7.9 [3]	1898	6.2
(Peninsula)	1.6	1.6	1.6	1.6	2.1	7.2	1906	8.1
(North)	11.2	11.8	19.5	12.9	15.0	7.7	1989	7.1
San Gregorio-Seal Cove							N/A	N/A
(North)	5.5	5.7	5.8	5.8	7.0	7.2		
Hayward							1868	6.8
(North)	17.1	17.1	17.1	17.2	16.5	6.5		
(South)	18.8	18.6	18.5	18.3	17.0	6.7		
Monte Vista-Shannon	20.9	20.4	20.0	19.3	17.1	6.7	N.A.	N.A.
Calaveras							1861	5.3
(North)	26.7	26.6	26.5	26.5	25.5	6.8	1955	5.5
(South)	40.9	40.4	40.1	39.5	37.4	6.2	1979	5.9
							1984	6.1
							2007	5.4

(1) Maximum Moment Magnitude based on California Geological Survey (CGS) fault parameters as updated in 2002 (Cao, et al., 2003), or as suggested by the SFPUC's General Seismic Requirements (SFPUC, 2006).
(2) Historic earthquakes shown may have occurred in other segments of the noted fault.
(3) The 1906 rupture event assumes rupture along the North Coast, Peninsula and Santa Cruz Mountains segments to San Juan Bautista. Maximum magnitude is based on the average 5 m displacement during the 1906 event (WGCEP, 2003; Petersen, et al., 1996).

GEOLOGY

The San Francisco Bay Area is located within the Coast Ranges Geomorphic Province. Past episodes of tectonism have folded and faulted the bedrock, creating the regional topography of the northwest trending ridges and valleys characteristic of the Coast Ranges Geomorphic Province. The San Francisco Bay and vicinity occupy a structurally controlled basin within the province. Late Pleistocene and Holocene sediments (less than 1 million years old) were deposited in the basin as it subsided.

The subject sites at CUP-10A and -18 are located in areas mapped as Colma Formation (Brabb, et al., 1988). Other sedimentary deposits mapped in close proximity to these sites include natural levee deposits, alluvial fan deposits, stream terrace deposits, and Merced Formation. The CUP-19, -22A and -41-4 sites are located in areas mapped as natural levee deposits and Colma Formation. Other sedimentary deposits mapped in close proximity to these sites include historic artificial fill, alluvial fan and stream terrace deposits, and Merced Formation. The geology in the project vicinity is shown on Figure 3 – Regional Geologic Map. Based on a regional geologic study as compiled as a regional geologic cross section of the Westside Basin – Lake Merced (SFPUC, 2008), the Franciscan Complex bedrock is anticipated to be on the order of 600 to 700 feet below ground surface at the subject sites. Geologic maps (Brabb, et al., 1988) describe the identified geologic units as follows:

- **af:** Artificial fill – loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made debris in various combinations and thicknesses which may exceed 30 m; some compacted and quite firm, but fill made before 1965 is nearly everywhere not compacted and consists of simply dumped materials.

- **Qhl:** Natural levee deposits (Holocene) – loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay; porous and permeable and provide conduits for transport of groundwater. Levee deposits border stream channels, usually both banks, and slope away to flatter floodplains and basins. Abandoned levee systems, no longer bordering stream channels, may be present.

- **Qof:** Older alluvial fan and stream terrace deposits (Pleistocene) – poorly consolidated and poorly indurated well- to poorly-sorted sand and gravel with varying thickness probably less than 30 m.

- **Qc:** Colma Formation (Pleistocene) – yellowish-gray, gray, yellowish-orange and red-brown, friable to loose, fine- to medium-grained arkosic sand with subordinate gravel, silt and clay; total thickness is typically unknown, but may up to 60 m.

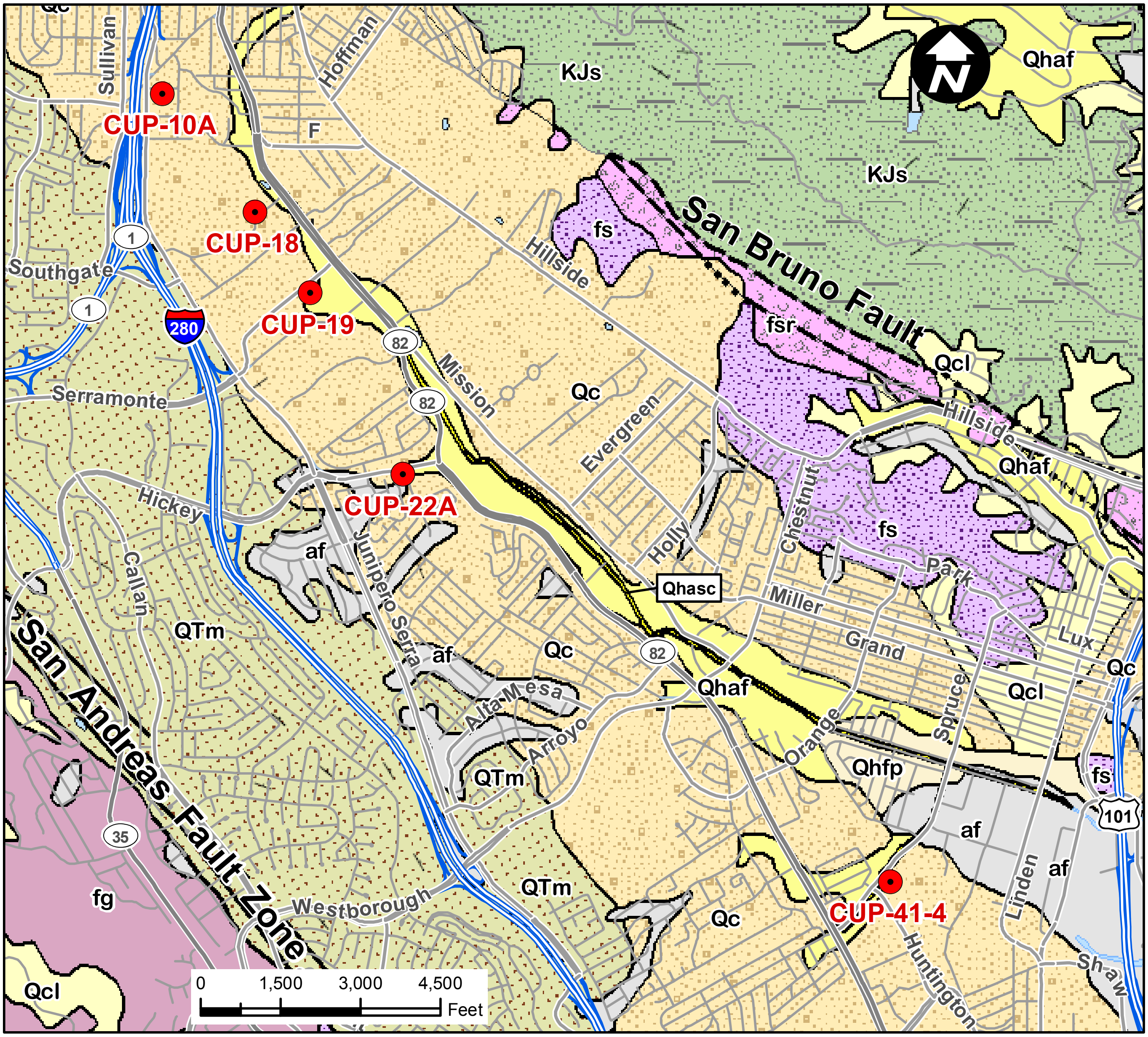
- **QTm:** Merced Formation (lower Pleistocene and upper Pliocene) – medium gray to yellowish gray, yellowish orange, medium- to very fine-grained, poorly indurated to friable sandstone, siltstone, and claystone, with some conglomerate lenses and a few friable beds of white volcanic ash; sandstone is typically silty, clayey, or conglomeratic; fossiliferous conglomerate is well cemented.

- **Qsr:** Slope debris and ravine fill - angular rock fragments in sand, silt, and clay matrix; generally light yellow to reddish brown. Maximum thickness approximately 80 feet.

- **Qd:** Dune sand - clean well-sorted fine to medium sand; yellowish brown to light gray.

- **KJf:** Franciscan Complex – mostly graywacke and shale (fs), and partly unnamed sandstone (KJs); fs consists of greenish gray to buff, fine- to coarse-grained sandstone, with interbedded siltstone and shale; KJs consists of dark gray to yellowish brown graywacke interbedded with shale in approximately equal amounts and resembling fs but the bedding in KJs is better developed.

FIGURE 3
REGIONAL GEOLOGIC MAP



Source: Brabb et. al., 1998, USGS OFR 98-137.

LEGEND

Geologic Units

af	Artificial Fill
Qhasc	Artificial Stream Channels
Qhfp	Floodplain Deposits
Qhaf	Alluvial Fan and Fluvial Deposits
Qcl	Colluvium
Qc	Colma Formation
QTm	Merced Formation
KJs	Unnamed Sandstone of San Bruno Mtn.
fs	Franciscan Sandstone
fg	Franciscan Greenstone
fsr	Franciscan Melange

CUP-22A Conjuntive Use Project (CUP) Sites

Structual Features

- geologic contact
- fault, approx. located
- fault, certain
- fault, concealed

EARTH MATERIALS

The exploratory borings for this investigation at the CUP-10A and -18 sites encountered artificial fill which was underlain by soils of Colma Formation (Qc). An intermediate stratum of natural levee deposits (Qhl) was encountered between the artificial fill and underlying soils of Colma Formation at the CUP-19 and -41-4 sites. At the CUP-22A site, artificial fill was underlain by soils of natural levee deposits to the total depth of exploration.

Artificial Fill. Artificial fill was encountered to depths of approximately 4 to 5 feet in borings GB-10A, -19 and -22A, and approximately 2 feet in borings GB-18 and -41-4. The fill was mainly comprised of light yellowish brown, damp to moist, loose to medium dense, silty fine sand. The origin of this fill at the subject sites of CUP-10A and -18 was likely a result of grading and reuse of on-site, near surface materials of Colma Formation (Qc). The fill at the CUP-19, -22A and -41-4 sites was likely to have originated from on-site, near surface soils of natural levee deposits (Qhl). At the CUP-10A site, the artificial fill was overlain by an asphalt concrete pavement. A surface layer of landscape bark was encountered above the artificial fill at the CUP-41-4 site.

Natural Levee Deposits. At the CUP-19, -22A and -41-4 sites, artificial fill was immediately underlain by soils of the natural levee deposits (Qhl). The thicknesses of the natural levee deposits encountered at the CUP-19 and -41-4 sites are 22, and 15 feet, respectively. The natural levee deposits were underlain by soils of the Colma Formation (Qc). The thickness of the natural levee deposits at the CUP-22A site exceeds 26.5 feet as the bottom contact of the natural levee deposits was not encountered within the total depth of exploration in boring GB-22A. The upper 6 to 8 feet of the soils in the natural levee deposits at the three subject sites consisted of light yellowish to olive brown, damp to moist, loose to medium dense, poorly graded fine sand to silty fine sand. The remaining lower portion of the soils in the natural levee deposits consisted of moist, medium dense to very dense, silty fine sand to sandy silt, and damp to moist, medium stiff to very stiff, sandy clay to clayey sand with some silt. Measured total unit weight ranged from 111 to 131 pounds per cubic feet (pcf), with a moisture content that ranged from 5 to 16 percent.

Colma Formation. Soils of the Colma Formation (Qc) were encountered at the CUP-10A, -18, -19 and -41-4 sites. At the CUP-10A and -18 sites, the soils of Colma Formation were encountered at relatively shallow depths of 5 and 2 feet, respectively, directly underlying the artificial fill. The Colma Formation soils at these two sites consisted of damp to moist, medium dense to very dense, poorly graded fine sand to silty fine sand. At GB-19 and -41-4 sites, the Colma Formation soils, which were encountered at deeper depths of 27 and 17 feet, respectively, were overlain by the natural levee deposits. The Colma Formation soils at these two sites consist of light yellowish to orange brown, moist to wet, dense to very dense, poorly graded fine sand with silt, silty fine sand, and sandy silt. Colma Formation soils at the four sites extended to the total depth of exploration (approximately 30 feet). Measured total unit weight for the Colma Formation soils at the four subject sites ranged from 113 to 129 pcf, with a moisture content ranging from 7 to 17 percent.

GROUNDWATER

Groundwater was not encountered during drilling of our exploratory borings GB-10A, -18, -19 and -22A to the total depths ranging from 30 to 30.5 feet. At GB-41-4, groundwater was encountered during drilling on December 16, 2008 at a depth of 27 feet. A summary of our observed groundwater levels is presented in Table 3 – Observed Groundwater Levels. Seasonal variations are expected to cause fluctuations in groundwater levels.

TABLE 3 – OBSERVED GROUNDWATER LEVELS

Boring	Date of Observation	Depth to Groundwater (feet)
GB-10A	12/15/2008	NE
GB-18	12/15/2008	NE
GB-19	12/15/2008	NE
GB-22A	12/16/2008	NE
GB-41-4	12/16/2008	27

NE = Not encountered.

CONCLUSIONS AND RECOMMENDATIONS

1.0 GENERAL

The following sections provide our conclusions and recommendations for evaluation and design of proposed station buildings at the five subject well sites of CUP-10A, -18, -19, -22A and -41-4. According to the Conceptual Engineering Report (MWH, 2008), station buildings at well sites CUP-10A, -18, -19 and -22A house a well and chemical treatment facilities. The station building at well site CUP-41-4 houses a well and filtration facilities. Based on our findings from our geotechnical field investigation, the CUP-10A and -18 sites are underlain by artificial fill and Colma Formation. Artificial fill at the CUP-22A site is underlain by natural levee deposits. At the CUP-19 and -41-4 sites, an intermediate stratum of natural levee deposits is interbedded between artificial fill and Colma Formation.

We consider the proposed improvements to be geotechnically feasible, provided that our geotechnical recommendations are incorporated into design and construction documents.

2.0 SEISMIC DESIGN CONSIDERATIONS

2.1 **General.** The main seismic hazards at the site are expected to be strong ground shaking and dynamic settlement within isolated zones of loose fill and natural levee deposits. Our seismic design considerations, including fault rupture, ground shaking, liquefaction and dynamic settlement, inundation by tsunamis, seismically-induced landslides, and seismic design with respect to the 2006 International Building Code (which the 2007 California Building Code has adopted) are provided in the following sections.

2.2 **Fault Rupture.** No active or potentially active faults are known to cross the subject sites. Consequently, the hazard posed by ground rupture due to fault offset is considered to be negligible.

2.3 **Ground Shaking**. Strong ground shaking will occur at the site as a result of a moderate to large earthquake occurring on one of the active regional faults. The San Andreas fault is closest to the subject sites (1.6 miles for CUP-10A, -18, -19 and -22A sites; and 2.1 miles for CUP-41-4 site), and therefore has the greatest capability of causing strong ground motions.

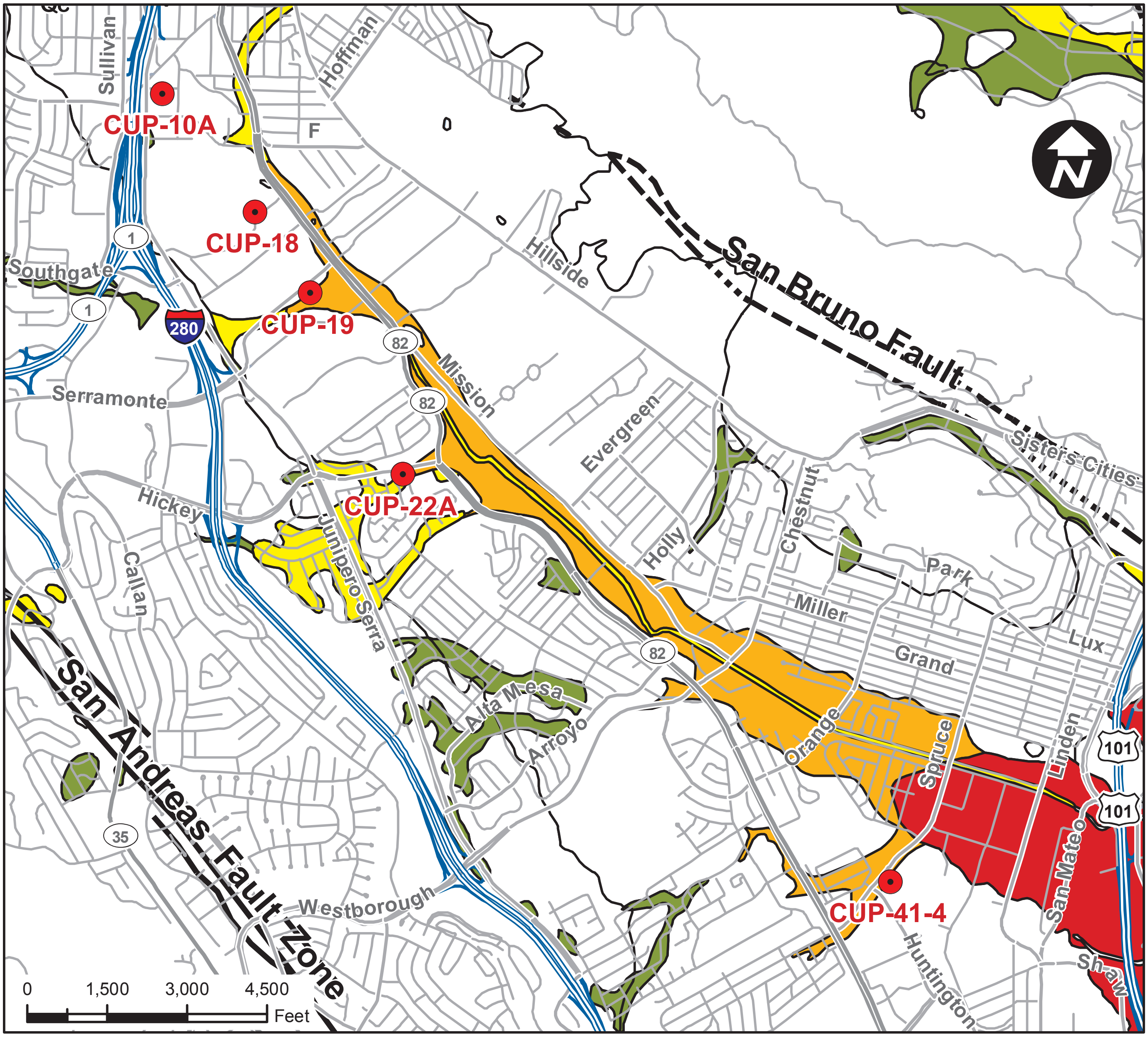
The California Geological Survey (CGS, formerly known as California Division of Mines and Geology) and United States Geological Survey (USGS) completed probabilistic seismic hazard maps in 1996 (Petersen et al., 1996), and subsequently updated fault parameters and revised the maps in 2002 (Cao, et al., 2003). USGS provides a web-based program to evaluate the USGS Probabilistic Uniform Hazard Response Spectra (http://earthquake.usgs.gov/research/hazmaps/design). Based on this data, the PGA at the site is estimated to be 0.71g for an earthquake having a 10 percent probability of exceedance in 50 years.

2.4 Liquefaction and Dynamic Settlement. Liquefaction is a phenomenon wherein a temporary, partial loss of shear strength occurs in a soil due to increases in pore pressure that result from cyclic loading during earthquakes. Saturated, loose to medium dense sands and silty sands are most susceptible to liquefaction. Consequences of liquefaction can include ground settlements, foundation failure, sand boils, and lateral spreading. Dynamic settlement is the densification of saturated and unsaturated soils during strong ground shaking. All soil types are prone to dynamic settlement, though loose, sand and silty sand are most susceptible.

The liquefaction susceptibility, as mapped by Witter et al. (2006), is illustrated on Figure 4 – Liquefaction Susceptibility Map. As can be seen from the figure, well sites at CUP-10A and -18 lie within a zone mapped as having a very low liquefaction susceptibility. The mapped liquefaction susceptibility at sites CUP-10 and -41-4 are moderate, and site CUP-22A lies within a zone mapped between moderate and high liquefaction susceptibility. Because of the regional focus of the liquefaction susceptibility mapping, the data only generally correlates with areas of known liquefaction hazard. The site-specific data from the borings is considered to be more indicative of liquefaction and dynamic settlement hazard. The following paragraphs further describe this hazard based on our subsurface investigation and laboratory testing program.

Due to the absence of groundwater within the 30 feet of total exploration depth for each exploratory boring at the CUP-10A, -18, -19 and -22A sites, and the generally dense nature of the Colma Formation (including the clayey nature of the natural levee deposits at the CUP-22A site) below this depth, liquefaction is not considered to be a significant consideration. Despite the observation of groundwater at a depth of 27 feet at the CUP-41-4 site, liquefaction is also not considered to be a significant consideration because of the dense nature of the Colma Formation encountered at this site. Pore pressure generation and liquefaction may occur in isolated pockets of looser material within the Colma Formation and natural levee deposits. The amount of surface settlement resulting from liquefaction is considered to be negligible at the five subject sites.

FIGURE 4
LIQUEFACTION SUSCEPTIBILITY MAP



Source: Witter, R.C., et. al.., 2006, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California: U.S. Geological Survey Open-File Report 06-1037

LEGEND

CUP-22A Conjuntive Use Project (CUP) Sites

Liquefaction Susceptibility

- Very Low
- Low
- Moderate
- High
- Very High

The amount of dynamic settlement for each site has been evaluated based on an anticipated earthquake event having a 10 percent probability of exceedance in 50 years. Dynamic settlement resulting from strong ground shaking at CUP-10A is estimated at 2 inches due to the loose nature of the artificial fill. At CUP-18, dynamic settlement is estimated at ¼ inch, and is not considered to be significant due to the presence of relatively dense Colma Formation beneath a relatively thin stratum of artificial fill. Dynamic settlement at CUP-19 is estimated at 2 inches, mostly due to a relatively loose layer of poorly graded sand near the upper stratum of natural levee deposits. As a result of a relatively loose layer of silty fine sand within the natural levee deposits, dynamic settlement is estimated at ½ inch for CUP-22A. Dynamic settlement resulting at CUP-41-4 is estimated at 4 inches, and is considered relatively significant due to a loose layer of silty fine sand that spans the upper 6 feet of the natural levee deposits. The hazard posed by dynamic settlement is therefore considered to be low at CUP-18 and -22A, and moderately high at CUP-10A, CUP-19 and -41-4.

2.5 **Inundation by Tsunamis.** Tsunamis are long period waves usually caused by underwater seismic disturbances, volcanic eruptions, or submerged landslides. The disturbance can occur thousands of miles from the San Francisco area, and generate a tsunami wave that affects the site. As tsunami waves approach the coast, they may increase in height to tens of feet.

Flooding due to tsunami is unlikely to occur at CUP-10A, -18, -19 and -22A due to their relatively high ground elevations and distance from the open Northern California coastline. Although CUP-41-4 is located on relatively low lying terrain estimated on the order 25 to 30 feet above Mean Sea Level (MSL), the potential of flooding during a tsunami is unlikely because of the distance to San Francisco Bay.

2.6 **Seismically-Induced Landslides.** Based on the flat topography surrounding the sites of CUP-10A, -22A and -41-4, seismically-induced landslide hazards do not exist at these sites. An elevated automobile dealership parking lot to the west of CUP-19 is not likely to pose seismically-induce landslide hazards because of an existing concrete retaining structure and 30 to 40 feet of setback distance between the retaining wall and proposed station building. At CUP-18 which is located at the foot of a mildly sloping terrain (on the order of 7:1 horizontal to vertical side slope ratio), seismically-induced landslide hazards are considered not likely because of the dense nature of the subsurface soils and absence of shallow groundwater.

2.7 **Seismic Design Parameters.** The proposed improvements may be designed in accordance with the International Building Code Static Force Procedure (ICC, 2006) using the seismic parameters as presented in Table 4 – 2006 International Building Code (IBC) Seismic Design Parameters in developing the site seismic response:

TABLE 4 – 2006 INTERNATIONAL BUILDING CODE SEISMIC DESIGN PARAMETERS

	Site CUP-10A	Site CUP-18	Site CUP-19	Site CUP-22A	Site CUP-41-4
Site Class	C	C	D	D	C
S_s (1) at 0.2-second	2.17	2.16	2.16	2.17	2.07
S_1 (1) at 1-second	1.22	1.21	1.21	1.22	1.13
Site Coefficient F_a	1.0	1.0	1.0	1.0	1.0
Site Coefficient F_v	1.3	1.3	1.5	1.5	1.3

(1) Maximum Considered Earthquake (MCE) Spectral Response Acceleration (in g).

3.0 GROUNDWATER

With the exception of exploratory boring GB-41-4, groundwater was not encountered in the remaining four 30-foot deep exploratory borings. At GB-41-4, groundwater was encountered during drilling at a depth of 27 feet below ground surface. The observation of groundwater at GB-41-4 is consistent with the 1½-mile proximity of the site from the San Francisco Bayshore coastline to the east, and the relatively flat, low lying topography (ground elevations on the order of 25 to 30 feet above mean sea level). It should be noted that groundwater levels are influenced by seasonal variations in precipitation, local irrigation, groundwater pumping and other factors, and are therefore, subject to variation. To account for seasonal variations, we recommend conservative design groundwater levels for structural design purposes as presented in Table 5 – Recommended Design Groundwater Levels. The actual depth to groundwater is expected to be considerably deeper.

Groundwater related design issues such as hydrostatic pressures on shoring elements (if implemented), excavation dewatering, and hydrostatic uplift pressures on the proposed buildings are not anticipated for excavations less than 20 feet below the ground surface at the relatively flat sites of CUP-10A, -19, -22A and -41-4. Due to a sloping terrain at CUP-18, the aforementioned groundwater related issues are not anticipated for excavations less than 15 feet below the ground surface. For excavations exceeding the mentioned depths, the contractor should anticipate groundwater inflow and the need for dewatering.

TABLE 5 – RECOMMENDED DESIGN GROUNDWATER LEVELS

Site Location	Recommended Design Groundwater Depth (feet)
CUP-10A	20
CUP-18	15
CUP-19	20
CUP-22A	20
GB-41-4	20

4.0 EARTHWORK

4.1 **General.** Given the earth materials on the project sites encountered during our exploration, the contractor should be able to carry out planned excavations using conventional heavy equipment.

Evaluation of the presence, or absence, and treatment of hazardous materials was not part of this study. If hazardous materials are encountered during excavation, proper handling and treatment during construction will depend on the contaminant type, concentration, and volatility of the contaminated materials.

General geotechnical considerations for site preparation, excavations, temporary shoring and bracing, engineered fill material, engineered fill placement and compaction, pipe bedding, and utility trench backfill are presented in the following sections.

4.2 **Site Preparation.** Site preparation will consist of demolition, excavation and removal of on-site materials such as pavement, concrete, abandoned utilities, and miscellaneous debris in preparation for the foundation excavations. Any creation of holes from the removal of such materials should be backfilled with engineered fill. Recommendations for engineered fill are provided in Sections 4.5 and 4.6. Also as part of site preparation, the location of active underground utilities should be determined and, if affected by construction activities, should be relocated or protected.

4.3 **Excavations.** We anticipate that excavations for the planned building improvements to extend up to only a few feet below existing ground elevation. Since CUP-18 is located near the foot of mildly sloping terrain, greater excavation may be necessary at this site.

Shallow excavations for the well station buildings will allow for unshored excavations with adequately sloped sidewalls. Vertically shored walls or braced excavations are anticipated where space constraints may not allow for open, sloped excavations. At a minimum, excavations should be constructed in accordance with the current California Occupational Safety and Health Administration (OSHA) regulations (Title 8, California Code of Regulations) pertaining to excavations. Temporary cut slopes are expected to be stable for configurations described in Title 8 for Type C soils and where unsupported should be cut back no steeper than 1 ½ horizontal to 1 vertical. All excavations should be closely monitored during construction to detect any evidence of instability.

Care should be taken when excavating near existing utilities and pipelines. Excavations can undermine support of adjacent existing pipelines and other subsurface structures. We recommend that some form of vertical shoring system be considered for excavated sidewalls that are adjacent to existing pipelines or other known buried adjacent structures.

As indicated in Section 2.4, loose fill soils at CUP-10A and -19 sites, and loose soils in the upper portion of natural levee deposits at CUP-19 and -41-4, may settle excessively during a seismic event, and may require mitigation if the estimated settlements exceed tolerable levels. Some of the near surface loose soils at the five subject sites will likely be removed during excavation for the proposed improvements. If any footings are founded above loose soils, overexcavation of loose soils and replacement with engineered fill may be required. For loose natural levee deposits encountered at depths of 8 to 12 feet at CUP-19, and 2 to 6 feet at CUP-41-4, removal of materials via conventional grading involving earth removal and replacement may not be practical; instead, remediation of loose materials at intermediate depths can be performed using densification improvement methods, as discussed in Section 6.3.

4.4 **Temporary Shoring and Bracing.** The type and design of the shoring will depend on the depth of excavation and excavation-bracing sequence. The shoring and bracing design and installation should be the responsibility of the construction contractor. As a general guideline, construction procedures, excavations, and design and construction of any temporary shoring should comply with the current OSHA Title 8 regulations pertaining to excavations. The shoring and bracing should accommodate surcharge loads that may be imposed by adjacent structures, traffic, or construction activities.

Possible shoring schemes include soldier pile and lagging and steel sheeting, both of which may include internal bracing struts to limit lateral deflections. Such braced and shored excavations will be subjected to lateral earth pressures. Recommended active, at-rest, and passive lateral earth pressures are provided in Section 5.

Horizontal and vertical movements of the ground are possible in the vicinity of the excavations. These movements can generally be reduced to acceptable levels by use of a properly designed and constructed shoring system. Measures should be taken to prevent the loss of sand through the gaps in the shoring or lagging.

4.5 **Engineered Fill Material.** Material for engineered fill should be inorganic, well graded, free of rocks or clods greater than 4 inches in greatest dimension or any other deleterious materials, and have a low potential for expansion. The material should have a liquid limit less than 35, a plasticity index less than 15 and no more than 25 percent passing the No. 200 sieve. Existing on-site soil may be re-used as engineered fill provided it meets the above criteria.

4.6 Engineered Fill Placement and Compaction. Engineered fill should be placed in layers no greater than 8 inches in uncompacted thickness, conditioned with water or allowed to dry to achieve a moisture content near optimum, then mechanically compacted to at least 90 percent relative compaction based on ASTM D1557. All engineered fill placed to support footings and the upper 6 inches of engineered fill supporting slabs-on-grade should be mechanically compacted to at least 95 percent relative compaction as determined by ASTM D1557. All compaction should be performed using mechanical compaction means; flooding or jetting should not be used as a means to achieve compaction. The ASTM D1557 laboratory compaction tests should be performed at the time of construction to provide a proper basis for compaction control.

4.7 Pipe Bedding for Small Diameter Pipes. Pipe bedding should consist of well-graded sand or a sand-gravel mixture. Maximum gravel size should be ½ inch and the bedding material should have less than 12 percent passing the No. 200 sieve. Uniformly graded material such as pea gravel should not be used as pipe bedding material. Pipe bedding should have a minimum thickness of 6 inches beneath the pipe and 6 inches above the pipe. If soft or otherwise unsuitable soils are exposed in the bottom of the trench excavation, the necessity of over-excavation should be evaluated by the project geotechnical engineer. All pipe bedding should be placed to achieve uniform contact with the pipe and a minimum relative compaction of 90 percent per ASTM D1557.

4.8 Utility Trench / Pipe Backfill. Utility and pipe trenches may be backfilled above the pipe zone with excavated on-site soils, provided they meet the gradation requirements of engineered fill. The backfill material should be placed in layers no greater than 8 inches in uncompacted thickness, moisture conditioned or allowed to dry to achieve a moisture content near optimum, then mechanically compacted to at least 90 percent relative compaction based on ASTM D1557. The upper 2 feet should be compacted to at least 95 percent relative compaction in areas where structural or traffic loads are anticipated.

5.0 LATERAL EARTH PRESSURES

5.1 Active Earth Pressure. Active earth pressures are imposed by the soil on walls that are unrestrained so that the top of the wall is free to translate or rotate at least 0.004H, where H is the height of the wall. The active earth pressure may be calculated using a design equivalent fluid pressure (EFP) for each of the subject sites as indicated in Table 6.1 – Active Earth Pressures.

TABLE 6.1 – ACTIVE EARTH PRESSURES

Site Location	CUP-10A	CUP-18	CUP-19	CUP-22A	CUP-41-4
Active EFP (1) (pcf)	30	30	35	35	35

1. EFP assumes that excavations do not extend below the groundwater table.

5.2 **At-Rest Earth Pressure.** At-rest pressures should be used for design of walls that are restrained such that the deflections required to develop active earth pressures cannot occur or are undesirable. The at-rest earth pressures may be calculated using a design EFP for each of the subject sites as indicated in Table 6.2 – At-Rest Earth Pressures.

TABLE 6.2 – AT-REST EARTH PRESSURES

Site Location	CUP-10A	CUP-18	CUP-19	CUP-22A	CUP-41-4
At-Rest EFP (1) (pcf)	50	50	55	55	55

1. EFP assumes that excavations do not extend below the groundwater table.

5.3 **Seismic Earth Pressure.** In addition to the active and at-rest pressures, retaining walls should be designed to consider additional earth pressures due to earthquake loading. The increment in earth pressure due to seismic loading, for both restrained and unrestrained below-grade walls, may be calculated using an inverted triangular distribution with the pressure at the top of the wall equal to a design earth pressure (EP) of 30H, wherein H is the height of the wall in feet, and diminishes to zero at the base of the wall, as indicated in Table 6.3 – Seismic Earth Pressures.

TABLE 6.3 – SEISMIC EARTH PRESSURES

Site Location	CUP-10A	CUP-18	CUP-19	CUP-22A	CUP-41-4
Seismic EP (1) at Top of Wall (psf)	30 H (2)	30 H (2)	30 H (2)	30 H (2)	30 H (2)

1. EFP assumes that excavations do not extend below the groundwater table.
2. H is the height of the wall in feet, and diminishes to zero at the base of the wall.

5.4 **Passive Earth Pressure.** Lateral loads on structures can be resisted by passive pressures that develop against the sides of below-grade structures such as walls or footings. The passive pressure depends on the lateral displacement of the wall or footing. In accordance with FEMA 356 (FEMA, 2000), the ultimate passive pressure is mobilized at a displacement of approximately 6 percent of the wall height. The ultimate passive earth pressure may be calculated using a design EFP that corresponds to the ultimate EFP as long as the structure can be mobilized to such level of displacement and still does not exceed the allowable displacement of the structure. Oftentimes, the displacement to achieve ultimate passive earth pressures exceeds the allowable displacement of the structure. Consequently, a design EFP needs to be reduced when the allowable displacement of the structure is less than 6 percent of the wall height. For displacements of approximately 0.8 and 3 percent of the wall height, the design EFP may be reduced to 50 and 85 percent of the ultimate EFP. Passive pressures computed using these design EFPs may be combined with the base friction mobilized at the concrete-soil interface to resist lateral loading (see Section 5.5). The passive earth pressures may be computed using the following design EFPs as indicated in Table 6.4 – Passive Earth Pressures:

TABLE 6.4 – PASSIVE EARTH PRESSURES

Site Location	CUP-10A	CUP-18	CUP-19	CUP-22A	CUP-41-4
Passive Ultimate EFP (1) at 6% Wall Height Displacement (pcf)	390	390	425	425	360
Passive EFP (1) at 3% Wall Height Displacement (pcf)	330	330	360	360	305
Passive EFP (1) at 0.8% Wall Height Displacement (pcf)	195	195	215	215	180

1. EFP assumes that excavations do not extend below the groundwater table.

5.5 **Base Friction.** A coefficient of friction of 0.4 may be used for estimating the resistance due to base friction. The coefficient should be multiplied by the dead load only. The passive earth pressure and base friction mobilized at the concrete-subgrade interface may be combined to resist lateral loading.

6.0 FOUNDATIONS

6.1 **Subgrade Preparation.** Subgrades to new shallow foundations for the proposed structures should be prepared to provide a flat, relatively dry, and firm working surface. If any unsuitable materials, such as, soft clays or silts, soils containing organic material, debris or other deleterious materials are encountered at subgrade, they should be over-excavated and restored to grade with engineered fill in accordance with Sections 4.5 and 4.6. The fill soils encountered in our exploratory borings were suitable for support of the proposed improvements provided the upper 12 inches are scarified, moisture conditioned, and recompacted. We recommend that the upper 12 inches of subgrade be scarified, moisture conditioned to near optimum moisture content, and compacted in accordance with Sections 4.5 and 4.6. The subgrade should be free of loose debris and ponded water prior to placing reinforcing steel and concrete.

6.2 Shallow Foundation Alternatives. A shallow foundation system is suitable for support of the proposed improvements at the subject sites. Alternatives for shallow foundation systems include grade beams / shallow footings, mat foundations, and post-tensioned foundations.

Grade Beams / Shallow Footings: Based on the findings from our subsurface evaluation and laboratory testing, the ultimate bearing capacity of soils below new footings within the footprint of proposed buildings varies according the geotechnical characteristics of soils encountered at each subject site. We recommend an ultimate bearing capacity of 10,000 pounds per square foot (psf) for soils below new footings at the CUP-10A, -18 and -19 sites, 11,000 psf for CUP-22A, and 7,600 psf for CUP-41-4. Settlement of footings to attain these ultimate bearing capacities are expected to be on the order of about 2 inches, and could be significantly more as the ultimate bearing capacity is exceeded. To limit foundation settlements to less than ½ inch for dead and live loads and less than 1 inch for total loads including wind and seismic, the allowable bearing capacities provided in Table 7 – Allowable Bearing Capacities of Grade Beams and Shallow Footings may be used.

TABLE 7 – ALLOWABLE BEARING CAPACITIES OF GRADE BEAMS AND SHALLOW FOOTINGS

Sites	Load Combination	Allowable Bearing Capacity
CUP-10A CUP-18 CUP-19	Dead Load	3,300 psf
	Dead + Live Load	3,800 psf
	Dead + Live + Wind or Seismic Loads	5,000 psf
CUP-22A	Dead Load	3,600 psf
	Dead + Live Load	4,100 psf
	Dead + Live + Wind or Seismic Loads	5,400 psf
CUP-41-4	Dead Load	2,500 psf
	Dead + Live Load	3,000 psf
	Dead + Live + Wind or Seismic Loads	3,800 psf

Allowable bearing capacities recommended herein are applicable to newly constructed footings with widths of at least 18 inches and footing embedment of at least 24 inches below lowest adjacent grade.

A static modulus of subgrade reaction of 60 pounds per cubic inch (pci) may be used in order to develop soil springs below the foundation elements. For the lateral resistance of grade beams and footings, the geotechnical design parameters provided in the Lateral Earth Pressures section may be used.

As discussed in Section 2.4, dynamic settlements of up to approximately ½ inch may affect the CUP-18 and -22A sites during an earthquake event. The remaining three sites are more susceptible to significant dynamic settlements during an earthquake event. Larger dynamic settlements, on the order of 2 inches at CUP-10A and CUP-19, and 4 inches at CUP-41-4, are anticipated during an earthquake event if these sites are not mitigated. These dynamic settlements are in addition to the settlements estimated for the building loads described above. Long-term consolidation settlements are not likely due to the granular nature of much of the subsurface soils, and the stiffness and overconsolidation of clayey soils.

***Mat Foundations*:** Effects from differential dynamic settlements at the CUP-10A, -19 and -41-4 sites may be limited by supporting the structures at these sites on structurally rigid mat foundations. A mat foundation is a large concrete slab, designed by a structural engineer for specific use, to interface one or more columns or pieces of equipment with the foundation soil. It may encompass the entire foundation footprint or only a portion. The mat contact stresses are generally lower than other shallow foundation types due to distribution of stress over a larger area and stress compensation from excavated soil. Thickness and reinforcement of the mat foundation should be in accordance with the recommendations of a structural engineer. The appropriate allowable contact pressure(s) beneath the mat foundations will vary with their size, shape, and other factors. To limit foundation static settlements to less than ½ inch for dead and live loads and less than 1 inch for total loads including wind and seismic, the contact pressure beneath the mats should not exceed the allowable bearing capacities as recommended in Table 7 – Allowable Bearing Capacities for Grade Beams and Shallow Footings. Mat foundations typically experience some deflection due to loads placed on the mat and the reaction of the soils underlying the mat. A design coefficient of subgrade reaction, $\mathbf{K_{v1}}$, of 260 kips per cubic foot (kcf) in compacted fill soils may be used for evaluating such deflections at the subject sites. This value is based on a square foot area and should be adjusted for the planned mat size. The coefficient of subgrade reaction, $\mathbf{K_B}$, for a mat of a specific dimension may be evaluated using the following equation:

$$\mathbf{K_{B}, = K_{v1}\ [(B+1)/2B]^2\ [(1+0.5(B/L)/1.5]}$$

where **B** is the width and **L** is the length of the foundation measured in feet.

Mat foundations bearing on fill may be designed using a coefficient of friction of 0.4 (total frictional resistance equals coefficient of friction times the dead load). The allowable lateral resistance can be taken as the sum of the frictional resistance and passive resistance provided the passive resistance does not exceed two-thirds of the total allowable resistance. For mat foundations, we recommend a passive resistance value of 300 psf per foot of depth, with a value not to exceed 3,000 psf. The passive resistance may be increased by one-third when considering loads of short duration such as wind or seismic forces.

***Post-Tensioned Foundations*:** Effects from differential dynamic settlements at the CUP-10A, -19 and -41-4 sites may be limited through the application of post-tensioning in reinforcing, and hence, increasing the structural rigidity of grade beams / shallow footings. Thickness and reinforcement of a post-tensioned foundation should be in accordance with the recommendations of a structural engineer.

6.3 **Densification Improvements.** Dynamic settlements of loose granular soils at CUP-10A, -19, and -41-4 are anticipated during an earthquake event if these sites are not mitigated. An estimate of the amount of dynamic settlement and the depth to the zone of susceptible soils are provided in Table 8 - Densification Improvements to Mitigate Dynamic Settlements. If the structures cannot be designed to withstand this amount of settlement, densification may be an option to improve susceptible soils. Due to the existing pipelines at the sites, it may be difficult to improve the soils without causing settlement of the pipelines or otherwise damaging them. Once the site layouts are finalized and the existing pipelines accurately located, we can provide further recommendations regarding densification improvements.

TABLE 8 – DENSIFICATION IMPROVEMENTS TO MITIGATE DYNAMIC SETTLEMENTS

Site Location	**CUP-10A**	**CUP-18**	**CUP-19**	**CUP-22A**	**CUP-41-4**
Estimated Dynamic Settlement (inches)	2	¼	2	½	4
Improvement Depth of Loose Granular Soils (feet)	5±	-- [3]	12±	-- [3]	12±
Potential Method(s) of Improvement [1]	RAP RIC OR [2]	-- [3]	RAP RIC	-- [3]	RAP RIC

1. Densification improvement methods are denoted by RAP for Rammed Aggregate Piers and RIC for Rapid Impact Compaction.
2. For the CUP-10A site, conventional method of overexcavation and recompaction (OR) of loose granular soils is also a viable alternative to the above densification improvement methods.
3. Densification improvements are not necessary because the potential for dynamic settlement is low at CUP-18 and -22A.

The loose granular soils at CUP-10A can be mitigated by overexcavation and recompaction. Loose granular soils as encountered in the upper natural levee deposits at CUP-19 and -41-4 are susceptible to dynamic settlements on the order of 2 and 4 inches, respectively, if they are left unmitigated. Since such susceptible materials were encountered at intermediate depths within the upper 12 feet and 8 feet at GB-19 and -41-4, densification improvements and/or intermediate foundation systems may be preferable and more feasible than earth grading involving mass excavation and recompaction of loose materials, or a deep foundation system. Intermediate foundations such as Rammed Aggregate Piers (RAP) and Rapid Impact Compaction (RIC) may be suitable in mitigating the potential for post-earthquake dynamic settlements of loose materials at CUP-19 and -41-4.

RAP is constructed by either replacement (drilling a cavity) or displacement (driving a mandrel) to the depth of treatment, and ramming select aggregate in thin lifts to form compacted aggregate “bulbs” and densified materials surrounding the aggregate (Farrell, et al., 2004 and 2008; Majchrzak, et al., 2004). While the replacement process allows better quality control through visual inspection of drill spoils, the displacement approach eliminates spoils and is suitable for granular materials. Predrilled shafts are typically 24, 30, 33 and 36 inches in diameter. The ramming equipment typically consists of 18- to 27-ton hydraulic excavators equipped with 2,000- to 4,000-pound hydraulic break hammers and specially modified beveled tampers. The hydraulic hammer typically delivers 1 to 2 million ft-lbs of ramming energy per minute to the beveled tamper at 300 to 500 blows per minute. The ramming action increases the lateral stress in the surrounding soil and increases stiffness of the stabilized composite soil mass. The beveled tamper densifies and embeds the crushed aggregate laterally into the sidewalls of the shaft. Densification in both vertical and lateral (radial) directions enhances shear strength, bearing capacity and stiffness of the mitigated soil mass. RAP is typically effective for intermediate treatment depths up to 30 feet. When RAP aggregate is extracted from locally recycled concrete or any of the materials approved by the US Green Building Council (USGBC), points can be earned toward a Green Building certification in accordance with the Leadership in Energy and Environmental Design (LEED) rating system.

RIC is economically viable in recompacting loose materials at intermediate depths beyond practical/feasible reach of conventional mass grading. Similar to the ground improvement principles for RAP, RIC increases bearing capacity, controls dynamic settlement, and reduces potential for liquefaction by increasing density and strength of loose materials within the treatment depth (Kristiansen, 2004; TerraSystems, Inc., undated). RIC, which was originally developed by the British Sheet Piling, Limited in collaboration with the British Ministry of Defence, is an improvement on the process of Deep Dynamic Compaction (DDC) for many applications. Excavator mounted equipment provides controlled impact compaction of the earth by dropping a 7.5-ton weight approximately 4 feet onto a 5-foot diameter tamper at a rate of 40 to 60 times a minute. The energy transfer of RIC to the ground is relatively efficient because its tamper stays in contact with the ground during the impacting sequence. Densification of underlying loose materials is sustained from repeated dynamic impact energy imparted from the compaction tamper. Depth of impact is typically on the order of 10 feet to 20 feet. Treatment depth diminishes with increasing presence of fines in the subsurface materials. It is advantageous to perform RIC after stripping and limited removal of shallow overburden fill.

Quality assurance of the remediation program, which consists of post-treatment density evaluation, is an integral part of the acceptance testing program. Cone penetration testing (CPT) is typically used in providing continuous measurement of the soil density of the improved site.

6.4 **Floor Slabs.** Slabs-on-grade should be supported on a 12-inch thick mat of compacted, engineered fill. Material for engineered fill and compaction requirements are presented in Sections 4.5 and 4.6. For moisture-sensitive flooring, floor slabs resting on soil should be underlain, at a minimum, by a capillary break system. We recommend 6 inches of clean coarse sand or pea gravel. When floor dampness is a concern, such as at CUP-41-4 where elevated moisture content was observed in the near surface soils, floor slabs should be underlain by a vapor barrier and capillary break system. We recommend a system consisting of a 10-mil polyethylene (or equivalent) membrane placed over 6 inches of clean coarse sand or pea gravel. The exposed subgrade should be moistened just prior to the placement of the capillary break system. A sand layer above the moisture barrier to aid in concrete curing should be evaluated by the structural engineer. The slab underlayment including the capillary break can be taken as part of the 12-inch thick pad of compacted, engineered fill described above. Flooring and waterproofing consultants should be consulted for additional slab waterproofing recommendations.

7.0 CORROSION

Schiff Associates performed corrosivity laboratory tests on one soil sample for each of the five subject sites. Their laboratory results are included in Appendix A – Supporting Geotechnical Data. They performed the following tests:

- Resistivity (As-Received and Saturated),
- pH,
- Electrical Conductivity,
- Chemical Analyses of Cations (e.g. Calcium, Magnesium, Sodium)
- Chemical Analyses of Anions (e.g. Carbonate, Bicarbonate, Chloride, Sulfate)
- Chemical Analyses of Ammonium
- Chemical Analyses of Nitrate
- Chemical Analyses of Sulfide
- Oxidation-reduction (Redox) Potential

Electrical resistivities indicate soils are mildly corrosive to ferrous metals. The soil pH values were near neutral. The soluble salt contents of the samples were low, and on-site soils present a negligible sulfate exposure to concrete structures.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 **Existing Underground Utilities.** A number of underground water main pipelines pass beneath and in the vicinity of the proposed sites, including the Baden Merced, California Water Main, Daly City Water Main, San Andreas No. 2, San Andreas No. 3, San Bruno Water Main and Sunset Supply pipelines. Other existing subsurface lines include the SFPUC transmission lines, sanitary sewer and storm sewer lines. Some of these utilities were located and marked prior to our subsurface investigation so that we would not damage them during drilling.

The City may consider remarking these utilities prior to construction of the improvements so they remain visible during earthwork and construction of the subject improvements. Any excavations made adjacent to existing utilities should be backfilled with on-site or imported soil to at least 90 percent relative compaction as evaluated by ASTM D 1557.

8.2 **Vibration and Noise Control During Densification Improvements.** Peak soil particle velocities generated from vibrations during either RAP or RIC will vary with soil type, and will increase as the degree of compaction achieved increases. A test section using the proposed method of densification should be performed prior to production to establish a safe working distance from adjacent vibration-sensitive structures. For protection of existing sensitive underground water main pipelines near the proposed building footprint from ground-borne vibrations induced by either RAP or RIC, the use of open excavated cut-off trenches may be considered in attenuating densification-induced vibrations.

The level of air-borne noise generated by the RAP and RIC equipment in an open site, as well as a hearing protection zone, needs to be evaluated as part of the construction considerations.

8.3 **Surface Drainage.** Proper surface drainage is essential for satisfactory site performance. Positive drainage should be provided and maintained to direct surface water away from building foundations and other site improvements. Positive drainage is defined as a slope of 2 percent or more over a distance of 5 feet or greater away from the foundations, flatwork, and tops of slopes. Runoff should then be directed by the use of swales or pipes into a collective drainage system. Surface water should not be allowed to pond adjacent to footings. We further recommend that the proposed structure be equipped with appropriate roof gutters and downspouts. Downspouts should discharge to a system of closed pipes that transport the collected water to a suitable discharge facility. We recommend that drought tolerant vegetation be used for site landscaping. Irrigation should be kept at levels just sufficient to maintain plant vigor.

9.0 CLOSURE

The conclusions and recommendations presented herein are professional opinions based on geotechnical and geologic data and the project as described. A review by this office of any foundation, excavation, grading plans and specifications, or other work product that relies on the content of this report, together with the opportunity to make supplemental recommendations is considered an integral part of this study. Should unanticipated conditions come to light during project development or should the project change from that described, we should be given the opportunity to review our recommendations.

The findings and professional opinions presented in this report are presented within the limits prescribed by the client, in accordance with generally accepted professional engineering and geologic practices. There is no other warranty, either express or implied, regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

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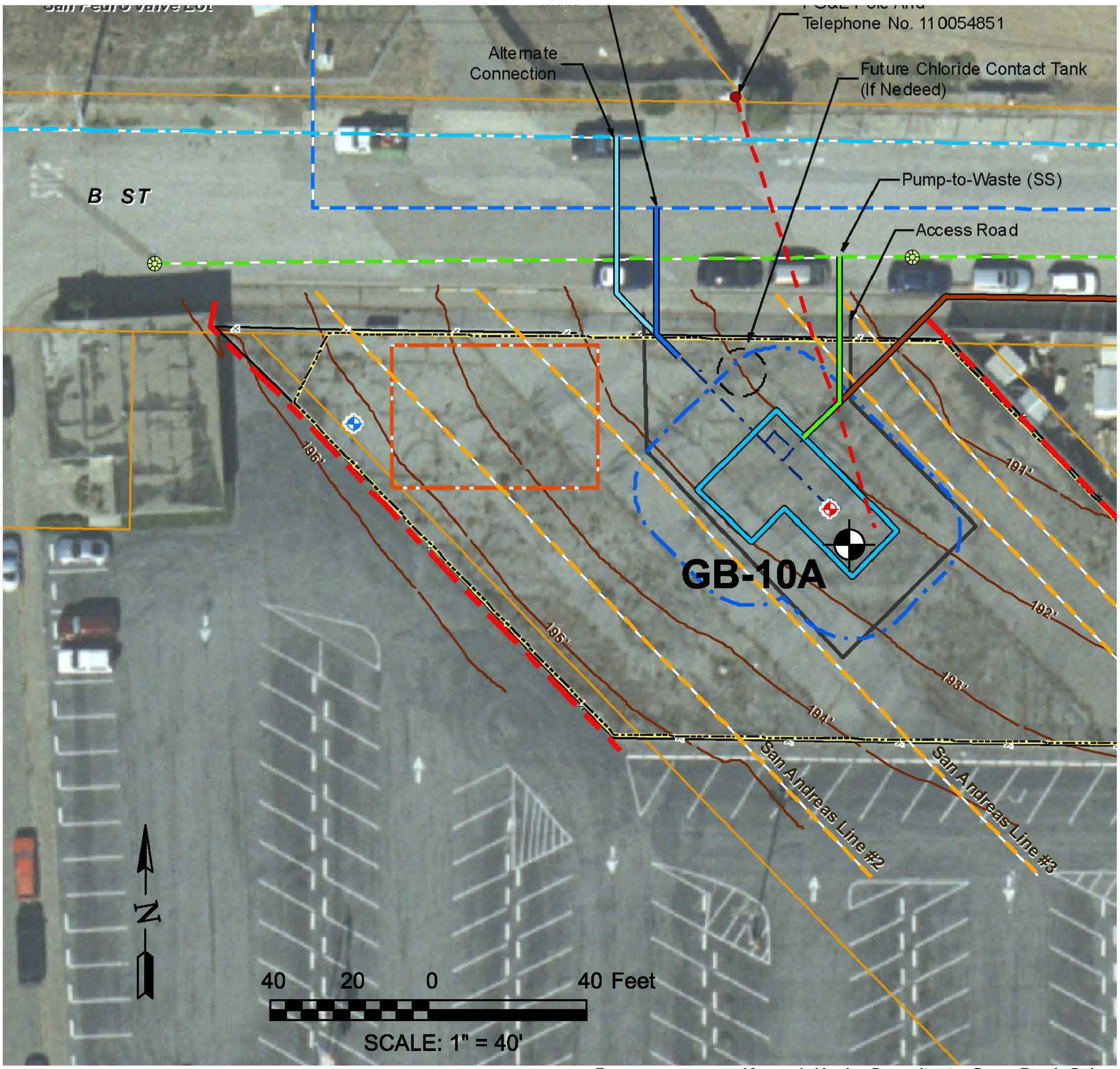
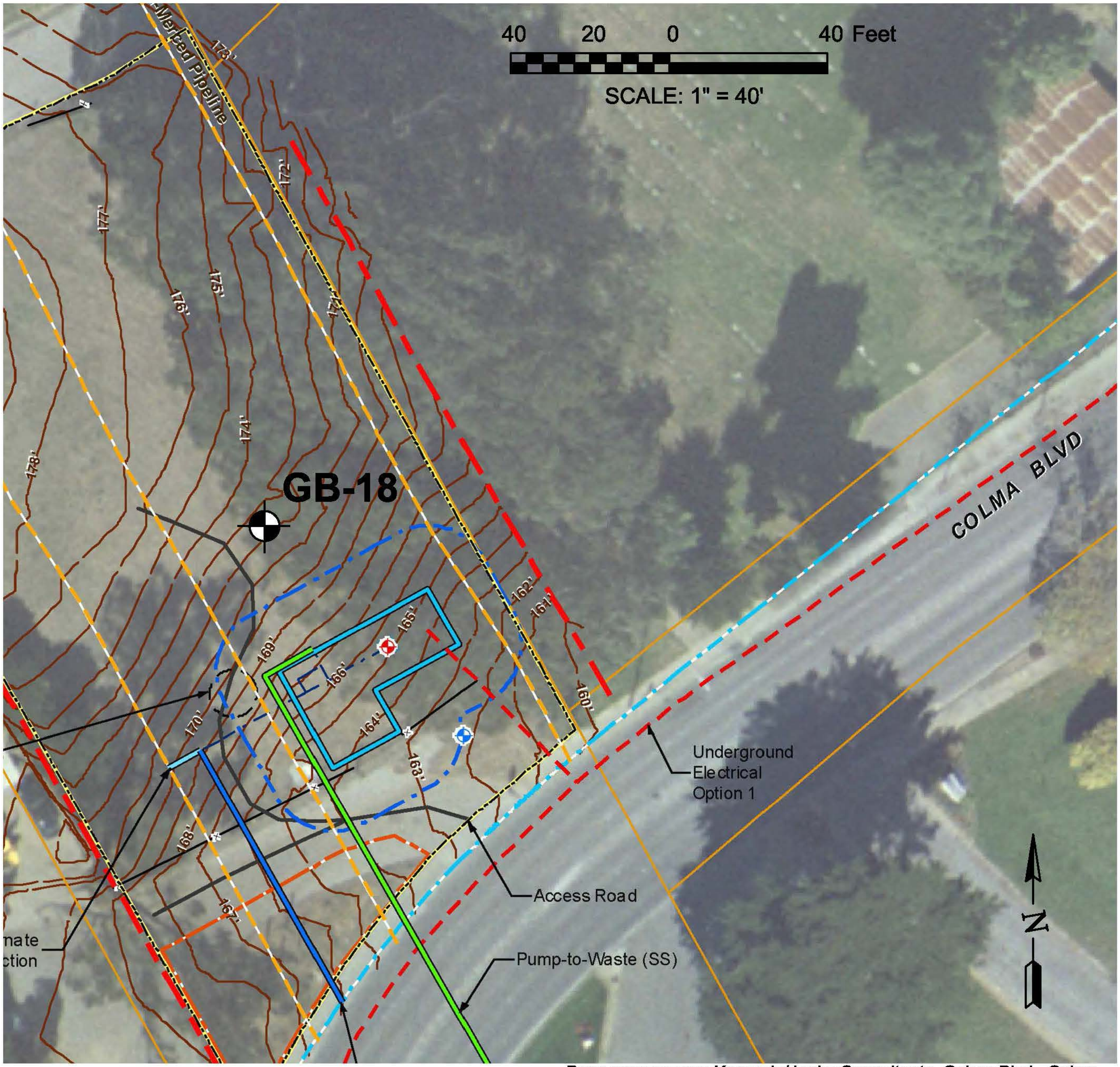


Base map source: Kennedy/Jenks Consultants, Serra Bowl, Colma, CUP-10A location map, dated 2/2/2009.

LEGEND

- Test Well
- Monitoring Well
- GB-10A Geotechnical Boring by Geotechnical Consultants, Inc. in December 2008.
- ConstructionArea
- StagingAreaBoundary
- Construction Area-16ft Building Buffer
- BuildingOutline
- AccessRoad
- Proposed Connection Main
- Alternate Connection
- Pump-to-Waste (SS)
- Pump-to-Waste (SD)
- RightOfWay
- Fence
- Topography
- Parcels - San Mateo County
- Transmission Line - SFPUC
- PG&E Pole
- Underground Electrical
- Water - CalWater
- Water - DalyCity
- Stormdrain Catch Basin - DalyCity
- Stormdrain Manhole - DalyCity
- Stormdrain - DalyCity
- Sanitary Sewer Manhole - DalyCity
- Sanitary Sewer - DalyCity

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	BORING LOCATION MAP FOR SITE CUP-10A	PLATE 1
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	APRIL 2009	SF08034



Base map source: Kennedy/Jenks Consultants, Colma Blvd., Colma, CUP-18 location map, dated 2/2/2009.

LEGEND

- Test Well
- Monitoring Well
- GB-18 Geotechnical Boring by Geotechnical Consultants, Inc. in December 2008.
- ConstructionArea
- StagingAreaBoundary
- Construction Area-16ft Building Buffer
- BuildingOutline
- AccessRoad
- Proposed Connection Main
- Alternate Connection
- Pump-to-Waste (SS)
- Pump-to-Waste (SD)
- RightOfWay
- Fence
- Topography
- Parcels - San Mateo County
- Transmission Line - SFPUC
- PG&E Pole
- Underground Electrical
- Water - CalWater
- Water - DalyCity
- Stormdrain Catch Basin - DalyCity
- Stormdrain Manhole - DalyCity
- Stormdrain - DalyCity
- Sanitary Sewer Manhole - DalyCity
- Sanitary Sewer - DalyCity

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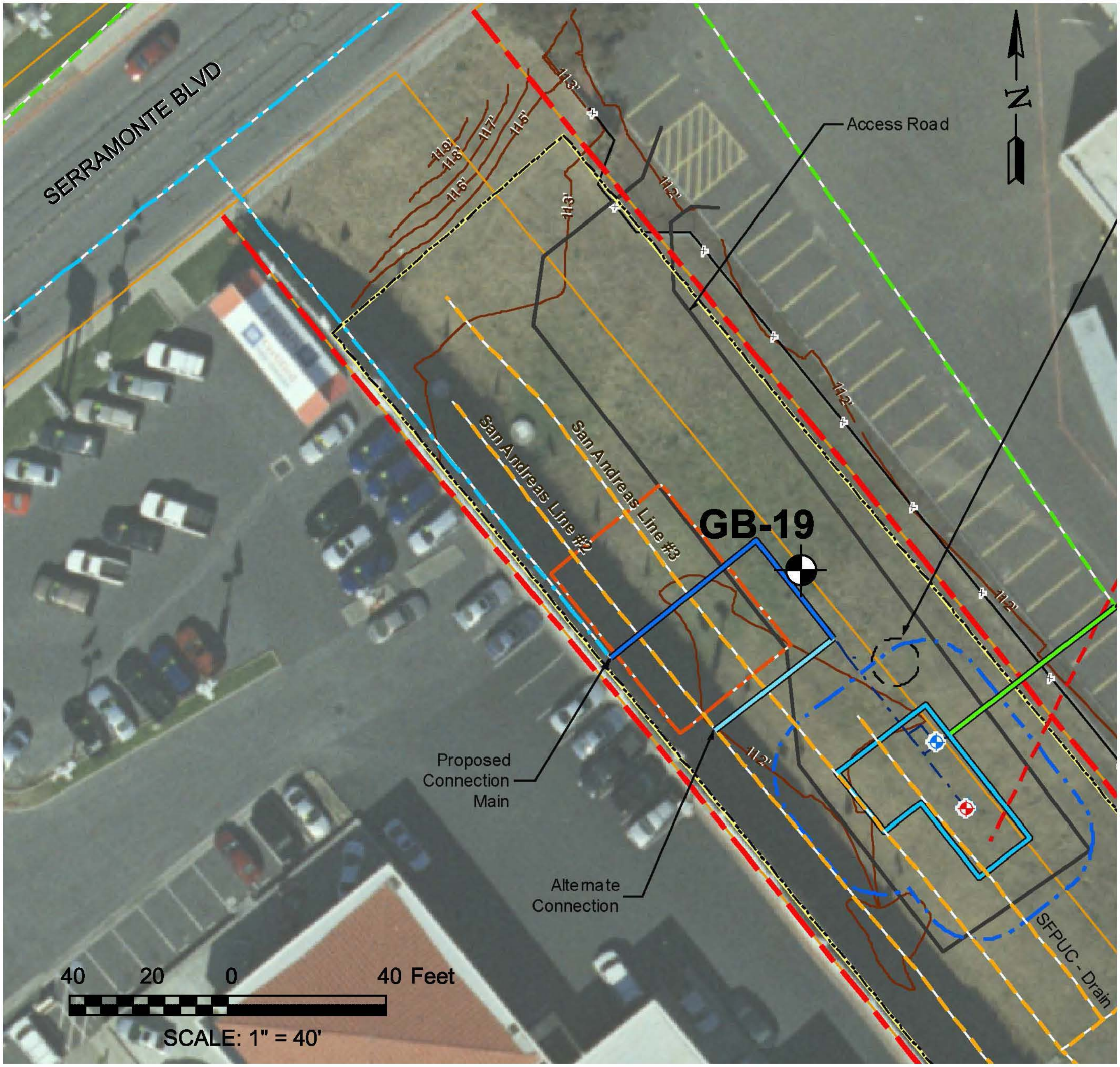
San Francisco, CA 94111

BORING LOCATION MAP FOR SITE CUP-18	**PLATE 2**
SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
APRIL 2009	**SF08034**

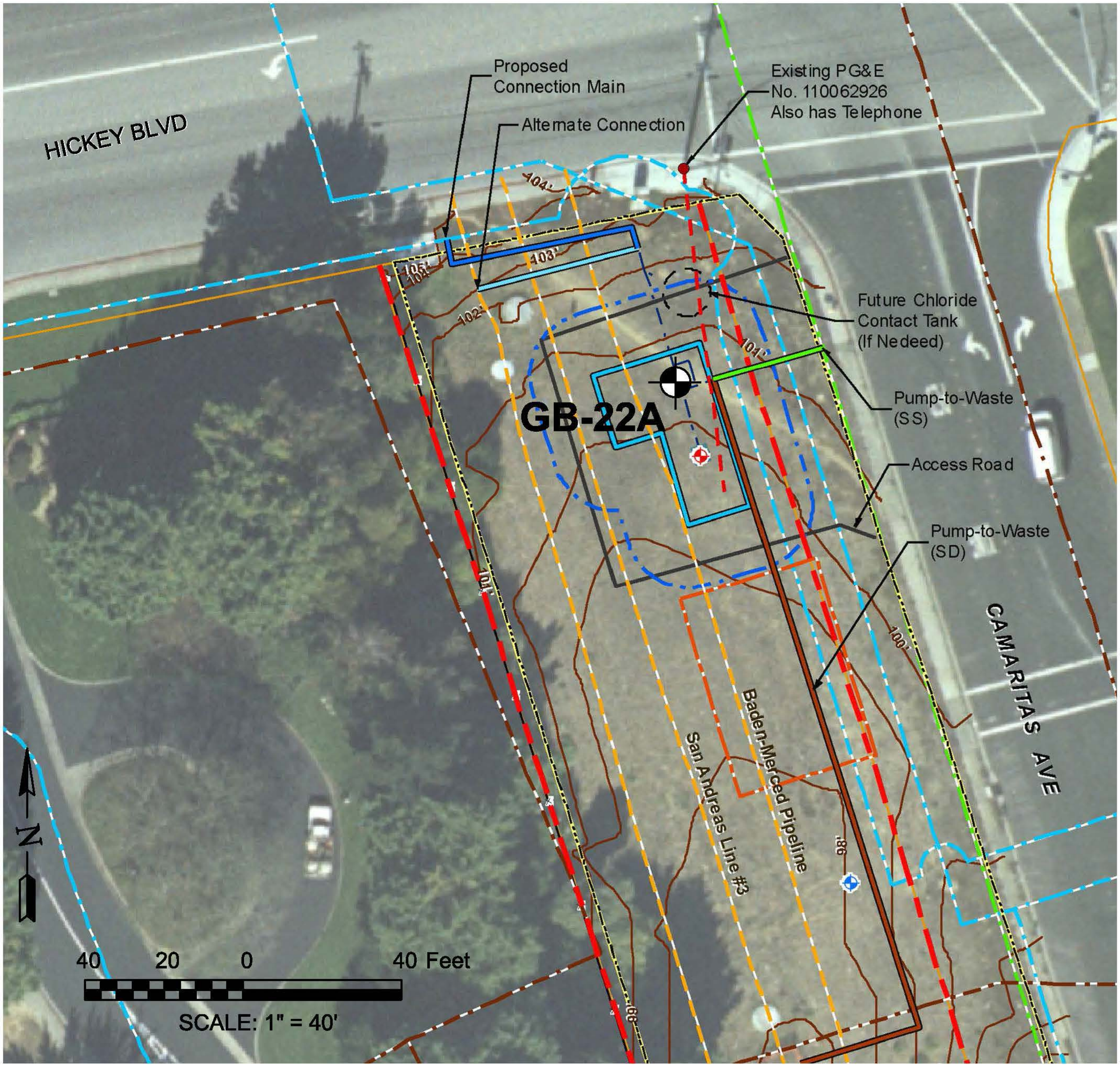


Base map source: Kennedy/Jenks Consultants, ROW AR Serramonte Blvd., Colma, CUP-19 location map, dated 2/2/2009.

LEGEND

- Test Well
- Monitoring Well
- GB-19 Geotechnical Boring by Geotechnical Consultants, Inc. in December 2008.
- ConstructionArea
- StagingArea Boundary
- Construction Area-16ft Building Buffer
- BuildingOutline
- AccessRoad
- Proposed Connection Main
- Alternate Connection
- Pump-to-Waste (SS)
- Pump-to-Waste (SD)
- RightOfWay
- Fence
- Topography
- Parcels - San Mateo County
- Transmission Line - SFPUC
- PG&E Transformer
- Underground Electrical
- Water - CalWater
- Water - DalyCity
- Stormdrain Catch Basin - DalyCity
- Stormdrain Manhole - DalyCity
- Stormdrain - DalyCity
- Sanitary Sewer Manhole - DalyCity
- Sanitary Sewer - DalyCity

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	BORING LOCATION MAP FOR SITE CUP-19	PLATE 3
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	APRIL 2009	SF08034

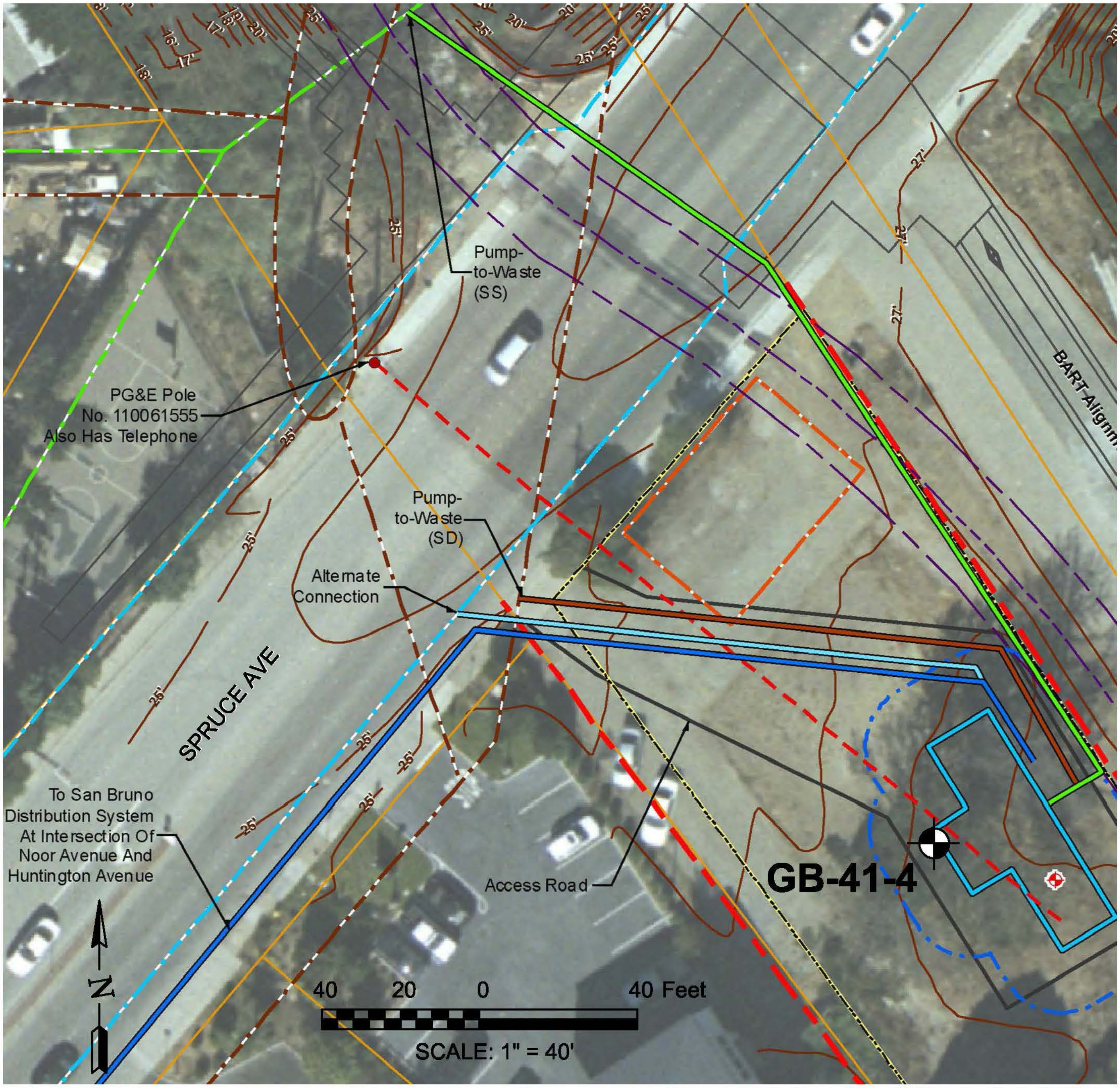


Base map source: Kennedy/Jenks Consultants, Hickey Blvd., South San Francisco, CUP-22A location map, dated 2/2/2009.

LEGEND

- Test Well
- Monitoring Well
- GB-22A Geotechnical Boring by Geotechnical Consultants, Inc. in December 2008.
- ConstructionArea
- StagingArea Boundary
- Construction Area-16ft Building Buffer
- BuildingOutline
- AccessRoad
- Proposed Connection Main
- Alternate Connection
- Pump-to-Waste (SS)
- Pump-to-Waste (SD)
- RightOfWay
- Fence
- Topography
- Parcels - San Mateo County
- Transmission Line - SFPUC
- PG&E Pole
- Underground Electrical
- Water - CalWater
- Stormdrain Manhole - South San Francisco
- Stormdrain - South San Francisco
- Sanitary Sewer - South San Francisco

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	**BORING LOCATION MAP FOR SITE CUP-22A**	**PLATE 4**
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	APRIL 2009	**SF08034**



Base map source: Kennedy/Jenks Consultants, SSF Linear Park, San Bruno, CUP-41-4 location map, dated 2/2/2009.

LEGEND

- Test Well
- GB-41-4 Geotechnical Boring by Geotechnical Consultants, Inc. in December 2008.
- ConstructionArea
- StagingAreaBoundary
- Construction Area-16ft Building Buffer
- BuildingOutline
- AccessRoad
- Proposed Connection Main
- Alternate Connection
- Pump-to-Waste (SS)
- Pump-to-Waste (SD)
- RightOfWay
- Fence
- Topography
- Parcels - San Mateo County
- Transmission Line - SFPUC
- PG&E Pole
- Underground Electrical
- Water - CalWater
- Stormdrain Manhole - South San Francisco
- Stormdrain - South San Francisco
- Sanitary Sewer - South San Francisco

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	BORING LOCATION MAP FOR SITE CUP-41-4	PLATE 5
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	APRIL 2009	SF08034

FINAL GEOTECHNICAL REPORT – CUP WELL LOCATIONS CUP-11A, CUP-23, CUP-36-1, CUP-44-1, AND CUP-M-1, SOUTH WESTSIDE BASIN GROUNDWATER STORAGE AND RECOVERY PROJECT, DECEMBER 2009

GEOTECHNICAL CONSULTANTS, INC.
Geotechnical Engineering • Geology • Hydrogeology

FINAL GEOTECHNICAL REPORT
CUP WELL LOCATIONS CUP-11A, CUP-23, CUP-36-1, CUP-44-1, AND CUP-M-1
SOUTH WESTSIDE BASIN GROUNDWATER STORAGE AND RECOVERY PROJECT
SAN MATEO COUNTY, CA

December 2009

Prepared for:

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San Francisco Public Utilities Commission

SF09020

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APPENDIX A – SUPPORTING GEOTECHNICAL DATA

INTRODUCTION

This geotechnical report presents the findings, conclusions, and recommendations of our geotechnical study performed for proposed buildings at groundwater well stations, including chemical treatment and filtration facilities at five designated groundwater production and monitoring well sites located in the northern part of San Mateo County, California (Figure 1 – Site Location Map). Groundwater monitoring wells have recently been constructed as part of the South Westside Basin Groundwater Storage and Recovery Project (GSR), a project developed through the coordination of the San Francisco Public Utilities Commission (SFPUC) and three partner agencies (California Water Service Company [Cal Water], the City of Daly City, and the City of San Bruno). This geotechnical report is being prepared for Kennedy/Jenks Consultants as part of their design services contract with the SFPUC and represents Phase 2 of the GSR. GTC previously completed subsurface exploration, laboratory testing and analysis at five sites for Phase 1 (GTC, April 2009).

We anticipate that the proposed well station buildings will typically be constructed with concrete masonry units (CMU), although the material selection will depend on the surrounding structures. The preliminary building footprints are as shown in Plates 1 through 5, Boring Location Plans. Geotechnical recommendations for additional improvements such as new pipeline connections and upgrades, which may require additional geotechnical borings, were not part of our scope of work.

WORK PERFORMED

In accordance with our scope of work as documented in the Subcontract Agreement (Amendment No. 3) with Kennedy/Jenks Consultants, Incorporated (KJ) dated August 2009 and subsequent conversations with personnel from KJ, we have completed the scope of work described below:

1. **Exploratory Drilling.** Subsurface conditions were explored by means of drilling one hollow-stem auger boring at each of the five CUP sites designated as CUP-11A, CUP-23, CUP-36-1, CUP-44-1, and CUP-M-1. To maintain consistency with the site numbering, our borings have been accordingly labeled as GB-11A, -23, -36-1, -44-1 and –M-1 for the sites. Boring number, date of drilling, surface elevation and depth for each boring are summarized in Table 1 – Summary of Geotechnical Borings. The surface elevations of the borings were evaluated from topographic maps which were prepared by Chaudhary & Associates from their field surveys performed between March of 2008 and September of 2009. The surface elevations presented in this report are approximate. All elevations on Table 1, and referred to throughout this report (unless otherwise noted), are with respect to 1988 North American Vertical Datum (NAVD 88).

2.

TABLE 1 – SUMMARY OF GEOTECHNICAL BORINGS

Boring	Date Drilled	Approximate Surface Elevation (feet, NAVD 88)	Approximate Depth (feet)
GB-11A	9/28/2009	159.5	35
GB-23	9/25/2009	83.5	50
GB-36-1	9/25/2009	66.5	50
GB-44-1	10/19/2009	111.0	35
GB-M-1	9/28/2009	26.0	40

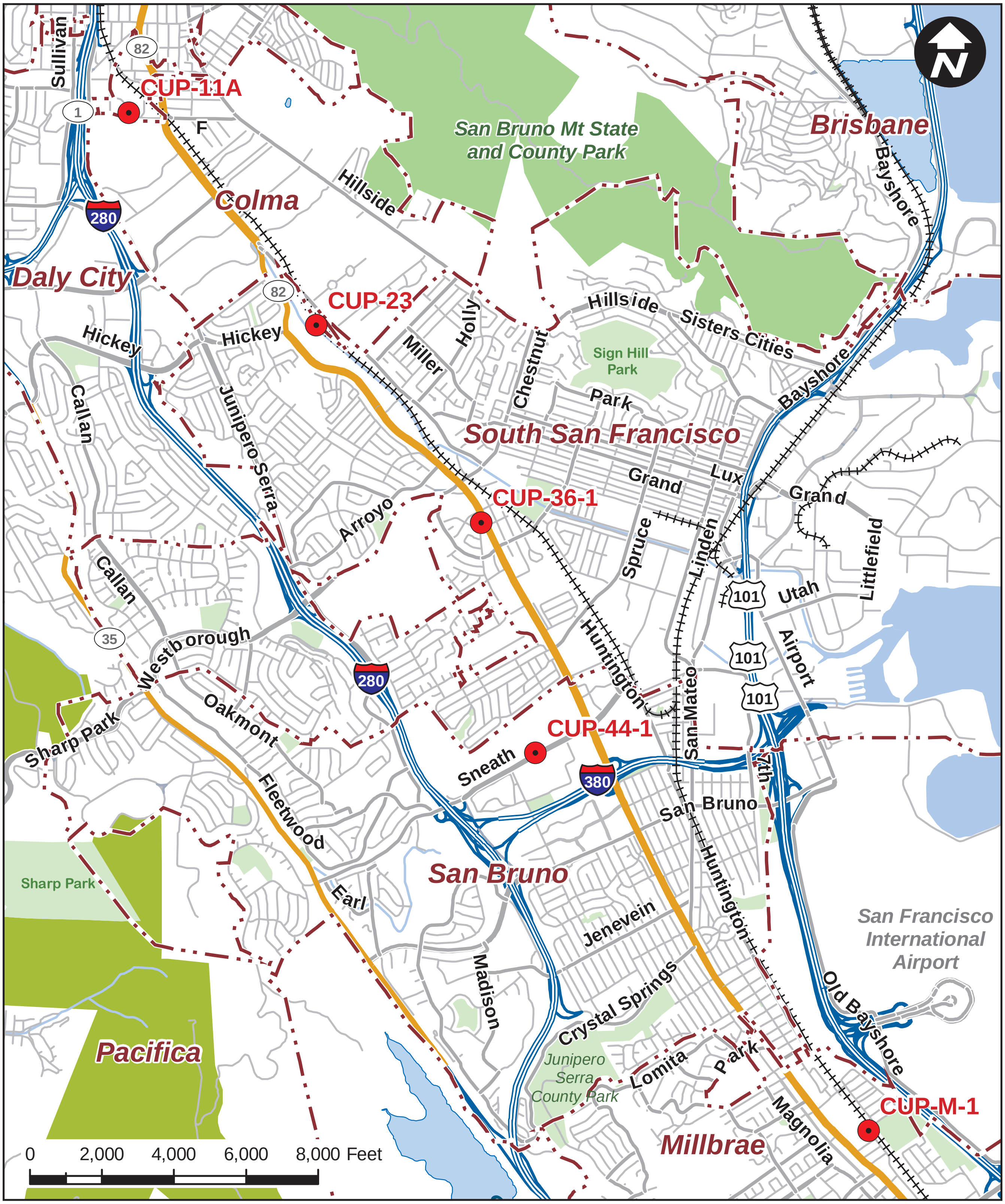
Soil samples were recovered using a split-spoon (Standard Penetration Test) sampler and relatively undisturbed 2 ½ inch diameter sleeve samples using a split-barrel sampler. We visually classified the soil during drilling. Selected samples were transferred to a laboratory for testing. The boring locations are shown on Plates 1 through 5 – Boring Location Plans. Boring logs are presented in Appendix A – Supporting Geotechnical Data as Plates A-1.1 through A-1.5. Upon completion of geotechnical exploration, the drill cuttings were collected in steel drums for analytical testing and appropriate disposal.

3. **Laboratory Testing.** Laboratory testing included moisture, density, grain size analysis, Atterberg limits and corrosion tests on selected soil samples to measure pertinent index and engineering properties. The laboratory test results are presented on the figures in Appendix A, and on the boring logs on Plates A-1.1 through -1.5.

4. **Engineering Analysis.** We analyzed subsurface conditions and laboratory test results, and reviewed regional and local geology and seismicity. Additionally, we analyzed the following geotechnical parameters:

   - Seismic hazards evaluation including strong ground shaking, liquefaction, seismic and dynamic settlements, and seismically-induced landslides;
   - Seismic design parameters in accordance with the 2006 International Building Code;
   - Bearing capacity (allowable and ultimate) and modulus of subgrade reaction (vertical soil springs) for shallow footings and grade beams, and mat foundations; and
   - Lateral earth pressures (active, passive, at-rest, and seismic increment) and base friction coefficients for restrained and unrestrained walls and/or buried footings.

FIGURE 1
SITE LOCATION MAP



5. **Report.** We prepared this report presenting our geotechnical findings, conclusions, and recommendations for the proposed improvements at the five sites for the GSR Phase 2.

Our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

FINDINGS

SITE CONDITIONS

The five sites are located from the north portion (CUP-11A) of the South Westside Groundwater Basin to near the southern boundary (CUP-M-1) in San Mateo County, California. The ground surface along a line which roughly transects the five sites, and parallels El Camino Real, generally descends in a northwest-to-southeast direction from elevations of approximately 160 feet to 20 feet above mean sea level for a distance of approximately 8 miles. Plates will be finalized in the Final Geotechnical Report. All boring locations were cleared of existing underground utilities prior to exploration.

The northernmost site CUP-11A is located southwest of F Street and the Colma BART station in the town of South San Francisco (Figure 1). As indicated on Plate 1 – Boring Location Plan for GB-11A, the site is located on a gentle to moderate east-facing slope. Southwest of the site are the BART parking lots and to the northeast, F Street.

GB-23 is located east of the intersection between Hickey Boulevard and El Camino Real in South San Francisco (Figure 1). As indicated on Plate 2 – Boring Location Plan for GB-23, the site is located on fairly level ground. The site is bounded by the Costco parking lot to the south, a mobile home park to the northwest and the drainage channel abutting the BART underground alignment to the northeast.

GB-36-1 is located to the south of the intersection between El Camino Real and Southwood Drive in the Town of South San Francisco (Figure 1). The general layout of the proposed improvements on Plate 3 – Boring Location Plan for GB-36-1 shows the boring on a gradual northeast-facing slope. The site is near recently re-graded pipeline construction access and is surrounded to the northwest by a parking lot for a funeral home, to the east by a descending slope with vegetation adjacent to El Camino Real and to the south by relatively flat, graded grounds with temporary structures and equipment serving as facilities for this project.

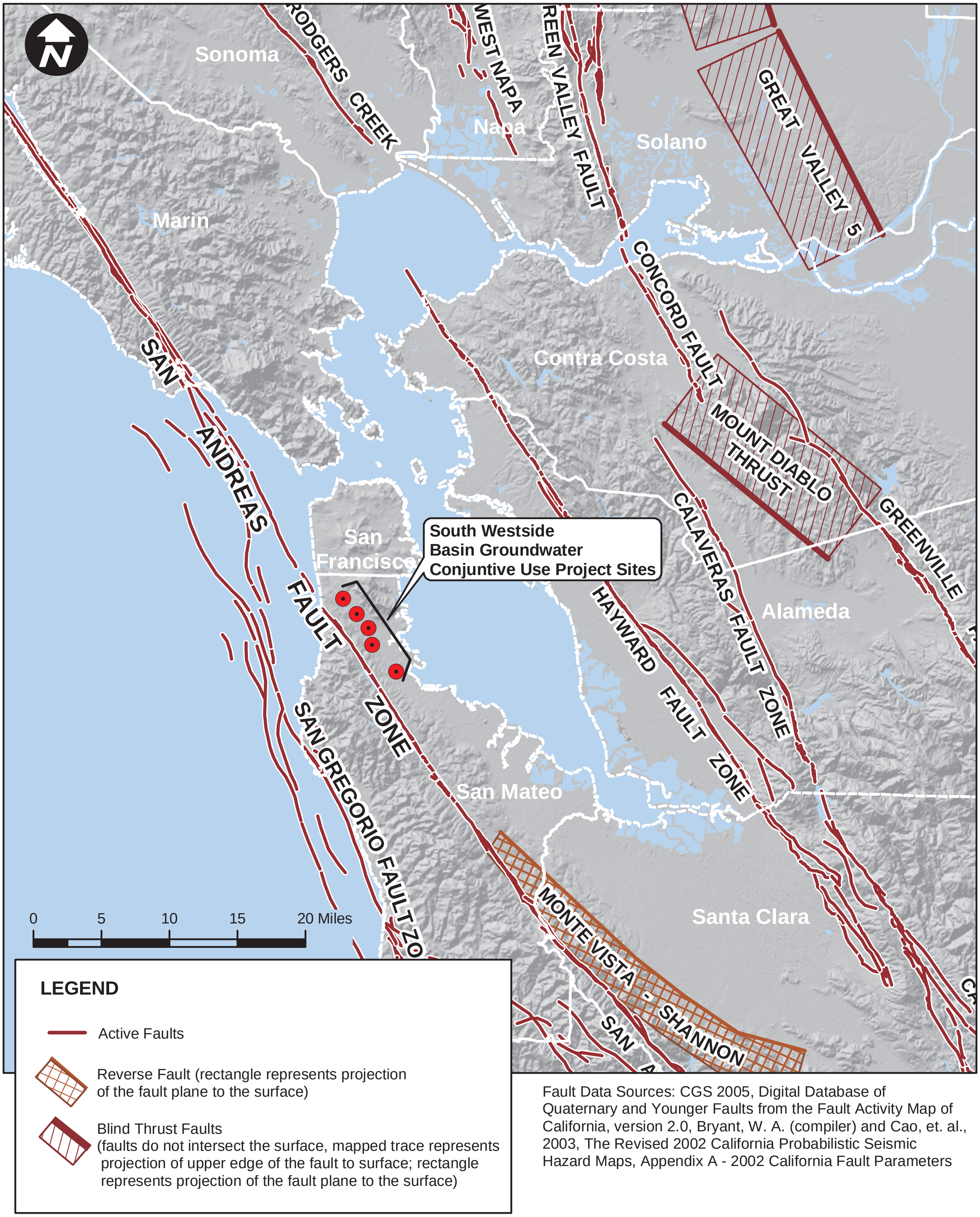
GB-44-1 is located to the south of the main building at the Golden Gate National Cemetery, just north of Sneath Lane in San Bruno (Figure 1). The general layout of the proposed improvements on Plate 4 – Boring Location Plan for GB-44-1 shows a generally level site with a slope some ways to the south, across Sneath Lane. The site is bounded to the south by a sidewalk abutting Sneath Lane and surrounded to the north, east and west by the Golden Gate Cemetery lawn and facilities.

The southernmost site of GB-M-1 is situated in the eastern corner of the parking lot at the Orchard Supply Hardware store at 900 El Camino Real in Millbrae (Figure 1). As shown on Plate 5 - Boring Location Plan for GB-M-1, this site is located in a flat asphalt-paved parking lot. The areas surrounding the site are also relatively flat. The site is surrounded to the northeast by the CalTrain tracks, to the southeast by a small lot containing a communications tower, to the northwest by the Orchard Supply Hardware storage yard, and to the southwest by the Orchard Supply Hardware loading dock and parking lot.

SEISMICITY

The San Francisco Bay Area contains several active faults that could cause strong ground shaking at the project site. Figure 2 – Regional Fault Map shows faults in the vicinity of the sites. The San Andreas Fault Zone – Peninsula Section is the nearest active fault and is located within 1.5 to 1.9 miles of the CUP-11A, CUP-23, CUP-36, CUP-44-1, and CUP-M-1 sites. The San Andreas Fault is a primary component in a complex system of right-lateral, strike-slip faults; including the San Andreas, San Gregorio-Seal Cove, Hayward, and Calaveras faults; collectively known as the San Andreas fault system. The San Andreas, Hayward, and Calaveras faults have produced historic earthquakes resulting in significant ground motion and movement. The San Andreas Fault is capable of producing an earthquake of an estimated maximum magnitude of 7.9M. This segment is estimated to have recurrence intervals on the order of 200 years. A summary of nearby faults is presented in Table 2 – Active and Potentially Active Faults.

FIGURE 2
REGIONAL ACTIVE FAULT MAP



Fault Data Sources: CGS 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0, Bryant, W. A. (compiler) and Cao, et. al., 2003, The Revised 2002 California Probabilistic Seismic Hazard Maps, Appendix A - 2002 California Fault Parameters

TABLE 2 – ACTIVE AND POTENTIALLY ACTIVE FAULTS

Fault	Distance to Fault (miles)					Estimated Maximum Earthquake Magnitude (1)	Historic Earthquakes (2)	
	GB-11A	GB-23	GB-36-1	GB-44-1	GB-M-1		Year	Magnitude
San Andreas - 1906 rupture Section	1.6 (3)	1.8 (3)	1.9 (3)	1.5 (3)	1.7 (3)	7.9 (3)	1838 1898 1906 1989	6.8 6.2 8.1 7.1
San Andreas – Peninsula Section	1.6	1.8	1.9	1.5	1.7	7.1		
San Andreas – North Section	11.5	13.0	14.3	15.5	18.1	7.6		
San Gregorio-Seal Cove – North Section	5.6	6.2	6.6	6.5	7.5	7.3	N.A.	N.A.
Hayward- North Section	17.1	16.9	16.8	17.2	16.8	6.9	1868	6.8
Hayward – South Section	18.7	18.0	17.4	17.5	16.8	6.9		
Monte Vista-Shannon	20.7	19.2	17.9	16.7	14.1	6.8	N.A.	N.A.
Calaveras – North Section	26.7	26.2	25.8	26.0	25.4	6.8	1861 1955 1979 1984 2007	5.3 5.5 5.9 6.1 5.4
Calaveras – South Section	40.7	39.3	38.1	37.3	35.0	6.2		

(1) Maximum Moment Magnitude based on California Geological Survey (CGS) fault parameters as updated in 2002 (Cao, et al., 2003), or as suggested by the SFPUC's General Seismic Requirements (SFPUC, 2006).
(2) Historic earthquakes listed may have occurred on any one of the listed sections of the associated fault. N.A. – No significant historic earthquakes have occurred on this fault or fault section.
(3) The 1906 rupture event assumes rupture along the North Coast, Peninsula and Santa Cruz Mountains sections to San Juan Bautista. Maximum magnitude is based on the average 5 m displacement during the 1906 event (WGCEP, 2003; Petersen, et al., 1996).

GEOLOGY

The San Francisco Bay Area is located within the Coast Ranges Geomorphic Province of California. Past episodes of tectonism have folded and faulted the bedrock, creating the regional topography of northwest trending ridges and valleys that is characteristic of the Coast Ranges Geomorphic Province. The San Francisco Bay and vicinity occupy a structurally controlled basin within the province. Late Pleistocene and Holocene sediments (less than 1 million years old) were deposited in the basin as it subsided.

All five sites are located in areas mapped as Colma Formation (Brabb, et al., 1998; Bonilla, 1998). Other sedimentary deposits mapped in close proximity to these sites include stream channel deposits and Merced Formation. In addition, a layer of artificial fill was encountered at each site. The geology in the project vicinity is shown on Figure 3 – Regional Geologic Map. Based on a regional geologic study as compiled as a regional geologic cross section of the Westside Basin – Lake Merced (SFPUC, 2008), the Franciscan Complex bedrock is anticipated to be on the order of 600 to 700 feet below ground surface at the sites. Geologic maps (Brabb, et al., 1998) describe the geologic units at and near each boring as follows:

- **af:** Artificial fill – loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made debris in various combinations and thicknesses which may exceed 30 m; some compacted and quite firm, but fill made before 1965 is nearly everywhere not compacted and consists of simply dumped materials.

- **Qhbm:** Bay mud (Holocene) – soft to stiff clay and silty clay underlying marshland and tidal flats (near Bayshore Freeway), contains few lenses of fine sand, silt, shells, and peat.

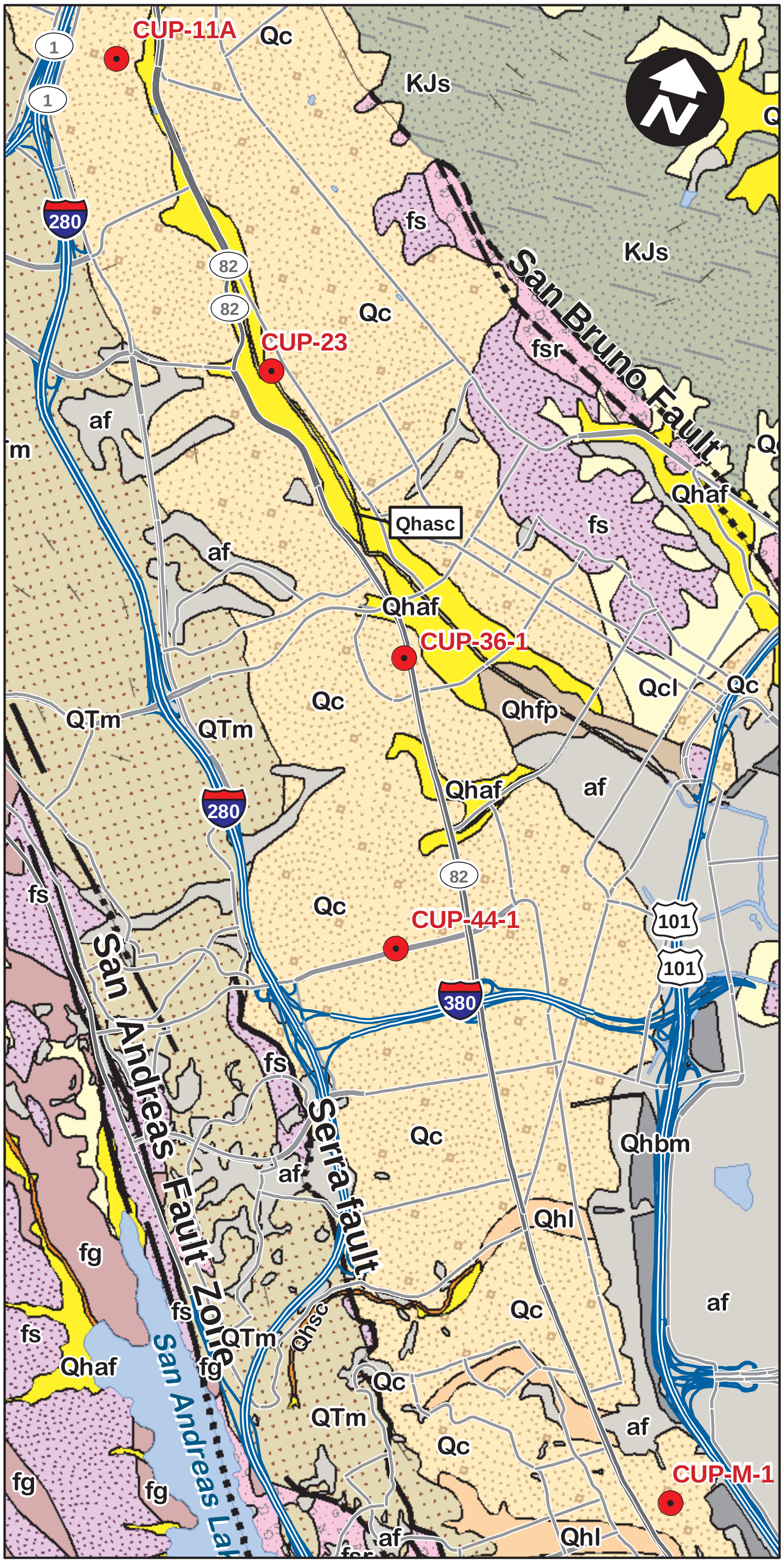
- **Qhl:** Natural levee deposits (Holocene) – loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay deposits that border stream channels and slope away to flatter floodplains and basins.

- **Qhfp:** Floodplain deposits (Holocene) – dense sandy to silty clay, with local lenses of coarser material (silt, sand, and pebbles).

- **Qc:** Colma Formation (Pleistocene) – yellowish-gray, gray, yellowish-orange and red-brown, friable to loose, fine- to medium-grained arkosic sand with subordinate gravel, silt and clay; total thickness is typically unknown, but may up to 60 m.

- **QTm:** Merced Formation (lower Pleistocene and upper Pliocene) – medium gray to yellowish gray, yellowish orange, medium- to very fine-grained, poorly indurated to friable sandstone, siltstone, and claystone, with some conglomerate lenses and a few friable beds of white volcanic ash; sandstone is typically silty, clayey, or conglomeratic; fossiliferous conglomerate is well cemented.

FIGURE 3
REGIONAL GEOLOGIC MAP



Source: Brabb et. al., 1998, USGS OFR 98-137.

LEGEND

CUP-11A — Conjuntive Use Project (CUP) Sites

Geologic Units

Historic

- af — Artificial fill
- Qhasc — Artificial stream channels

Holocene

- Qhfp — Floodplain deposits
- Qhaf — Alluvial fan and fluvial deposits
- Qhsc — Stream channel deposits
- Qcl — Colluvium
- Qhbm — Bay mud
- Qhl — Natural levee deposits

Pleistocene

- Qc — Colma Formation

Pleistocene to Pliocene

- QTm — Merced Formation

Cretaceous to Jurassic

- KJs — Unnamed sandstone of San Bruno Mtn.
- fs — Franciscan sandstone
- fg — Franciscan greenstone
- fsr — Franciscan melange

Structual Features

- geologic contact
- fault, approx. located
- fault, certain
- fault, concealed

0 2,000 4,000 6,000 8,000 Feet

EARTH MATERIALS

The exploratory borings for this investigation (GB-11A, -23, -36-1, -44-1 and –M-1) encountered artificial fill which was underlain by poorly to moderately consolidated sandstone of the Colma Formation (Qc). The artificial fill represents disturbed soil and fill materials placed for site grading and pipeline trench backfill.

Artificial Fill. Artificial fill was encountered to depths of approximately 4 feet in borings GB-11A and GB-23 where the local topography is flat. Fill thickness measures 14.5 feet at GB-36-1 where trenching and construction of large diameter pipelines has disturbed the ground to greater depth. Fill at GB-44-1 was approximately 8.5 feet thick. Fill placed for leveling at GB-M-1 is 9 feet thick. The fill was mainly comprised of dry to damp, loose to medium dense, silty sand and sandy silt; A 5 foot thick gravel layer directly underlies the asphalt parking lot at GB-M-1. The origin of sand and silt fill at the sites was likely derived from grading and reuse of on-site, near surface materials of Colma Formation (Qc).

Colma Formation. Soils of the Colma Formation (Qc) were encountered at all five CUP sites below the artificial fill. The Colma Formation soils consisted predominantly of yellowish brown to yellowish gray, damp to moist, medium dense to very dense, silty sand and poorly graded sand with silt. Thin beds of clayey sand, sandy silt, silt, and clayey silt were encountered at the northerly sites (GB-11A, GB-23, GB-36-1 and GB-44-1). Layers of wet clay with sand and clayey gravel were encountered at the bottom of the two more southern borings, GB-44-1 and GB-M-1. Colma Formation soils at the five sites extended to the total depth of exploration (35 to 50 feet). Measured total unit weight for the Colma Formation soils at the five sites ranged from 101 to 115 pcf, with a moisture content ranging from 5 to 17 percent in the granular materials and 11 to 27 percent in the clay and silt layers.

GROUNDWATER

Groundwater was not encountered during drilling of our exploratory borings GB-11A, -23, -36-1 and -44-1 to total depths ranging from 35 to 50 feet. At GB-M-1, groundwater was encountered during drilling on September 28, 2009 at a depth of approximately 23 feet. A summary of our observed groundwater levels is presented in Table 3 – Observed Groundwater Levels. Seasonal variations are expected to cause fluctuations in groundwater levels.

TABLE 3 – OBSERVED GROUNDWATER LEVELS

Boring	Date of Observation	Depth to Groundwater (feet)
GB-11A	9/28/2009	Not Encountered
GB-23	9/25/2009	Not Encountered
GB-36-1	9/25/2009	Not Encountered
GB-44-1	10/19/2009	Not Encountered
GB-M-1	9/28/2009	23

CONCLUSIONS AND RECOMMENDATIONS

1.0 GENERAL

The following sections provide our conclusions and recommendations for evaluation and design of proposed station buildings at the five sites of CUP-11A, -23, -36-1, -44-1 and –M-1. According to preliminary site maps given us by Kennedy/Jenks Consultants, the station buildings at well sites CUP-23, -36-1, and –M-1 house chemical treatment facilities and the station building at well site CUP-44-1 houses filtration facilities. Based on our findings from our geotechnical field investigation, the GB-11A, -23, -36-1, -44-1 and -M-1 sites are underlain by artificial fill and Colma Formation.

We consider the proposed improvements to be geotechnically feasible, provided that our geotechnical recommendations are incorporated into design and construction documents.

2.0 SEISMIC DESIGN CONSIDERATIONS

2.1 **General.** The main seismic hazards at the site are expected to be strong ground shaking and dynamic settlement within isolated zones of loose fill. Our seismic design considerations, including fault rupture, ground shaking, liquefaction and dynamic settlement, inundation by tsunamis, seismically-induced landslides, and seismic design with respect to the 2006 International Building Code (which the 2007 California Building Code has adopted) are provided in the following sections.

2.2 **Fault Rupture.** No active or potentially active faults are known to cross the sites. Consequently, the hazard posed by ground rupture due to fault offset is considered to be negligible.

2.3 **Ground Shaking**. Strong ground shaking will occur at the site as a result of a moderate to large earthquake occurring on one of the active regional faults. The San Andreas Fault is closest to the sites (1.5 to 1.9 miles for all borings; GB-11A, -23, -36-1, -44-1 and -M-1) and therefore has the greatest capability of causing strong ground motions.

The California Geological Survey (CGS, formerly known as California Division of Mines and Geology) and United States Geological Survey (USGS) completed probabilistic seismic hazard maps in 1996 (Petersen et al., 1996), and subsequently updated fault parameters and revised the maps in 2002 (Cao, et al., 2003). USGS provides a web-based program to evaluate the USGS Probabilistic Uniform Hazard

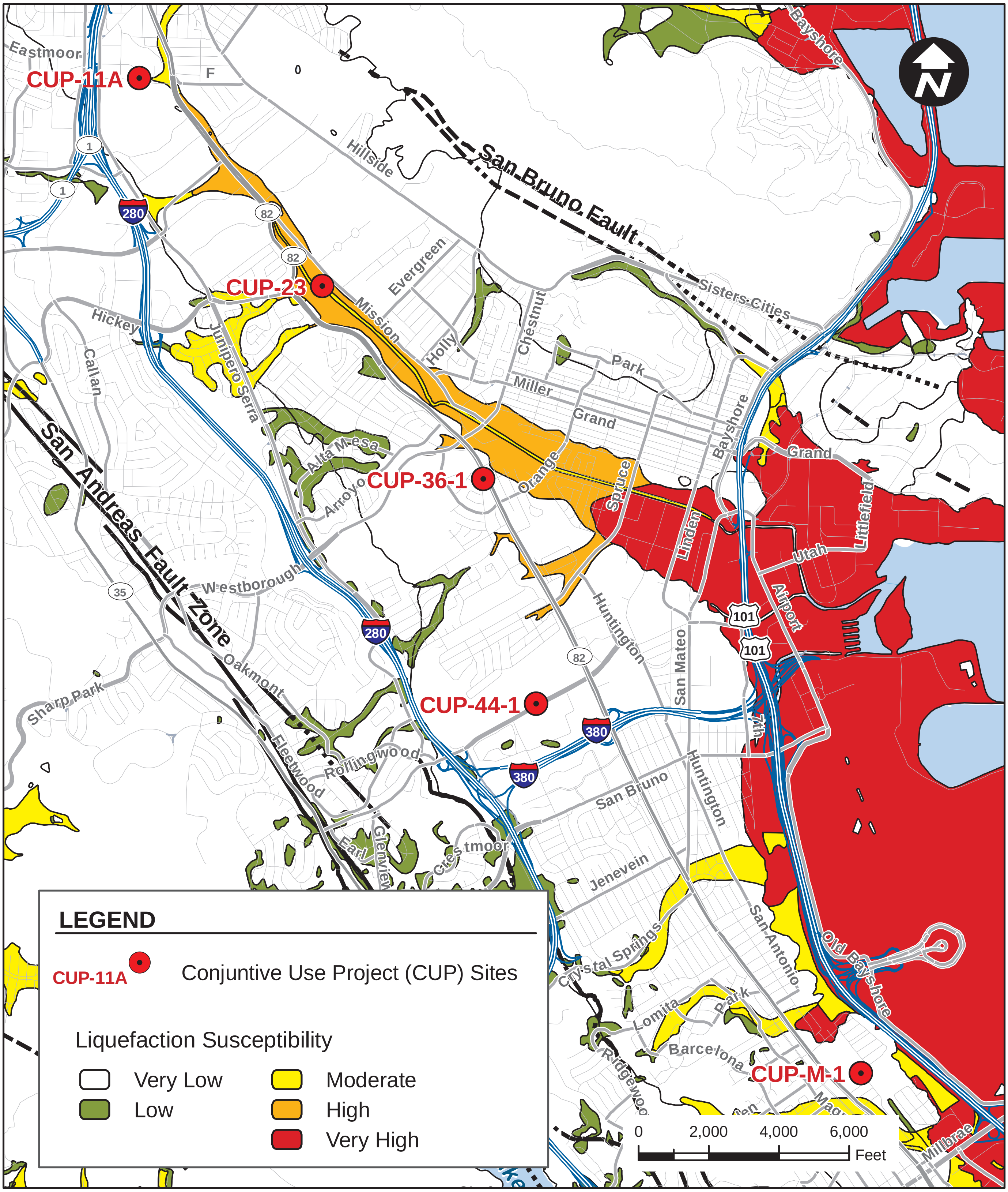
Response Spectra (http://earthquake.usgs.gov/research/hazmaps/design). Based on this data, the peak ground acceleration (PGA) at the site is estimated to be 0.71g for an earthquake having a 10 percent probability of exceedance in 50 years.

2.4 **Liquefaction and Dynamic Settlement.** Liquefaction is a phenomenon wherein a temporary, partial loss of shear strength occurs in a soil due to increases in pore pressure that result from cyclic loading during earthquakes. Saturated, loose to medium dense sands and silty sands are most susceptible to liquefaction. Consequences of liquefaction can include ground settlements, foundation failure, sand boils, and lateral spreading. Dynamic settlement is the densification of saturated and unsaturated soils during strong ground shaking. All soil types are prone to dynamic settlement, though loose, sand and silty sand are most susceptible.

The liquefaction susceptibility, as mapped by Witter et al. (2006), is illustrated on Figure 4 – Liquefaction Susceptibility Map. As can be seen from the figure, boring sites GB-11A, GB-36, GB-44-1, and GB-M-1 lie within a zone mapped as having very low liquefaction susceptibility. The mapped liquefaction susceptibility at site GB-23 is moderate. Because of the regional focus of the liquefaction susceptibility mapping, the data only generally correlates with areas of known liquefaction hazard. The site-specific data from the borings is considered to be more indicative of liquefaction and dynamic settlement hazard. The following discussion further describes this hazard based on our subsurface investigation and laboratory testing program.

Due to the absence of groundwater within the 35 to 50 feet of total exploration depth for each of the exploratory borings GB-11A, -23, -36-1 and -44-1, and the generally dense nature of the Colma Formation below this depth, liquefaction is not considered to be a significant consideration. Despite the observation of groundwater at a depth of 23 feet at the GB-M-1 site, liquefaction is also not considered to be a significant consideration because of the dense and clayey nature of the Colma Formation encountered at this site. Pore pressure generation and liquefaction may occur in isolated pockets of looser material within the Colma Formation, however, the amount of surface settlement resulting from liquefaction is considered to be negligible at the five sites.

FIGURE 4
LIQUEFACTION SUSCEPTIBILITY MAP



Source: Witter, R.C., et. al.., 2006, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California: U.S. Geological Survey Open-File Report 06-1037

The amount of dynamic settlement for each site has been evaluated based on an anticipated earthquake event having a 10 percent probability of exceedance in 50 years. Dynamic settlement resulting from strong ground shaking at GB-11A and -23 is estimated at less than ¼ inches due to the dense nature of the near-surface Colma Formation beneath a relatively thin stratum of artificial fill. Dynamic settlement of the artificial fill at GB-36-1 is considered relatively significant with an estimate of up to 2 inches, provided proper mitigations are made in accordance with Section 6.1. As a result of medium dense silty sand within the upper 15 feet, dynamic settlement is estimated at 1 inch for GB-44-1. Dynamic settlement resulting at GB-M-1 is estimated at less than 1 ½ inches, as a result of medium dense silty sand in the Colma Formation above the groundwater level. The hazard posed by dynamic settlement is therefore considered to be low at GB-11A and,-23 and moderately high at GB-36-1, -44-1 and –M-1. Flexible pipe connections are recommended to accommodate dynamic settlements due to seismic loading.

2.5 **Inundation by Tsunamis.** Tsunamis are long period waves usually caused by underwater seismic disturbances, volcanic eruptions, or submerged landslides. The disturbance can occur thousands of miles from the San Francisco area, and generate a tsunami wave that affects the site. As tsunami waves approach the coast, they may increase in height to tens of feet.

Flooding due to tsunami is unlikely to occur at GB-11A, -23, -36-1 and -44-1 due to their relatively high ground elevations and distance from the open Northern California coastline. Although GB-M-1 is located on relatively low lying terrain at elevation 26 feet above Mean Sea Level (MSL), the potential of flooding during a tsunami is unlikely because of the distance to San Francisco Bay.

2.6 **Seismically-Induced Landslides.** Based on the flat topography surrounding the sites of GB-23, -44-1 and –M-1, seismically-induced landslide hazards do not exist at these sites. At GB-11A which is located on mildly sloping terrain (on the order of 5:1 horizontal to vertical side slope ratio), seismically-induced landslide hazards are considered not likely because of the dense nature of the subsurface soils and absence of shallow groundwater. Boring GB-36-1 is situated with very mild slopes (on the order of 10:1 horizontal to vertical side slope ratio) to the north and northeast towards the funeral home and El Camino Real. Seismically-induced landslide hazards are considered not likely due to the presence of generally dense granular materials and absence of shallow groundwater.

2.7 **Seismic Design Parameters.** The proposed improvements may be designed in accordance with the International Building Code Static Force Procedure (ICC, 2006) using the seismic parameters as presented in Table 4 – 2006 International Building Code (IBC) Seismic Design Parameters in developing the site seismic response:

TABLE 4 – 2006 INTERNATIONAL BUILDING CODE SEISMIC DESIGN PARAMETERS

	Site GB-11A	Site GB-23	Site GB-36-1	Site GB-44-1	Site GB-M-1
Site Class	C	C	D	D	D
S_s [1] at 0.2-second	2.162	2.129	2.105	2.160	2.105
S_1 [1] at 1-second	1.213	1.180	1.157	1.210	1.158
Site Coefficient F_a	1.0	1.0	1.0	1.0	1.0
Site Coefficient F_v	1.3	1.3	1.5	1.5	1.5

[1] Maximum Considered Earthquake (MCE) Spectral Response Acceleration (in units of g).

3.0 GROUNDWATER

With the exception of exploratory boring GB-M-1, groundwater was not encountered in the remaining exploratory borings. At GB-M-1, groundwater was encountered during drilling at a depth of 23 feet below ground surface. The observation of groundwater at GB-M-1 is consistent with the low lying topography (ground elevations of 25 to 30 feet above mean sea level). It should be noted that groundwater levels are influenced by seasonal variations in precipitation, local irrigation, groundwater pumping and other factors, and are therefore, subject to variation. As the proposed footing foundations are expected to be within the top 5 feet, groundwater is not anticipated within the depth of foundation excavation.

4.0 EARTHWORK

4.1 **General.** Given the earth materials on the project sites encountered during our exploration, the contractor should be able to carry out planned excavations using conventional heavy equipment.

Evaluation of the presence, or absence, and treatment of hazardous materials was not part of this study. If hazardous materials are encountered during excavation, proper handling and treatment during construction will depend on the contaminant type, concentration, and volatility of the contaminated materials.

General geotechnical considerations for site preparation, excavations, temporary shoring and bracing, engineered fill material, engineered fill placement and compaction, pipe bedding, and utility trench backfill are presented in the following sections.

4.2 **Site Preparation.** Site preparation will consist of demolition, excavation and removal of on-site materials such as pavement, concrete, abandoned utilities, and miscellaneous debris in preparation for the foundation excavations. Any creation of holes from the removal of such materials should be backfilled with engineered fill.

Recommendations for engineered fill are provided in Sections 4.5 and 4.6. Also as part of site preparation, the location of active underground utilities should be determined and, if affected by construction activities, should be relocated or protected.

4.3 **Excavations.** We anticipate that excavations for the planned building improvements to extend only a few feet below existing ground elevation. Since GB-11A is located near the foot of mildly sloping terrain, greater excavation may be necessary at this site.

Shallow excavations for the buildings will allow for unshored excavations with adequately sloped sidewalls. Vertically shored walls or braced excavations are anticipated where space constraints may not allow for open, sloped excavations. At a minimum, excavations should be constructed in accordance with the current California Occupational Safety and Health Administration (OSHA) regulations (Title 8, California Code of Regulations) pertaining to excavations. Temporary cut slopes are expected to be stable for configurations described in Title 8 for Type C soils and when unsupported, should be cut back no steeper than 1 ½ horizontal to 1 vertical. All excavations should be closely monitored during construction to detect any evidence of instability.

Care should be taken when excavating near existing utilities and pipelines. Excavations can undermine support of adjacent existing pipelines and other subsurface structures. We recommend that some form of vertical shoring system be considered for excavated sidewalls that are adjacent to existing pipelines or other known buried adjacent structures.

Some of the near surface loose soils at the five sites will likely be removed during excavation for the proposed improvements. If any footings are founded above loose soils, over-excavation of loose soils and replacement with engineered fill may be required. Remediation of loose materials at intermediate depths can be performed using densification improvement methods, as discussed in Section 6.1.

4.4 **Temporary Shoring and Bracing.** The type and design of the shoring will depend on the depth of excavation and excavation-bracing sequence. The shoring and bracing design and installation should be the responsibility of the construction contractor. As a general guideline, construction procedures, excavations, and design and construction of any temporary shoring should comply with the current OSHA Title 8 regulations pertaining to excavations. The shoring and bracing should accommodate surcharge loads that may be imposed by adjacent structures, traffic, or construction activities.

Possible shoring schemes include soldier pile and lagging and steel sheeting, both of which may include internal bracing struts to limit lateral deflections. Such braced and shored excavations will be subjected to lateral earth pressures. Recommended active, at-rest, and passive lateral earth pressures are provided in Section 5.

Horizontal and vertical movements of the ground are possible in the vicinity of the excavations. These movements can generally be reduced to acceptable levels by use of a properly designed and constructed shoring system. Measures should be taken to prevent the loss of sand through the gaps in the shoring or lagging.

4.5 **Engineered Fill Material.** Material for engineered fill should be inorganic, well graded, free of rocks or clods greater than 4 inches in greatest dimension or any other deleterious materials, and have a low potential for expansion. The material should have a liquid limit less than 35, a plasticity index less than 15 and no more than 25 percent passing the No. 200 sieve. Existing on-site soil may be re-used as engineered fill provided it meets the above criteria.

4.6 **Engineered Fill Placement and Compaction.** Engineered fill should be placed in layers no greater than 8 inches in uncompacted thickness, conditioned with water or allowed to dry to achieve a moisture content near optimum, then mechanically compacted to at least 90 percent relative compaction based on ASTM D1557. All engineered fill placed to support footings and the upper 6 inches of engineered fill supporting slabs-on-grade should be mechanically compacted to at least 95 percent relative compaction as determined by ASTM D1557. Specific engineered fill placement requirements exist for GB-36-1 as outlined in Section 6.1. All compaction should be performed using mechanical compaction means; flooding or jetting should not be used as a means to achieve compaction. The ASTM D1557 laboratory compaction tests should be performed at the time of construction to provide a proper basis for compaction control.

4.7 **Pipe Bedding for Small Diameter Pipes.** Pipe bedding should consist of well-graded sand or a sand-gravel mixture. Maximum gravel size should be ½ inch and the bedding material should have less than 12 percent passing the No. 200 sieve. Uniformly graded material such as pea gravel should not be used as pipe bedding material. Pipe bedding should have a minimum thickness of 6 inches beneath the pipe and 6 inches above the pipe. If soft or otherwise unsuitable soils are exposed in the bottom of the trench excavation, the necessity of over-excavation should be evaluated by the project geotechnical engineer. All pipe bedding should be placed to achieve uniform contact with the pipe and mechanically compacted to a minimum relative compaction of 90 percent per ASTM D1557. Flexible pipe connections are recommended to accommodate dynamic settlements due to seismic loading. Estimates of dynamic settlement at each site are provided in Section 2.4 – Liquefaction and Dynamic Settlement.

4.8 **Utility Trench / Pipe Backfill.** Utility and pipe trenches may be backfilled above the pipe zone with excavated on-site soils, provided they meet the gradation requirements of engineered fill. The backfill material should be placed in layers no greater than 8 inches in uncompacted thickness, moisture conditioned or allowed to dry to achieve a moisture content near optimum, then mechanically compacted to at least 90 percent relative compaction based on ASTM D1557. The upper 2 feet should be compacted to at least 95 percent relative compaction in areas where structural or traffic loads are anticipated.

5.0 LATERAL EARTH PRESSURES

5.1 **Active Earth Pressure.** Active earth pressures are imposed by the soil on walls that are unrestrained so that the top of the wall is free to translate or rotate at least 0.004H, where H is the height of the wall. The active earth pressure may be calculated using a design equivalent fluid pressure (EFP) for each of the sites as indicated in Table 5.1 – Active Earth Pressures.

TABLE 5.1 – ACTIVE EARTH PRESSURES

Site Location	**GB-11A**	**GB-23**	**GB-36-1**	**GB-44-1**	**GB-M-1**
Active EFP (1) (pcf)	30	30	30	35	35

1. EFP assumes that excavations do not extend below the groundwater table.

5.2 **At-Rest Earth Pressure.** At-rest pressures should be used for design of walls that are restrained such that the deflections required to develop active earth pressures cannot occur or are undesirable. The at-rest earth pressures may be calculated using a design EFP for each of the sites as indicated in Table 5.2 – At-Rest Earth Pressures.

TABLE 5.2 – AT-REST EARTH PRESSURES

Site Location	**GB-11A**	**GB-23**	**GB-36-1**	**GB-44-1**	**GB-M-1**
At-Rest EFP (1) (pcf)	50	50	50	55	55

1. EFP assumes that excavations do not extend below the groundwater table.

5.3 **Seismic Earth Pressure.** In addition to the active and at-rest pressures, retaining walls should be designed to consider additional earth pressures due to earthquake loading. The increment in earth pressure due to seismic loading, for both restrained and unrestrained below-grade walls, may be calculated using an inverted triangular distribution with the pressure at the top of the wall equal to a design earth pressure (EP) of 50H, wherein H is the height of the wall in feet, and diminishes to zero at the base of the wall, as indicated in Table 5.3 – Seismic Earth Pressures.

TABLE 5.3 – SEISMIC EARTH PRESSURES

Site Location	GB-11A	GB-23	GB-36-1	GB-44-1	GB-M-1
Seismic EP (1) at Top of Wall (psf)	50 H (2)	50 H (2)	50 H (2)	55 H (2)	55 H (2)

1. EFP assumes that excavations do not extend below the groundwater table.
2. H is the height of the wall in feet, and diminishes to zero at the base of the wall.

5.4 **Passive Earth Pressure.** Lateral loads on structures can be resisted by passive pressures that develop against the sides of below-grade structures such as walls or footings. The passive pressure depends on the lateral displacement of the wall or footing. In accordance with FEMA 356 (FEMA, 2000), the ultimate passive pressure is mobilized at a displacement of approximately 6 percent of the wall height. The ultimate passive earth pressure may be calculated using a design EFP that corresponds to the ultimate EFP as long as the structure can be mobilized to such level of displacement and still does not exceed the allowable displacement of the structure. Oftentimes, the displacement to achieve ultimate passive earth pressures exceeds the allowable displacement of the structure. Consequently, a design EFP needs to be reduced when the allowable displacement of the structure is less than 6 percent of the wall height. For displacements of approximately 0.8 and 3 percent of the wall height, the design EFP may be reduced to 50 and 85 percent of the ultimate EFP. Passive pressures computed using these design EFPs may be combined with the base friction mobilized at the concrete-soil interface to resist lateral loading (see Section 5.5). The passive earth pressures may be computed using the following design EFPs as indicated in Table 5.4 – Passive Earth Pressures:

TABLE 5.4 – PASSIVE EARTH PRESSURES

Site Location	GB-11A	GB-23	GB-36-1	GB-44-1	GB-M-1
Passive Ultimate EFP (1) at 6% Wall Height Displacement (pcf)	300	280	300	320	320
Passive EFP (1) at 3% Wall Height Displacement (pcf)	250	240	250	270	270
Passive EFP (1) at 0.8% Wall Height Displacement (pcf)	150	140	150	160	160

1. EFP assumes that excavations do not extend below the groundwater table.

5.5 **Base Friction.** A coefficient of friction of 0.4 may be used for estimating the resistance due to base friction. The coefficient should be multiplied by the dead load only. The passive earth pressure and base friction mobilized at the concrete-subgrade interface may be combined to resist lateral loading.

6.0 FOUNDATIONS

6.1 Subgrade Preparation. Subgrades to new shallow foundations for the proposed structures should be prepared to provide a flat, relatively dry, and firm working surface. If any unsuitable materials, such as, soft clays or silts, soils containing organic material, debris or other deleterious materials are encountered at subgrade, they should be over-excavated and restored to grade with engineered fill in accordance with Sections 4.5 and 4.6. The fill soils encountered in our exploratory borings were suitable for support of the proposed improvements provided the upper 12 inches are scarified, moisture conditioned, and recompacted. We recommend that the upper 12 inches of subgrade be scarified, moisture conditioned to near optimum moisture content, and compacted in accordance with Sections 4.5 and 4.6. The subgrade should be free of loose debris and ponded water prior to placing reinforcing steel and concrete.

Dynamic settlements of loose to medium dense granular soils at GB-36-1, -44-1, and -M-1 are anticipated during an earthquake event if these sites are not mitigated. Estimates of dynamic settlement at each site are provided in Section 2.4 – Liquefaction and Dynamic Settlement. Special mitigation measures against settlement at CUP-36-1 require additional over-excavation of artificial fill materials below any foundations. This over-excavation must extend three feet below proposed footing elevation, or, if competent Colma Formation materials are encountered within those three feet, six inches into Colma Formation materials. Engineered fill shall then be placed, moisture treated to near optimum water content and mechanically compacted to 95 percent relative compaction as determined by ASTM D1557.

6.2 Shallow Foundation Alternatives. A shallow foundation system is suitable for support of the proposed improvements at the sites. Alternatives for shallow foundation systems include grade beams / shallow footings, mat foundations, and post-tensioned foundations.

Grade Beams / Shallow Footings: Based on the findings from our subsurface evaluation and laboratory testing, the ultimate bearing capacity of soils below new footings within the footprint of proposed buildings varies according the geotechnical characteristics of soils encountered at each site. We recommend an allowable bearing capacity of 3,000 pounds per square foot (psf) for soils below new footings at the GB-11A, -23, -36-1, -44-1 and -M-1 sites. This bearing capacity includes a factor of safety of at least three against bearing failure, and is applicable to newly constructed footings with widths of at least 18 inches and footing embedment of at least 24 inches below lowest adjacent grade.

A static modulus of subgrade reaction of 60 pounds per cubic inch (pci) may be used in order to develop soil springs below the foundation elements. For the lateral resistance of grade beams and footings, the geotechnical design parameters provided in the Lateral Earth Pressures section may be used.

As discussed in Section 2.4, dynamic settlements of up to approximately ¼ inch may affect the GB-11A and -23 sites during an earthquake event. The remaining three sites are more susceptible to significant dynamic settlements during an earthquake event. Larger dynamic settlements, on the order of 1 to 2 inches at GB-36-1, -44-1 and -M-1 are anticipated during an earthquake event if these sites are not mitigated. These dynamic settlements are in addition to the settlements estimated for the building loads described above. Long-term consolidation settlements are not likely due to the granular nature of much of the subsurface soils, and the stiffness and overconsolidation of clayey soils.

***Mat Foundations*:** Effects from differential dynamic settlements at the GB-36-1, 44-1 and M-1 sites may be limited by supporting the structures at these sites on structurally rigid mat foundations. A mat foundation is a large concrete slab, designed by a structural engineer for specific use, to interface one or more columns or pieces of equipment with the foundation soil. It may encompass the entire foundation footprint or only a portion. The mat contact stresses are generally lower than other shallow foundation types due to distribution of stress over a larger area and stress compensation from excavated soil. Thickness and reinforcement of the mat foundation should be in accordance with the recommendations of a structural engineer. The appropriate allowable contact pressure(s) beneath the mat foundations will vary with their size, shape, and other factors. To limit foundation static settlements to less than ½ inch for dead and live loads and less than 1 inch for total loads including wind and seismic, the contact pressure beneath the mats should not exceed the allowable bearing capacities as recommended above for grade beams / shallow foundations. Mat foundations typically experience some deflection due to loads placed on the mat and the reaction of the soils underlying the mat. A design coefficient of subgrade reaction, $\mathbf{K_{v1}}$, of 260 kips per cubic foot (kcf) in compacted fill soils may be used for evaluating such deflections at the sites. This value is based on a square foot area and should be adjusted for the planned mat size. The coefficient of subgrade reaction, $\mathbf{K_B}$, for a mat of a specific dimension may be evaluated using the following equation:

$$\mathbf{K_B, = K_{v1}\,[(B+1)/2B]^2\,[(1+0.5(B/L)/1.5]}$$

where **B** is the width and **L** is the length of the foundation measured in feet.

Mat foundations bearing on fill may be designed using a coefficient of friction of 0.4 (total frictional resistance equals coefficient of friction times the dead load). The allowable lateral resistance can be taken as the sum of the frictional resistance and passive resistance provided the passive resistance does not exceed two-thirds of the total allowable resistance.

***Post-Tensioned Foundations*:** Effects from differential dynamic settlements at the GB-36-1, -44-1 and -M-1 sites may be limited through the application of post-tensioning in reinforcing, and hence, increasing the structural rigidity of grade beams / shallow footings. Thickness and reinforcement of a post-tensioned foundation should be in accordance with the recommendations of a structural engineer.

6.3 **Floor Slabs.** Slabs-on-grade should be supported on a 12-inch thick mat of compacted, engineered fill. Material for engineered fill and compaction requirements are presented in Sections 4.5 and 4.6. For moisture-sensitive flooring, floor slabs resting on soil should be underlain, at a minimum, by a capillary break system. We recommend 6 inches of clean coarse sand or pea gravel. When floor dampness is a concern, possibly in a low-lying area such as GB-M-1, floor slabs should be underlain by a vapor barrier and capillary break system. We recommend a system consisting of a 10-mil polyethylene (or equivalent) membrane placed over 6 inches of clean coarse sand or pea gravel. The exposed subgrade should be moistened just prior to the placement of the capillary break system. A sand layer above the moisture barrier to aid in concrete curing should be evaluated by the structural engineer. The slab underlayment including the capillary break can be taken as part of the 12-inch thick pad of compacted, engineered fill described above. Flooring and waterproofing consultants should be consulted for additional slab waterproofing recommendations.

7.0 CORROSION

Schiff Associates performed corrosivity laboratory tests on one soil sample for each of the five completed sites. Their laboratory results are included in Appendix A – Supporting Geotechnical Data. They performed the following tests:

- Resistivity (As-Received and Saturated),
- pH,
- Electrical Conductivity,
- Chemical Analyses of Cations (Calcium, Magnesium, Sodium, Potassium)
- Chemical Analyses of Anions (Carbonate, Bicarbonate, Fluoride, Chloride, Sulfate, Phosphate)
- Chemical Analyses of Ammonium
- Chemical Analyses of Nitrate

Electrical resistivities indicate soils range from moderately corrosive to highly corrosive to ferrous metals in GB-11A, -M-1 and -44-1.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 **Geotechnical Observation of Construction Activities.** We should be retained during construction to provide site observation and consultation concerning the condition of the bottom of excavations pertaining to foundation construction and pipeline trench excavation. Foundation grades should be observed and, where necessary, tested under the direction of a qualified geotechnical engineer to verify compliance with final design recommendations. All site preparation work and excavations should also be observed to compare the generalized site conditions assumed in the final design report with those found on site at the time of construction.

8.2 **Existing Underground Utilities.** A number of underground water main pipelines pass beneath and in the vicinity of the proposed sites. Other existing subsurface lines include the SFPUC transmission lines, sanitary sewer and storm sewer lines. Some of these utilities were located and marked prior to our subsurface investigation so that we would not damage them during drilling.

The City may consider remarking these utilities prior to construction of the improvements so they remain visible during earthwork and construction of the improvements. Any excavations made adjacent to existing utilities should be backfilled with on-site or imported soil to at least 90 percent relative compaction as evaluated by ASTM D 1557.

8.3 **Surface Drainage.** Proper surface drainage is essential for satisfactory site performance. Positive drainage should be provided and maintained to direct surface water away from building foundations and other site improvements. Positive drainage is defined as a slope of 2 percent or more over a distance of 5 feet or greater away from the foundations, flatwork, and tops of slopes. Runoff should then be directed by the use of swales or pipes into a collective drainage system. Surface water should not be allowed to pond adjacent to footings. We further recommend that the proposed structure be equipped with appropriate roof gutters and downspouts. Downspouts should discharge to a system of closed pipes that transport the collected water to a suitable discharge facility. We recommend that drought tolerant vegetation be used for site landscaping. Irrigation should be kept at levels just sufficient to maintain plant vigor.

9.0 CLOSURE

The conclusions and recommendations presented herein are professional opinions based on geotechnical and geologic data and the project as described. A review by this office of any foundation, excavation, grading plans and specifications, or other work product that relies on the content of this report, together with the opportunity to make supplemental recommendations is considered an integral part of this study. Should unanticipated conditions come to light during project development or should the project change from that described, we should be given the opportunity to review our recommendations.

The findings and professional opinions presented in this report are presented within the limits prescribed by the client, in accordance with generally accepted professional engineering and geologic practices. There is no other warranty, either express or implied, regarding the conclusions, recommendations, and opinions presented in this report.

Submitted by:
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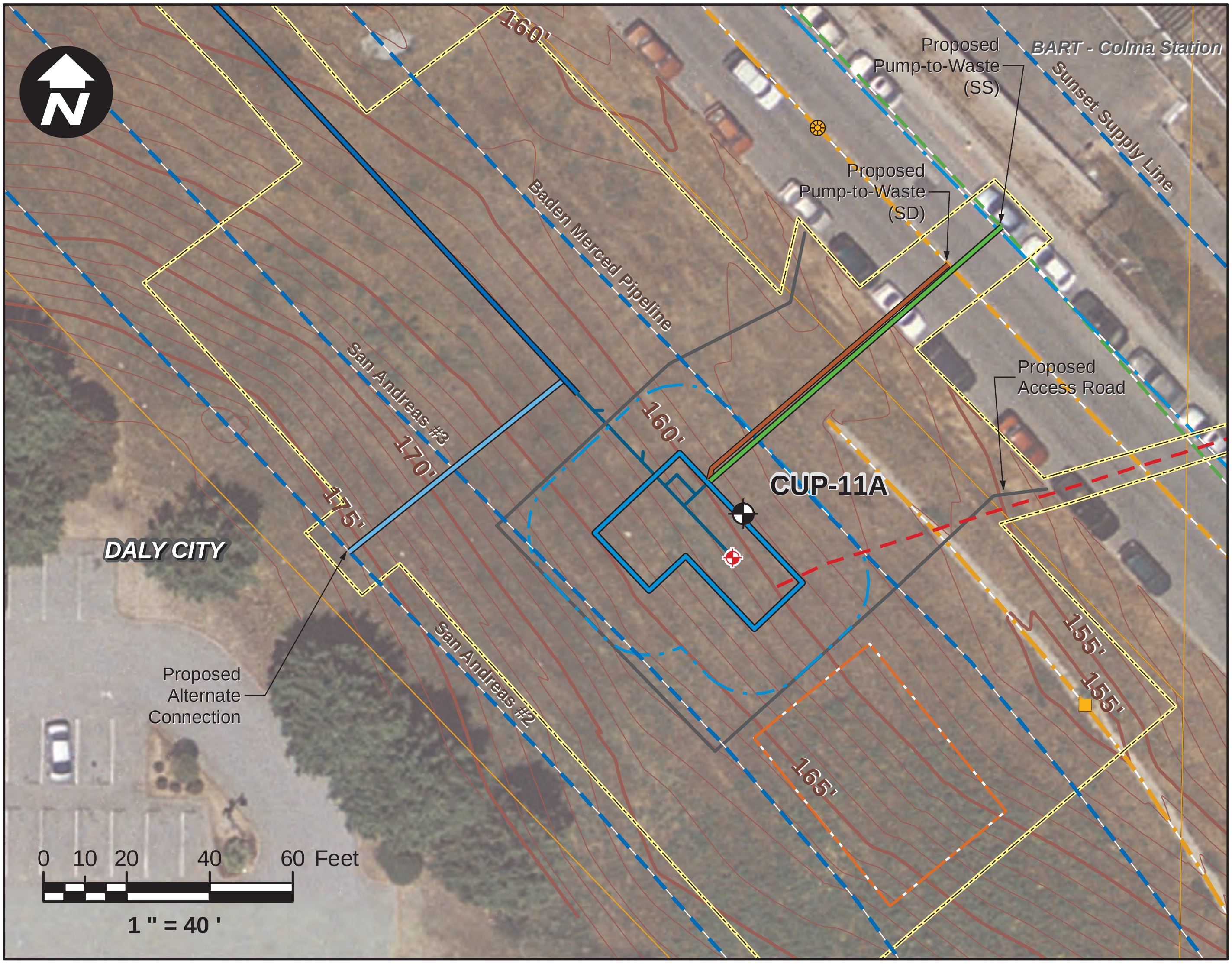


Legend

Geotecnical Boring by GTC in September 2009.

Proposed Test Well - Phase 1

Proposed Construction Area for Test Well and Connections

Proposed Staging Area Boundary

Proposed Construction Area-16ft Building Buffer

Proposed Building with Chemical Treatment

Existing Parcels - San Mateo County

Proposed Access Road

Proposed Connection Main

Proposed Alternate Connection

Proposed Pump-to-Waste (SS)

Proposed Pump-to-Waste (SD)

Existing 5-Foot Contour Lines

Existing 1-Foot Contour LInes

Existing PG&E Pole

Proposed Underground Electrical

Existing Transmission Line - SFPUC

Existing Water - CalWater

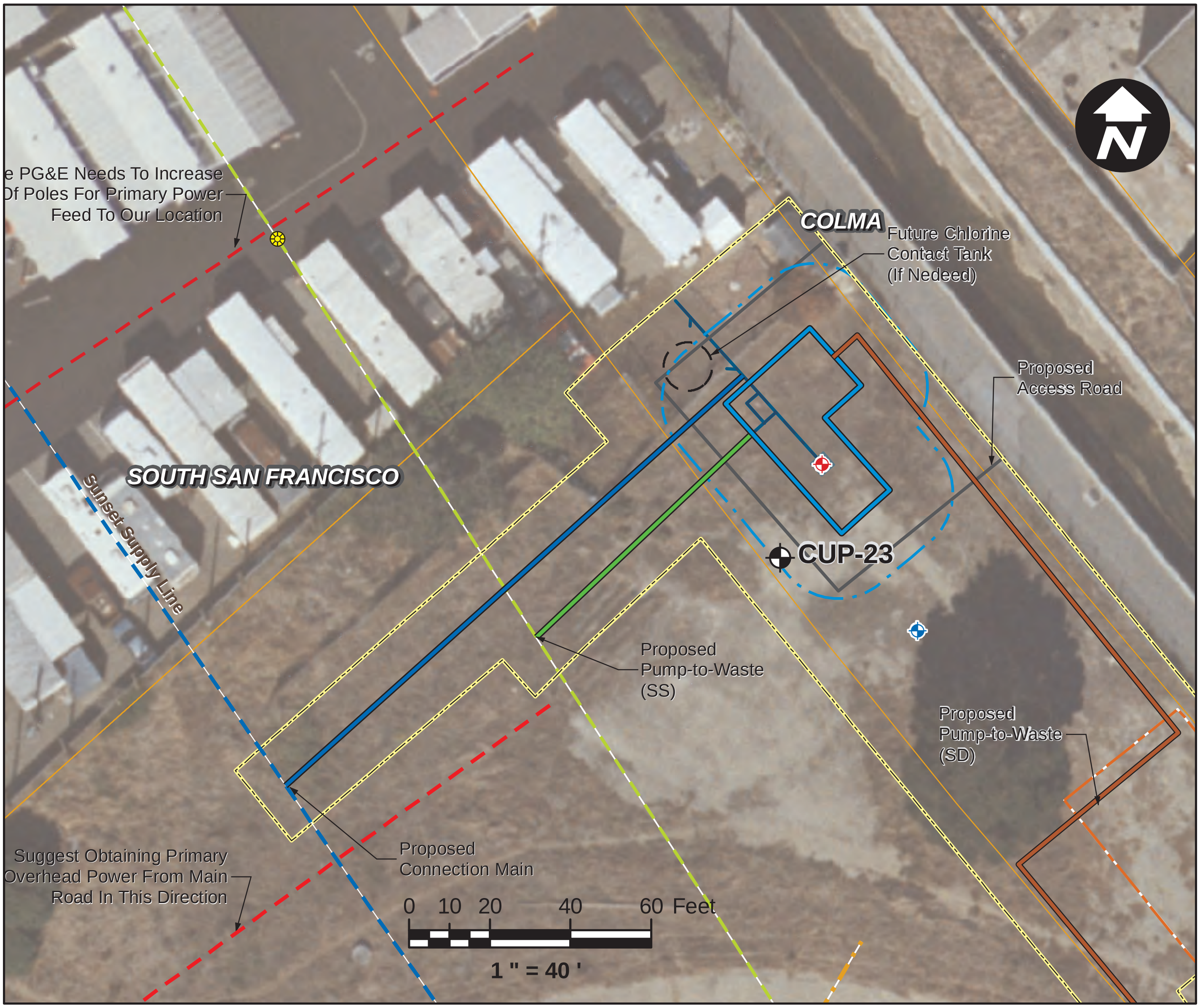
Existing Sanitary Sewer - DalyCity

Existing Stormdrain Catch Basin - Colma

Existing Stormdrain Manhole - Colma

Existing Stormdrain - Colma

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	BORING LOCATION PLAN FOR CUP-11A	PLATE 1
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	DECEMBER 2009	SF09020



Legend

- Geotecnical Boring by GTC in September 2009.
- Proposed Test Well - Phase 2
- Proposed Monitoring Well - Phase 2
- Proposed Construction Area for Test Well & Connections
- Proposed Staging Area Boundary for Well Building
- Proposed Construction Area-16ft Building Buffer
- Proposed Building and Chemical Treatment
- Proposed Access Road
- Existing Parcels - San Mateo County
- Proposed Connection Main
- Proposed Pump-to-Waste (SS)
- Proposed Pump-to-Waste (SD)
- Existing Transmission Line - SFPUC
- Proposed Underground Electrical
- Existing Sanitary Sewer Manhole - DalyCity
- Existing Sanitary Sewer - DalyCity
- Existing Stormdrain - SSF

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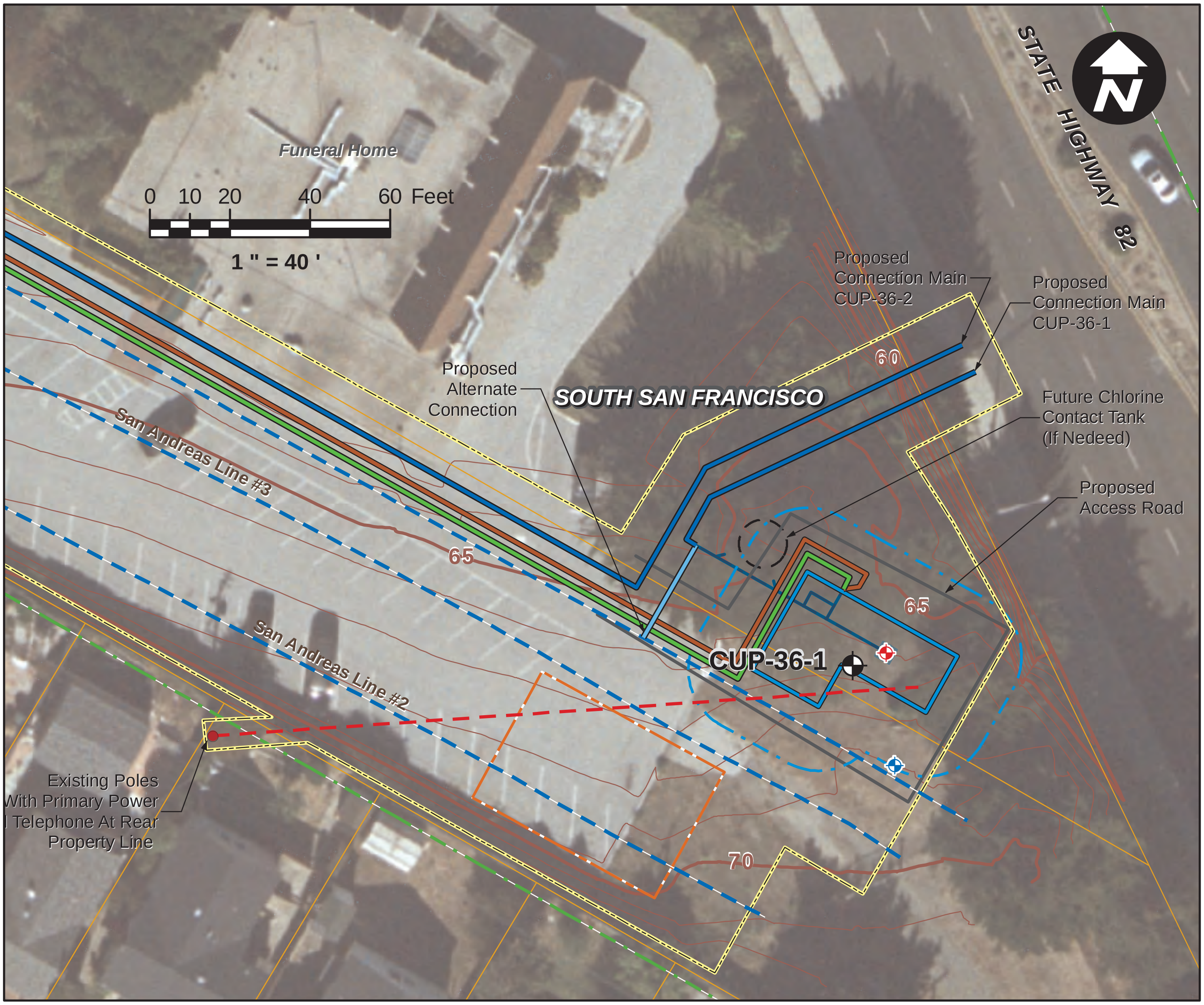
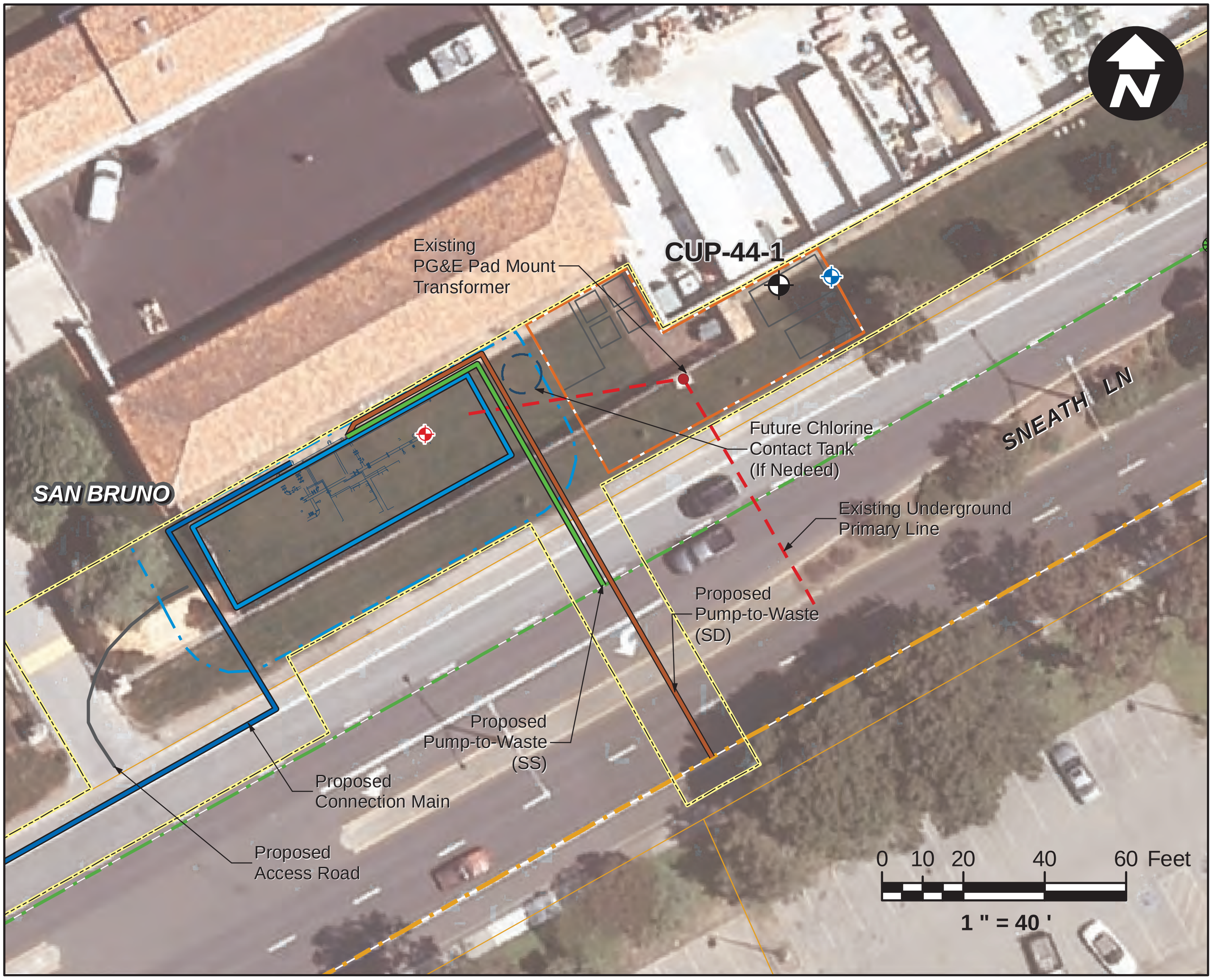
BORING LOCATION PLAN FOR CUP-23	PLATE 2
SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
DECEMBER 2009	SF09020



Legend

- Geotecnical Boring by GTC in September 2009.
- Proposed Test Well - Phase 2
- Monitoring Well Installed in Phase 1
- Proposed Construction Area for Test Well and Connections
- Proposed Staging Area Boundary for Well Building
- Proposed Construction Area-16ft Building Buffer
- Proposed Building with Chemical Treatment
- Proposed AccessRoad
- Proposed Connection Main
- Proposed Alternate Connection
- Proposed Pump-to-Waste (SS)
- Proposed Pump-to-Waste (SD)
- 5-Foot Contour Lines
- 1-Foot Contour Lines
- Existing Parcels - San Mateo County
- Existing Transmission Line - SFPUC
- Existing PG&E Pole
- Proposed Underground Electrical
- Existing Sanitary Sewer Manhole - SSF
- Existing Sanitary Sewer - SSF

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	BORING LOCATION PLAN FOR CUP-36-1	PLATE 3
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	DECEMBER 2009	SF09020



Legend

- Geotecnical Boring by GTC in September 2009.
- Proposed Test Well - Phase 2
- Proposed Monitoring Well - Phase 2
- Proposed Construction Area for Test Well and Connections
- Proposed Staging Area Boundary for Well Building
- Proposed Construction Area-16ft Building Buffer
- Proposed Building with Filtration
- Proposed Access Road
- Proposed Connection Main
- Proposed Alternate Connection
- Proposed Pump-to-Waste (SS)
- Proposed Pump-to-Waste (SD)
- Topography
- Existing Parcels - San Mateo County
- Existing Transmission Line - SFPUC_Surveyed
- Existing PG&E Transformer
- Proposed Underground Electrical
- Existing Water - CalWater
- Existing Catch Basin - San Bruno
- Existing Manhole - San Bruno
- Existing Storm Drain - San Bruno
- Existing Sanitary Sewer Manhole - San Bruno
- Existing Sanitary Sewer - San Bruno

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San Francisco, CA 94111

BORING LOCATION PLAN FOR CUP-44-1	PLATE 4
SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
DECEMBER 2009	SF09020

Legend

- Geotecnical Boring by GTC in September 2009.
- Proposed Test Well - Phase 2
- Proposed Monitoring Well - Phase 2
- Proposed Construction Area for Test Well and Connections
- Proposed Staging Area Boundary for Well Building
- Proposed Construction Area-16ft Building Buffer
- Proposed Building with Chemical Building
- Proposed Access Road
- Proposed Connection Main
- Proposed Well Connnection Pipe
- Proposed Alternate Connection
- Proposed Pump-to-Waste (SS)
- Proposed Pump-to-Waste (SD)
- Existing Parcels - San Mateo County
- Transmission Line - SFPUC_Surveyed
- Existing PG&E Pole
- Existing Over Head Electrical
- Proposed Underground Electrical
- Existing Water - DalyCity
- Existing Water - CalWater

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome St., Suite 402 San Francisco, CA 94111	BORING LOCATION PLAN FOR CUP-M-1	PLATE 5
	SOUTH WESTSIDE GROUNDWATER BASIN CUP PROJECT	
	DECEMBER 2009	SF09020

GEOTECHNICAL REPORT – CUP-3A AND CUP-7 SITES, REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT, NOVEMBER 2011 (REVISED JANUARY 2012)

GEOTECHNICAL CONSULTANTS, INC.
Geotechnical Engineering • Geology • Hydrogeology

GEOTECHNICAL REPORT
CUP-3A AND CUP-7 SITES
REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT
SAN MATEO COUNTY, CA

November 2011
(Revised January 2012)

Prepared for:

San Francisco Public Utilities Commission
1155 Market Street
San Francisco, California 94103

Owner:

San Francisco Public Utilities Commission

GTC Project No. SF11004

500 Sansome Street, Suite 402 • San Francisco, CA 94111 • (415) 981-9950

GEOTECHNICAL CONSULTANTS, INC.
Geotechnical Engineering • Geology • Hydrogeology

Mr. Thomas Hull, S.E.
San Francisco Public Utilities Commission
1155 Market Street
San Francisco, California 94103

November 28, 2011
(Revised January 16, 2012)
GTC Project No. SF11004

Subject: Geotechnical Report
Regional Groundwater Storage & Recovery Project
CUP-3A and CUP-7 Sites
San Mateo County, California

Dear Mr. Hull:

The San Francisco Public Utilities Commission (SFPUC) is planning for the design and construction of proposed improvements to facilitate groundwater well stations, and chemical treatment and filtration facilities at two designated CUP-3A and CUP-7 sites located in northern San Mateo County, California. The proposed wells are part of the Regional Groundwater Storage and Recovery Project. We have previously submitted geotechnical reports for ten other GSR sites located in northern San Mateo County. We prepared this report (revised from the previously submitted report dated November 28, 2011) presenting our geotechnical findings, conclusions, and recommendations for the proposed improvements at the CUP-3A and CUP-7 sites. This report was developed in accordance with Task Order No. 6 of the design services Contract No. CS-998B.

Sincerely,
Geotechnical Consultants, Inc.

Nick S. Ng, G.E.
Senior Geotechnical Engineer

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APPENDIX A – SUPPORTING GEOTECHNICAL DATA

INTRODUCTION

This geotechnical report presents the findings, conclusions, and recommendations of our geotechnical study performed for proposed buildings to facilitate groundwater well stations, and chemical treatment and filtration facilities at two designated sites, CUP-3A and CUP-7, located in the northern part of San Mateo County, California (**Figure 1 – Site Location Map**). The proposed wells are part of the Regional Groundwater Storage and Recovery Project (GSR), a project being developed through the coordination of the San Francisco Public Utilities Commission (SFPUC) and local partner agencies (i.e., City of Daly City, City of San Bruno, and Cal Water). We have previously performed geotechnical investigations and submitted geotechnical design reports (GTC, 2009a and 2009b) at ten other sites in northern San Mateo County for the project. This geotechnical report is being prepared for the SFPUC as part of Task Order No. 6 of the design services Contract No. CS-998.B.

Although the CUP-44-2 site was initially proposed along with the CUP-7 site for our geotechnical evaluation, we were subsequently instructed by the SFPUC not to pursue our study of the CUP-44-2 site for this task due to issues pertaining to restrictions on accessibility and building layout. Instead, we have been authorized to evaluate the CUP-3A and CUP-7 sites.

We anticipate that the proposed lightly loaded station buildings will typically be constructed with concrete, although the material selection will depend on the surrounding structures. According to the site location and floor plans developed at the 65 percent design progress in June, 2011 (SFPUC, 2011), a new well station building which houses a production well and related chemical treatment facilities are anticipated at the CUP-3A site. The footprint size of proposed well station building is approximately 1,523 square feet (35 feet by 43½ feet). At the CUP-7 site, the well station fenced enclosure is approximately 576 square feet (18 feet by 32 feet). Other improvements located adjacent to each well station exterior include concrete paving, and a transformer pad. The preliminary layout of the proposed well station buildings and related facilities is shown on **Plates 1 and 2 – Exploration Location Plan**. Geotechnical recommendations for additional improvements such as new pipeline connections and upgrades, which may require additional geotechnical borings, were not part of our scope of work.

Our understanding of the project is based on a site visit on July 26, 2011, discussions with the SFPUC Design Team, preliminary 65 percent progress drawings of the project sites, a review of geotechnical information as referenced in this report, and results from our field exploration and laboratory testing programs. The objectives of our geotechnical study are to: (1) review available geotechnical/geologic information in the site vicinity to understand site conditions; (2) perform a subsurface exploration program to classify subsurface soil types, conduct in-situ soil tests, and collect soil samples for geotechnical laboratory testing; and (3) perform geotechnical engineering analyses to assess potential geo-hazards and develop recommendations for the design and construction of the proposed well station facilities.

FIGURE 1 – SITE LOCATION MAP

WORK PERFORMED

In accordance with our proposal dated January 24, 2011, and subsequent discussions with the SFPUC Design Team, we completed the scope of work described below:

1. **Review of Background Information.** We reviewed available plans, and geotechnical and geologic data for the project sites. Based on our review of existing data, we developed a field exploration program as discussed below.

2. **Field Exploration Program.** We explored subsurface conditions by means of drilling one hollow-stem auger boring at each of the CUP-3A and CUP-7 sites. The exploratory locations for the CUP-3A and CUP-7 sites are shown on **Plates 1 and 2 – Exploration Location Plans**, respectively. Details of our exploration program including the site location and exploration number, method of exploration, date of drilling, existing surface elevation, and bottom depth and elevation are presented for each boring in **Table 1 – Summary of Geotechnical Exploration**. The elevations presented on **Table 1**, and referred to throughout this report, are estimated from the topographic contours on the preliminary 65 percent site plans (SFPUC, 2011) and referenced with respect to 1988 North American Vertical Datum (NAVD88).

   TABLE 1 – SUMMARY OF GEOTECHNICAL EXPLORATION

Site Location and Exploration No.	Method	Exploration Date	Surface Elevation (feet)[1]	Bottom Depth (feet)	Bottom Elevation (feet)[1]
CUP-3A	Stem Auger	8/8/2011	+190	51.4	+139
CUP-7	Stem Auger	8/8/2011	+132	36.3	+96

   1. Surface elevation relative to NAVD88 datum is estimated from the topographic contours on the preliminary 65 percent progress site location plans dated June, 2011 from SFPUC (2011).

   We visually classified the soil during drilling. We recovered split-spoon (Standard Penetration Test) samples and relatively undisturbed 2 ½ inch diameter sleeve samples using a split-barrel sampler. Selected samples were transferred to a laboratory for testing. Boring logs are presented on **Plates A-1.1 and A-1.2** in **Appendix A – Supporting Geotechnical Data**.

3. **Laboratory Testing.** We performed moisture, density, grain size analysis, Atterberg limits, direct shear and corrosion tests on selected soil samples to measure pertinent index and engineering properties. The laboratory test results are presented on the figures in **Appendix A**, and on the boring logs on **Plates A-1.1 and A-1.2**.

4. **Engineering Analysis.** We analyzed subsurface conditions and laboratory test results, and reviewed regional and local geology and seismicity. Based on our evaluation, we provided the following geotechnical recommendations for design:

   - Geologic and seismic hazards: Assessment of hazards associated with fault rupture, strong ground shaking, liquefaction, seismically-induced landslide, lateral spread and tsunami, seismic settlement and differential compaction, and recommendations on mitigation measures, where appropriate; and allowable design parameters for short-term seismic loading.
   - Site response spectra: Evaluated seismic design parameters in accordance with the International Building Code Static Force Procedure (ICC, 2009) as adopted in the 2010 California Building Code (ICC, 2010), and ASCE7-05.
   - Allowable and ultimate bearing capacity: Evaluation of allowable and ultimate soil bearing pressures and modulus of subgrade reaction (vertical soil springs) for the anticipated shallow foundation systems (shallow footings with grade beams, and mat foundations).
   - Anticipated settlements: Assessment of total and differential settlements for shallow foundation systems that are anticipated for the proposed well stations. Development of options for mitigating excessive dynamic settlements.
   - Earthwork recommendations: Development of recommendations for site preparation and grading, excavations, engineered fill (including placement and compaction), structural fill, and pipe trenching, bedding and backfilling; and assessment of the suitability of site-excavated material for re-use as fill or backfill material.
   - Lateral earth pressures: Recommendations of design lateral earth (including active, passive, at-rest, and seismic increment) pressures and coefficient(s) of base sliding friction for unrestrained and restrained retaining walls and/or buried footings.
   - Corrosion recommendations: Discussion of the corrosion test results, identification of on-site soils which may cause corrosion or other deleterious effects to concrete or steel.
   - Construction considerations: Discussion pertaining to geotechnical conditions at the project sites including mitigation of excessive dynamic settlements.
   - Groundwater considerations: Discussion of anticipated groundwater conditions during construction.

5. **Report.** We prepared this report presenting our geotechnical findings, conclusions, and recommendations for the proposed improvements at the GSR project sites.

FINDINGS

SITE CONDITIONS

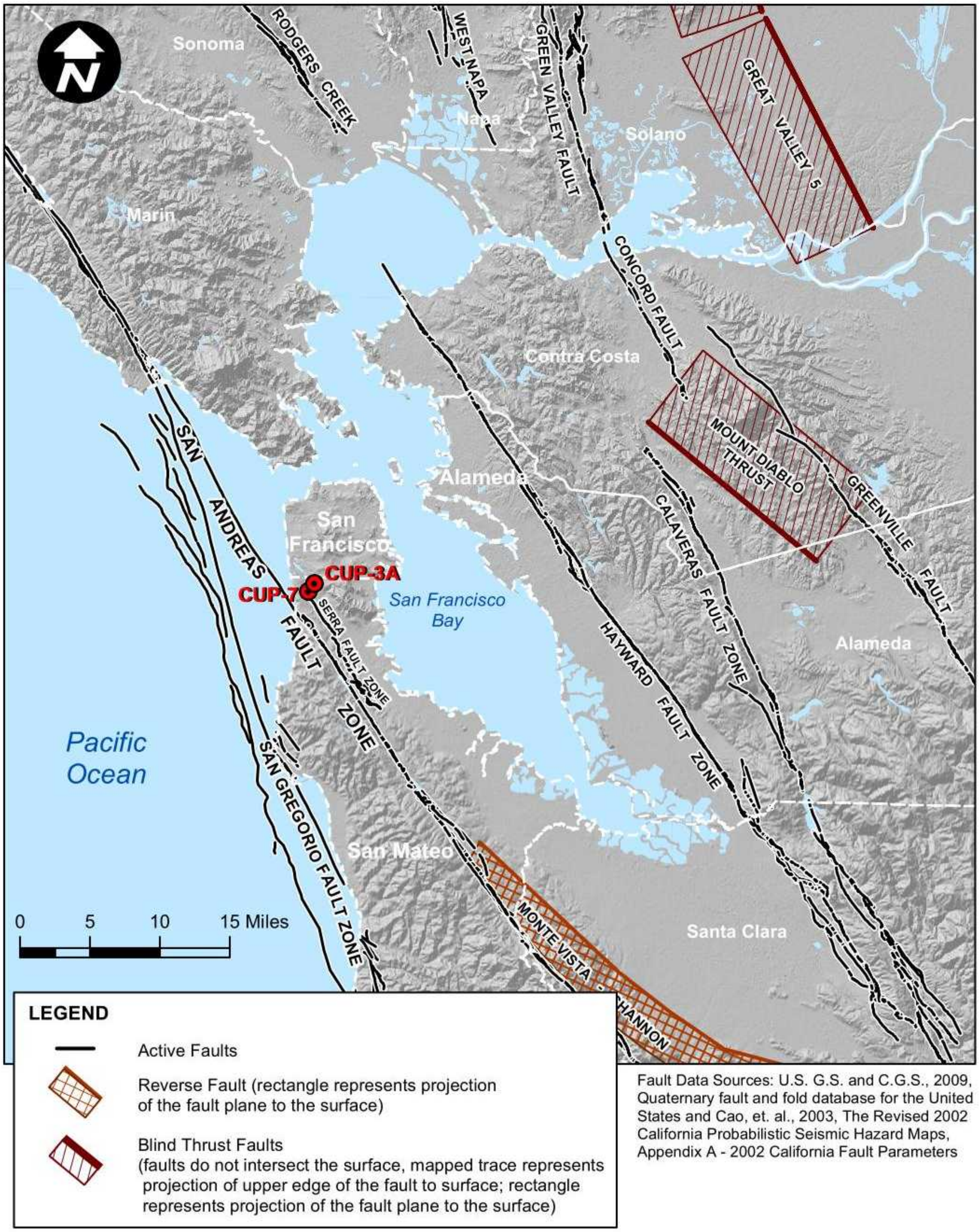
The two GSR project sites are located at northern San Mateo County, California. The CUP-3A site is located within the northeast portion of the Lake Merced Golf Club in Daly City, California, and is surrounded at about 30 feet to the east by Interstate 280 (I-280), and about 100 feet to the north by parking lot of the 45 Poncetta Drive apartment complex. As indicated on **Plate 1**, the CUP-3A site is situated on a relatively flat, unpaved pad that is currently occupied by an existing public restroom and some buried utility lines (including a PG&E gas transmission pipeline and some water main pipelines). About 20 feet to the west from the nearest edge of the proposed well station building at the site, the relatively flat terrain descends about 8 feet on a 3:1 (horizontal:vertical) slope to a paved driveway that separates the project site from a putting green (lawn). The slope appears to be sparsely planted with trees.

The CUP-7 site is located about 160 feet northeast of the intersection between 87th Street and Park Plaza Drive in Broadmoor, California. The project site which is situated on an undeveloped, grassed area is surrounded with Park Plaza Drive to the west, a 10-foot wide paved walkway and residential units to the south, and a sloping terrain to the north and east. As indicated on **Plate 2**, the CUP-7 site is situated on a relatively flat to mildly sloping terrain that descends north-to-northeast along the Park Plaza Drive orientation. From the northeast corner of the proposed well station fenced enclosure at the CUP-7 site, the terrain descends about 20 feet on an approximately 3:1 (horizontal:vertical) slope in a northeast direction toward the track and field of the Garden Village Elementary School. The slope appears to be densely vegetated with low to moderately tall trees and shrubs. The nearest residential unit is located about 50 feet south of the site.

SEISMICITY

The San Francisco Bay Area contains several active faults that could cause strong ground shaking at the project sites. **Figure 2 – Regional Active Fault Map** shows faults in the vicinity of the project sites. The San Andreas Fault Zone (including the 1906 Rupture Event and Peninsula Segment) is the nearest active fault and is located about 0.8 and 1.4 miles from the CUP-7 and CUP-3A sites, respectively. The San Andreas Fault is a primary component in a complex system of right-lateral, strike-slip faults; including the San Andreas, San Gregorio-Seal Cove, Hayward, and Calaveras faults; collectively known as the San Andreas Fault system. The San Andreas, San Gregorio-Seal Cove, Hayward, and Calaveras Faults have produced measurable historic ground motion and movement. The San Andreas Fault is capable of producing an earthquake of an estimated maximum magnitude of M7.9. This segment is estimated to have recurrence intervals on the order of 200 years. A summary of nearby faults is presented in **Table 2 – Active and Potentially Active Faults**.

FIGURE 2 – REGIONAL ACTIVE FAULT MAP



Fault Data Sources: U.S. G.S. and C.G.S., 2009, Quaternary fault and fold database for the United States and Cao, et. al., 2003, The Revised 2002 California Probabilistic Seismic Hazard Maps, Appendix A - 2002 California Fault Parameters

TABLE 2 – ACTIVE AND POTENTIALLY ACTIVE FAULTS

Fault	Distance to Fault (miles)		Estimated Maximum Earthquake Magnitude (1)	Historic Earthquakes (2)	
	CUP-3A	CUP-7		Year	Magnitude
San Andreas - 1906 Rupture Section	1.4 (3)	0.8 (3)	7.9 (3)	1838 1898 1906 1989	6.8 6.2 8.1 7.1
San Andreas – Peninsula Section	1.4	0.8	7.1		
San Andreas – North Section	8.0	8.2	7.6		
San Gregorio-Seal Cove – North Section	5.8	5.2	7.3	N.A.	N.A.
Hayward- North Section	16	16	6.9	1868	6.8
Hayward – South Section	18	18	6.9		
Monte Vista-Shannon	20	20	6.8	n.a.	n.a.
Calaveras – North Section	26	26	6.8	1861 1955 1979 1984 2007	5.3 5.5 5.9 6.1 5.4
Calaveras – South Section	40	40	6.2		

(1) Maximum Moment Magnitude based on California Geological Survey (CGS) fault parameters as updated in 2002 (Cao, et al., 2003), or as suggested by the SFPUC's General Seismic Requirements (SFPUC, 2006).
(2) Historic earthquakes listed may have occurred on any one of the listed sections of the associated fault; n.a. (not applicable) indicates that no significant historic earthquakes have occurred on this fault or fault section.
(3) The 1906 rupture event assumes rupture along the North Coast, Peninsula and Santa Cruz Mountains sections to San Juan Bautista. Maximum magnitude is based on the average 5 m displacement during the 1906 event (WGCEP, 2003; Petersen, et al., 1996). Site-to-fault distances are based on the USGS 2008 updated National Seismic Hazard Mapping Program (Petersen et al., 2008) and interactive de-aggregation at URL https://geohazards.usgs.gov/deaggint/2008/.

GEOLOGY

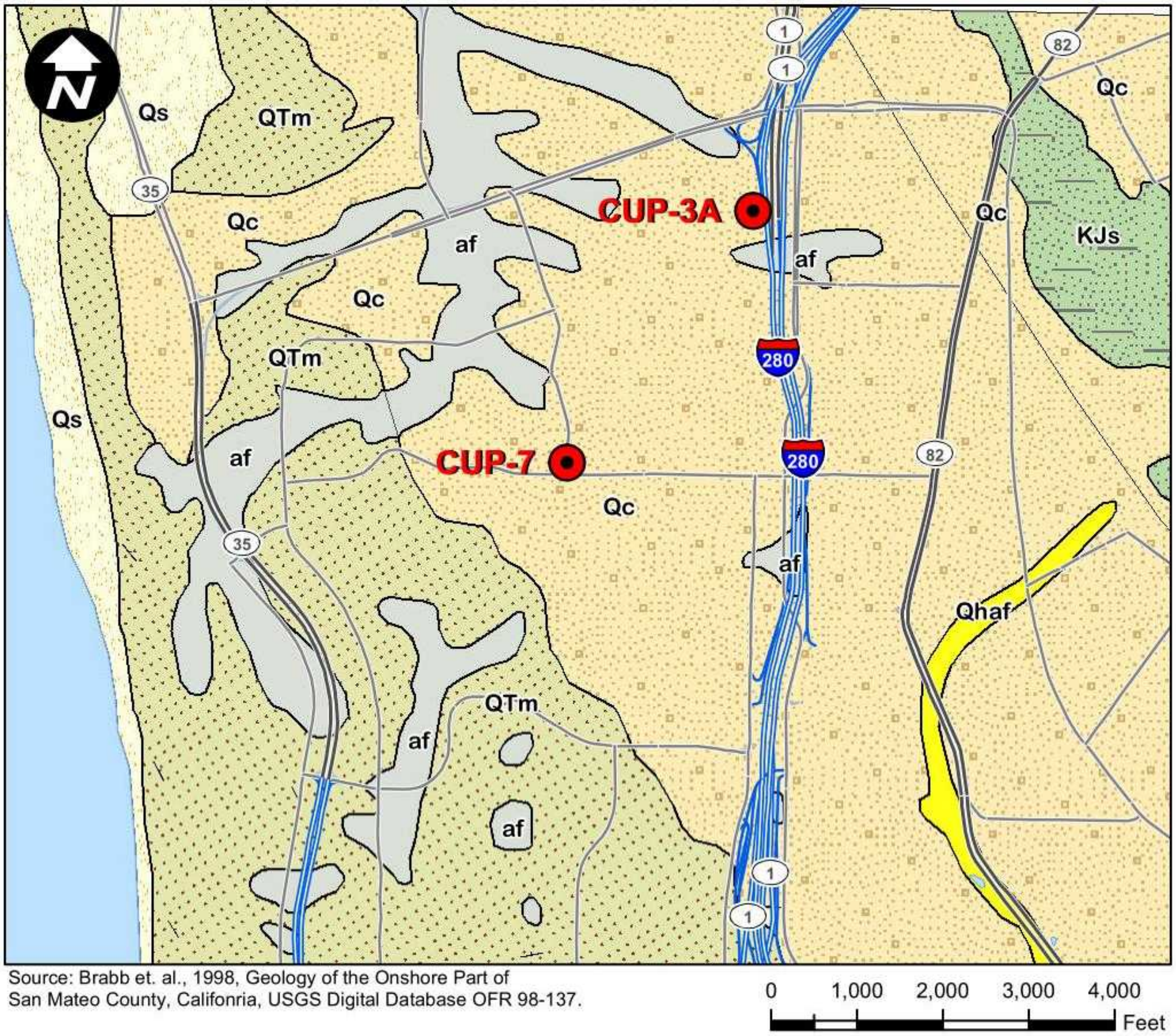
The San Francisco Bay Area is located within the Coast Ranges Geomorphic Province. Past episodes of tectonism have folded and faulted the bedrock, creating the regional topography of the northwest trending ridges and valleys characteristic of the Coast Ranges Geomorphic Province. The San Francisco Bay and vicinity occupy a structurally controlled basin within the province. Late Pleistocene and Holocene sediments (less than 1 million years old) were deposited in the basin as it subsided.

The two project sites are located in areas mapped as Colma Formation (Brabb, et al., 1988). Other sedimentary deposits mapped in close proximity to the sites include Merced

Formation, Sand Dune and Beach Deposits, and Unnamed Sandstone. A layer of artificial fill was encountered at each site. The geology in the project vicinity is shown on **Figure 3 – Regional Geologic Map**. Based on a regional geologic study as compiled as a regional geologic cross section of the Westside Basin – Lake Merced (SFPUC, 2008), the Franciscan Complex bedrock is anticipated to be on the order of 600 to 700 feet below ground surface at the sites. Geologic maps (Brabb, et al., 1998) describe the geologic units at and near each boring as follows:

- **af:** Artificial fill (Historic) – loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made debris in various combinations and thicknesses which may exceed 30 m; some compacted and quite firm, but fill made before 1965 is nearly everywhere not compacted and consists of simply dumped materials.
- **Qs:** Sand Dune and Beach Deposits (Holocene) – predominantly loose, medium- to coarse-grained, well-sorted sand but also includes pebbles, cobbles, and silt; thickness is typically less than 6 m in most places, but in other places may exceed 30 m.
- **Qc:** Colma Formation (Pleistocene) – yellowish-gray, gray, yellowish-orange and red-brown, friable to loose, fine- to medium-grained arkosic sand with subordinate gravel, silt and clay; total thickness is typically unknown, but may up to 60 m.
- **QTm:** Merced Formation (lower Pleistocene and upper Pliocene) – medium gray to yellowish gray, yellowish orange, medium- to very fine-grained, poorly indurated to friable sandstone, siltstone, and claystone, with some conglomerate lenses and a few friable beds of white volcanic ash; sandstone is typically silty, clayey, or conglomeratic; fossiliferous conglomerate is well cemented.
- **KJs:** Unnamed Sandstone (Cretaceous or Jurrasic) – dark gray to yellowish brown greywacke interbedded with shale in approximately equal amounts; unit resembles some Franciscan greywacke (fs) but bedding is better developed herein; the unit is exposed in San Bruno Mountain, where it is about 1,000 m thick.

FIGURE 3 – REGIONAL GEOLOGIC MAP



LEGEND

Geologic Units

Historic

af — Artificial fill

Holocene

Qhaf — Alluvial fan and fluvial deposits

Qcl — Sand dune and beach deposits

Pleistocene

Qc — Colma Formation

Pleistocene to Pliocene

QTm — Merced Formation

Cretaceous to Jurassic

KJs — Unnamed sandstone

Structual Features

—— geologic contact

EARTH MATERIALS

The exploration for this investigation encountered artificial fill (af) which was underlain by Colma Formation (Qc). The artificial fill represents disturbed soil and fill materials previously placed during site grading at the project sites. The exploratory locations are shown on **Plates 1 and 2**.

Artificial Fill (af). Artificial fill consisting of medium dense, poorly grade fine grained sand with silt was encountered to a depth of about 8 feet in boring CUP-7. The grade at the Garden Village Elementary School track and field is located about 20 feet below the CUP-7 site. The origin of fill at the site was likely derived from grading and reuse of on-site, near surface materials of Colma Formation (Qc).

At boring CUP-3A, artificial fill consisted of an upper 20 feet of loose to dense, poorly graded fine sand with silt, and a remainder 11 feet of dense, silty fine sand. Judging from distinctly lower density and less fines content, the upper 20 feet of looser materials may likely have been derived from more recent activities such as, grading and reuse of on-site, near surface artificial fill around the Lake Merced Golf Course, and construction of an elevated pad for the existing public restroom building. In comparison to the upper fill, the lower stratum of fill with higher density and higher fines content are closer in resemblance to the engineering properties of the underlying Colma Formation.

At the project sites, measured total unit weights ranged from 101 to 113 pounds per cubic foot (pcf) and moisture contents ranged from 4 to 12 percent.

Colma Formation. Soils of the Colma Formation (Qc) were encountered below the artificial fill at the two project sites. The Colma Formation soils consisted predominantly of yellowish, reddish and grayish brown, dense to very dense, silty fine grained sand with oxide staining. An isolated layer of medium dense, silty fine sand was observed within the upper portion of the Colma Formation at CUP-3A. Colma Formation soils at the two sites extended to the total depth of exploration (36.3 to 51.4 feet). A moisture content ranging from 9 to 18 percent was measured in the Colma Formation soils at the two sites.

GROUNDWATER

Groundwater was not encountered during auger drilling of the two exploratory borings CUP-3A and CUP-7. Groundwater levels are likely to be influenced by seasonal variations in precipitation, percolations from storm water runoff and local irrigation, groundwater pumping and other factors, and are therefore expected to fluctuate considerably from the observed groundwater levels.

CONCLUSIONS AND RECOMMENDATIONS

1.0 GENERAL

The following sections provide our conclusions and recommendations for evaluation and design of the proposed well station buildings at two sites of CUP-3A and CUP-7. According to preliminary 65 percent drawings (SFPUC, 2011), proposed improvements at CUP-3A consist of a well station building that houses facilities such as, a production well and chemical treatment equipment, concrete paving, and transformer pad. Proposed improvements at CUP-7 consist of a fenced pad with a production well and electrical equipment. Based on findings from our geotechnical field investigation, the project sites are underlain by artificial fill (af) and Colma Formation (Qc).

We consider the proposed improvements to be geotechnically feasible, provided that our geotechnical recommendations are incorporated into design and construction documents.

2.0 SEISMIC DESIGN CONSIDERATIONS

2.1 **General.** The main seismic hazards at the site are expected to be strong ground shaking and seismic settlement and differential compaction within the loose to medium dense portion of fill and upper Colma Formation. Our seismic design considerations, including fault rupture, ground shaking, liquefaction, seismic settlement and dynamic (differential compaction) settlement, inundation by tsunamis, seismically-induced lateral spreading, and seismic design with respect to the 2009 International Building Code (which the 2010 California Building Code has adopted) and ASCE7-05 are provided in the following sections.

2.2 **Fault Rupture.** No active or potentially active faults are known to cross the subject sites. Consequently, the hazard posed by ground rupture due to fault offset is considered to be negligible.

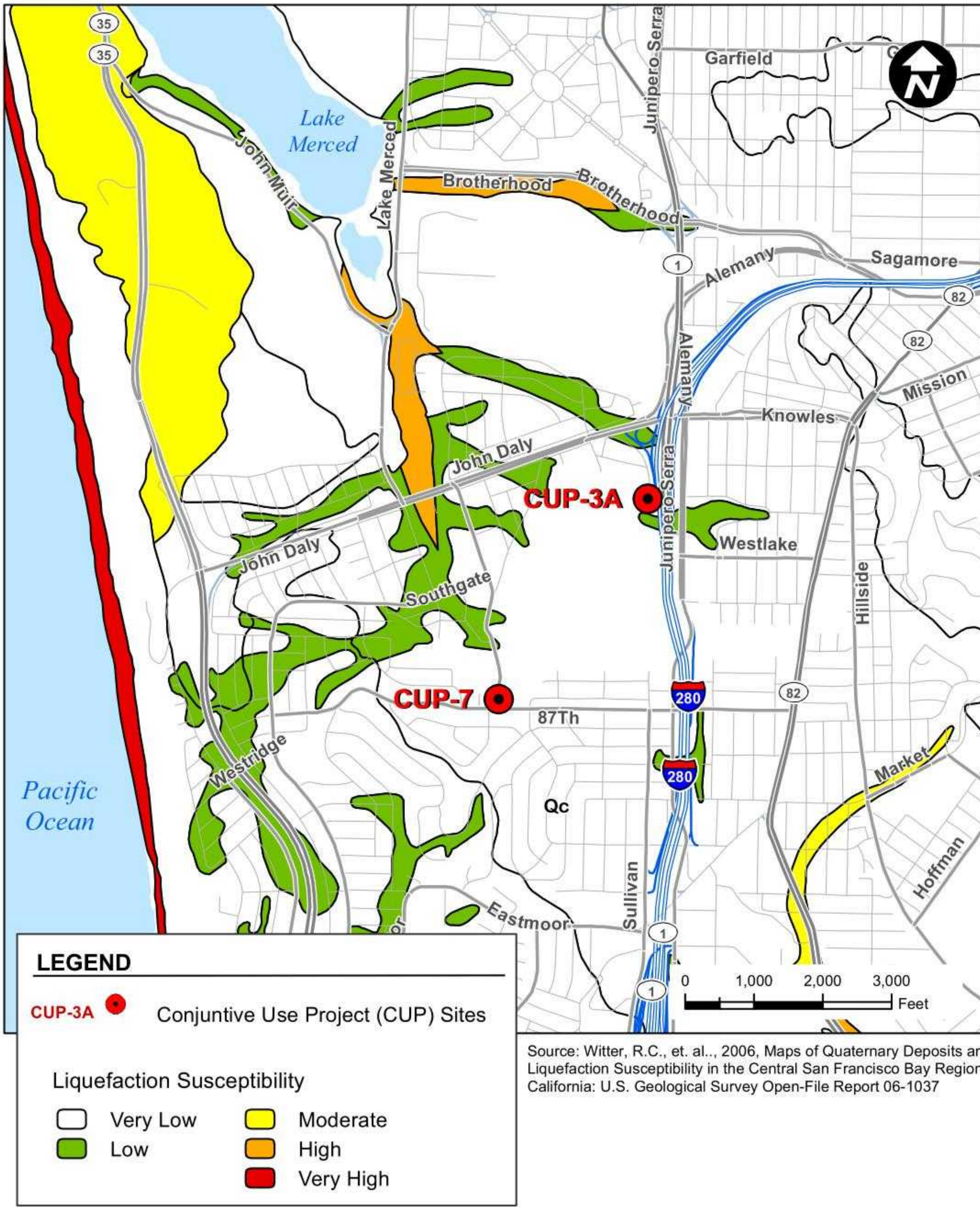
2.3 **Ground Shaking**. Strong ground shaking will occur at the site as a result of a moderate to large earthquake occurring on one of the active regional faults. The San Andreas Fault is closest to the sites at about 0.8 and 1.4 miles to the southwest from CUP-7 and CUP-3A sites, respectively. Based on de-aggregation of seismic sources from the probabilistic seismic hazard analysis (USGS, 2008), the Northern San Andreas Fault and San Gregorio-Seal Cove Fault segments of the San Andreas Fault system are the only individual fault segments that each contributes more than 2 percent to the overall mean hazard at various spectral periods from 0 to 5 seconds. Therefore, the San Andreas Fault system has the greatest capability of causing strong ground motions. Of the two segments of the San Andreas Fault system, the Northern San Andreas Fault segment with an event magnitude M7.9 and shorter source-to-side distances of 0.8 to 1.4 miles is the dominant event relative to the smaller event magnitude M7.3 at longer source-to-site distances of 5.2 to 5.8 miles for the San Gregorio-Seal Cove Fault segment.

The California Geological Survey (CGS, formerly known as California Division of Mines and Geology) and United States Geological Survey (USGS) completed probabilistic seismic hazard maps in 1996 (Petersen et al., 1996), and subsequently updated fault parameters and revised the maps in 2002 (Cao, et al., 2003, and WGCEP, 2003) and 2008 (Petersen, et al, 2008, and WGCEP, 2008). USGS provides a web-based program to evaluate the USGS Probabilistic Uniform Hazard Response Spectra (http://earthquake.usgs.gov/research/hazmaps/design). Based on the 2008 USGS update, the peak ground acceleration (PGA) at a 975-year return period (an earthquake event having a 5 percent probability of exceedance in 50 years) is estimated to be 0.82g and 0.87g for the CUP-3A and CUP-7 sites, respectively. PGA at the Maximum Credible Earthquake (MCE) level for the two sites are controlled by the dominant event of the Northern San Andreas Fault segment with a magnitude M7.9 and R0.8 to R1.4 miles, as discussed above and based on seismic de-aggregation of the PSHA (USGS, 2008). To evaluate PGA at the MCE level, the 2008 Next Generation Attenuation (NGA08) method (EERI, 2008) provides estimated PGA of 0.80g and 0.84g which correspond to the upper limits at the 84^{th} percentile deterministic level (median plus one standard deviation) for the dominant earthquake event. For this study, PGA corresponding to 0.80g and 0.84g are used for geotechnical earthquake engineering evaluation at the CUP-3A and CUP-7 sites, respectively.

2.4 Liquefaction and Dynamic Settlement. Liquefaction is a phenomenon wherein a temporary, partial loss of shear strength occurs in a soil due to increases in pore pressure that result from cyclic loading during earthquakes. Saturated, loose to medium dense sands and silty sands are most susceptible to liquefaction. Consequences of liquefaction can include ground settlements, foundation failure, sand boils, and lateral spreading. Dynamic settlement is the densification of saturated and unsaturated soils during strong ground shaking. All soil types are prone to dynamic settlement, though loose, sand and silty sand are most susceptible.

Liquefaction: The liquefaction susceptibility, as mapped by Witter et al. (2006), is illustrated on **Figure 4 – Liquefaction Susceptibility Map**. As can be seen from the figure, the CUP-3A site lies within a zone mapped as having very low to low liquefaction susceptibility. A zone of very low liquefaction susceptibility is mapped for the CUP-7 site. Because of the regional focus of the liquefaction susceptibility mapping, the data only generally correlates with areas of known liquefaction hazard. The site-specific data from the borings is considered to be more indicative of liquefaction and dynamic settlement hazard. The following paragraphs further describe this hazard based on our subsurface investigation and laboratory testing program.

FIGURE 4 – LIQUEFACTION SUSCEPTIBILITY MAP



Source: Witter, R.C., et. al.., 2006, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California: U.S. Geological Survey Open-File Report 06-1037

Due to the absence of groundwater within the total exploration depths of about 36 to 51 feet at the two project sites and material density that generally increases with depth, liquefaction is not considered to be a significant consideration for the Colma Formation below these depths. As discussed earlier in this report, groundwater levels are likely to be influenced by rainfall and storm water runoff, and are expected to fluctuate considerably from the observed groundwater levels. Hence, liquefaction susceptibility has to be considered for higher groundwater conditions as recommended in Section 3. In evaluating liquefaction susceptibility of the materials explored from the borings at the project sites, we have conservatively assumed groundwater levels of 20 feet at CUP-3A, and 10 feet at CUP-7. Below an assumed groundwater level of 10 feet, the dense to very dense silty sand of the Colma Formation encountered in boring CUP-7 is not susceptible to liquefaction. The dense silty sand of the artificial fill encountered below an assumed groundwater level of 20 feet in boring CUP-3A is also not susceptible to liquefaction. An isolated layer/pocket of medium dense silty sand within the upper portion the Colma Formation at a depth of about 35 feet is not considered to pose significant risk of seismic induced reconsolidation settlement to the site. Volumetric reconsolidation settlement is not considered to be significant for the soil below a groundwater depth of 10 feet in boring CUP-7. Results from our liquefaction analysis are presented on **Table 3 – Summary of Dynamic Settlements**.

Our liquefaction analysis has been conducted using the Simplified Cyclic Stress Ratio module within the SHAKE2000 computer program for one-dimensional analysis of geotechnical earthquake engineering problems (Geomotions, 2011). Detailed information regarding the analysis methods can be found in the following references: Cetin and Seed (2000 and 2004), Cetin et al. (2004), Moss et al. (2006), Seed et al. (1985 and 2003), Seed and Idriss (1971), and Youd et al. (2001 and 2003).

Dynamic Settlement of Dry Sand: Seismically induced dynamic settlements at CUP-3A are estimated at 4 inches, due to the presence of up to 20 feet of unsaturated, loose to medium dense fill sand near the surface. At CUP-7, such dynamic settlements are estimated at ¾ inch. Differential settlements (over a distance of 80 feet) are estimated to be 1 inch at CUP-3A and ¼ inch at CUP-7. Differential settlements can be linearly interpolated from these estimated values when the dimensions (distances) of the proposed improvement footprint are less than 80 feet. Results of our dynamic settlements of dry sands are presented on **Table 3 – Summary of Dynamic Settlements**.

Our evaluation of dynamic differential compaction settlement of unsaturated sand has been conducted in conjunction with liquefaction analysis using the Simplified Cyclic Stress Ratio module within the SHAKE2000 computer program for one-dimensional analysis of geotechnical earthquake engineering problems (Geomotions, 2011). For unsaturated sand layers, the volumetric strains for a site-specific dominant earthquake magnitude other than the reference magnitude M7.5 are calculated by multiplying the site-specific volumetric strains with correction factors as recommended by Tokimatsu and Seed (1987). These adjusted volumetric strains are doubled to account for the effects from multi-directional shaking. Detailed information regarding the calculation method can be found in the above references.

Total Seismic Settlement: Total seismic settlement is the cumulative of volumetric reconsolidation settlement of saturated sand due to liquefaction and dynamic settlement of dry sand. Since volumetric reconsolidation settlement due to liquefaction is not considered as likely to occur at the two project sites, the total seismic settlement is equivalent to the dynamic settlement of dry sand. The results indicate the propensity for dynamic (compaction) settlement of dry sand is similar for the two groundwater conditions. Results of total and differential dynamic settlements are presented on **Table 3 – Summary of Dynamic Settlements**.

In addition to the estimated seismic settlements presented above, pockets of loose unsaturated granular soil which may be encountered during subgrade preparation should be removed to reduce potential for uneven seismic densification. Based on our evaluation, the hazard posed by differential settlement due to dynamic settlement resulting from liquefaction of saturated sand and dynamic settlement of unsaturated sand is considered to be moderate for CUP-3A and low for CUP-7. Measures for mitigating excessive seismically induced settlements for the project sites are addressed in **Section 6**.

TABLE 3 – SUMMARY OF DYNAMIC SETTLEMENTS

	CUP-3A		CUP-7	
	Groundwater Depth		Groundwater Depth	
	20 feet	50 feet	10 feet	50 feet
Volumetric Reconsolidation (inches)	0	--[(1)]	0	--[(1)]
Dynamic Dry Sand Settlement (inches)	4	4	½	¾
Total Dynamic Settlement (inches)	4	4	½	¾
Differential Dynamic Settlement (inches) [(2)]	1	1	¼	¼

1. Liquefaction does not occur in unsaturated soil above the lower groundwater depth of 50 feet.
2. Differential dynamic settlements can be linearly interpolated from these estimated values when the dimensions (distances) of the proposed improvement footprint are less than 80 feet.

2.5 Inundation by Tsunamis. While tsunamis can be triggered by various sources such as an earthquake, a landslide, a volcanic eruption, or even a large meteor crashing into the ocean, the most common trigger is related to a large, submarine earthquake that creates a significant upward movement of the sea floor to result in a rise of water at the ocean surface (CGS, 2009). As the mound of water, which can travel up to 500 miles per hour in the open ocean, approaches the shoreline, it slows down to about 30 miles per hour and builds up significantly in amplitude (height). Hence, a tsunami hazard mitigation program which includes emergency preparedness and evacuation is essential to areas that have been identified as potentially susceptible to inundation from tsunami.

The project sites are not mapped within areas that are potentially susceptible to tsunami inundation (CalEMA, 2009). Given that the project site elevations are well above the Mean Sea Level (MSL) and they are located at distances in excess of one mile from the nearest Pacific Ocean coastal area to the west, the project sites are not considered to be potentially susceptible to inundation from tsunami.

2.6 **Seismically-Induced Landsliding and Lateral Spreading.** Although an embankment (about 8-foot high, descending on an about 3:1 slope) is located about 20 feet to the west from the nearest edge of the proposed well station building at the CUP-3A site, the potential susceptibility of the site to lateral spreading toward the embankment free face is considered low because the isolated layer of potentially liquefiable medium dense within the Colma Formation at a depth of 35 feet is located well below the toe of the 8-foot tall embankment.

At the CUP-7 site, the terrain can be characterized as mildly sloping (descending about 13:1) along the Park Plaza Drive, and an embankment (about 20-foot high) that descends on an about 3:1 slope from the northeast corner of the proposed building footprint to the Jefferson Elementary School track and field. The potential susceptibility of the CUP-7 site to lateral spreading is considered to be low because Colma Formation soil at this site is not susceptible to liquefaction.

An evaluation of static stability of the slopes at the CUP-3A and CUP-7 sites using the method of stability charts by Janbu (USACE, 2003) indicates stable slopes with factors of safety (FOS) in excess of 2. Roots from vegetation/shrubs and low to moderately tall trees along the slopes at the two project sites provide additional strengthening of the near surface soil mass and may reduce the potential for surficial sloughing. A confluence of the above factors suggests that the potential for seismically-induced instability of the slope (including landsliding and lateral spreading) is considered to be low at the two project sites.

2.7 **Seismic Design Parameters.** The proposed improvements may be designed in accordance with the International Building Code Static Force Procedure (ICC, 2009) as adopted in the 2010 California Building Code (ICC, 2010) using the seismic parameters presented in **Table 4 – Seismic Design Parameters**. Based on our exploration, a Site Class D has been designated for the CUP-3A site, and a Site Class C for CUP-7. The seismic design parameters have been developed for the ASCE7-05 Maximum Considered Earthquake using the Earthquake Ground Motion Parameters Application (Version 5.1.0) as developed by the USGS (2011).

TABLE 4 – SEISMIC DESIGN PARAMETERS

	CUP-3A	CUP-7
Mapped Spectral Acceleration		
S_s at 0.2-second	2.096	0.875
S_1 at 1-second	1.149	2.186
Site Adjustment Factor		
Site Class	D	C
Site Coefficient F_a	1.0	1.0
Site Coefficient F_v	1.5	1.3
Site Adjusted Spectral Acceleration		
SMs = F_a x S_s	2.096	2.186
SM1 = F_v x S_1	1.724	1.607
Design Spectral Acceleration		
SDs = 2/3 x SMs	1.397	1.457
SD1 = 2/3 x SM1	1.149	1.071

3.0 GROUNDWATER

Groundwater was not encountered during drilling at the two CUP-3A and CUP-7 borings. Groundwater levels are influenced by seasonal variations in precipitation, percolations from storm water runoff and local irrigation, groundwater pumping and other factors, and are therefore, subject to variation. To account for seasonal variations, we recommend conservative design groundwater levels for structural design purposes as presented in **Table 5 – Recommended Design Groundwater Levels**.

Groundwater related design issues such as hydrostatic pressures on shoring elements (if implemented), excavation dewatering, and hydrostatic uplift pressures on the proposed buildings are not anticipated for excavations less than 5 feet below the ground surface. For excavations exceeding the design groundwater depths, the contractor should anticipate groundwater inflow that may require dewatering. For intermediate excavations between 5 feet and the design groundwater depths, the contractor should anticipate the possibility of inflow of groundwater seepage.

TABLE 5 – RECOMMENDED DESIGN GROUNDWATER LEVELS

Proposed Site Location	Design Groundwater Depth (feet)
CUP-3A	20
CUP-7	10

4.0 EARTHWORK

4.1 **General.** Given the earth materials on the project site encountered during our exploration, the contractor should be able to carry out planned excavations using conventional heavy equipment.

Evaluation of the presence, or absence, and treatment of hazardous materials was not part of this study. If hazardous materials are encountered during excavation, proper handling and treatment during construction will depend on the contaminant type, concentration, and volatility of the contaminated materials.

General geotechnical considerations for site preparation, excavations, temporary shoring and bracing, engineered fill material, engineered fill placement and compaction, pipe bedding, and utility trench backfill are presented in the following sections.

4.2 **Site Preparation.** Site preparation will consist of demolition, excavation and removal of on-site materials such as pavement, concrete, abandoned utilities, and miscellaneous debris in preparation for the foundation excavations. Any creation of holes from the removal of such materials should be backfilled with engineered fill. Recommendations for engineered fill are provided in Sections 4.5 and 4.6. Also as part of site preparation, the location of active underground utilities should be determined and, if affected by construction activities, should be relocated or protected.

4.3 **Excavations.** We anticipate that excavations for the planned building improvements to extend up to no more than a few feet below existing ground elevation. Shallow excavations for the proposed facilities will allow for unshored excavations with adequately sloped sidewalls. Vertically shored walls or braced excavations are anticipated where space constraints may not allow for open, sloped excavations. At a minimum, excavations should be constructed in accordance with the current California Occupational Safety and Health Administration (OSHA) regulations (Title 8, California Code of Regulations) pertaining to excavations. Temporary cut slopes are expected to be stable for configurations described in Title 8 for Type C soils and where unsupported should be cut back no steeper than 1 ½ horizontal to 1 vertical. All excavations should be closely monitored during construction to detect any evidence of instability.

Care should be taken when excavating near existing utilities and pipelines. Excavations can undermine support of adjacent existing pipelines and other subsurface structures. We recommend that some form of vertical shoring system be considered for excavated sidewalls that are adjacent to existing pipelines or other known buried adjacent structures.

Some of the near surface loose soils at the project sites will likely be removed during excavation for the proposed improvements. If any footings are founded above loose or soft soils, overexcavation of loose or soft soils and replacement with engineered fill may be required.

4.4 **Temporary Shoring and Bracing.** The type and design of the shoring will depend on the depth of excavation and excavation-bracing sequence. The shoring and bracing design and installation should be the responsibility of the construction contractor. As a general guideline, construction procedures, excavations, and design and construction of any temporary shoring should comply with the current OSHA Title 8 regulations pertaining to excavations. The shoring and bracing should accommodate surcharge loads that may be imposed by adjacent structures, traffic, or construction activities.

Possible shoring schemes include soldier pile and lagging and steel sheeting, both of which may include internal bracing struts to limit lateral deflections. Such braced and shored excavations will be subjected to lateral earth pressures. Recommended active, at-rest, and passive lateral earth pressures are provided in Section 5.

Horizontal and vertical movements of the ground are possible in the vicinity of the excavations. These movements can generally be reduced to acceptable levels by use of a properly designed and constructed shoring system. Measures should be taken to prevent the loss of sand through the gaps in the shoring or lagging.

4.5 **Engineered Fill Material.** Material for engineered fill should be inorganic, well graded, free of rocks or clods greater than 4 inches in greatest dimension or any other deleterious materials, and have a low potential for expansion. The material should have a liquid limit less than 35, a plasticity index less than 15 and no more than 25 percent passing the No. 200 sieve. Existing on-site soil may be re-used as engineered fill provided it meets the above criteria.

4.6 **Engineered Fill Placement and Compaction.** Engineered fill consisting of existing on-site fill which meets the requirements above should be placed in layers no greater than 8 inches in un-compacted thickness, conditioned with water or allowed to dry to achieve moisture content near optimum, then mechanically compacted to at least 90 percent relative compaction based on ASTM D1557. All engineered fill placed to support footings and the upper 6 inches of engineered fill supporting slabs-on-grade should be mechanically compacted to at least 95 percent relative compaction as determined by ASTM D1557. All compaction should be performed using mechanical compaction means; flooding or jetting should not be used as a means to achieve compaction. The ASTM D1557 laboratory compaction tests should be performed at the time of construction to provide a proper basis for compaction control.

4.7 Structural Backfill. Structures extending below grade should be backfilled with structural fill to a minimum width of two feet beyond the foundation footprint. Structural backfill should meet the following gradation:

Sieve Size	Percent Passing
3 inches	100
1½ inches	80 to 100
#4	50 to 100
#16	40 to 90
#50	10 to 60
#200	0 to 10

Backfill should be moisture conditioned to within two percent above optimum, placed in layers not exceeding 8 inches in uncompacted uniform thickness, and mechanically compacted to 90 percent relative compaction per ASTM D1557.

4.8 Pipe Bedding for Small Diameter Pipes. Pipe bedding should consist of well-graded sand or a sand-gravel mixture. Maximum gravel size should be ½ inch and the bedding material should have less than 12 percent passing the No. 200 sieve. Uniformly graded material such as pea gravel should not be used as pipe bedding material. Pipe bedding should have a minimum thickness of 6 inches beneath the pipe and 6 inches above the pipe. If soft or otherwise unsuitable soils are exposed in the bottom of the trench excavation, the necessity of over-excavation should be evaluated by the project geotechnical engineer. All pipe bedding should be placed to achieve uniform contact with the pipe and a minimum relative compaction of 90 percent per ASTM D1557.

4.9 Utility Trench / Pipe Backfill. Utility and pipe trenches may be backfilled above the pipe zone with excavated on-site soils, provided they meet the gradation requirements of engineered fill. The backfill material should be placed in layers no greater than 8 inches in uncompacted thickness, moisture conditioned or allowed to dry to achieve a moisture content near optimum, then mechanically compacted to at least 90 percent relative compaction based on ASTM D1557. The upper 2 feet should be compacted to at least 95 percent relative compaction in areas where structural or traffic loads are anticipated.

5.0 LATERAL EARTH PRESSURES

General. Structural components that extend below ground surface, such as concrete vaults, below-grade walls, and the sides of shallow foundations, will experience lateral earth pressure from the soil and hydrostatic pressure from any existing groundwater. Recommendations for the active, at-rest, passive, and seismic earth pressures, and coefficient of base friction to resist active and at-rest loads are summarized on **Table 6 – Lateral Earth Pressures**, and discussed in the following sections. Because the anticipated excavations will be limited to a depth not exceeding about 5 feet, and the design groundwater level is expected to be below 5 feet, hydrostatic pressures have not been considered.

Active Earth Pressure. Active earth pressures are imposed by the soil on below-grade structures that are unrestrained so that the top of the wall is free to translate or rotate at least 0.004H, where H is the height of the wall. The active earth pressure may be calculated using a design equivalent fluid pressure (EFP) of 40 pcf at the project sites.

At-Rest Earth Pressure. At-rest pressures should be used for design of below-grade structures that are restrained such that the greater deflections that are mobilized to develop the lesser active earth pressures cannot occur (or are undesirable). The at-rest earth pressures may be calculated using a design EFP of 60 pcf at the project sites.

Seismic Earth Pressure. In addition to the active and at-rest pressures, below-grade structures should be designed to consider additional earth pressures due to earthquake loading. The increment in earth pressure due to seismic loading, for both restrained and unrestrained below-grade structures, may be calculated using an inverted triangular distribution with the pressure at the top of the below-grade structures equal to a design earth pressure (EP) of 35H at the project sites, wherein H is the height of the buried structure in feet, and diminishes linearly with depth to zero at the base of the buried structure.

Passive Earth Pressure. Lateral loads can be resisted by passive pressures that develop against the sides of below-grade structures. The passive pressure depends on the lateral displacement of the wall or footing. In accordance with FEMA 356 (FEMA, 2000), the ultimate passive pressure is mobilized at a displacement of approximately 6 percent of the wall height. The ultimate passive earth pressure may be calculated using a design EFP that corresponds to the ultimate EFP as long as the structure can be mobilized to such level of displacement and still does not exceed the allowable displacement of the structure. Oftentimes, the displacement to achieve ultimate passive earth pressures exceeds the allowable displacement of the structure. Consequently, a design EFP needs to be reduced when the allowable displacement of the structure is less than 6 percent of the wall height. For displacements of approximately 0.8 and 3 percent of the wall height, the design EFP may be reduced to 50 and 85 percent of the ultimate EFP. Passive pressures computed using these design EFPs may be combined with the base friction mobilized at the concrete-soil interface to resist lateral loading. Passive earth pressures at the project sites may be computed using the design EFP of 400, 340 and 200 pcf for allowable wall displacements of about 6, 3 and 0.8 percent of wall height, respectively.

Base Friction. A coefficient of friction of 0.4 may be used for estimating the resistance due to base friction at the project sites. The coefficient should be multiplied by the dead load only. The passive earth pressure and base friction mobilized at the concrete-subgrade interface may be combined to resist lateral loading.

TABLE 6 – LATERAL EARTH PRESSURES

Lateral Pressures and Base Friction	CUP-3A	CUP-7
Active Equivalent Earth Pressure (pcf)	40	40
At-Rest Equivalent Earth Pressure (pcf)	60	60 pcf
Seismic Active Earth Pressure[2] (pcf)	35H [2,3]	35H [2,3]
Passive Equivalent Earth Pressure:		
Allowable Displacement 0.06 H[3] (psf)	400	400
Allowable Displacement 0.03 H[3] (psf)	340	340
Allowable Displacement 0.008 H[3] (psf)	200	200
Base Friction Factor	0.4	0.4

1. No hydrostatic effect assuming structural embedment remains above a depth of 5 feet.
2. The seismically induced active earth pressure increment should be applied to the wall as an inverted triangular distribution that decreases linearly from the top to zero at the bottom.
3. H is buried structure height relative to the finished exterior grade adjacent to the buried structure.

6.0 FOUNDATIONS

6.1 Subgrade Preparation. Subgrades to new shallow and deep foundations for the proposed structures should be prepared to provide a flat, relatively dry, and firm working surface. If any unsuitable materials, such as, soft clays or silts, soils containing organic material, debris or other deleterious materials are encountered at subgrade, they should be over-excavated and restored to grade with engineered fill in accordance with Sections 4.5 and 4.6. The fill soils encountered in our exploratory borings were suitable for support of the proposed improvements provided the upper 12 inches are scarified, moisture conditioned, and recompacted. We recommend that the upper 12 inches of subgrade be scarified, moisture conditioned to near optimum moisture content, and compacted in accordance with Sections 4.5 and 4.6. The subgrade should be free of loose debris and ponded water prior to placing reinforcing steel and concrete.

Although long term consolidation settlement is considered minor due to the granular nature of the fill materials, dynamic settlements of loose to medium dense granular soils at CUP-3A and CUP-7 are anticipated during an earthquake event if these sites are not mitigated. Estimates of dynamic settlement at each site are provided in Section 2.4 and Table 3. Special mitigation measures against dynamic settlement at two project sites require additional over-excavation of artificial fill materials below any foundations. This over-excavation must extend at least three feet below proposed footing elevation. Engineered fill shall then be placed, moisture treated to near optimum water content and mechanically compacted to 95 percent relative compaction as determined by ASTM D1557.

6.2 Shallow Foundation Alternatives. A shallow foundation system is suitable for support of the proposed improvements at the CUP-7 site as long as recommendations in Section 6.1 are incorporated into design. Alternatives for shallow foundation systems include grade beams / shallow footings, mat foundations, and post-tensioned foundations. Since a significant dynamic settlement on the order of 4 inches anticipated at the CUP-3A site is due to the loose sandy fill in the upper 20 feet, ground improvement may be needed at this site for a shallow foundation system. Ground improvement strategies such as, in situ densification methods of Geopiers and Rapid Impact Compaction, may not be very feasible because: 1) they may be cost prohibitive due to a significant treatment depth of at about 20 feet; and 2) they may generate vibration related impacts to adjacent structures during construction. Earthwork grading to excavate and recompact the upper 5 feet of loose fill beneath the proposed building footprint at CUP-3A is more appropriate from a cost standpoint in reducing the differential settlement from 1 inch to ¼ inch (and total settlement from 4 inches to 1 inch). Other alternatives to overexcavation and recompaction of the upper 5 feet of loose fill may include a more costly deep foundation system which will be discussed in Section 6.4.

Grade Beams / Shallow Footings: Based on the findings from our subsurface evaluation and laboratory testing, we recommend an allowable bearing capacity of 2,500 pounds per square foot (psf) for soils below new footings at the CUP-3A and CUP-7 sites as long as the recommendations for subgrade preparation in Section 6.1 are incorporated into the design. This bearing capacity includes a factor of safety of at least three against bearing failure, and is applicable to newly constructed footings with widths of at least 18 inches and footing embedment of at least 24 inches below lowest adjacent grade.

A static modulus of subgrade reaction of 60 pounds per cubic inch (pci) may be used in order to develop soil springs below the foundation elements. For the lateral resistance of grade beams and footings, the geotechnical design parameters provided in the Lateral Earth Pressures section may be used.

As discussed in Section 2.4, differential dynamic settlement is relatively minor on the order of ¼ inch at the CUP-7 site during an earthquake event. The remaining CUP-

3A site is more susceptible to a differential dynamic settlement on the order of 1 inch during an earthquake event if the site is not mitigated. To reduce this to a minor amount on the order of ¼ inch, the site should be mitigated by overexcavating and recompacting the upper 5 feet of soil below grade to develop a mass of densified soil beneath the proposed building at CUP-3A. Long-term consolidation settlements are not likely due to the granular nature of much of the subsurface soils. Therefore, total dynamic settlements are approximately equivalent to the estimated dynamic settlements at the two project sites. After site mitigation via overexcavating and recompacting the upper 5 feet of soil at CUP-3A, the total dynamic settlement is expected to reduce from 4 inches to 1 inch, and the differential settlement from 1 inch to ¼ inch. Total settlements due to dead loads and normal duration live loads are expected to be less than ¼ inch, and are likely to occur during or immediately after construction.

***Mat Foundations*:** Effects from differential dynamic settlements at the two project sites may be limited by supporting the structures at these sites on structurally rigid mat foundations. A mat foundation is a large concrete slab, designed by a structural engineer for specific use, to interface one or more columns or pieces of equipment with the foundation soil. It may encompass the entire foundation footprint or only a portion. The mat contact stresses are generally lower than other shallow foundation types due to distribution of stress over a larger area and stress compensation from excavated soil. Thickness and reinforcement of the mat foundation should be in accordance with the recommendations of a structural engineer. The appropriate allowable contact pressure(s) beneath the mat foundations will vary with their size, shape, and other factors. Without mitigating the upper 5 feet at loose fill at CUP-3A, a mat foundation system may limit foundation differential settlements to less than 3/4 inch for dead and live loads and less than 1 inch for total loads including wind and seismic, as long as the contact pressure beneath the mats should not exceed the allowable bearing capacities as recommended above for grade beams / shallow foundations. Mat foundations are not anticipated at CUP-7. Mat foundations typically experience some deflection due to loads placed on the mat and the reaction of the soils underlying the mat. A design coefficient of subgrade reaction, $\mathbf{K_{v1}}$, of 260 kips per cubic foot (kcf) in compacted fill soils may be used for evaluating such deflections at the sites. This value is based on a square foot area and should be adjusted for the planned mat size. The coefficient of subgrade reaction, $\mathbf{K_B}$, for a mat of a specific dimension may be evaluated using the following equation:

$$\mathbf{K_B, = K_{v1}\,[(B+1)/2B]^2\,[(1+0.5(B/L)/1.5]}$$

where **B** is the width and **L** is the length of the foundation measured in feet.

Mat foundations bearing on fill may be designed using a coefficient of friction of 0.4 (total frictional resistance equals coefficient of friction times the dead load). The allowable lateral resistance can be taken as the sum of the frictional resistance and passive resistance provided the passive resistance does not exceed two-thirds of the total allowable resistance.

Post-Tensioned Foundations: Effects from differential dynamic settlements at the two project sites may be limited through the application of post-tensioning in reinforcing, and hence, increasing the structural rigidity of grade beams / shallow footings. Thickness and reinforcement of a post-tensioned foundation should be in accordance with the recommendations of a structural engineer.

6.3 **Floor Slabs.** Slabs-on-grade should be supported on a 12-inch thick mat of compacted, engineered fill. Material for engineered fill and compaction requirements are presented in Sections 4.5 and 4.6. For moisture-sensitive flooring, floor slabs resting on soil should be underlain, at a minimum, by a capillary break system. We recommend 6 inches of clean coarse sand or pea gravel. When floor dampness is a concern, floor slabs should be underlain by a vapor barrier and capillary break system. We recommend a system consisting of a 10-mil polyethylene (or equivalent) membrane placed over 6 inches of clean coarse sand or pea gravel. The exposed subgrade should be moistened just prior to the placement of the capillary break system. A sand layer above the moisture barrier to aid in concrete curing should be evaluated by the structural engineer. The slab underlayment including the capillary break can be taken as part of the 12-inch thick pad of compacted, engineered fill described above. Flooring and waterproofing consultants should be consulted for additional slab waterproofing recommendations.

6.4 **Deep Foundations.** To mitigate significant dynamic settlement at the CUP-3A site, a deep foundation system that may include feasible alternatives such as, driven precast concrete piles (DPCP) and closed-end pipe piles, may be used to transfer building loads to a competent material of the Colma Formation for end bearing support at a depth of at least 40 feet. Should deep foundation be considered for design at the CUP-3A site, we would like to be given an opportunity in providing design consultation services/support to the structural engineer in providing geotechnical design parameters for evaluating the pile foundation system, as appropriate.

7.0 CORROSION

Schiff Associates performed corrosivity laboratory tests on two soil samples. Their laboratory results are included in **Appendix A – Supporting Geotechnical Data**. They performed the following tests:

- Resistivity (As-Received and Saturated)
- pH
- Electrical Conductivity
- Chemical Analyses of Cations (e.g. Calcium, Magnesium, Sodium)
- Chemical Analyses of Anions (e.g. Carbonate, Bicarbonate, Chloride, Sulfate)
- Chemical Analyses of Ammonium

- Chemical Analyses of Nitrate
- Chemical Analyses of Sulfide
- Oxidation-reduction (Redox) Potential

Electrical resistivities indicate soils are moderately corrosive to ferrous metals at the CUP-3A site and mildly corrosive at the CUP-7 site. The soil pH values indicate moderately alkaline soils at the CUP-3A site and slightly acidic soils at the CUP-7 site. Based on the pH values, the sites are classified as non-corrosive. The soluble salt contents of the samples are low indicating a low corrosion potential, and on-site near-surface soils present a negligible sulfate exposure to concrete structures. Based on the criteria in the Caltrans Corrosion Guidelines (Caltrans, 2003), the two project sites would not be classified as a corrosive site based on testing of near-surface soil samples.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 Geotechnical Observation of Construction Activities. We should be retained during construction to provide site observation and consultation concerning the condition of the bottom of excavations pertaining to foundation construction and pipeline trench excavation. Foundation grades should be observed and, where necessary, tested under the direction of a qualified geotechnical engineer to verify compliance with final design recommendations. All site preparation work and excavations should also be observed to compare the generalized site conditions assumed in the final design report with those found on site at the time of construction.

8.2 Existing Underground Utilities. A number of underground water main pipelines pass beneath and in the vicinity of the proposed sites. Other existing subsurface lines include the SFPUC transmission lines, and sanitary and storm sewer lines. A PG&E gas transmission pipeline is located near the CUP-3A site. Some of these utilities were located and marked prior to our exploration to avoid damaging them during drilling.

The City may consider remarking these utilities prior to construction of the improvements so they remain visible during earthwork and construction of the improvements. Any excavations made adjacent to existing utilities should be backfilled with on-site or imported soil to at least 90 percent relative compaction (ASTM D 1557).

8.3 Surface Drainage. Proper surface drainage is essential for satisfactory site performance. Positive drainage should be provided and maintained to direct surface water away from building foundations and other site improvements. Positive drainage is defined as a slope of 2 percent or more over a distance of 5 feet or greater away from the foundations, flatwork, and tops of slopes. Runoff should then be directed by the use of swales or pipes into a collective drainage system. Surface water should not be allowed to pond adjacent to footings. We further recommend that the proposed structure be equipped with appropriate roof gutters and downspouts. Downspouts should discharge to a system of closed pipes that transport the collected water to a suitable discharge facility. We recommend that drought tolerant vegetation be used for site landscaping. Irrigation should be kept at levels just sufficient to maintain plant vigor.

9.0 CLOSURE

The conclusions and recommendations presented herein are professional opinions based on geotechnical and geologic data and the project as described. A review by this office of any foundation, excavation, grading plans and specifications, or other work product that relies on the content of this report, together with the opportunity to make supplemental recommendations is considered an integral part of this study. Should unanticipated conditions come to light during project development or should the project change from that described, we should be given the opportunity to review our recommendations.

The findings and professional opinions presented in this report are presented within the limits prescribed by the client, in accordance with generally accepted professional engineering and geologic practices. There is no other warranty, either express or implied.

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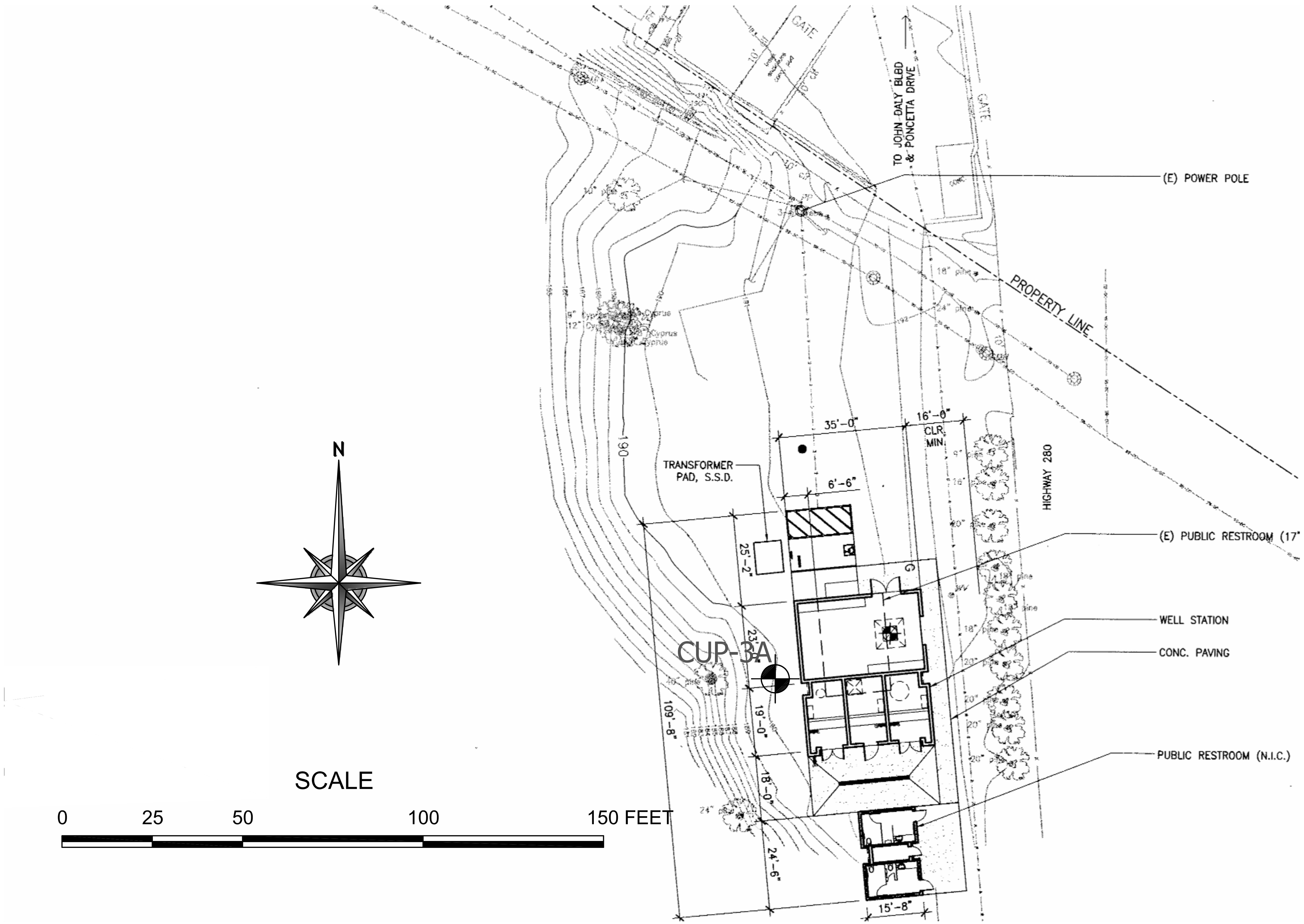
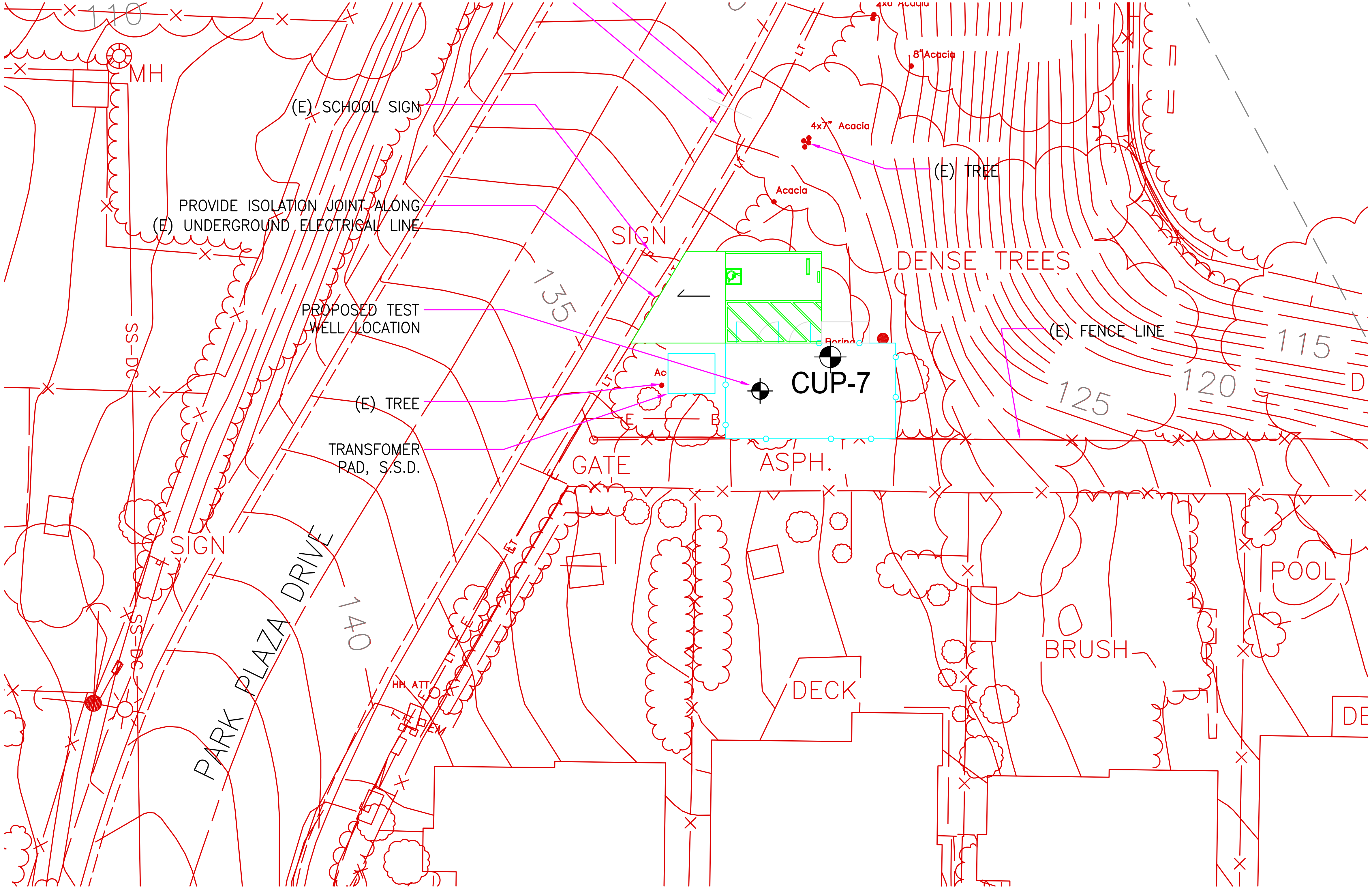


LEGEND

CUP-3A — Geotechnical boring performed by Geotechnical Consultants, Inc. on August 8, 2011.

Source: San Francisco Public Utilities Commission, 2011, 65% Progress Print, Site Plan, CUP-3A, Lake Merced Golf Club, Daly City, Regional Groundwater Storage and Recovery Project, Contract No. WD-2600, Sheet No. A-1.0, June.

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome Street, Suite 402 San Francisco, CA 94111	EXPLORATION LOCATION PLAN	PLATE 1
	REGIONAL GROUNDWATER STORAGE & RECOVERY PROJECT, CUP-3A SITE	
	JANUARY 2012	SF11014



LEGEND

CUP-7 Geotechnical boring performed by Geotechnical Consultants, Inc. on August 8, 2011.

SCALE

0 25 50 75 FEET

Source: San Francisco Public Utilities Commission, 2011, 65% Progress Print, Site Plan, CUP-7, Park Plaza, Regional Groundwater Storage and Recovery Project, Contract No. WD-2600, Sheet No. A-4.0, June.

GEOTECHNICAL CONSULTANTS, INC. 500 Sansome Street, Suite 402 San Francisco, CA 94111	EXPLORATION LOCATION PLAN	PLATE 2
	REGIONAL GROUNDWATER STORAGE & RECOVERY PROJECT, CUP-7 SITE	
	JANUARY 2012	SF11014

Appendix I

Energy Use Calculations

CALCULATIONS FOR GSR ENERGY USE IMPACTS
12/6/11

Project Impacts in 2018

WATER SUPPLY SOURCE	Average Daily Production (mgd)					
	GSR Project				Baseline	Change
	Put-year 32%	Take-year 23%	Hold-year 45%	weighted average		
Partner Agencies (PA)						
Groundwater wells	1.38	6.90	6.90	5.13	6.84	(1.71)
SFPUC						
Regional Water System (RWS)	5.52	(7.23)	-	0.10	-	0.10
GSR Groundwater wells	0.04	7.23	0.04	1.69	-	1.69
Total	**6.94**	**6.90**	**6.94**	**6.93**	**6.84**	**0.09**

WATER SUPPLY SOURCE	Average Annual Energy Consumption (kW-hrs) (rounded to nearest million kWh)					
	GSR Project				Baseline	Change
	Put-year 32%	Take-year 23%	Hold-year 45%	weighted average		
Partner Agencies (PA)						
Groundwater wells	3,000,000	16,000,000	16,000,000	12,000,000	16,000,000	(4,000,000)
SFPUC						
Regional Water System (RWS)	1,000,000	(1,000,000)	-	0	-	-
GSR Groundwater wells	0	17,000,000	0	4,000,000	-	4,000,000
Total	**4,000,000**	**32,000,000**	**16,000,000**	**16,000,000**	**16,000,000**	**-**
Percent Increase/Decrease						**0.0%**

Energy Data		***Units***	***Source of Data***
RWS Progam Environmental Impact Report (PEIR) Energy Consumption (2002)	44,000,000	kW-hr	PEIR (SF Planning Dept. 2008) was used because it was the base year used in the PEIR, and the only year with easily available energy use data for the Regional Water System
RWS Average Daily Production (2002)	275	Mgal/d	5/10/11 email from Antonia Sivyer per David Cameron
RWS Annual Water Production (2002)	100,375	Mgal	Average daily production X 365 days
RWS PEIR Unit-Energy Consumption (2002)	438	kW-hr/Mgal	2002 Energy consumption / 2002 Water Production
RWS Average Daily Production (2009)	219	Mgal/d	12/1/11 email from David Cameron (FY 2009 is 7/1/09 to 6/30/10)
RWS Baseline Energy Consumption (2009)	34,976,000	kW-hr	Average daily production x PEIR Unit-Energy Consumption x 365 days
RWS Average Daily Production (2018)	265	Mgal/d	Water System Improvement Proram (WSIP) Phased Variant from PEIR (SF Planning Dept. 2008)
RWS Future Energy Consumption (2030)	47,500,000	kW-hr	PEIR (SF Planning Dept. 2008)
RWS Average Daily Production (2030)	300	Mgal/d	PEIR (SF Planning Dept. 2008)
RWS Annual Water Production (2030)	109,500	Mgal	Average daily production X 365 days
RWS Future Unit-Energy Consumption (2030)	434	kW-hr/Mgal	2030 Energy consumption / 2030 Water Production
GSR Groundwater Energy Use (take year)	17,065,115	kW-hr	12-2-11 SFPUC GSR Groundwater Wells estimated KWh usage
GSR Groundwater Daily Production	7.23	Mgal/d	Project Description
GSR Groundwater Annual Water Production	2,639	Mgal	Average daily production X 365 days
GSR Unit-Energy Consumption	6,467	kW-hr/Mgal	GSR Energy consumption / GSR Water Production
GSR Groundwater Energy Use (put and hold year)	373,827	kW-hr	12-2-11 SFPUC GSR Groundwater Wells estimated KWh usage
PA Groundwater Unit-Energy Consumption	6,467	kW-hr/Mgal	Estimated to be the same as GSR
% of Put years in hydro sequence	32%		Table 10.1-9 in Kennedy/Jenks TM 10.1 Groundwater Modeling Analysis 2012
% of Take years in hydro sequence	23%		Table 10.1-9 in Kennedy/Jenks TM 10.1 Groundwater Modeling Analysis 2012
% of Hold years in hydro sequence	45%		Table 10.1-9 in Kennedy/Jenks TM 10.1 Groundwater Modeling Analysis 2012
	100%		

Appendix J

Vegetation Change Analysis Methodology

APPENDIX J- LAKE MERCED VEGETATION CHANGE ANALYSIS METHODOLOGY

Building upon prior studies, ESA updated a Geographic Information System (GIS) vegetation layer created by Nomad Ecology in 2010[1]. Using ArcGIS, ESA overlaid the 2010 vegetation data on high resolution 2010 aerials and then ground-truthed the resulting imagery in the field in May 2012. In general, the 2010 data correlated well with aerial signatures of the various vegetation types on the 2010 aerial photo and conditions on the ground. All discrepancies were mapped in the field and the 2010 vegetation layer was updated using the annotated field maps and aerial interpretation comparing the 2008 and 2010 aerials. To reduce the complexity of modeling vegetation change in response to water level management, many of the distinct vegetation types mapped by Nomad Ecology (Nomad 2011) were combined with similar types. Table J-1 presents the results of the vegetation mapping update, along with results from 2002 and 2010, for comparative purposes. See Figure 5.14-1 (Lake Merced 2012 Vegetation Types) in Section 5.14, Biological Resources for the updated Lake Merced vegetation map.

A GIS database was constructed using Light Detection and Ranging (LIDAR) (Foxgrover and Barnard 2012) surface topographic data, and bathymetric data supplied by the San Francisco Public Utilities Commission (SFPUC) (Sea Survey/Entrix 1987). The two data sets differ substantially in precision and vertical control, such that the bathymetric data were adjusted by hand to conform more closely with the greater vertical precision of the LIDAR data[2] as well as current aerial photos (USGS 2011). For example, in many cases, overlays of vegetation mapping and the bathymetric data resulted in the appearance of certain species or vegetation types occurring in much deeper water than field observations would support.

A set action of "action rules" was developed to predict the response of different vegetation types to changing inundation levels. Action rules were drawn from previous modeling efforts specific to Lake Merced (Stillwater Sciences 2009; EDAW 2004) and the Lower Crystal Springs Reservoir (ESA 2009), available literature on vegetation tolerance to inundation, and field observations. The action rules (see Table J-1 [Vegetation Model Action Rules]) are based on the following general principles:

1 The 2010 GIS vegetation layer was created by Nomad (Nomad 2011) using heads up digitizing on a 2008 aerial photo base and then verifying the results in the field.

2 The original bathymetric data created by Sea Survey and Entrix in 1987 was digitized from a scanned image and adjusted to "fit" a 2001 orthophoto background by Talavera & Richardson in 2001. Upon comparing the bathymetric data with April, 2011 aerial imagery it was clear that the data did not fit within the confines of lake as shown in the current aerial imagery. ESA adjusted the bathymetry again to fit the current imagery. The accuracy of the bathymetric data affects the amount of vegetation impacted with decreasing water surface elevation, which may be overestimated or underestimated.

TABLE J-1
Vegetation Model Action Rules

Class/Vegetation Type	Remove:	Add:	Replacer Status	Conflict Rule for Adding:
Class 1[(a)]				
Bulrush wetland	< -5	0 to -5	Primary Replacer	In areas of replacement overlap, the adjacent replacer wins. In areas where both replacers are adjacent, bulrush wins. In areas of no replacer adjacency, bulrush wins.
Cattail	< -3	0 to -3	Secondary Replacer	
Knotweed wetland	< -2	0 to -2	Secondary Replacer	
Class 2[(a)]				
Arroyo willow	< 0	1 to 0	Primary Replacer	In areas of replacement overlap, the adjacent replacer wins. In areas where both replacers are adjacent, willow wins. In areas where no adjacency, willow wins.
Rush meadow	< -1	1 to 0	Secondary Replacer	
Giant vetch	< -1	n/a	n/a	
Class 3[(a)(b)]				
Coastal scrub	< 1	n/a	n/a	
Dune scrub	< 1	n/a	n/a	
Oak woodland	< 1	n/a	n/a	
Non-native forest	< 1	n/a	n/a	
Non-native herbaceous	< 1	n/a	n/a	
Annual grassland	< 1	n/a	n/a	
Perennial grassland	< 1	n/a	n/a	

Source: ESA 2012

Notes:

Seasonal variation is 1 foot higher than average in wet season and 1 foot less than average in dry season.
Elevations are relative to modeled water surface elevation.

(a) **Class 1 - Tolerant:** Can survive permanent inundation at depths equal to or less than 5 feet below average annual WSE.
Class 2 - Moderately Intolerant: Survives inundation up to three months during dormant season.
Class 3 - Intolerant: This class is generally unable to survive inundation for more than two consecutive weeks.

(b) Upland vegetation types would not replace others as WSE rises.

The lower limit of both woody and herbaceous upland vegetation is determined by the maximum water surface elevation (WSE). The lower limit of upland vegetation is determined by inundation frequency and duration, a principal that also is applied in the federal method for determining the boundary between wetlands and non-wetlands for jurisdictional purposes. Observations of current conditions at Lake Merced, coupled with previous mapping and descriptions (SFRPD 2006; May and Associates 2009; Nomad 2011) indicate that the lower limit of upland woody vegetation is above the maximum WSE, which restricts upland plant species lacking adaptation to prolonged inundation or soil saturation. Upland woody vegetation will occur, but not persist, at the mean water level, and will be replaced by opportunistic wetland vegetation dominated by bulrush and knotweed. The lower limits of upland herbaceous communities also extend down to the maximum WSE, and would be replaced by wetlands if the water level rises.

The upper and lower limits of wetland vegetation depend on depth of inundation and inundation tolerance. For example, most herbaceous wetlands fringing Lake Merced occur no higher than 1 foot above the projected existing conditions mean WSE of 5.7 feet and at assumed depths no greater than 2 feet below WSE. The wetland species that make up these communities do not require year-round inundation. In contrast, bulrush wetlands require at least nine months inundation or soil saturation, readily tolerate permanent inundation, and are found at elevations no more than 1 foot above the seasonal high water elevation, and no greater than 5 feet lower than mean WSE.

Vegetation was categorized into three classes associated with water inundation tolerance. Inundation tolerance is largely a function of seasonal fluctuations in lake levels. Monthly water levels increase up to 1 foot above the annual average during winter (February through May), declining to 1 foot below average annual water level towards the end of the growing season (August through November) (Stillwater 2009). Class 1 includes vegetation types that are extremely tolerant and can survive permanent inundation. Class 2 vegetation is somewhat tolerant and can survive partial inundation due to seasonal variations. Class 3 vegetation is intolerant and cannot survive seasonal inundation. ESA developed action rules based on this classification that determined how vegetation would die or establish as WSE rises.

Replacement criteria not only took elevation relative to WSE into account but also adjacency of vegetation types. Overlapping depth tolerance among different wetland types requires complex rules for resolving conflicts when two wetland types have the potential to occupy the same elevation zone. For the purposes of the analysis, therefore, these conflicts were resolved by creating action rules that restrict the amount of overlap. The action rules also govern interactions between vegetation types for projected WSE that would cause the loss of one type and its replacement by one or more other type. For example, bulrush and knotweed have a somewhat overlapping tolerance to inundation. Priority rules for replacement instruct the GIS-based analysis to replace a “drowned” vegetation type with bulrush or knotweed (the most aggressive “replacer” types) based on the elevation of the replaced vegetation and its proximity to the nearest replacer type.

The GIS-based analysis was conducted to estimate vegetation response to changes in lake levels over time using the newly updated vegetation data, topography, bathymetry, slope, output from the water level models, and the action rules for vegetation change. For the purposes of the vegetation change analysis, the initial baseline estimates for existing vegetation acreage are those which would occur at a mean annual WSE of 6 feet City Datum. This is slightly higher than the baseline WSE of 5.7 feet used for the Kennedy Jenks hydrologic modeling but was necessary in order to correspond to the topographic data, which was created at 1 foot elevation intervals. The 2012 vegetation mapping update was based on a April 2011 aerial photo, at which time, according to historic WSE data (SFPUC 2011) Lake Merced WSE was at about 7 feet City Datum. The acreages given for the 6-foot WSE were obtained by running the receding WSE model on the 2012 vegetation data. In addition, the analysis only included vegetation at or below 13 feet City Datum, since this is the maximum possible lake water level due to the existing spillway height and therefore, elevation, at which vegetation change would be expected due to changes in WSE. Therefore, for the upland vegetation types and for arroyo willow riparian scrub, acreage located above the 13 foot elevation, as mapped in Figure 15.4-1 (Lake Merced 2012 Vegetation Types), would remain unchanged.

To determine impacts to vegetation associated with water surface elevation change it is necessary to have an accurate topographical representation of the area. For elevation above the surface of Lake Merced, ESA obtained a high resolution LIDAR derived digital elevation model (DEM) to provide accurate elevation data. Past Lake Merced inundation studies used 1 foot photogrametically created elevation contour data derived from flights of the area in 1996. The LIDAR derived elevation data were used in place of the photogrammetry data because they are considerably more current (2010) and determined to be a better representation of current conditions[3]. From the DEM, ESA created 1 foot elevation contour polygons so that areas could be calculated for each elevation range. For bathymetric topography ESA used contour data provided by the SFPUC. These contours were originally created from depth soundings of the lakes in 1987; the data was subsequently adjusted in 2001 to fit current aerial photos of that time. Visual analysis of the contour data compared to current aerial photos (2011) revealed inconsistencies along the shoreline. It was therefore necessary to modify the bathymetric data to match the aerial photos and surface DEM to create an accurate topographical representation. The adjusted bathymetric data was converted to a Triangular Irregular Network (TIN) which in turn was used to produce 1 foot contour polygons by interpolating elevation gaps in the original contour data. The 1 foot bathymetric elevation contours and the 1 foot DEM derived surface elevation contours were then combined to create a complete elevation dataset of the area. This finished elevation dataset was intersected with the vegetation data to determine distribution of vegetation by elevation ranges.

Two different approaches were used to determine impacts to vegetation associated with increasing and decreasing WSE under the proposed project. For impacts associated with water surface increase, a GIS approach similar to past inundation studies was used. As described above, action rules were established for each vegetation type dictating how vegetation would respond to increasing water surface elevation. Once the action rules were established for a relative water surface elevation, they were applied to every 1 foot contour up to the 13 foot spillway elevation. The resulting vegetation statistics were used to determine impacts to vegetation types due to increase in water surface elevation.

For decreasing water levels, a statistical approach was used to determine vegetation response. Unlike water rising scenarios in which parameters can be applied to current vegetation, the majority of land associated with decreasing water levels is currently inundated and free of vegetation (except for certain wetland species). For this approach ESA analyzed the proportions of vegetation at each elevation contour relative to the current water surface level and applied the statistics to lower water surface elevation. This approach keeps the vegetation distribution the same for each elevation range relative to the WSE, but due to differences in area for each elevation range the vegetation area totals are different for each modeled WSE. For example, if the contour range of 0 to 1 foot is currently inhabited with 60 percent bulrush wetland and 40 percent knotweed wetlands, that proportion (60 percent and 40 percent) would be assigned to the -1 to 0 foot contour range modeling a water surface decrease of 1 foot.

[3] LIDAR tends to be superior when there is dense vegetative cover. ESA compared aerial photos where the historic WSE was known with the LIDAR and the photogrammetry derived elevation data and the LIDAR was a better match relative to the shoreline, which represents the WSE.

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Appendix K

Lake Merced Water Quality Data and Graphs

APPENDIX K

LAKE MERCED WATER QUALITY DATA AND GRAPHS

REGIONAL GROUNDWATER STORAGE AND RECOVERY PROJECT

April 2013

INTRODUCTION

This Appendix includes the following information:

- A list of abbreviations used in the water quality data or graphs;
- *Lake Merced Water Quality Data* includes a tabulation of historic Lake Merced water quality data; and
- *Lake Merced Water Quality Graphs* includes graphs of Lake Merced water quality at various lake levels over time.

The information in this appendix has been prepared by ESA.

ABBREVIATIONS USED IN THIS APPENDIX

The following is a list of abbreviations used in this Appendix:

Alk = alkalinity

Br = bromide

°C = degrees Centigrade

Cl^- = chloride

Cond = electrical conductivity

DO = dissolved oxygen

Fe = iron

Fl^- = fluoride

Ft = feet

Hard = hardness

mg/L = milligrams per liter

mmho/cm = micromhos per centimeter

Mn = manganese

MPN = most probable number

MTBE = methyl tertiary-butyl ether

mv = millivolts

NH3-N = ammonium

NO3-N = nitrate as nitrogen

No./m^3 = number per cubic meter

No./mL = number per milliliter

ntu = nephelometric turbidity unit

ORP = oxidation reduction potential

Orth P = orthophosphate

Pb = lead

SO4 = sulfate

TDS = total dissolved solids

Temp = temperature

TKN = total kjeldahl nitrogen

TOC = total organic carbon

Tot P = total phosphate

Turb = turbidity

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WATER QUALITY DATA

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	22.7	22.1	13.7	15.5	18.3	19.6	13.2		18.4	12.5	14.8	20.6	19.3	11.8	13.2	22.4	19.8	11.6	15.1	17.2
5	20.9	22.1	13.7	15.5	18.3	18.9	13.1		18.2	12.3	14.5	20.3	18.7	11.6	13.0	21.5	18.5	11.2	14.9	16.7
10	17.9	21.6	13.7	14.2	18.2	18.8	12.9		18.2	12.2	14.4	20.2	18.6	11.6	12.2	18.9	17.6	11.1	13.7	16.2
14									18.2	12.2				11.6			17.2			
15	17.8	21.4	13.7	12.9	18.0	18.8	12.7				14.4	19.8	18.5		12.1	18.4		11.0	13.3	16.1
16	17.8	21.1		12.9											12.1				13.2	16.1
17																				
17.4																				
17.5																				
18			13.7								14.4									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	21.0		13.2	15.1	17.5	19.3	12.8		17.8	11.5	15.1	19.94	18.3	11.1	12.7	22.1	18.3	10.8	13.9	16.5
5	19.9		13.2	14.9	17.4	18.7	12.7		17.8	11.5	14.6	19.8	17.9	10.9	12.4	20.5	17.5	10.6	13.8	16.3
9																	17.3			
10	17.7		13.2	13.9	17.3	18.6	12.5		17.8	11.3	14.5	19.7	17.8	10.9	12.0	18.4		10.4	13.3	16.0
11																			13.3	16.0
12				13.5																
13											14.5									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	########	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	19.4	17.2	15.8	12.3	17.4	20.4	19.1	13.2	19.9	19.5	16.5	12.8	12.5	17.2	21.1	18.3	18.9	17.0	13.7	13.1
5	19.2	17.2	15.8	12.0	17.4	19.7	18.9	12.4	19.8	19.5	16.4	12.0	12.3	17.1	21.1	18.2	18.5	16.1	13.7	13.1
10	19.1	17.2	15.8	11.9	17.4	18.9	18.8	12.3	19.7	19.4	16.3	11.9	12.1	16.9	21.1	18.2	17.8	16.1	13.7	13.1
14																				
15	18.4	17.2	15.7	11.9	17.3	18.5	18.8	12.3	19.5	19.2	16.3	11.7	11.9	16.8	19.4	18.2	17.3	16.0	13.7	13.0
16	18.4				17.0			12.3								18.2				
17							18.8		19.3	19.1	16.3		11.9				17.2			
17.4																				
17.5																				
18												11.7		16.7				16.0	13.7	12.9
18.8																				
19															19.1					
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	########	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	18.7	16.4	15.2	11.8	17.0	19.9	18.4	12.6	19.2	19.2	16.2	12.2	12.5	16.9	20.9	17.7	18.5	n/a	13.0	12.7
5	18.6	16.4	15.1	11.5	17.0	19.2	18.3	11.8	19.1	19.1	16.0	11.0	12.0	16.7	20.7	17.7	18.1	n/a	12.9	12.6
9																				
10	18.0	16.4	15.1	11.3	17.0	18.3	18.2	11.7	18.8	18.8	15.9	10.8	11.8	16.3	20.0	17.5	17.4	n/a	12.9	12.5
11					17.0	18.1														
12				11.3			18.2		18.7		15.8							n/a		
13								11.7		18.7		11.3	11.6		19.3	17.5	17.1		12.9	
13.8																				
14														16.2						12.3
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	12.3	13.1	16.1	20.2	18.5	17.0	10.9	16.5	19.4	22.1	10.1	14.7	20.4	19.9	14.4	14.4	19.1	19.6	10.9
5	11.9	12.9	16.0	19.6	18.5	17.0	10.8	14.1	19.3	20.0	10.2	14.5	19.3	18.9	13.9	14.2	18.5	19.3	10.4
10	11.9	12.9	15.9	18.5	18.5	17.0	10.8	13.9	18.8	18.8	10.1	14.3	17.3	18.2	13.9	13.4	16.8	19.2	10.3
14																			
15	11.8	12.7	15.8	18.2	18.5	16.9	10.8	13.7	18.6	18.5	9.9	14.3	17.2	18.0	13.8	13.4	16.5	18.6	10.3
16																			
17																			
17.4														17.8					
17.5															13.8				
18	11.8					16.8				18.4									
18.8													17.1						10.4
19		12.6	14.7	17.5	18.5		10.8	13.5	17.2		9.9								
19.3																		18.5	
19.9																	16.4		
20												13.6				13.3			
20.6												13.5							

Lake Merced
North East

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	11.6	12.8	16.1	19.5	18.1	16.7	10.2	15.4	19.4	20.7	9.29	14.8	20.1	19.3	13.6	14.0	18.1	19.3	10.4
5	11.2	12.5	16.0	18.8	18.1	16.7	10.2	14.3	19.3	20.1	9.29	14.6	19.0	18.9	13.3	13.5	17.3	19.2	9.9
9																			
10	11.2	12.3	16.0	18.1	18.0	16.6	10.1	14.2	19.0	18.7	9.17	14.4	17.3	18.0	13.2	13.3	16.8	19.1	9.9
11																			
12																			
13	11.2					16.6							17.1	17.8					
13.8																		18.6	
14		12.2		18.0	18.0					18.2									
14.1															13.2				
14.7																13.3			9.9
15			15.9				10.1	13.9	18.7		9.21	14.2					**16.3**		
15.8												14.2							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	20.5	21.9	13.6	15.1	17.9	19.5	12.6	17.7	18.0	12.2	14.8	19.9	18.7	11.6	12.7	21.1	19.6	11.3	14.3	16.1
5	18.8	21.9	13.6		17.9	18.6	12.3	17.5	18.0	12.2	14.4	19.8	18.3	11.5	12.2	20.5	18.5	10.6	14.2	16.0
6				14.1																
10	17.3	21.2	13.6		17.9	18.6	12.3	17.3	18.0	12.2	14.1	19.8	18.2	11.5	12.0	18.5	17.6	10.6	13.5	15.9
12				14.0																
15	17.0	20.8	13.6		17.6	18.6	12.3	16.8	18.0	12.0	13.9	18.3	18.1	11.5	11.8	17.8	17.1	10.6	13.3	15.2
16	17.0	20.7												11.5		17.8	17.0	10.7		
17	17.0									12.0									13.3	
18				13.3	17.6				18.0			18.3	18.2		11.8					15.1
18.2																				
18.9																				
19				13.3			12.2													
20								16.5			14.0									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	20.8	21.8	13.5	15.6	18.5	19.6	12.8	18.2	18.5	12.2	14.5	20.3	19.0	11.7	13.2	21.6	19.5	11.5	14.7	16.4
5	20.5	21.6	13.5	15.1	18.5	18.7	12.7	17.9	18.4	12.2	14.2	20.3	18.6	11.6	12.8	20.8	19.0	10.9	14.5	16.4
10	17.9	21.1	13.5		18.4	18.7	12.6	17.8	18.4	12.2	14.1	19.7	18.6	11.5	12.6	18.9	17.8	10.9	13.3	15.4
12				14.9																
15	17.2	20.8	13.5		17.7	18.7	12.5	17.1	18.3	12.1	13.9	19.1	18.6	11.5	11.9	17.8	17.1	10.9	13.2	15.4
16	17.1	20.8															17.1	11.1		
17														11.5						
18				13.8	17.6				18.3	12.1		18.2			11.8	17.7			13.1	15.6
19							12.5	16.8					18.5							
19.2																				
20											14.0									
20.4																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	########	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	18.6	17.3	15.6	12.1	16.6	19.3	18.5	12.8	19.1	19.0	16.1	12.5	12.1	15.8	20.5	18.2	18.3	16.5	13.5	13.0
5	18.5	17.3	15.6	12.1	16.6	19.2	18.5	12.3	19.1	19.0	16.1	11.8	11.7	15.6	20.5	18.2	18.3	16.0	13.5	13.0
6																				
10	18.5	17.2	15.5	12.0	16.4	18.4	18.4	12.2	18.9	18.8	16.0	11.7	11.5	15.5	19.7	18.2	18.0	15.8	13.5	13.0
12																				
15	18.5	17.0	15.5	11.8	16.1	18.1	18.4	12.2	18.0	18.8	16.0	11.7	11.4	15.4	19.0	18.2	17.1	15.7	13.5	13.0
16	18.5	17.0		11.8																
17			15.6			18.1					16.0	11.8	11.3							
18					16.0					18.7							16.9		13.4	
18.2																				
18.9																				
19							18.4	12.2	17.8											12.9
20														15.4	18.5	18.1		15.6		
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	########	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	19.1	17.3	15.6	11.9	17.2	20.1	18.8	13.1	19.6	19.6	16.3	12.4	12.1	16.0	20.5	18.5	18.7	16.6	13.6	13.1
5	19.1	17.3	15.6	11.9	17.2	20.0	18.7	12.2	19.5	19.6	16.3	11.7	11.6	15.6	20.5	18.5	18.3	16.2	13.6	13.1
10	18.9	17.3	15.6	11.8	17.2	19.3	18.6	12.2	18.9	19.4	16.2	11.6	11.5	15.5	20.3	18.5	17.3	16.1	13.6	13.1
12																				
15	18.9	17.2	15.6	11.8	16.8	18.4	18.5	12.2	18.1	18.8	16.2	11.6	11.4	15.5	19.0	18.1	16.9	16.0	13.6	13.0
16		17.2																		
17	18.8		15.6			18.1					16.1		11.4							
18					16.1															
19				11.8			18.5			18.7		11.6						16.0		
19.2																				
20								12.2	17.8					15.5	18.6	18.1	16.9		13.6	12.9
20.4																				
21														15.5						
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	11.7	12.7	15.3	19.1	18.5	16.9	11.0	14.5	18.6	20.3	10.1	13.82	18.8	19.5	13.82	13.6	18.1	19.2	10.5
5	11.6	12.6	15.3	19.0	18.5	16.9	11.0	14.0	18.6	19.9	9.8	13.7	18.1	19.1	13.71	12.8	17.5	19.1	10.4
6																12.8			
10	11.6	12.6	15.2	18.9	18.4	16.9	11.0	13.9	18.4	18.8	9.8	13.57	17.3	18.1	13.68		16.7	19.0	10.4
12																			
15	11.5	12.5	15.1	18.3	18.4	16.9	10.9	13.8	18.4	18.4	9.7	13.56	16.7	17.9	13.61	12.7	16.3	18.6	10.3
16																			
17																			
18	11.5																		
18.2																			10.4
18.9																		18.4	
19						16.8									13.6				
20		12.5	15.1	18.0	18.4		10.9	13.6	18.1	18.1	9.7	13.45	16.5			12.7	16.3		
20.1														17.8					
20.6																12.7			
20.8																	16.3		
21				18.0				13.6		18.1	9.7								
21.5												13.45							
22									18.0										

Lake Merced
South - Pump
Station

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**	**Temp**
Ft	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Surf	11.9	12.5	15.7	19.5	18.6	16.9	10.9	14.5	19.2	20.9	10.0	13.9	19.5	19.2	14.0	13.6	18.7	19.6	10.6
5	11.8	12.4	15.6	19.3	18.6	16.9	10.9	13.9	19.0	20.6	9.9	13.9	18.2	19.1	13.9	12.8	18.0	19.6	10.4
10	11.8	12.3	15.6	18.5	18.6	16.9	10.9	13.7	18.3	18.9	9.8	13.9	17.6	18.2	13.9	12.8	16.8	19.0	10.4
12																			
15	11.8	12.3	15.6	18.1	18.6	16.7	10.9	13.6	18.3	18.6	9.8	13.9	16.5	18.0	13.8	12.8	16.3	18.7	10.4
16																			
17																			
18						16.7													
19																			
19.2																		18.5	
20	11.7	12.3	15.3	18.0			10.9	13.6	18.2	18.3	9.8	13.9	16.4	17.8		12.8	16.3		
20.4																			10.4
21		12.3		18.0	18.5					18.3	9.8		16.5	17.8	13.8				
21.5																	16.3		
22			15.3				10.9	13.6	18.1										
22.8																12.8			
23.2												13.9							

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.79	9.07	8.42	8.50	8.79	8.75	8.49		8.37	8.29	8.31	8.73	8.36	8.51	8.45	9.02	8.68	8.08	8.72	8.32	8.75
5	8.67	8.96	8.33	8.49	8.77	8.59	8.47		8.27	8.24	8.34	8.72	8.33	8.47	8.37	9.03	8.46	7.95	8.68	8.27	8.69
10	8.12	8.59	8.27	8.05	8.73	8.40	8.36		8.26	8.19	8.36	8.72	8.34	8.47	8.12	8.02	7.99	7.90	8.38	7.98	8.67
14									8.21	8.17				8.37			7.76				
15	8.00	8.42	8.29	7.73	8.22	8.21	8.23				8.37	8.15	8.24		7.92	7.94		7.85	8.07	7.88	8.26
16	7.96	8.24		7.73											7.91				8.07	7.84	8.24
17																					
17.4																					
17.5																					
18			8.29								8.04										
18.8																					
19																					
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.37		7.96	8.00	8.16	8.31	8.35		8.12	8.18	8.26	8.19	7.89	8.48	8.28	8.74	8.12	7.96	8.36	7.97	8.39
5	8.14		7.95	7.91	8.12	8.16	8.33		8.11	8.18	8.25	8.22	7.88	8.44	8.16	8.50	7.69	7.90	8.26	7.90	8.35
9																	7.61				
10	7.81		7.93	7.61	8.03	8.13	8.24		8.07	8.13	8.25	8.12	7.86	8.43	7.88	7.80		7.82	7.97	7.74	7.84
11																			7.96	7.66	
12				7.52																	
13											7.99										
13.8																					
14																					
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.08	8.29	8.23	8.47	8.51	7.81	7.47	8.26	8.42	7.79	8.17	8.53	8.69	8.28	8.29	8.51	8.10	7.89	8.17	8.07	8.26
5	8.07	8.26	8.13	8.46	8.42	7.75	7.39	8.24	8.39	7.75	8.15	8.52	8.68	8.26	8.27	8.45	8.04	7.88	8.10	8.03	8.24
10	8.07	8.26	8.10	8.47	7.99	7.71	7.35	8.21	8.38	7.76	8.13	8.49	8.66	8.23	8.26	8.08	8.23	7.87	8.08	8.04	8.23
14																					
15	8.08	8.24	8.08	8.31	7.76	7.68	7.34	8.07	8.07	7.73	8.10	8.44	8.64	7.59	8.25	7.78	8.41	7.91	8.05	8.04	8.18
16				7.94			7.33								8.25						
17						7.68		8.03	7.65	7.73		8.44				7.7					
17.4																					
17.5																					
18											8.08		8.62				8.63	7.95	7.80	8.03	
18.8																					
19														7.51							8.04
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.03	8.20	7.99	7.91	8.19	7.70	7.41	8.39	8.16	7.65	8.11	8.40	8.81	8.00	8.22	8.25	n/a	7.80	8.11	7.91	8.29
5	8.04	8.12	7.95	7.85	8.03	7.63	7.31	8.35	8.14	7.64	8.06	8.44	8.78	7.94	8.21	8.15	n/a	7.81	7.92	7.86	8.22
9																					
10	8.05	8.10	7.80	7.85	7.55	7.57	7.29	8.15	7.98	7.63	8.03	8.43	8.60	7.55	8.17	7.72	n/a	7.86	7.79	7.85	8.03
11				7.87	7.53																
12			7.80			7.60		8.09		7.61							n/a				
13							7.29		7.73		8.00	8.36		7.46	8.13	7.65		7.95		7.84	
13.8																					
14													8.52						7.67		7.92
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

Depth	26-Apr-06 pH	14-Jun-06 pH	24-Aug-06 pH	25-Oct-06 pH	20-Dec-06 pH	29-Mar-07 pH	26-Jun-07 pH	20-Aug-07 pH	27-Dec-07 pH	28-Mar-08 pH	10-Jun-08 pH	24-Sep-08 pH	4-Dec-08 pH	24-Mar-09 pH	4-Jun-09 pH	22-Sep-09 pH	15-Dec-09 pH
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.37	8.89	8.15	8.37	8.40	8.96	8.66	9.09	7.75	8.36	8.83	8.79	7.97	8.30	8.66	8.84	8.20
5	8.31	8.75	8.13	8.36	8.31	8.77	8.62	8.72	7.75	8.32	8.67	8.39	7.92	8.30	8.62	8.84	8.13
10	8.25	8.20	8.11	8.34	8.30	8.34	8.26	8.44	7.72	8.31	8.09	8.13	7.90	8.21	8.30	8.91	8.07
14																	
15	8.04	8.10	8.08	8.31	8.30	8.22	8.03	8.08	7.64	8.32	7.99	8.02	7.86	8.19	8.19	8.99	8.07
16																	
17																	
17.4												7.77					
17.5													7.85	7.85			
18				8.10				7.96									
18.8											7.72						8.03
19	7.84	7.97	8.03		8.29	8.00	7.66		7.64								
19.3																8.94	
19.9															8.15		
20										8.12				8.17			
20.6										8.18							

Lake Merced
North East

Depth	26-Apr-06 pH	14-Jun-06 pH	24-Aug-06 pH	25-Oct-06 pH	20-Dec-06 pH	29-Mar-07 pH	26-Jun-07 pH	20-Aug-07 pH	27-Dec-07 pH	28-Mar-08 pH	10-Jun-08 pH	24-Sep-08 pH	4-Dec-08 pH	24-Mar-09 pH	4-Jun-09 pH	22-Sep-09 pH	15-Dec-09 pH
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.08	8.35	8.05	8.23	8.13	8.87	8.36	8.83	7.49	8.15	8.59	8.55	7.66	8.26	8.44	8.62	8.09
5	8.08	7.97	8.02	8.24	8.07	8.61	8.28	8.69	7.48	8.16	8.38	8.44	7.60	8.27	8.28	8.64	8.05
9																	
10	8.06	7.88	7.93	8.24	8.05	8.20	7.99	8.01	7.42	8.10	7.72	7.82	7.60	8.25	8.23	8.59	8.09
11																	
12																	
13				8.23							7.71	7.63					
13.8																8.64	
14		7.88	7.91					8.00									
14.1													7.57				
14.7														8.35			8.06
15	7.95				8.06	7.98	7.72		7.43	8.01					7.92		
15.8										8.01							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.70	8.72	8.03	8.16	8.44	8.41	8.21	8.63	8.17	8.29	8.25	8.54	8.39	8.19	8.14	8.61	8.44	8.17	8.52	8.03	8.30
5	8.41	8.67	8.03		8.42	8.22	8.16	8.63	8.13	8.33	8.46	8.47	8.18	8.16	8.10	8.60	8.39	8.16	8.49	8.03	8.26
6				8.02																	
10	8.02	7.91	8.03		8.41	8.16	8.11	8.58	8.12	8.31	8.53	8.20	8.11	8.15	8.05	8.01	7.96	8.11	8.35	8.03	8.24
12				7.97																	
15	7.66	7.77	8.00		7.78	8.00	8.09	8.32	8.12	8.18	8.49	7.56	8.22	8.14	7.94	7.61	7.53	8.06	8.18	7.93	8.24
16	7.66	7.78												8.08		7.55	7.48	7.60			8.09
17	7.72									8.17									8.01		
18				7.74	7.73				8.11			7.62	7.70		7.82					7.44	
18.2																					
18.9																					
19				7.75			8.06														
20								8.14			8.10										
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.70	8.62	7.99	8.29	8.70	8.46	8.28	8.70	8.53	8.33	8.29	8.66	8.33	8.17	8.19	8.63	8.40	8.18	8.55	8.04	8.41
5	8.68	8.40	7.96	8.26	8.63	8.38	8.27	8.69	8.40	8.34	8.24	8.65	8.25	8.14	8.14	8.60	8.36	8.15	8.49	8.04	8.37
10	8.22	7.85	7.94		8.57	8.33	8.20	8.68	8.37	8.28	8.24	7.86	8.30	8.13	8.03	8.17	8.10	8.14	8.08	7.89	8.36
12				8.16																	
15	7.92	7.73	7.93		7.85	8.32	8.18	8.46	8.37	8.19	8.18	7.52	8.48	8.13	7.89	7.66	7.52	8.10	7.92	7.91	8.36
16	7.87	7.76															7.42	7.50			
17														8.10							8.35
18				7.68	7.68				8.34	8.14		7.50			7.71	7.61			7.85	7.42	
19							8.13	8.29					7.93								
19.2																					
20											7.84										
20.4																					
21																					
21.5																					
22																					
22.8																					
23.2																					

Lake Merced
South - Pistol
Range

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.23	8.08	7.92	8.03	8.27	7.49	7.66	8.54	8.15	7.70	7.87	8.31	8.81	8.53	7.97	8.34	6.89	7.77	7.97	8.03	8.23
5	8.21	8.06	7.91	8.01	8.21	7.48	7.63	8.51	8.08	7.69	7.83	8.21	8.78	8.50	7.95	8.32	6.85	7.77	7.95	8.01	8.21
6																					
10	8.16	7.94	7.90	7.92	7.74	7.44	7.63	8.40	8.01	7.68	7.82	8.13	8.73	7.95	7.92	8.18	6.79	7.79	7.94	7.98	8.20
12																					
15	8.14	7.94	7.84	7.71	7.47	7.44	7.62	7.90	7.84	7.67	7.82	8.19	8.73	7.53	7.88	7.68	6.78	7.81	7.92	7.95	8.19
16	8.11		7.82																		
17		7.96			7.42					7.63	7.79	8.12									
18				7.57					7.75							7.54		7.81		7.93	
18.2																					
18.9																					
19						7.47	7.61	7.76											7.75		
20													8.67	7.40	7.75		6.83				8.18
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06
Depth	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**	**pH**
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.24	8.16	7.89	8.19	8.34	7.58	7.52	8.61	8.37	7.62	7.90	8.24	8.84	8.53	8.09	8.44	8.19	7.86	8.09	8.03	8.22
5	8.22	8.15	7.86	8.18	8.32	7.48	7.47	8.60	8.36	7.61	7.88	8.17	8.81	8.49	8.07	8.24	8.15	7.84	8.03	8.00	8.19
10	8.24	8.15	7.86	8.18	8.15	7.36	7.46	8.29	8.13	7.58	7.87	8.12	8.79	8.42	7.99	7.81	8.14	7.84	8.01	7.98	8.17
12																					
15	8.24	8.14	7.87	8.00	7.74	7.31	7.46	8.02	7.66	7.52	7.85	7.93	8.77	7.49	7.78	7.58	6.83	7.86	7.91	7.97	8.16
16	8.19																				
17		8.14			7.45					7.52		7.93									
18				7.61																	
19			7.83			7.31			7.56		7.84						6.90				
19.2																					
20							7.43	7.91					8.75	7.41	7.84	7.49		7.89	7.82	7.95	8.13
20.4																					
21													8.74								8.12
21.5																					
22																					
22.8																					
23.2																					

Lake Merced South - Pistol Range

Depth	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.19	8.53	7.97	8.20	8.26	8.67	8.24	8.60	7.91	8.14	8.32	8.70	7.85	8.07	8.40	8.56	8.01
5	8.15	8.49	7.94	8.18	8.17	8.66	8.20	8.48	7.85	8.13	8.24	8.64	7.83	8.08	8.36	8.54	7.97
6																	
10	8.10	8.32	7.90	8.16	8.06	8.53	8.05	8.17	7.84	8.12	8.10	8.03	7.82	8.04	8.18	8.54	7.94
12																	
15	8.06	7.90	7.88	8.13	8.04	8.27	7.99	7.88	7.83	8.13	8.02	7.90	7.81	8.04	8.03	8.29	7.90
16																	
17																	
18																	
18.2																	7.85
18.9																8.37	
19				7.96									7.80				
20	7.90	7.79	7.83		8.08	8.20	7.62	7.59	7.78	8.13	7.49			8.03	8.05		
20.1												7.53					
20.6														7.58			
20.8															7.95		
21		7.78				8.20		7.59	7.69								
21.5										8.17							
22							7.60										

Lake Merced South - Pump Station

Depth	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
Ft	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units	pH units
Surf	8.49	8.57	8.06	8.19	8.23	8.60	8.33	8.66	7.84	8.13	8.39	8.63	7.86	8.43	8.49	8.57	8.06
5	8.44	8.52	8.04	8.16	8.18	8.57	8.27	8.64	7.84	8.13	8.28	8.60	7.82	8.43	8.49	8.56	8.05
10	8.42	8.05	8.04	8.09	8.10	8.38	7.94	8.15	7.78	8.14	8.19	7.93	7.79	8.44	8.20	8.15	8.05
12																	
15	8.35	7.93	8.01	7.87	8.04	8.11	7.80	7.92	7.79	8.14	7.70	7.88	7.78	8.52	7.99	8.10	8.05
16																	
17																	
18				7.89													
19																	
19.2																8.16	
20	8.11	7.81			8.04	8.07	7.72	7.77	7.79	8.17	7.65	7.81		8.61	7.90		
20.4																	8.05
21		7.77	7.86					7.71	7.83		7.49	7.56	7.74				
21.5															7.89		
22	8.02				8.05	8.11	7.70										
22.8														8.57			
23.2										8.19							

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	742	842	888	864	728	774	726		793	851	711	729	755	780	738	808	861	811	757	755
5	744	844	902	883	728	757	726		795	850	712	734	760	781	736	807	866	812	757	757
10	754	855	917	974	728	761	727		795	862	714	737	762	781	740	826	874	814	760	766
14									796	864				778			881			
15	758	871	919	1020	737	764	729				724	753	764		743	834		812	763	769
16	757	882		1070											742				766	769
17																				
17.4																				
17.5																				
18			949								716									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	716		818	736	706	762	689		784	822	664	724	749	745	686	787	832	753	693	722
5	718		821	741	706	763	689		784	824	667	728	756	745	687	792	835	753	695	724
9																	843			
10	720		822	742	706	763	690		784	834	670	731	764	746	689	803		754	697	727
11																			697	726
12				747																
13											684									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	755	802	820	753	747	778	674	633	717	342	752	717	673	676	703	745	794	781	806	678
5	757	803	821	753	748	779	638	647	717	613	755	717	675	676	703	746	795	730	806	680
10	759	803	821	754	748	787	639	642	717	613	759	718	677	675	703	745	799	734	807	681
14																				
15	769	804	822	754	752	792	640	644	718	620	760	724	679	675	704	745	801	734	806	682
16	769				759			646								745				
17							640		724	627	760		679				806			
17.4																				
17.5																				
18												723		675				732	807	692
18.8																				
19															716					
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	740	775	785	696	711	754	650	640	709	613	750	716	667	666	702	742	794	n/a	795	664
5	741	775	786	697	712	756	651	644	709	612	750	724	668	665	702	742	796	n/a	795	668
9																				
10	748	776	787	697	712	761	651	645	712	614	750	731	672	665	703	743	800	n/a	795	672
11					712	765														
12				697			651		714		752							n/a		
13								646		609		726	670		710	744	806		796	
13.8																				
14														667						683
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	658	700	634	666	717	733	596	563	724	717	731	696	713	774	809	751	774	692	697
5	660	699	634	669	717	733	593	565	726	724	731	696	718	786	810	751	774	697	697
10	661	699	635	675	718	734	594	567	734	732	731	697	730	790	810	752	780	704	698
14																			
15	662	698	638	677	718	735	594	569	738	736	732	697	731	792	811	753	781	717	698
16																			
17																			
17.4														798					
17.5															811				
18	662					744				740									
18.8													736						698
19		699	656	696	720		593	576	753		732								
19.3																		726	
19.9																	782		
20												702				753			
20.6												703							

Lake Merced
North East

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	649	690	646	678	725	739	598	565	735	730	724.3	697	726	780	796	738	770	692	679
5	651	690	645	678	726	740	600	568	738	732	724.5	696	731	782	796	738	773	695	679
9																			
10	652	692	645	679	727	740	597	569	743	740	724.9	697	738	792	796	739	773	703	678
11																			
12																			
13	652					740							744	799					
13.8																		718	
14		696		682	727					749									
14.1															796				
14.7																739			679
15			647				597	573	749		726.8	697					777		
15.8												697							

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	490	573	639	590	547	585	560	565	597	635	557	580	599	620	600	673	707	667	639	648
5	492	573	664		547	585	558	565	597	643	563	584	603	620	600	673	707	667	626	649
6				603																
10	492	576	674		547	585	558	565	597	646	562	588	605	619	599	671	710	668	627	650
12				613																
15	494	578	689		550	584	555	567	597	650	562	598	606	619	600	674	713	668	629	652
16	494	580												619		675	714	665		
17	494									650									630	
18				621	552				596			599	605		601					660
18.2																				
18.9																				
19				629			557													
20								568			560									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond	Cond
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	490	574	594	555	544	585	561	565	595	637	588	579	598	619	601	674	708	668	639	646
5	490	575	595	554	545	584	561	565	597	639	587	580	601	620	601	673	707	666	639	647
10	492	577	594		546	585	561	566	597	642	587	595	600	620	601	671	709	666	641	648
12				560																
15	493	578	594		548	585	561	566	597	646	588	591	605	620	601	674	712	666	641	649
16	493	579															715	673		
17														620						
18				563	552				597	647		668			602	678			643	651
19							561	567					601							
19.2																				
20											599									
20.4																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	659	683	630	602	594	622	437	434	411	454	538	490	532	517	533	535	616	522	625	536
5	659	684	632	602	594	624	522	455	461	455	538	490	532	517	533	536	592	524	624	537
6																				
10	660	684	645	602	595	627	522	441	463	452	538	466	535	516	534	537	593	528	625	538
12																				
15	660	684	646	603	596	628	522	441	465	454	539	461	535	517	534	538	595	526	626	539
16	659	684		603																
17			647			629					540	453	536							
18					597					450							601		627	
18.2																				
18.9																				
19							522	440	470											540
20														517	538	539		528		
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	659	684	620	598	592	621	436	431	469	525	538	449	532	515	533	536	611	546	619	537
5	659	684	621	598	593	622	437	444	467	525	538	443	531	515	533	536	612	529	620	538
10	660	684	621	598	593	623	436	453	466	527	538	444	531	515	533	537	613	535	620	539
12																				
15	660	685	621	598	594	624	438	451	468	529	539	443	532	515	532	540	614	533	621	540
16		685																		
17	660		621			627					539		533							
18					595															
19				598			438			532		444						533		
19.2																				
20								450	468					515	534	527	616		621	541
20.4																				
21														515						
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	529	569	542	562	600	564	520	473	610	611	612	597.6	623	662	685.2	656	682	611	610
5	530	569	542	562	600	564	524	474	613	613	613	597.4	623	663	685.4	655	681	613	610
6																			
10	531	569	542	562	609	564	525	474	615	613	613	597.3	623	669	685.3	656	682	614	610
12																			
15	532	569	543	563	607	564	528	479	616	614	614	597.2	622	670	685.5	656	683	620	610
16																			
17																			
18	533																		
18.2																			610
18.9																		625	
19						566									685.3				
20		567	544	564	609		522	481	618	616	614	597.2	624			656	683		
20.1														702					
20.6																652			
20.8																	683		
21				564				482		617	613								
21.5												597							
22									619										

Lake Merced
South - Pump
Station

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**	**Cond**
Ft	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm	mmho/cm
Surf	531	569	538	562	594	566	498	475	610	612	613	597	624	662	684	656	682	610	611
5	531	569	539	562	595	566	500	476	612	611	613	598	623	662	684	655	681	610	610
10	532	568	539	564	595	566	500	476	615	614	613	597	623	669	685	655	683	618	611
12																			
15	533	568	540	563	596	568	502	479	616	614	613	597	625	670	685	656	684	618	610
16																			
17																			
18						570													
19																			
19.2																		623	
20	533	567	541	564			501	481	617	614	614	597	625	670		655	684		
20.4																			611
21		566		564	598					615	613		625	684	686				
21.5																	685		
22			542				500	481	621										
22.8																656			
23.2												598							

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf			569	518	466	495	465		508	544	455	466	484	499	472	517	551	519	485	483
5			578	530	466	484	465		509	544	456	470	486	500	471	517	554	520	485	484
10			587	584	466	487	465		509	551	457	471	488	500	474	529	560	521	486	490
14									509	553				498			564			
15			588	612	472	489	466				463	482	489		475	534		520	488	492
16				642											475				490	492
17																				
17.4																				
17.5																				
18			608								459									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf			524	442	452	488	441		502	526	426	464	479	477	439	503	533	482	444	462
5			525	445	452	488	441		502	527	427	466	484	477	440	507	534	482	445	463
9																	539			
10			526	445	452	488	442		502	533	429	468	489	478	441	514		482	446	465
11																			446	464
12				448																
13											438									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	483	514	525	482	478	498	431	405	459	219	482	459	431	432	450	477	508	500	516	434	421
5	485	514	525	482	479	499	408	414	459	393	483	459	432	432	450	477	509	467	516	435	422
10	486	514	525	482	479	504	409	411	459	392	485	459	433	432	450	477	511	470	516	436	423
14																					
15	492	514	526	483	481	507	410	412	460	397	486	463	435	432	451	477	513	469	516	436	423
16	492				485			414								477					
17							410		463	401	487		435				516				
17.4																					
17.5																					
18												462		432				469	516	443	424
18.8																					
19															458						
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	474	496	502	446	455	483	416	409	454	392		458	426	426	449	475	508	n/a	509	425	415
5	474	496	503	446	456	484	417	412	454	392		463	427	426	449	475	509	n/a	509	427	416
9																					
10	479	497	504	446	456	487	417	413	455	393		468	429	426	450	475	512	n/a	509	430	417
11					456	490															
12				446			417		457									n/a			
13								413		390		465	429		454	476	516		509		418
13.8																					
14														427						437	
14.1																					
14.7																					
15																					
15.8																					

Appendix K

Lake Merced
North

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	448	406	426	459	469	382	360	463	459	468	446	456	495	518	481	495	443	446
5	448	406	428	459	469	380	362	465	463	468	446	460	503	518	481	495	446	446
10	448	406	432	459	470	380	363	470	468	468	446	467	505	518	481	499	451	447
14																		
15	447	409	433	459	470	380	364	472	470	468	446	468	507	519	482	500	459	447
16																		
17																		
17.4													511					
17.5														519				
18					476				473									
18.8												471						447
19	448	420	445	461		379	369	482		468								
19.3																	465	
19.9																501		
20											449				482			
20.6											450							

Lake Merced
North East

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	442	413	434	464	473	383	362	470	467	464	446	465	499	510	472	493	443	434
5	442	413	434	465	474	384	363	472	468	464	446	468	501	510	472	495	445	434
9																		
10	443	413	434	465	473	382	364	476	474	464	446	472	507	510	473	495	450	434
11																		
12																		
13					474							476	511					
13.8																	459	
14	445		436	465					479									
14.1														510				
14.7															473			434
15		414				382	366	479		465	446					497		
15.8											446							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf			409	354	350	375	358	361	382	406	357	371	383	397	384	431	452	427	409	415
5			425		350	374	358	361	382	412	360	374	386	397	384	431	452	427	400	415
6				362																
10			431		350	374	357	362	382	413	360	377	387	396	384	430	454	427	401	416
12				368																
15			441		352	374	355	363	382	416	360	383	388	396	384	432	456	427	402	417
16														396		432	457	425		
17										416									403	
18				373	353				381			384	388		384					422
18.2																				
18.9																				
19				377			356													
20								363			358									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf			380	333	348	374	359	362	381	408	376	370	383	396	385	431	453	427	409	414
5			381	332	349	374	359	362	382	409	376	371	384	397	384	431	453	426	409	414
10			380		349	374	359	362	382	411	376	381	384	397	384	429	454	426	410	415
12				336																
15			380		351	374	359	362	382	414	376	377	387	397	385	431	456	426	410	416
16																	458	431		
17														397						
18				338	353				382	414		427			385	434			412	417
19							359	363					385							
19.2																				
20											383									
20.4																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	422	437	403	385	380	398	280	278	265	291	344	314	340	331	341	342	394	334	400	343	338
5	422	438	405	385	380	399	334	291	295	291	344	313	340	331	341	343	379	335	400	344	339
6																					
10	422	438	413	385	381	401	334	282	296	289	345	298	343	330	342	344	380	338	400	345	340
12																					
15	422	438	413	386	381	402	334	282	297	290	345	295	343	331	342	344	381	336	401	345	341
16	422	438		386																	
17			414			402					346	290	343								
18					382					288							384		401		341
18.2																					
18.9																					
19							334	282	301											346	
20														331	344	345		338			
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS	TDS
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	422	438	397	383	379	397	279	276	300	336	344	287	340	330	341	342	391	350	396	344	340
5	422	438	397	383	379	398	279	284	299	336	344	284	340	330	341	343	392	339	397	344	340
10	422	438	397	383	379	398	279	290	298	337	344	284	340	330	341	344	393	342	397	345	341
12																					
15	422	438	397	383	380	399	280	289	300	339	345	284	341	330	341	346	393	341	397	346	341
16		438																			
17	422		398			401					345		341								
18					381																
19				383			280			340		284						341			
19.2																					
20								288	299					330	342	342	394		397	346	341
20.4																					
21														330							
21.5																					
22																					
22.8																					
23.2																					

Lake Merced
South - Pistol
Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	364	347	360	384	361	333	303	391	391	392	382	399	423	439	420	436	391	390
5	364	347	359	384	361	335	304	392	392	393	382	399	424	439	419	436	392	390
6																		
10	364	347	360	389	361	336	304	393	392	393	382	399	428	439	420	437	393	390
12																		
15	364	347	361	389	361	338	307	394	393	393	382	398	429	439	420	437	397	390
16																		
17																		
18																		
18.2																		391
18.9																	400	
19					362									439				
20	363	348	361	390		334	308	396	394	393	382	399			420	437		
20.1													449					
20.6															418			
20.8																437		
21			361				309		394	392								
21.5											382							
22								396										

Lake Merced
South - Pump
Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**	**TDS**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	364	345	359	380	362	319	304	391	391	392	382	399	424	438	420	436	390	391
5	364	345	359	381	362	320	305	392	391	392	382	399	424	438	419	436	390	391
10	364	345	361	381	362	321	305	393	393	392	382	399	428	438	419	437	396	391
12																		
15	364	345	361	381	364	321	307	394	393	393	382	400	429	438	420	437	396	391
16																		
17																		
18					365													
19																		
19.2																	398	
20	363	346	361			321	308	395	393	393	382	400	429		419	438		
20.4																		391
21	362		361	383					394	393		400	438	439				
21.5																438		
22		347				320	308	398										
22.8															420			
23.2											383							

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	14.5	10.2	6.7	9.6	9.3	8.6	9.1		7.6	7.9	7.7	10.8	7.3	7.9	9.9	13.1	13.0	9.4	10.6	11.0	10.8
5	10.0	9.8	5.2	9.5	9.1	6.4	9.0		6.2	7.1	7.3	9.2	6.4	7.5	9.0	12.5	8.8	8.0	10.3	10.2	9.3
10	2.0	2.4	4.7	4.9	8.5	4.2	7.6		6.2	6.6	7.1	8.9	5.9	7.3	6.4	0.4	3.1	8.2	6.3	4.4	8.2
14									5.7	6.6				4.4			0.7				
15	0.5	0.2	4.7	0.37	3.4	1.1	6.2				6.7	1.0	4.6		3.8	0.6		8.6	1.5	2.5	1.2
16	0.2	0.2		0.27											3.9				0.6	1.2	1.1
17																					
17.4																					
17.5																					
18			4.5								0.1										
18.8																					
19																					
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	11.5		5.9	8.0	6.9	7.6	9.5		6.8	9.5	8.7	7.6	6.0	9.7	9.5	11.1	8.1	9.6	8.8	9.1	10.0
5	9.1		5.7	7.3	6.5	6.1	9.3		6.6	9.0	8.1	7.3	5.2	9.3	8.5	7.0	2.7	9.3	8.2	8.1	9.1
9																	1.2				
10	3.0		5.4	3.2	5.6	5.7	8.5		6.1	8.1	7.2	5.9	4.7	9.0	6.4	0.4		8.9	3.6	5.5	3.2
11																			3.3	2.0	
12				0.86																	
13											0.1										
13.8																					
14																					
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	6.3	6.6	9.6	9.7	10.8	6.7	8.7	5.8	9.4	8.1	8.2	7.9	7.0	7.1	11.3	8.6	7.4	8.5	8.1	8.1	8.5
5	6.1	6.3	8.4	9.4	9.4	5.7	5.9	5.4	9.0	6.4	7.6	7.8	6.8	7.0	10.5	6.6	7.0	7.8	7.5	7.8	8.0
10	5.9	6.2	8.0	9.2	3.2	5.1	4.1	5.1	8.9	6.6	6.9	7.6	6.8	6.8	6.5	6.1	6.8	7.5	7.5	7.8	7.5
14																					
15	5.8	5.8	7.4	7.2	0.3	4.7	3.5	2.4	5.2	5.9	5.3	6.9	6.6	0.2	2.6	5.9	6.9	6.9	7.6	7.3	5.0
16				3.8			3.5														
17						4.6		0.9	0.2	5.7		6.8									
17.4																					
17.5																					
18											4.1		6.5					3.5	7.5		
18.8																					
19														0.2						4.9	0.3
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	8.5	8.7	10.1	7.4	9.6	7.4	9.1	7.6	8.3	8.1	9.5	9.1	8.0	6.6	9.9		7.8	9.4	7.9	9.6	7.9
5	8.4	7.6	9.6	6.9	7.7	6.5	5.9	7.2	7.9	7.7	7.6	9.3	7.8	5.9	8.7		7.6	7.5	7.3	9.2	8.0
9																					
10	7.7	7.5	7.7	6.6	1.4	5.4	4.1	4.7	5.7	7.6	5.6	9.1	6.4	1.2	3.1		7.3	5.6	6.9	6.6	7.7
11				6.7	0.8																
12			6.7			5.7		3.4		5.8											
13							4.1		0.2		0.3	8.2		0.2					6.7		
13.8																					
14													4.9					3.3		3.8	
14.1																					
14.7																					
15																					5.6
15.8																					

Lake Merced
North

	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth Ft	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L
Surf	12.3	6.5	5.5	8.2	9.8	10.2	17.9	8.2	8.9	17.9	13.4	5.9	9.3	13.5	10.5	8.9
5	10.5	6.4	5.3	8.0	8.1	9.4	9.4	8.1	8.5	14.1	6.1	4.9	9.2	12.5	6.5	7.7
10	3.7	6.1	5.1	7.9	5.8	4.8	6.6	7.7	8.3	4.4	2.5	4.5	7.3	6.6	1.3	7.1
14																
15	2.2	6.0	5.1	7.9	4.8	2.5	2.7	6.2	8.0	3.2	0.1	3.7	7.0	4.9	0.3	6.8
16																
17																
17.4											0.1					
17.5												3.7	3.7			
18			0.8				0.5									
18.8										0.9						6.7
19	0.3	5.7		7.7	1.1	0.5		6.3								
19.3															0.3	
19.9														2.4		
20									0.6				5.5			
20.6									0.4							

Lake Merced
North East

	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth Ft	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L	**DO** mg/L
Surf	8.9	7.5	6.5	7.0	10.5	9.6	14.0	6.37	8.7	14.3	12.7	4.9	8.6	11.5	9.7	9.8
5	4.8	7.1	6.5	6.9	8.0	8.2	10.9	6.20	8.8	10.4	10.6	4.0	8.2	9.1	7.2	8.9
9																
10	3.3	6.0	6.5	6.7	5.7	5.2	3.9	5.38	7.9	2.8	1.8	4.0	6.7	8.1	1.0	8.9
11																
12																
13			6.4							0.7	0.1					
13.8															0.4	
14	1.1	4.8					0.3									
14.1												3.9				
14.7													0.8			6.0
15				6.6	1.4	1.6		0.58	6.5					3.0		
15.8									6.2							

Lake Merced
South - Pistol

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Ft	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L
0	12.4	8.5	7.4	8.6	8.7	7.9	8.9	8.0	6.6	9.8	9.2	9.4	7.9	7.4	9.0	9.5	11.2	9.5	9.8	9.9	8.0
5	9.2	7.9	7.3		8.5	6.6	8.6	7.9	6.4	9.7	8.8	8.2	6.2	7.3	8.5	9.3	10.4	9.2	9.7	9.8	7.7
6				7.9																	
10	6.7	1.6	7.3		8.4	6.1	8.3	7.5	6.2	9.5	8.4	6.0	5.6	7.2	8.1	5.2	6.5	8.7	8.7	9.3	7.5
12				7.5																	
15	3.5	0.2	6.6		4.6	4.9	8.2	5.9	6.2	8.5	7.7	0.1	5.5	7.0	7.2	1.3	1.9	8.3	6.7	8.3	7.0
16	3.3	0.2												6.8		1.2	1.4	0.4			1.7
17	3.4									8.7									1.6		
18				5.5	4.5				6.3			0.1	***0.05***		6.2					0.2	
18.2																					
18.9																					
19				5.4			8.1														
20								4.7			0.2										
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South -

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Ft	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L	DO mg/L
Surf	12.2	7.6	6.8	9.2	10.1	8.0	9.5	8.3	9.0	10.2	8.8	10.5	8.9	6.8	9.2	9.7	10.7	10.1	10.0	9.8	8.7
5	12.1	5.0	6.6	9.2	9.7	7.4	9.4	8.2	7.7	9.8	8.6	10.0	7.7	6.7	8.8	9.3	10.2	9.7	9.9	9.8	8.6
10	7.8	1.9	6.3		9.1	7.0	8.9	7.9	7.6	9.6	8.4	3.3	7.4	6.6	8.2	6.3	7.7	9.6	6.0	8.1	8.2
12				8.7																	
15	5.5	0.2	6.2		4.9	6.9	8.8	6.6	7.7	8.9	7.8	0.1	7.1	6.3	6.5	1.6	2.0	9.2	3.0	7.9	8.0
16	4.5	0.2															1.1	0.6			
17														6.1							7.5
18				4.4	3.2				7.4	8.7		0.1			4.6	0.7			0.5	0.1	
19							8.3	5.2					0.1								
19.2																					
20											0.1										
20.4																					
21																					
21.5																					
22																					
22.8																					
23.2																					

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	8.0	6.5	10.1	8.5	9.8	6.7	9.1	8.3	7.5	7.4	8.1	9.5	8.0	8.1	9.9	8.6	8.3	8.9	9.1	8.8	8.1
5	7.8	6.2	10.0	8.4	9.1	6.7	8.4	8.0	6.9	7.1	7.3	8.8	7.9	8.1	9.6	8.1	8.3	8.7	8.9	8.8	7.9
6																					
10	7.4	5.2	10.0	7.7	5.5	6.3	8.1	7.5	6.4	6.7	6.8	8.2	7.6	5.3	8.6	7.0	8.2	8.7	8.7	8.8	7.7
12																					
15	6.7	4.9	9.6	5.9	2.6	6.2	7.9	3.2	4.9	6.5	6.5	8.6	7.6	2.2	4.2	6.6	8.2	8.6	8.6	8.7	7.4
16	5.8		9.3																		
17		3.2			2.0					3.8	3.7	7.8									
18				4.5					3.5										8.6		
18.2																					
18.9																					
19						5.8	7.8	0.3										7.4			
20													7.2							8.6	5.9
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South -

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	7.9	7.3	9.4	9.5	9.9	7.6	9.0	8.8	9.6	6.5	7.9	9.5	8.1	8.3	10.5	8.8	8.5	9.0	9.2	8.8	9.7
5	7.6	7.2	9.2	9.4	9.4	6.5	8.0	8.6	9.3	6.1	7.5	9.0	7.9	8.1	8.6	8.2	8.2	8.7	8.8	8.6	9.5
10	7.7	7.2	9.1	9.3	8.0	4.8	7.7	6.6	7.2	5.5	6.5	9.0	7.8	7.7	6.0	7.2	8.1	8.5	8.6	8.4	9.4
12																					
15	7.6	7.1	9.2	7.8	4.6	3.9	7.6	4.4	3.0	3.6	6.1	7.0	7.8	1.9	2.6	5.0	8.1	7.8	8.7	8.3	8.9
16	7.0																				
17		6.9			1.2					3.5		6.9									
18				4.7																	
19			8.5			3.9			0.3		5.3										
19.2																					
20							7.0	2.0					7.6					7.6	8.7	8.0	7.3
20.4																					
21													7.6							7.9	
21.5																					
22																					6.4
22.8																					
23.2																					

Lake Merced
South - Pistol

	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	9.4	6.5	7.1	8.4	9.1	8.4	11.5	10.9	8.9	11.5	11.9	7.1	10.0	10.5	9.8	9.8
5	9.1	6.2	7.0	8.4	8.9	7.7	10.1	10.2	9.0	10.9	10.9	6.7	9.9	9.9	8.0	9.5
6																
10	8.2	5.9	7.0	7.7	8.8	6.8	8.0	10.1	8.6	10.2	4.5	6.6	9.2	8.0	6.7	9.3
12																
15	5.0	5.9	6.7	7.4	8.5	6.7	5.2	10.0	8.5	9.5	3.0	6.4	9.1	6.6	0.3	8.7
16																
17																
18																
18.2																7.8
18.9															0.4	
19			4.1									6.3				
20	3.6	5.9		4.4	7.2	3.2	1.5	9.7	8.2	0.6			8.3	6.5		
20.1											0.2					
20.6													2.8			
20.8														0.7		
21	3.3				6.9		1.4	9.3								
21.5									7.9							
22						1.9										

Lake Merced
South -

	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**	**DO**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	9.7	6.2	6.6	7.8	8.6	8.9	11.8	10.9	9.2	11.7	11.2	8.4	10.2	10.9	11.0	9.22
5	9.4	6.0	6.4	7.6	8.5	8.0	11.5	10.9	9.3	11.0	10.6	8.0	9.7	10.8	9.8	9.12
10	5.9	6.0	5.5	7.3	6.7	6.0	7.4	10.2	9.3	10.3	3.7	7.7	9.6	7.8	2.3	8.86
12																
15	4.7	5.9	0.7	7.2	6.2	4.5	5.3	10.0	9.2	6.3	3.3	7.6	9.5	5.2	0.3	8.65
16																
17																
18			0.5													
19																
19.2															0.4	
20	3.3			7.2	6.1	3.7	3.4	9.9	9.2	5.4	2.6		9.4	3.6		
20.4																8.59
21	2.4	4.0					3.2	9.9		0.5	0.2	7.2				
21.5														0.4		
22				7.1	5.7	2.1										
22.8													0.5			
23.2									9.0							

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	295	186	305	274	290	264	395		352	328	191	202	269	302	366	166	232	319	261	215
5	302	173	305	262	286	251	394		353	328	178	192	271	293	366	159	233	318	253	205
10	319	138	305	231	280	232	393		352	329	168	168	269	276	364	47	236	315	234	176
14									353	330				240			231			
15	328	9	305	206	271	202	393				141	128	267		359	25		308	188	136
16	329	13		205											354				94	40
17																				
17.4																				
17.5																				
18			309								54									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	338		281	262	315	299	423		344	278	186	346	253	296	351	169	223	272	268	218
5	347		276	253	315	297	424		343	265	166	341	252	284	349	143	223	264	264	203
9																	214			
10	361		271	244	315	297	426		343	236	110	335	249	265	343	44		246	241	168
11																			207	62
12				237																
13											-48									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	457	451	528	547	540	470	498	473	437	299	373	330	328	323	173	378	265	427	319	298	228
5	455	451	528	547	540	471	498	474	436	294	372	330	323	309	169	378	258	419	316	297	229
10	451	450	527	547	538	473	498	475	435	287	371	331	313	304	151	377	248	391	309	296	229
14																					
15	443	446	525	544	537	471	497	475	429	268	370	332	303	298	102	376	233	367	297	293	229
16	332				530			475								373					
17							497		409	69	368		293				219				
17.4																					
17.5																					
18												334		290				338	281	295	228
18.8																					
19															-3						
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	416	438	529	542	538	469	494	474	442	205	339	276	319	275	147	374	264	n/a	289	239	216
5	376	433	529	541	538	469	493	475	441	186	333	269	313	259	132	374	257	n/a	276	228	211
9																					
10	323	397	529	540	537	468	491	474	442	143	325	256	304	244	71	374	236	n/a	255	214	202
11					535	448															
12				533			485		441		314							n/a			
13								471		55		213	290		-21	374	218		227		184
13.8																					
14														198						190	
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	285	213	278	315	369	356	230	185	304	296	278	280	227	447	324	305	255	381
5	285	209	259	314	368	359	231	175	296	294	269	274	191	448	322	298	226	382
10	285	203	232	313	367	358	242	139	295	293	260	240	152	448	322	274	140	382
14																		
15	285	186	208	309	364	355	242	76	269	288	242	211	88	448	319	255	89	381
16																		
17																		
17.4													-4					
17.5														448				
18					368				268									
18.8												93						381
19	287	130	161	305		350	239	-31		287								
19.3																	79	
19.9																199		
20											77				317			
20.6											58							

Lake Merced
North East

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	268	244	328	310	379	360	204	243	295	251	316	276	263	515	273	333	292	347
5	268	238	328	308	378	361	204	234	277	239	312	260	249	518	263	331	260	343
9																		
10	267	232	323	303	377	360	210	227	251	202	294	187	136	519	248	323	186	331
11																		
12																		
13					376							31	10					
13.8																	133	
14	266		318	296					74									
14.1														521				
14.7															199			318
15		215				357	203	220		103	278					319		
15.8											260							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	311	276	233	292	286	287	404	349	340	301	225	174	184	429	431	216	262	280	266	224
5	325	276	228		282	287	403	347	340	294	207	148	175	429	432	215	264	276	259	211
6				291																
10	336	290	214		275	283	402	344	339	288	196	119	164	429	431	219	274	266	248	200
12				289																
15	346	287	197		273	274	400	343	339	283	181	-56	136	429	431	217	284	254	221	183
16	346	288												431		206	283	175		
17	344									277									139	
18				287	265				339			-57	56		430					61
18.2																				
18.9																				
19				287			398													
20								346			172									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**	**ORP**
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	303	242	269	297	289	287	366	313	336	316	176	203	198	421	410	225	243	264	268	232
5	305	241	264	299	286	284	361	309	337	313	173	193	190	421	411	226	243	262	263	225
10	318	244	258		278	265	350	298	337	312	159	159	170	421	411	227	246	256	249	212
12				285																
15	326	241	257		273	252	337	280	336	311	140	105	132	418	412	231	255	239	214	181
16	324	246															259	138		
17														418						
18				286	269				335	309		30			411	228			114	66
19							320	258					29							
19.2																				
20											63									
20.4																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	348	453	526	547	542	482	502	431	414	318	341	315	319	321	221	355	284	309	315	318	235
5	336	453	523	547	542	481	497	431	407	314	338	316	312	310	214	353	277	307	312	316	232
6																					
10	315	453	518	547	541	481	486	430	385	305	322	315	305	291	203	349	267	302	306	315	228
12																					
15	286	451	507	544	537	477	466	430	358	298	315	313	293	275	190	344	255	295	298	313	223
16	208	445		540																	
17			423			467					311	316	252								
18					526					232							210		289		212
18.2																					
18.9																					
19							430	429	159											313	
20														258	157	341		278			
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	414	449	518	543	533	468	506	402	445	260	341	338	335	321	260	376	279	349	323	318	231
5	401	449	516	543	532	466	506	401	445	251	342	338	332	312	254	377	275	345	322	318	231
10	374	448	513	542	529	464	506	400	446	236	342	339	325	303	238	378	263	321	318	318	230
12																					
15	334	445	505	537	524	457	503	398	446	207	344	340	317	297	222	383	251	294	312	318	230
16		438																			
17	260		491			447					345		295								
18					510																
19				530			502			155		340						278			
19.2																					
20								398	446					293	193	386	237		301	318	229
20.4																					
21														290							
21.5																					
22																					
22.8																					
23.2																					

Lake Merced
South - Pistol
Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	276	303	417	254	428	343	357	356	364	304	356	283	240	472	350	322	337	374
5	276	301	416	250	428	346	356	358	360	305	352	277	230	472	346	315	316	374
6																		
10	275	299	412	243	428	350	361	361	357	303	345	255	214	471	342	305	296	372
12																		
15	274	294	411	235	428	349	373	364	343	299	337	234	152	470	338	298	254	368
16																		
17																		
18																		
18.2																		366
18.9																	237	
19					430									468				
20	272	290	409	220		344	370	372	317	296	324	128			328	273		
20.1													19					
20.6															326			
20.8																198		
21			404				368		290	295								
21.5											299							
22								373										

Lake Merced
South - Pump
Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP	ORP
Ft	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Surf	281	289	396	284	416	364	331	326	339	415	472	272	260	82	284	306	344	385
5	282	288	396	283	416	366	332	327	337	415	472	266	254	77	282	296	332	384
10	282	287	399	282	417	370	333	334	339	417	471	256	242	74	278	286	320	383
12																		
15	282	286	399	279	419	372	343	335	331	417	469	243	217	73	263	265	301	380
16																		
17																		
18					419													
19																		
19.2																	294	
20	281	288	399			371	344	336	314	416	464	217	185		244	241		
20.4																		377
21	281		398	277					292	414		91	35	70				
21.5																195		
22		287				369	339	335										
22.8															170			
23.2											455							

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	10.0	25	28	10	32.6		20.0		32.0	26.1	19.0	28.8	28.2	26.7	21.1	30.3	27.0	3.7	11.0	31.9
5	10.0	24	25	11	31.1		20.5		32.0	25.0	19.0	27.3	25.0	26.6	21.6	34.8	30.0	3.2	9.2	33.7
10	7.4	26	29	11	25.6		20.8		33.0	24.6	19.1	28.0	28.5	27.6	23.7	32.0	30.0	3.9	13.6	33.3
14									30.0	27.9				27.8			30.0			
15	7.4	28	24	13	28.5		22.1					28.2	28.7		21.9	21.8		4.6	13.4	23.9
16																				
17																				
17.4																				
17.5																				
18											20.0									
18.8																				
19																				
19.3																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	8.2		7.0	6.7	19.4		32.3		23.0	24.1	25.4	22.7	21.7	36.4	33.1	30.0	20.0	3.9	16.1	24.1
5	7.5		5.2	8.3	20.3		29.6		22.0	26.6	25.4	27.4	20.4	32.8	32.7	30.0	21.0	3.0	17.2	24.1
9																	20.0			
10	8.1		7.1	10	18.3		31.1		23.0	24.9		26.1	48.7	32.3	32.9	33.3		3.5	17.0	24.9
12																				
13											32.6									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	23.0	23.0	14.9	20.4	22.0	32.5	24.3	29.6	1.6	14.0	11.0	3.4	3.7	1.2	8.2	11.3	11.0	13.6	10.0	9.4
5	23.0	28.0	4.5	18.5	25.1	34.7	22.1	28.2	1.9	14.0	13.0	3.5	4.1	1.4	8.6	11.0	12.0	13.5	12.0	7.7
10	23.0	23.0	9.7	22.4	25.0	32.6	22.9	25.8	1.2	13.0	13.0	5.6	3.9	1.6	8.3	11.9	11.0	13.5	11.0	8.4
14																				
15	16.0	25.0	19.6	21.8	24.0	28.1	25.5	24.8	1.5	14.0	11.0	7.5	4.4	1.5	8.2	13.1	11.0	13.4	10.0	6.5
16																12.6				
17										14.0			5.0				8.0			
17.4																				
17.5																				
18												7.6		1.5				12.8	10.0	7.3
18.8																				
19															8.8					
19.3																				
20																				
20.6																				

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	29.0	20.0	19.0	19.6	17.0	23.4	28.1	29.8	12.2	14.0	11.0	6.1	8.2	7.6	10.8	15.1	12.0	12.6	9.5	10.0
5	26.0	19.0	16.3	20.7	16.8	21.2	31.4	24.7	11.3	15.0	11.0	6.6	4.6	9.1	11.0	16.0	12.0	13.6	10.0	8.5
9																				
10	25.0	21.0	25.8	20.2	17.4	20.6	22.7	18.4	10.5	15.0	11.0	5.5	8.7	9.5	9.2	16.8	12.0	12.6	9.0	6.5
12																				
13										14.0		5.5	4.8		10.3	15.5	11.0	11.0	10.0	
13.8																				
14														9.7						5.3
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	11.0	8.2	10.5	23.5	23.0	27.0	25.0	19.0	21.0	32.0	15.2	7.2	32.0			14.7	15.4
5	10.0	6.7	9.6	23.5	23.0	24.0	24.0	18.0	22.0	36.1	15.0	7.3	30.0			14	18.1
10	8.9	7.5	11.0	18.2	21.5	20.0	23.0	18.0	18.0	33.4	14.2	7.6	22.0			13.8	
14																	
15	11.0	6.8	11.0	14.9	22.2	21.0	21.0	21.0	18.0	36.1	14.5	7.5	25.0			14.7	
16																	
17																	
17.4																	
17.5																	
18	10.0					21.0				24.3							
18.8													20.0				
19		8.4	7.3	13.4	22.0		23.0	20.0	18.0		14.2						
19.3																	
20																15.2	
20.6												10.3					

Lake Merced
North East

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	11.0	13.0	2.1	20.8	18.0	23.0	17.0	17.0	21.0	27.0	8.2	9.2	22.0			**13.4**	19.3
5	11.0	13.0	1.9	20.5	18.0	23.0	16.0	18.0	21.0	28.0	8.8	10.0	23.0			**14.7**	18.4
9																	
10	11.0	13.0	1.9	17.2	18.0	25.0	16.0	17.0	19.0	26.0	8.6	9.5	22.0			**14**	
12																	
13	11.0					24.0							19.0				
13.8																	
14		12.0		14.4	20.0					27.0							
14.1																	
14.7																**14.8**	
15			2.0				17.0	16.0	19.0		8.7						
15.8												9.4					

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	20.0	32	22	8.4	13.2		12.1	16.1	25.0	23.9	20.6	16.6	19.1	10.7	9.4	14.0	13.0	2.2	9.0	13.0
5	20.0	28	22		12.3		12.0	17.1	23.0	27.1	17.0	15.4	19.1	11.8	10.9	14.4	13.0	2.7	8.8	12.5
6				9.9																
10	20.0	26	22		10.5		12.2	16.0	22.0	28.5	18.0	15.8	19.0	10.6	10.3	13.5	13.0	3.6	8.8	12.3
12				11																
15	18.0	25	24		9.7		11.3	16.3	22.0	28.6				12.0	13.1	16.5	13.0	3.0	8.8	13.6
16	18.0	28																		
17																				
18				11								12.1	16.8							
18.9																				
19																				
20											17.0									
20.6																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb	Turb
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	20.0	28	22	9.8	10.8		10.2	16.0	30.0	28.2	18.2	17.7	21.2	9.8	10.1	12.8	13.0	2.5	7.9	13.2
5	18.0	30	19	10	12.5		10.4	15.4	26.0	28.9	18.0	15.1	19.2	10.1	9.7	12.2	14.0	3.2	10.1	12.4
10	18.0	24	20		10.2		11.7	15.1	24.0	33.3	16.8	14.5	19.1	10.7	9.6	12.3	15.0	2.5	10.0	12.7
12				8.6																
15	17.0	26	19		9.1		11.8	16.3	25.0	31.6				11.9	10.1	14.4	13.0	3.0	10.3	13.0
16																				
17																				
18				12								15.3								
19													19.1							
19.2																				
20											17.1									
21																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	17.0	20.0	12.6	14.3	12.8	15.6	16.2	19.5	11.8	22.0	19.0	15.0	11.3	7.8	10.2	9.1	7.0	12.8	10.0	9.4
5	14.0	20.0	13.0	14.5	12.0	17.4	14.1	17.9	12.3	21.0	18.0	15.0	10.7	8.2	11.4	9.9	7.0	11.0	11.0	9.4
6																				
10	13.0	17.0	12.1	14.9	9.5	18.8	15.2	16.2	11.8	20.0	18.0	17.0	12.3	8.2	10.6	9.6	7.0	9.7	10.0	8.7
12																				
15	13.0	20.0	6.9	13.4	12.3	15.3	15.1	19.2	12.5	20.0	18.0	14.0	17.2	7.6	11.2	8.3	7.0	9.7	11.0	9.0
16																				
17												16.0	11.5							
18										18.0							7.0		11.0	
18.9																				
19																				10.0
20														9.2	9.1	8.3		9.6		
20.6																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	13.0	22.0	8.0	15.0	11.2	16.3	14.4	17.3	11.4	20.0	18.0	14.0	2.5	8.1	10.2	10.4	7.0	10.7	11.0	11.0
5	12.0	16.0	7.6	14.6	9.8	17.5	18.2	19.5	11.3	20.0	18.0	12.0	11.4	7.5	11.0	11.1	7.0	10.4	10.0	9.6
10	12.0	17.0	8.0	13.7	11.0	17.1	11.9	18.6	11.1	23.0	18.0	13.0	12.7	7.8	9.7	11.7	7.8	9.9	10.0	8.6
12																				
15	12.0	17.0	7.3	13.3	10.8	18.0	13.3	15.7	12.7	17.0	19.0	12.0	10.4	7.6	11.1	9.5	7.5	8.8	10.0	9.2
16																				
17													12.3							
18																				
19										16.0		13.0						8.8		
19.2																				
20															10.1	10.2	7.5		9.6	9.2
21														7.6						
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09
Depth	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	9.9	11.0	11.0	11.8	22.5	24.0	10.0	7.0	12.5	10.5	14.3	7.2	8.7			8.6	10.4
5	9.6	10.0	11.8	14.1	21.0	20.0	11.0	6.7	12.0	11.0	15.3	7.3	9.3			8.9	9.6
6																	
10	11.0	10.0	11.0	14.2	21.0	20.0	10.0	7.3	12.0		15.1	7.6	9.0			7.5	
12																	
15	11.0	11.0	10.5	13.8	23.0	18.0	11.0	7.0	11.0	11.0	14.1	7.5	9.2			7.8	
16																	
17																	
18	11.0																
18.9																	
19						22.0											
20		10.0	9.8		21.0		11.0						8.7				
20.6																8.5	
21				15.4				6.8			14.2						
21.5												10.3					
22									11.0								

Lake Merced
South - Pump
Station

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09
Depth	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**	**Turb**
Ft	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu	ntu
Surf	10.0	10.0	10.3	12.0	20.5	21.0	10.0	7.2	12.0	11.0	14.1	8.5	8.5			9.1	9.52
5	9.8	10.0	10.5	14.5	22.0	21.0	10.0	7.1	12.8	11.0	14.1	7.2	8.7			9.8	9.08
10	11.0	9.4	10.3	12.8	21.5	22.0	10.0	6.9	11.0	7.0	14.0	7.0	8.5			9.5	
12																	
15	11.0	9.1	11.5	11.8	21.0	17.0	11.0	6.7	11.0	9.5	14.2	7.2	9.0			10.3	
16																	
17																	
18						12.0											
19																	
19.2																	
20	11.0																
21		9.4		12.2	21.0					12.0	14.9		8.9				
22			11.4				11.0	6.8	10.0								
22.8																10.3	
23.2												7.2					

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	274	304	300	233	244		232		276	264	248	228	210	264	220	256	280	---	230	260
5	274	304	300	236	234		234		272	276	240	228	220	264	244	248	280	---	225	250
10	272	304	300	231	236		240		268	272	240	236	225	268	252	248	280	---	220	245
14									260	272				268			280			
15	272	304	300	240	242		236					236	220		244	248		---	235	245
16																				
17																				
17.4																				
17.5																				
18											240									
18.8																				
19																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	262		285	214	224		220		268	244	216	224	210	236	216	240	260	---	225	230
5	260		288	202	232		220		268	240	220	232	220	252	224	244	260	---	240	235
9																	264			
10	260		286	205	234		232		272	240		228	220	252	224	252		---	245	240
12																				
13											228									
13.8																				
14																				
14.1																				
15																				
15.8																				

Lake Merced
North

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	235	232	235	225	210	235	255	260	204	264	220	255	204	200	220	220	240	248	232	230	225
5	240	240	240	230	220	260	270	265	204	264	224	255	200	200	252	225	244	244	232	235	235
10	250	248	250	240	230	270	275	270	204	264	224	250	200	205	248	230	252	240	234	235	230
14																					
15	255	252	260	240	230	270	275	270	204	266	226	250	204	205	244	235	248	240	236	235	225
16																235					
17										266			204				244				
17.4																					
17.5																					
18												250		210				244	236	230	225
18.8																					
19															216						
20																					
20.6																					

Lake Merced
North East

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	255	256	255	230	230	270	280	280	208	262	226	235	204	195	236	240	244	240	234	215	215
5	250	256	255	230	225	270	280	285	208	264	226	235	204	190	240	225	244	240	234	215	215
9																					
10	250	256	260	235	225	270	280	285	210	266	228	235	208	190	244	200	248	240	236	225	210
12																					
13										266		235	208		244	235	256	240	238		210
13.8																					
14														185						235	
14.1																					
15																					
15.8																					

Lake Merced
North

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	210	194	195	240	228	224	230	250	248	244	208	220		
5	208	194	200	220	228	224	230	250	248	244	228	232		
10	206	194	200	205	232	224	225	248	244	244	208	240		
14														
15	204	195	205	225	228	212	225	248	244	248	208	240		
16														
17														
17.4														
17.5														
18					220				244					
18.8												240		
19	206	196	210	235		204	225	246		264				
20														
20.6											228			

Lake Merced
North East

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	180	196	200	215	228	220	235	248	256	252	212	244		
5	152	196	200	225	228	220	235	248	264	248	200	232		
9														
10	114	195	205	240	224	216	235	250	268	244	224	232		
12														
13					216							228		
13.8														
14	88		210	210					268					
14.1														
15		194				216	215	250		236				
15.8											220			

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	172	190	204	162	170		170	176	180	196	188	180	160	188	184	180	196	---	190	190
5	172	190	198		170		168	172	178	180	184	172	165	180	172	184	196	---	190	190
6				155																
10	172	190	198		170		166	168	180	204	184	176	160	184	188	184	200	---	195	195
12				158																
15	172	190	197		170		166	176	180	184				196	180	188	200	---	195	195
16	172	190																		
17																				
18				161								172	170							
19																				
20											172									
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk	Alk
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	172	192	196	155	166		166	168	178	200	178	176	170	196	176	196	204	---	200	200
5	172	190	198	160	166		170	180	186	184	184	180	175	188	184	188	204	---	200	190
10	172	190	200		170		170	176	182	180	176	180	160	200	184	192	208	---	195	180
12				158																
15	172	190	196		170		170	172	182	200				200	180	176	208	---	190	180
16																				
17																				
18				157								168								
19													165							
20											176									
21																				
22																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	200	208	190	190	170	195	155	150	132	170	150	160	152	150	170	150	176	160	162	155	170
5	205	208	190	190	170	190	150	155	132	170	150	165	152	135	164	175	172	160	162	155	170
6																					
10	215	208	200	185	175	180	150	160	132	168	150	170	148	125	156	170	164	170	160	158	168
12																					
15	220	208	200	185	175	190	145	165	132	168	150	170	144	135	158	165	168	168	160	158	166
16																					
17												170	136								
18										166							172		160		163
19																				162	
20														155	158	150		164			
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	210	200	190	170	165	200	175	150	144	168	152	160	136	145	158	165	168	166	160	162	155
5	210	200	190	180	165	200	180	155	144	168	152	165	136	140	158	145	164	168	160	165	155
10	205	208	195	185	170	200	180	150	144	168	152	170	140	140	160	160	160	176	158	168	155
12																					
15	205	212	195	185	170	200	180	145	144	168	152	160	140	145	160	170	164	170	158	168	162
16																					
17													140								
18																					
19										168		155						160			
20															158	140	168		158	165	162
21														145							
22																					
23.2																					

Lake Merced
South - Pistol
Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	146	148	170	170	156	168	160	178	180	184	168	160		
5	146	150	165	165	164	168	160	178	180	184	156	164		
6														
10	148	146	160	160	172	168	160	178		182	152	168		
12														
15	148	144	155	170	164	160	160	178	192	182	156	172		
16														
17														
18														
19					156									
20	154	142		175		156						184		
21			150				160			186				
21.5											172			
22								178						

Lake Merced
South - Pump
Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**	**Alk**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	154	142	170	225	172	172	162	180	180	184	168	156		
5	152	140	145	210	160	168	162	180	180	184	160	172		
10	150	140	150	210	148	164	162	182	180	184	164	184		
12														
15	148	138	155	230	156	160	162	182	188	184	168	188		
16														
17														
18					164									
19														
20														
21	146		160	210					196	182		160		
22		142				152	162	182						
23.2											152			

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	272	290	277	231	240		240		266	280	256	248	270	252	232	260	276	---	245	250
5	272	290	280	227	244		240		276	272	252	244	260	256	252	264	280	---	260	250
10	272	290	280	229	244		246		270	260	248	244	245	268	260	272	284	---	250	255
14									260	256				268			284			
15	272	290	280	232	244		246					244	245		252	272		---	260	260
16																				
17																				
17.4																				
17.5																				
18											244									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	268		272	218	235		228		240	252	220	244	255	240	236	272	280	---	260	260
5	268		273	214	245		250		256	280	232	236	245	260	240	272	284	---	250	260
9																	284			
10	268		273	212	255		252		274	280		240	265	256	244	272		---	250	265
12																				
13											228									
13.8																				
14																				
14.1																				
14.4																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	260	260	285	265	240	255	265	250	236	262	256	255	240	245	252	220	240	244	248	240	220
5	260	264	280	255	255	250	245	255	238	264	256	255	232	230	244	225	244	240	248	245	215
10	255	264	280	250	250	280	225	250	242	265	258	255	228	220	220	230	248	240	248	240	235
14																					
15	255	268	275	250	250	280	225	240	244	264	258	255	224	220	220	235	252	244	246	235	235
16																235					
17										262			224				260				
17.4																					
17.5																					
18												255		220				256	244	220	210
18.8																					
19															220						
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	280	276	280	260	255	255	240	265	246	262	266	260	236	250	256	260	248	276	250	240	235
5	275	276	260	245	255	270	240	275	246	264	266	260	236	245	252	245	252	260	250	245	235
9																					
10	270	280	265	245	255	280	245	280	248	267	266	265	236	235	230	275	264	248	250	235	220
12																					
13										264		270	236		224	275	256	254	250		215
13.8																					
14														220						215	
14.1																					
14.4																					
14.7																					
15																					
15.8																					

Lake Merced
North

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	222	200	205	235	236	224	230	244	248	244	240	232	244	240	232	250	272	264
5	218	202	215	240	240	224	230	244	248	244	240	232	260	268	264	246	278	256
10	218	202	225	245	248	228	226	244	244	244	240	256	260	268	260	258	266	268
14																		
15	220	204	225	235	244	232	228	244	244	248	240	252		272	224	252	272	276
16																		
17																		
17.4													272					
17.5														280				
18					240				244									
18.8												244						284
19	220	204	220	230		236	232	244		264								
19.3																	276	
19.9																252		
20															228			
20.6											228							

Lake Merced
North East

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	218	206	215	230	236	236	235	246	246	248	220	260	252	256	232	256	274	264
5	220	206	220	235	236	236	235	246	246	240	232	264	260	208	228	250	270	256
9																		
10	222	206	230	240	232	232	235	244	246	244	236	260	256	272	224	256	272	256
12																		
13					228							232	256					
13.8																	274	
14	222		235	240					250									
14.1														252				
14.4																		
14.7															240			272
15		206				232	225	242		244						254		
15.8											244							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	172	185	185	157	185		176	168	188	196	184	180	200	200	200	212	228	---	200	205
5	170	186	182		185		174	188	188	204	188	172	195	188	188	212	228	---	200	205
6				156																
10	170	186	182		195		180	192	190	200	192	176	180	192	192	216	224	---	200	210
12				163																
15	170	186	182		195		176	192	188	180				208	200	216	220	---	200	210
16	170	186																		
17																				
18				158								172	200							
18.2																				
18.5																				
18.9																				
19																				
20											188									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	172	186	182	156	185		176	184	184	192	192	180	185	204	196	216	220	---	215	210
5	170	186	182	161	185		176	180	186	204	188	184	195	188	192	208	220	---	210	210
10	170	186	184		185		180	168	184	192	184	180	185	184	200	208	224	---	210	210
12				154																
15	170	186	178		190		182	184	188	180				200	188	204	224	---	210	205
16																				
17																				
18				157								180								
19													200							
19.2																				
20											176									
20.4																				
20.9																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	205	224	200	195	210	205	175	170	162	168	175	175	164	160	174	220	176	176	178	167	170
5	210	224	200	180	190	205	160	170	162	168	175	175	164	160	170	195	180	176	178	172	175
6																					
10	215	220	205	180	180	210	150	175	162	168	174	175	160	160	168	170	188	184	178	170	180
12																					
15	215	216	205	180	170	210	145	175	162	168	174	170	160	165	166	190	180	190	180	170	175
16																					
17												170	160								
18										168							172		180		165
18.2																					
18.5																					
18.9																					
19																				172	
20														175	164	210		188			
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	230	220	195	210	180	205	175	170	162	162	170	180	156	145	156	175	160	180	176	168	168
5	220	220	195	195	190	210	165	175	162	164	170	180	160	150	156	195	164	176	176	168	172
10	210	228	200	200	165	210	160	175	160	166	170	180	160	155	156	175	172	172	176	168	175
12																					
15	210	230	200	200	165	210	155	170	160	165	170	175	164	150	156	200	172	168	176	170	175
16																					
17													164								
18																					
19										164		170						196			
19.2																					
20															158	175	192		176	172	178
20.4																					
20.9																					
21														140							
21.5																					
22																					
22.8																					
23.2																					

Lake Merced South - Pistol Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	165	160	165	175	192	180	180	188	188	194	168	164	208	220	196	200	220	220
5	166	160	175	170	184	172	180	188	188	194	168	184	208	212	196	202	220	208
6																		
10	168	160	185	170	176	168	178	188		194	168	200	208	200	196	204	214	216
12																		
15	168	160	190	175	180	176	178	186	188	194	188	192	192	200	200	204	218	220
16																		
17																		
18																		
18.2																		208
18.5														196				
18.9																	218	
19					184													
20	168	160		190		180						200						
20.1													200					
20.6															188			
20.8																200		
21			165				180			192								
21.5											200							
22								186										

Lake Merced South - Pump Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**	**Hard**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	170	157	165	170	176	184	180	192	188	192	168	172	192	228	196	200	218	216
5	168	160	165	170	180	176	180	192	188	192	172	204	208		196	206	220	228
10	168	162	170	180	184	172	180	190	188	194	188	200	208	196	196	204	224	208
12																		
15	166	162	175	190	176	172	178	186	188	192	192	176	208	196	196	204	224	220
16																		
17																		
18					168													
19																		
19.2																	232	
20																		
20.4																		228
20.9														196				
21	162		170	180					188	190		200						
21.5																204		
22		162				168	178	184										
22.8															196			
23.2											180							

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	93	100	110	82	83	101	84		91	93	90	87	90	91	89	94	101	98	89	91
5	92	98	110	82	81	100	84		91	93	88	87	90	91	89	94	100	91	95	91
10	93	97	110	82	81	101	84		91	93	85	87	90	91	89	93	101	91	96	91
14									91	93				91			100			
15	94	97	100	82	81	100	84					87	90		89	93		92	96	91
16																				
17																				
17.4																				
17.5																				
18											85									
18.8																				
19																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	84		87	66	73	88	76		86	85	86	80	83	82	78	83	88	74	80	82
5	84		88	66	73	88	76		86	86	80	80	83	82	77	83	88	75	77	81
9																	87			
10	84		88	66	73	87	76		86	86		80	83	82	77	83		78	78	80
12																				
13											76									
14																				
14.1																				
15																				
15.8																				

Lake Merced
North

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	95	96	100	86	83	94	102	103	87	87	87	98	93	83	85	91	91	89	89	78
5	93	98	100	86	83	94	102	105	86	87	89	98	93	82	86	91	90	89	89	78
10	93	100	100	87	83	94	102	105	86	89	90	98	92	82	87	90	89	90	88	78
14																				
15	93	100	100	87	83	94	102	105	85	92	91	98	92	81	86	90	89	90	89	78
16																90				
17										93			91				89			
17.4																				
17.5																				
18												98		80				90	90	78
18.8																				
19															86					
20																				
20.6																				

Lake Merced
North East

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	83	86	86	74	70	88	96	104	88	88	85	100	86	75	83	85	87	86	90	74
5	82	88	86	74	70	87	96	106	88	88	84	100	86	75	83	84	87	86	90	74
9																				
10	82	88	86	74	70	87	96	106	88	88	84	100	86	76	82	83	88	86	89	73
12																				
13										88		100	86		82	83	88	86	89	
14														76						72
14.1																				
15																				
15.8																				

Lake Merced
North

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	84	84	78	83	84	86	95	83	91	90	96	100	100		
5	84	84	78	83	85	86	95	84	91	90	96	100	100		
10	84	84	78	83	86	87	95	86	90	89	94	100	100		
14															
15	83	84	78	82	86	87	96	87	89	89	93	100	100		
16															
17															
17.4															
17.5															
18	83					87				90					
18.8													100		
19		84	78	82	86		96	88	89		92				
20															
20.6												100			

Lake Merced
North East

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	90	82	75	80	82	93	92	86	90	90	91	100	100		
5	88	82	75	80	82	93	94	87	90	89	91	100	100		
9															
10	88	80	76	80	82	93	95	87	88	89	90	98	100		
12															
13	86					93							100		
14		80		80	82					88					
14.1															
15			76				95	87	87		90				
15.8												98			

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	61	63	70	58	59	83	65	64	69	71	75	70	71	74	74	78	83	75	83	80
5	61	63	69		58	83	65	64	69	71	75	69	71	74	73	78	83	76	82	80
6				58																
10	60	63	69		58	83	65	64	69	71	75	69	71	74	73	78	83	77	83	82
12				58																
15	61	63	69		58	83	65	64	69	71				73	73	78	83	78	82	82
16	60	63																		
17																				
18				58								69	71							
19																				
20											77									
21																				
21.5																				
22																				

Lake Merced
South -
Pump Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	61	63	69	58	60	83	66	64	69	71	76	70	71	73	73	77	83	79	80	83
5	61	63	69	58	59	83	66	64	69	71	76	69	71	73	73	77	83	81	81	83
10	61	63	69		58	83	65	64	69	71	77	69	71	73	73	77	83	79	83	82
12				58																
15	61	63	69		58	83	66	64	69	71				73	73	77	83	80	82	82
16																				
17																				
18				58								69								
19													70							
20											72									
21																				
22																				
23.2																				

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	83	88	78	73	68	75	80	75	56	67	68	84	67	65	71	72	72	72	78	68
5	83	88	78	73	68	75	80	75	56	66	67	84	67	65	71	73	72	72	78	66
6																				
10	82	88	78	72	68	76	80	76	57	65	65	85	67	64	71	74	72	73	77	65
12																				
15	82	88	78	72	68	76	80	76	58	63	65	85	67	64	71	72	72	73	77	66
16																				
17												85	67							
18										62							72		76	
19																				69
20														64	71	71		72		
21																				
21.5																				
22																				

Lake Merced
South -
Pump Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	82	87	76	73	68	76	78	74	61	65	63	82	63	65	71	72	73	73	77	73
5	82	84	76	73	68	76	78	74	60	65	63	82	63	65	71	72	73	73	77	72
10	81	84	75	73	68	77	78	75	60	65	64	84	64	65	71	71	73	73	77	72
12																				
15	81	82	75	73	68	77	78	75	59	64	65	84	64	65	70	71	73	72	76	82
16																				
17													64							
18																				
19										64		85						72		
20															70	72	73		76	84
21														65						
22																				
23.2																				

Lake Merced
South - Pistol
Range

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	73	74	70	70	75	88	87	84	82	84	87	94	98		
5	73	74	70	70	75	88	88	84	82	84	87	94	97		
6															
10	73	74	70	71	75	88	88	83	82		88	94	96		
12															
15	73	74	70	71	75	90	88	83	81	83	88	94	98		
16															
17															
18	73														
19						90									
20		74	70		75		88						98		
21				71				82			88				
21.5												94			
22									81						

Lake Merced
South -
Pump Station

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-	Cl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	74	74	70	71	75	90	89	83	81	83	86	93	98		
5	74	74	70	71	75	90	88	80	81	83	86	93	98		
10	73	74	70	72	74	90	88	76	81	83	86	94	96		
12															
15	73	74	72	72	74	90	88	76	80	83	86	94	98		
16															
17															
18						90									
19															
20	73														
21		74		72	74					83	86		98		
22			72				88	76	80						
23.2												94			

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.045	0.045	0.045	0.045	0.045	0.045	0.025		0.025	0.025	0.025	0.025	0.025	0.005	0.025	0.025	0.005	0.005	0.01	0.05	0.005
5	0.045	0.045	0.045	0.045	0.045	0.045	0.025		0.025	0.025	0.025	0.025	0.025	0.005	0.025	0.025	0.005	0.005	0.01	0.06	0.005
10	0.045	0.045	0.045	0.045	0.045	0.045	0.025		0.025	0.025	0.025	0.025	0.025	0.005	0.025	0.025	0.005	0.005	0.01	0.005	0.005
14									0.025	0.025				0.005			0.005				
15	0.045	0.045	0.045	0.045	0.045	0.045	0.025					0.025	0.025		0.025	0.025		0.005	0.01	0.005	0.005
16																					
17																					
17.4																					
17.5																					
18											0.025										
18.8																					
19																					
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.045		0.16	0.045	0.045	0.045	0.025		0.025	0.025	0.025	0.025	0.025	0.005	0.025	0.025	0.005	0.005	0.01	0.005	0.005
5	0.045		0.16	0.045	0.045	0.045	0.025		0.025	0.025	0.025	0.025	0.025	0.005	0.025	0.025	0.005	0.005	0.01	0.005	0.005
9																	0.005				
10	0.045		0.16	0.045	0.045	0.045	0.025		0.025	0.025		0.025	0.025	0.005	0.025	0.025		0.005	0.01	0.005	0.005
11																					
12																					
13											0.025										
13.8																					
14																					
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

Depth	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	0.34	0.02	***0.005***	1.42	1.10	0.86	0.32	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.11	***0.005***	***0.005***	***0.005***
5	***0.005***	1.06	0.02	***0.005***	1.48	1.10	0.90	0.50	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.42	***0.005***	***0.005***	***0.005***
10	***0.005***	0.48	***0.005***	***0.005***	1.54	1.20	0.90	0.66	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.24	***0.005***	0.02	***0.005***
14																						
15	***0.005***	0.46	***0.005***	***0.005***	1.48	1.20	0.78	0.48	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.14	***0.005***	0.09	***0.005***
16															***0.005***							
17									***0.005***			***0.005***				***0.005***						
17.4																						
17.5																						
18											***0.005***		***0.005***				***0.005***	***0.005***	***0.005***	***0.005***		
18.8																						
19														***0.005***							0.13	***0.005***
19.3																						
19.9																						
20																						
20.6																						

Lake Merced
North East

Depth	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	***0.005***	1.00	0.82	1.50	0.32	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.31	***0.005***	***0.005***	***0.005***
5	***0.005***	***0.005***	***0.005***	***0.005***	1.00	0.64	0.90	0.48	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.24	***0.005***	***0.005***	***0.005***
9																						
10	***0.005***	***0.005***	0.02	***0.005***	0.64	0.66	0.86	0.48	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
11																						
12																						
13									***0.005***		***0.005***	***0.005***		***0.005***	***0.005***	***0.005***	***0.005***	***0.005***		***0.005***		
13.8																						
14													***0.005***						0.48		***0.005***	
14.1																						
14.7																						
15																						***0.005***
15.8																						

Lake Merced
North

Depth	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.005	0.005	0.005	0.93	0.005	0.005	0.005	0.07
5	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.03	0.005	0.005	0.005	1.10	0.005	0.005	0.005	0.08
10	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.005	0.005	0.005	0.96	0.005	0.005	0.005	0.07
14																
15	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.04	0.005	0.005		0.93	0.005	0.005	0.005	0.10
16																
17																
17.4											0.005					
17.5												0.96				
18			0.005				0.005									
18.8										0.005						0.12
19	0.005	0.005		0.005	0.005	0.005		0.04								
19.3															0.005	
19.9														0.005		
20													0.005			
20.6									0.005							

Lake Merced
North East

Depth	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.005	0.005	0.005	0.06	0.005	0.005	0.005	0.11	0.005	0.005	0.005	0.37	0.005	0.005	0.005	0.09
5	0.005	0.005	0.005	0.06	0.005	0.005	0.005	0.10	0.005	0.005	0.005	0.17	0.005	0.005	0.005	0.11
9																
10	0.005	0.005	0.005	0.05	0.005	0.005	0.005	0.12	0.005	0.005	0.02	0.63	0.005	0.005	0.005	0.12
11																
12																
13			0.005							0.005	0.01					
13.8															0.005	
14	0.005	0.005					0.005									
14.1												0.78				
14.7													0.005			0.12
15				0.05	0.005	0.005		0.10						0.005		
15.8									0.005							

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.045***	***0.045***	***0.045***	***0.045***	***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
5	***0.045***	***0.045***	***0.045***		***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
6				***0.045***																	
10	***0.045***	***0.045***	***0.045***		***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
12				***0.045***																	
15	***0.045***	***0.045***	***0.045***		***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***				***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
16	***0.045***	***0.045***																			
17																					
18				***0.045***								***0.025***	***0.025***								
18.2																					
18.5																					
18.9																					
19																					
20											***0.025***										
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.045***	***0.045***	***0.045***	***0.045***	***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
5	***0.045***	***0.045***	***0.045***	***0.045***	***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.005***	***0.025***	***0.025***	***0.005***	0.01	***0.01***	***0.005***	***0.005***
10	***0.045***	***0.045***	***0.045***		***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.025***	***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
12				***0.045***																	
15	***0.045***	***0.045***	***0.045***		***0.045***	***0.045***	***0.025***	***0.025***	***0.025***	***0.025***				***0.005***	***0.025***	***0.025***	***0.005***	***0.005***	***0.01***	***0.005***	***0.005***
16																					
17																					
18				***0.045***								***0.025***									
19													***0.025***								
19.2																					
20											***0.025***										
20.4																					
20.9																					
21																					
21.5																					
22																					
22.8																					
23.2																					

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol
Range

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	0.04	0.02	***0.005***	0.05	0.54	0.14	0.05	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
5	***0.005***	0.06	***0.005***	***0.005***	0.20	0.55	0.15	0.09	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
6																						
10	***0.005***	0.04	0.01	***0.005***	0.35	0.52	0.08	0.11	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
12																						
15	***0.005***	0.23	***0.005***	***0.005***	0.40	0.49	0.07	0.32	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
16																						
17											***0.005***	***0.005***										
18									***0.005***							***0.005***		***0.005***		***0.005***		
18.2																						
18.5																						
18.9																						
19																			***0.005***			
20													***0.005***	***0.005***	***0.005***		***0.005***				***0.005***	***0.005***
20.1																						
20.6																						
20.8																						
21																						
21.5																						
22																						

Lake Merced
South - Pump
Station

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	0.01	0.02	***0.005***	***0.005***	0.49	0.03	0.23	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
5	***0.005***	***0.005***	0.01	***0.005***	0.62	0.48	0.35	0.11	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
10	***0.005***	***0.005***	***0.005***	***0.005***	0.44	0.46	0.05	0.31	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
12																						
15	***0.005***	0.01	***0.005***	***0.005***	0.40	0.45	0.10	0.50	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***
16																						
17												***0.005***										
18																						
19									***0.005***		***0.005***						***0.005***					
19.2																						
20														***0.005***	***0.005***	***0.005***		***0.005***	***0.005***	***0.005***		
20.4																						
20.9																						
21													***0.005***								***0.005***	
21.5																						
22																						***0.005***
22.8																						
23.2																						

Lake Merced
South - Pistol
Range

	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.06	***0.005***	***0.005***	***0.005***	***0.005***
5	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.06	***0.005***	***0.005***	***0.005***	***0.005***
6																
10	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***		***0.005***	***0.005***	***0.005***	***0.005***	0.11	***0.005***	***0.005***	***0.005***	***0.005***
12																
15	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.08	0.21	***0.005***	***0.005***	***0.005***	***0.005***
16																
17																
18																
18.2																***0.005***
18.5												0.31				
18.9															***0.005***	
19			***0.005***													
20		***0.005***		***0.005***						***0.005***						
20.1											0.15					
20.6													***0.005***			
20.8														***0.005***		
21	***0.005***				0.01			***0.005***								
21.5									***0.005***							
22						***0.005***										

Lake Merced
South - Pump
Station

	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N	NO_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.03	***0.005***	***0.005***	***0.005***	***0.005***
5	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***		***0.005***	***0.005***	***0.005***	***0.005***
10	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.04	***0.005***	***0.005***	***0.005***	***0.005***
12																
15	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.06	***0.005***	***0.005***	***0.005***	***0.005***
16																
17																
18			***0.005***													
19																
19.2															***0.005***	
20																
20.4																***0.005***
20.9												0.14				
21	***0.005***	***0.005***					***0.005***	***0.005***		***0.005***						
21.5														***0.005***		
22				***0.005***	***0.005***	***0.005***										
22.8													***0.005***			
23.2									***0.005***							

Lake
Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf														5.30	2.13	0.90	4.26	1.70	---	2.6
5															9.64	***0.25***	0.95	1.50	---	2.9
10															4.09	0.50	1.68	1.20	---	3.0
14														3.40			2.35			
15															2.58	5.80		1.40	---	1.9
16																				
17																				
17.4																				
17.5																				
18																				
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake
Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf														9.40	5.66	0.25	2.35	1.00	---	1.9
5															3.42	0.25	1.56	1.60	---	1.6
9																	3.08			
10														6.60	3.70	1.10		1.40	---	1.8
11																				
12																				
13																				
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake
Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	23.0	10.0	2.2	1.5	8.0	4.1	11.30	5.7	10.2	6.4	6.3	4.1	4.7	5.2	1.13	7.90	1.85	3.50	6.6	NA
5	21.3	7.3	2.2	1.5	4.4	2.8	9.50	5.3	8.3	3.5	5.9	1.3	6.3	4.4	0.98	5.70	2.27	2.97	3.5	NA
10	9.0	7.8	2.4	1.6	2.9	2.0	5.50	4.4	8.1	9.1	11.4	0.6	6.9	3.8	0.84	3.80	2.07	4.48	4.5	NA
14																				
15	11.0	12.2	2.9	1.8	1.5	1.9	4.30	2.9	7.4	7.6	6.8	3.2	7.8	3.3	0.47	5.50	2.13	4.48	2.5	NA
16																3.00				
17										10.5			9.2				4.03			
17.4																				
17.5																				
18												1.1		2.4				5.88	2.8	NA
18.8																				
19															0.59					
19.3																				
19.9																				
20																				
20.6																				

Lake
Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	24.0	9.4	1.9	1.6	5.9	3.4	9.80	6.6	5.8	7.5	4.4	5.6	5.7	7.5	1.04	8.40	5.74	5.94	0.9	NA
5	10.2	6.2	2.0	1.6	4.2	2.3	3.20	5.2	1.5	18.0	13.3	3.4					3.72	7.00	6.0	NA
9																				
10	6.5	6.8	1.8	1.4	7.7	1.2	1.90	3.0	4.8	5.2	12.1	6.0	6.7	7.0	0.93	8.80	5.57	3.78	7.7	NA
11																				
12																				
13										6.3		3.5	9.9		0.71	5.3	2.80	4.59	2.8	
13.8																				
14														6.6						NA
14.1																				
14.7																				
15																				
15.8																				

Lake
Merced
North

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	3.42	1.13		1.82	3.96	4.60	2.53	1.74	2.33	2.70	2.2	0.78	2.49	2.9	4.0		3.22	3.95	1.26
5	1.51	1.15		1.86	2.86	2.62	2.65	1.81	2.73	1.50	2.1	0.93	2.69	2.8	2.6		3.16	3.95	1.32
10	2.52	0.99		1.92	4.56	2.81	2.72	1.68	2.35	1.50	2.6	0.52	2.27	2.7	2.9		2.72	6.92	2.49
14																			
15	3.36	0.99		1.85	3.19	5.94	2.62	1.27	2.41	2.20	1.8	0.56	2.18		2.3		2.91	7.48	2.58
16																			
17																			
17.4														2.1					
17.5															2.9				
18	4.54					2.42													
18.8													3.02						2.63
19		***0.45***		1.95	2.80		2.38	1.39	1.95		2.0								
19.3																		4.20	
19.9																	2.74		
20																			
20.6												1.0							

Lake
Merced
North East

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	1.06	0.45		2.25	3.56	4.62	2.02	2.1	1.57	1.50	1.4	0.36	1.79	2.6	2.7		2.97	3.92	2.91
5		0.45		1.37	3.18	3.86	2.10	1.7	2.00	2.00	1.6	0.36	2.55	2.4	2.5		2.44	4.00	0.98
9																			
10	2.02	0.45		1.43	3.05	5.85	3.40	1.7	1.89	1.60	1.6	0.57	2.07	2.4	2.2		2.32	3.42	2.55
11																			
12																			
13	1.57					4.66							1.54	2.4					
13.8																		4.06	
14		1.21		1.32	3.57					1.50									
14.1															2.7				
14.7																			2.94
15							2.21	1.2	1.99		1.5						2.27		
15.8												0.80							

Lake Merced South - Pistol Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0														3.60	7.45	***0.25***	2.91	0.97	---	1.3
5															5.36	***0.25***	0.73	1.00	---	1.3
6																				
10															5.99	0.40	1.62	1.10	---	1.4
12																				
15															4.93	1.50	1.23	0.98	---	1.3
16														2.00						
17																				
18																				
18.2																				
18.9																				
19																				
20																				
20.1																				
20.8																				
21																				
21.5																				
22																				

Lake Merced South - Pump Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf														5.70	7.62		3.59	0.97		1.4
5															6.61	1.00	5.10	1.10		1.3
10															3.70	1.50	5.43	1.20		1.3
12																				
15															2.30	0.25	8.46	1.10		1.5
16																				
17														3.40						
18																				
19																				
19.2																				
20																				
20.4																				
21																				
21.5																				
22																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Appendix K

Lake Merced South - Pistol Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	7.9	15.0	1.9	1.1	13.8	3.3	9.10	2.6	12.0	12.7	6.4	6.5	7.9	7.5	1.16	3.70	1.88	6.16	1.8	NA
5	10.5	5.5	2.0	1.3	9.9	9.0	6.00	1.5	7.2	8.8	5.4	5.3	6.0	5.1	0.91	5.10	4.20	3.92	2.3	NA
6																				
10	9.7	8.8	1.9	1.3	7.3	1.9	1.80	2.6	5.8	6.2	4.8	2.7	7.1	4.5	0.64	6.50	2.18	6.27	2.4	NA
12																				
15	5.8	6.2	2.0	1.3	1.9	0.4	1.10	0.9	4.4	4.0	4.0	2.1	8.0	3.9	0.49	5.60	2.30	4.20	2.3	NA
16																				
17												0.60	12.8							
18										5.10							1.79		3.6	
18.2																				
18.9																				
19																				NA
20														2.6	0.30	3.20		5.82		
20.1																				
20.8																				
21																				
21.5																				
22																				

Lake Merced South - Pump Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	8.7	10.9	1.8	1.1	9.4	3.3	5.80	1.7	8.5	11.7	7.3	4.2	5.6	5.5	1.05	5.10	2.52	3.71	2.7	NA
5	3.2	9.2	1.9	1.4	7.9	9.0	18.80	8.1	28.2	9.2	14.8	2.6	7.1	5.3	0.88	5.60	3.95	3.08	2.7	NA
10	10.9	9.9	1.8	1.2	5.2	1.9	8.50	3.2	11.8	18.6	6.5	2.3	7.7	4.5	0.69	8.40	2.55	2.41	1.4	NA
12																				
15	4.9	6.0	2.1	1.2	4.4	0.4	2.20	3.1	10.6	5.9	4.9	1.7	8.7	4.0	0.50	7.00	2.80	3.64	2.4	NA
16																				
17													9.7							
18																				
19										4.50		0.90						4.48		
19.2																				
20															0.29	6.60	3.30		9.7	NA
20.4																				
21														5.1						
21.5																				
22																				
23.2																				

Lake Merced South - Pistol Range

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.95	1.16		1.78	2.7	3.58	1.4	0.90	1.37	1.50	1.4	0.47	0.84	2.3	2.6		2.60	9.16	2.13
5	2.46	1.11		0.71	3.2	2.20	4.2	1.05	2.49	1.10	1.2	0.42	1.57	2.2	2.6		1.79	3.44	2.44
6																			
10	0.95	***0.45***		0.94	2.7	2.16	2.3	1.04	1.36	1.50	1.2	0.89	1.01	2.7	2.5		1.85	3.42	2.16
12																			
15		1.16		1.55	2.4	2.10	1.6	1.06	***0.25***	1.00	1.3	0.64	1.12	2.2	2.4		1.90	3.00	2.58
16																			
17																			
18	1.12																		
18.2																			2.41
18.9																		3.28	
19						2.16									2.3				
20		***0.45***			2.4		2.2						1.15						
20.1														2.1					
20.8																	1.85		
21				1.78				0.91			1.3								
21.5												0.45							
22									1.37										

Lake Merced South - Pump Station

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**	**TKN**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	1.18	0.45		0.95	3.58	3.6	2.28	0.94	1.22	1.10	1.5	0.81	1.12	2.6	2.0		3.11	3.42	2.32
5	1.34	1.23		1.72	2.30	3.4	2.50	1.09	1.60	1.20	1.1	0.33	0.95	2.7	2.5		2.10	3.81	2.10
10	1.09	0.45		2.27	3.43	2.3	2.67	1.06	1.56	1.30	1.4	0.76	1.04	2.4	2.6		1.88	3.81	2.02
12																			
15	2.52	0.92		2.14	2.90	2.3	4.21	1.16	1.40	1.20	1.2	0.82	2.21	2.2	2.4		1.88	3.08	2.49
16																			
17																			
18						2.0													
19																			
19.2																		3.00	
20	2.35																		
20.4																			2.16
21		***0.45***		1.37	5.33					1.60	1.3		1.51	1.9	2.3				
21.5																	1.90		
22							1.57	1.62	1.57										
23.2												0.17							

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.05	0.05	0.05	0.03	0.02		0.11		0.04	0.05	0.03	0.025	0.025		0.05	0.05	0.05	0.12	0.06	0.06	0.11	0.04
5	0.05	0.05	0.05	0.02	0.05		0.14		0.01	0.05	0.03	0.025	0.025		0.04	0.07	0.03	0.09	0.06	0.08	0.07	0.06
10	0.05	0.05	0.05	0.02	0.03		0.17		0.07	0.05	0.03	0.025	0.025		0.04	0.05	0.09	0.10	0.03	0.03	0.06	0.05
14									0.02	0.05							0.05					
15	0.13	0.66	0.05	0.04	0.02		0.20					0.025	0.025		0.05	0.24		0.04	0.04	0.05	0.09	0.04
16																						
17																						
17.4																						
17.5																						
18											0.03											
18.8																						
19																						
19.3																						
19.9																						
20																						
20.6																						

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.05		0.05	0.03	0.03		0.05		0.005	0.05	0.03	0.04	0.025		0.26	0.05	0.05	0.10	0.08	0.05	0.09	0.03
5	0.05		0.1	0.02	0.02		0.04		0.005	0.05	0.04	0.04	0.025		0.05	0.06	0.06	0.07	0.11	0.05	0.09	0.06
9																	0.05					
10	0.05		0.05	0.04	0.03		0.05		0.01	0.03		0.04	0.025		0.05	0.06		0.04	0.09	0.04	0.08	0.04
11																						
12																						
13											0.04											
13.8																						
14																						
14.1																						
14.7																						
15																						
15.8																						

Lake Merced
North

	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.10	0.08	0.31	0.13	0.09	0.11	0.01	0.12	0.03	0.03	0.09	0.09	0.09	***0.005***	0.03	0.04	0.06	0.05	0.03	***0.005***	0.03	0.04	0.07
5	0.11	0.13	0.35	0.53	0.15	0.12	0.01	0.05	0.06	0.02	0.07	0.04	0.10	0.04	0.03	0.05	0.06	0.04	0.09	0.01	0.04	0.04	0.02
10	0.10	0.06	0.31	0.18	0.21	0.06	0.01	0.04	0.11	0.05	0.06	0.06	0.08	***0.005***	0.02	0.05	0.08	0.05	0.09	0.02	0.05	0.05	0.02
14																							
15	0.10	0.07	0.36	0.12	0.16	0.10	0.01	0.08	0.10	0.02	0.02	0.04	0.11	***0.005***	0.01	0.05	0.11	0.02	0.07	0.02	0.05	0.08	0.03
16														0.04									
17								0.08			0.04				0.03								
17.4																							
17.5																							
18										0.06		0.03				0.03	0.09	0.03	0.04				
18.8																							
19													0.11							0.02	0.04	0.10	0.03
19.3																							
19.9																							
20																							
20.6																							

Lake Merced
North East

	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.05	0.03	0.22	0.08	0.19	0.10	0.005	0.03	0.03	0.03	0.03	0.04	0.11	0.01	0.01	0.02	0.05	0.06	0.02	0.03	0.15	0.07	0.13
5	0.07	0.03	0.19	0.08	0.16	0.08	0.005	0.03	0.05	0.01	0.08	0.05	0.15	0.15	0.04	0.04	0.08	0.03	0.03	0.02	0.15	0.07	0.02
9																							
10	0.06	0.07	0.29	0.12	0.09	0.09	0.005	0.28	0.03	0.02	0.06	0.03	0.10	0.06	0.04	0.05	0.07	0.03	0.06	0.03	0.13	0.06	0.12
11																							
12																							
13								0.05		0.04	0.07		0.10	0.06	0.03	0.05	0.07		0.05				
13.8																							
14												0.02						0.01		0.02		0.02	0.10
14.1																							
14.7																							
15																					0.15		
15.8																							

Lake Merced
North

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.03	0.21	0.02	0.03	0.05	0.07	0.06	0.05	0.06	0.58	0.17	0.06	0.05	0.25
5	0.10	0.25	0.02	0.04	0.05	0.06	0.03	0.10	0.08	0.60	0.04	0.05	0.04	0.30
10	0.09	0.18	***0.005***	0.02	0.05	0.06	0.05	0.11	0.09	0.64	0.07	0.05	0.02	0.27
14														
15	0.08	0.22	0.04	0.02	0.06	0.10	0.03	0.06		0.70	0.03	0.05	0.09	0.35
16														
17														
17.4									0.18					
17.5										0.78	0.78			
18	0.04			0.09	0.05									
18.8								0.11						0.37
19		0.22	0.04			0.10								
19.3													0.75	
19.9												0.04		
20											0.03			
20.6							0.03							

Lake Merced
North East

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**	**NH_3-N**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.05	0.40	0.04	0.24	0.08	0.25	0.01	0.10	0.07	0.72	0.01	0.04	0.03	0.19
5	0.09	0.40	0.03	0.17	0.06	0.23	0.02	0.05	0.06	0.70	0.03	0.03	0.01	0.20
9														
10	0.09	0.42	0.03	0.03	0.09	0.24	0.10	0.05	0.21	0.76	0.13	0.04	0.02	0.23
11														
12														
13	0.05							0.03	0.25					
13.8													0.14	
14					0.04									
14.1										0.72				
14.7											0.02			0.22
15		0.37	0.03	0.05		0.29						0.03		
15.8							0.04							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.05	0.13	0.05	0.04	0.06		0.02	0.02	0.005	0.04	0.02	0.04	0.05		0.02	0.06	0.04	0.03	0.05	0.04	0.05	0.06
5	0.05	0.05	0.05		0.03		0.03	0.03	0.005	0.04	0.03	0.04	0.025		0.02	0.05	0.04	0.13	0.04	0.05	0.04	0.04
6				0.03																		
10	0.05	0.05	0.05		0.03		0.04	0.04	0.005	0.04	0.03	0.04	0.025		0.005	0.07	0.05	0.02	0.01	0.04	0.06	0.04
12				0.03																		
15	0.05	0.05	0.05		0.03		0.04	0.04	0.005	0.04					0.02	0.03	0.04	0.19	0.14	0.04	0.05	0.03
16	0.05	0.05																				
17																						
18				0.03								0.04	0.025									
18.2																						
18.9																						
19																						
20											0.04											
20.1																						
20.6																						
20.8																						
21																						
21.5																						
22																						

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.05	0.05	0.05	0.03	0.03		0.005	0.005	0.01	0.05	0.03	0.01	0.025		0.03	0.11	0.05	0.05	0.06	0.03	0.03	0.04
5	0.05	0.05	0.05	0.03	0.04		0.04	0.04	0.02	0.07	0.03	0.07	0.025		0.03	0.05	0.05	0.12	0.05	0.04	0.09	0.03
10	0.05	0.12	0.05		0.04		0.01	0.01	0.02	0.05	0.03	0.06	0.025		0.06	0.03	0.04	0.04	0.05	0.11	0.05	0.04
12				0.07																		
15	0.05	0.05	0.05		0.03		0.01	0.01	0.01	0.04					0.03	0.03	0.05	0.12	0.04	0.04	0.04	0.03
16																						
17																						
18				0.07								0.005										
19													0.025									
19.2																						
20											0.04											
20.4																						
21																						
21.5																						
22																						
22.8																						
23.2																						

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol
Range

	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.11	0.13	0.03	0.04	0.07	0.16	0.005	0.06	0.04	0.04	0.02	0.02	0.03	0.04	0.02	0.01	0.02	0.07	0.04	0.02	0.03	0.05	0.08
5	0.06	0.03	0.16	0.07	0.11	0.04	0.005	0.08	0.03	0.01	0.05	0.04	0.09	0.06	0.04	0.04	0.02	0.09	0.04	0.02	0.03	0.04	0.10
6																							
10	0.03	0.03	0.05	0.07	0.11	0.05	0.04	0.04	0.03	0.04	0.06	0.03	0.07	0.07	0.03	0.03	0.02	0.08	0.03	0.02	0.04	0.05	0.06
12																							
15	0.18	0.02	0.15	0.07	0.06	0.21	0.005	0.07	0.05	0.04	0.03	0.02	0.06	0.06	0.02	0.05	0.02	0.10	0.04	0.02	0.04	0.07	0.12
16																							
17										0.03	0.02												
18								0.04							0.02		0.02		0.04				
18.2																							
18.9																							
19																		0.06					
20												***0.005***	0.06	0.03		0.03				0.04	0.04		0.03
20.1																							
20.6																							
20.8																							
21																						0.02	
21.5																							
22																							

Lake Merced
South - Pump
Station

	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.07	0.02	0.04	0.07	0.05	0.07	0.32	0.04	0.04	0.02	0.04	0.05	0.03	0.05	0.005	0.02	0.01	0.07	0.02	0.06	0.04	0.06	0.06
5	0.06	0.08	0.08	0.08	0.05	0.04	0.44	0.02	0.04	0.01	0.03	0.03	0.05	0.03	0.03	0.02	0.02	0.07	0.02	0.03	0.04	0.02	0.03
10	0.65	0.03	0.11	0.12	0.07	0.04	0.34	0.07	0.03	0.05	0.02	0.03	0.06	***0.005***	0.005	0.03	0.02	0.06	0.02	0.03	0.03	0.07	0.04
12																							
15	0.06	0.03	0.09	0.06	0.07	0.03	0.08	0.05	0.02	0.03	0.03	0.04	0.05	0.02	0.005	0.02	0.02	0.06	0.02	0.03	0.04	0.05	0.03
16																							
17											0.02												
18																							
19								0.05		0.04						0.02							
19.2																							
20													0.05	0.01	0.01		0.04	0.06	0.03				
20.4																							
21												0.01								0.06		0.02	0.08
21.5																							
22																					0.03		
22.8																							
23.2																							

Lake Merced
South - Pistol
Range

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.08	0.09	0.02	0.03	0.04	0.19	***0.005***	0.01	0.09	0.06	0.01	0.03	0.04	0.07
5	0.10	0.07	0.01	0.03	0.04	0.15	0.01	0.11	0.09	0.08	0.01	0.03	0.04	0.09
6														
10	0.10	0.07	0.02	0.03		0.01	***0.005***	0.04	0.07	0.06	0.01	0.02	0.05	0.06
12														
15	0.11	0.09	0.02	0.04	0.03	0.05	0.01	0.09	0.12	0.07	0.01	0.03	0.04	0.07
16														
17														
18														
18.2														0.04
18.9													0.04	
19	0.12									0.06				
20		0.09			0.03			0.02						
20.1									0.18					
20.6											0.005			
20.8												0.02		
21			0.02			0.01								
21.5							0.04							
22				0.03										

Lake Merced
South - Pump
Station

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N	NH_3-N
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.12	0.07	0.02	0.03	0.02	0.03	***0.005***	0.08	0.09	0.04	0.01	0.04	0.05	0.08
5	0.09	0.07	0.02	0.04	0.03	0.13	***0.005***	0.11	0.08		0.005	0.04	0.06	0.08
10	0.09	0.06	0.02	0.03	0.02	0.01	0.03	0.05	0.08	0.04	0.05	0.02	0.05	0.06
12														
15	0.32	0.07	0.08	0.12	0.03	0.19	0.03	0.10	0.10	0.06	0.07	0.03	0.04	0.06
16														
17														
18	0.47													
19														
19.2													0.04	
20														
20.4														0.03
21					0.05	0.04		0.06		0.04				
21.5												0.01		
22		0.08	0.09	0.06										
22.8											0.12			
23.2							0.04							

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.01	0.12	0.07	0.01	0.12	0.03	0.01		0.08	0.05	0.01	0.04	0.05	0.02	0.01	0.01	0.03	0.03	0.01	0.08
5	0.01	0.13	0.07	0.01	0.13	0.03	0.01		0.08	0.05	0.01	0.03	0.08	0.04	0.01	0.03	0.03	0.05	0.01	0.10
10	0.01	0.14	0.09	0.01	0.12	0.03	0.01		0.08	0.06	0.01	0.04	0.05	0.03	0.03	0.04	0.03	0.04	0.01	0.07
14									0.09	0.05				0.03			0.05			
15	0.01	0.23	0.07	0.03	0.17	0.05	0.01					0.06	0.05		0.01	0.13		0.04	0.01	0.10
16																				
17																				
17.4																				
17.5																				
18											0.01									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.01		0.06	0.01	0.19	0.01	0.03		0.06	0.05	0.01	0.09	0.08	0.03	0.01	0.03	0.005	0.05	0.01	0.06
5	0.01		0.05	0.01	0.17	0.04	0.04		0.06	0.05	0.01	0.09	0.08	0.03	0.01	0.05	0.04	0.04	0.01	0.06
9																	0.03			
10	0.01		0.05	0.01	0.18	0.03	0.04		0.06	0.05		0.09	0.07	0.02	0.01	0.07		0.03	0.01	0.08
11																				
12																				
13											0.01									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.14	0.16	0.23	0.07	0.03	0.18	0.31	0.16	0.29	0.24	0.09	0.01	***0.005***	0.05	0.11	0.11	0.16	0.20	0.19	0.16	0.06
5	0.14	0.13	0.26	0.05	0.01	0.20	0.32	0.20	0.29	0.24	0.07	0.01	***0.005***	0.05	0.10	0.13	0.23	0.20	0.18	0.17	0.07
10	0.14	0.13	0.23	0.03	0.05	0.20	0.29	0.18	0.28	0.24	0.04	***0.005***	0.06	0.03	0.10	0.11	0.17	0.21	0.18	0.16	0.07
14																					
15	0.15	0.13	0.21	0.01	0.07	0.22	0.30	0.16	0.29	0.21	0.07	0.01	***0.005***	0.03	0.09	0.12	0.18	0.23	0.15	0.10	0.10
16																0.10					
17										0.25			***0.005***				0.20				
17.4																					
17.5																					
18												0.01		0.04				0.18	0.14	0.09	0.14
18.8																					
19															0.10						
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.14	0.13	0.18	0.05	0.03	0.19	0.33	0.18	0.23	0.12	0.14	0.05	0.03	0.04	0.10	0.16	0.15	0.14	0.10	0.05	0.12
5	0.13	0.10	0.18	0.04	0.03	0.19	0.32	0.18	0.28	0.20	0.18	0.03	0.02	0.03	0.35	0.16	0.18	0.14	0.09	0.06	0.09
9																					
10	0.15	0.10	0.18	0.02	0.03	0.21	0.35	0.16	0.21	0.16	0.22	0.08	0.05	0.03	0.13	0.15	0.15	0.14	0.10	0.04	0.08
11																					
12																					
13										0.20		0.05	0.02		0.21	0.14	0.13	0.16	0.08		0.04
13.8																					
14														0.10						0.03	
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.08	0.11	0.26	0.12	0.28	0.15	0.08	0.13	0.13	0.11	0.06	0.16	0.20	0.39	0.18	0.26	0.30	0.19
5	0.18	0.12	0.30	0.13	0.28	0.13	0.08	0.13	0.16	0.10	0.06	0.24	0.26	0.40	0.18	0.26	0.30	0.22
10	0.16	0.12	0.28	0.18	0.31	0.15	0.07	0.14	0.14	0.14	0.18	0.24	0.25	0.36	0.17	0.28	0.30	0.27
14																		
15	0.19	0.14	0.28	0.18	0.34	0.15	0.09	0.16	0.15	0.12	0.09	0.26		0.31	0.16	0.26	0.36	0.21
16																		
17																		
17.4													0.29					
17.5														0.40				
18					0.30				0.21									
18.8												0.18						0.22
19	0.15	0.17	0.30	0.21		0.13	0.09	0.23		0.10								
19.3																	0.33	
19.9																0.21		
20															0.13			
20.6											0.08							

Lake Merced
North East

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.09	0.21	0.23	0.19	0.26	0.16	0.09	0.13	0.11	0.11	0.02	0.13	0.20	0.36	0.04	0.26	0.31	0.24
5	0.09	0.20	0.24	0.20	0.25	0.14	0.09	0.13	0.13	0.10	0.04	0.17	0.20	0.30	0.06	0.22	0.32	0.23
9																		
10	0.07	0.19	0.24	0.19	0.25	0.15	0.07	0.16	0.14	0.09	0.06	0.20	0.30	0.33	0.05	0.18	0.30	0.23
11																		
12																		
13					0.25							0.16	0.32					
13.8																	0.32	
14	0.07		0.24	0.15					0.17									
14.1														0.26				
14.7															0.06			0.22
15		0.19				0.14	0.08	0.18		0.09						0.12		
15.8											0.01							

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.01***	0.02	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	0.02	***0.01***	***0.01***	***0.005***	0.03	***0.01***	0.09
5	***0.01***	0.03	***0.01***		***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	0.02	***0.01***	***0.01***	***0.005***	0.03	***0.01***	0.06
6				***0.01***																
10	***0.01***	0.05	***0.01***		***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	0.04	***0.01***	***0.01***	***0.005***	0.03	***0.01***	0.09
12				***0.01***																
15	***0.01***	0.08	***0.01***		***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***				0.03	***0.01***	0.03	***0.005***	0.03	***0.01***	0.06
16	***0.01***	0.08																		
17																				
18				***0.01***								***0.01***	***0.01***							
18.2																				
18.5																				
18.9																				
19																				
20											***0.01***									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South -
Pump Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.01***	0.04	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	0.04	***0.01***	***0.01***	***0.005***	0.02	***0.01***	0.09
5	***0.01***	0.03	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	0.06	***0.01***	***0.01***	***0.005***	0.03	***0.01***	0.12
10	***0.01***	0.05	***0.01***		***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	0.04	***0.01***	***0.01***	***0.005***	0.03	***0.01***	0.07
12				***0.01***																
15	***0.01***	0.08	***0.01***		***0.01***	***0.01***	***0.01***	***0.01***	***0.01***	***0.01***				0.03	***0.01***	***0.01***	***0.005***	0.03	***0.01***	0.10
16																				
17																				
18				***0.01***								***0.01***								
19													***0.01***							
19.2																				
20											***0.01***									
20.4																				
20.9																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced South - Pistol Range

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.08	0.09	0.15	0.11	0.10	0.04	0.15	0.10	0.12	0.06	0.08	0.11	0.03	0.10	0.11	0.07	0.13	0.10	0.09	0.11	0.07
5	0.11	0.09	0.13	0.06	0.06	0.11	0.15	0.12	0.12	0.05	0.10	0.08	0.03	0.09	0.08	0.09	0.11	0.10	0.07	0.11	0.05
6																					
10	0.10	0.06	0.18	0.01	0.03	0.10	0.12	0.10	0.13	0.07	0.09	0.11	0.02	0.09	0.08	0.12	0.10	0.09	0.04	0.13	0.04
12																					
15	0.12	0.06	0.21	0.01	0.03	0.10	0.16	0.11	0.15	0.07	0.05	0.06	0.02	0.10	0.11	0.10	0.12	0.07	0.05	0.10	0.03
16																					
17												0.08	0.01								
18										0.09							0.10		0.06		0.03
18.2																					
18.5																					
18.9																					
19																				0.11	
20														0.11	0.06	0.12		0.06			
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced South - Pump Station

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P	Orth P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.11	0.10	0.17	0.02	0.07	0.06	0.13	0.09	0.13	0.09	0.13	0.02	0.04	0.07	0.12	0.12	0.08	0.02	0.08	0.10	0.03
5	0.11	0.08	0.18	0.01	0.02	0.13	0.14	0.10	0.13	0.04	0.10	0.03	0.02	0.11	0.11	0.14	0.09	0.05	0.06	0.09	0.06
10	0.12	0.10	0.15	0.02	0.01	0.10	0.09	0.09	0.14	0.06	0.09	0.14	0.03	0.10	0.11	0.11	0.09	0.05	0.04	0.11	0.06
12																					
15	0.08	0.09	0.20	0.01	0.01	0.08	0.13	0.14	0.14	0.14	0.11	0.05	0.04	0.12	0.09	0.13	0.14	0.04	0.05	0.10	0.06
16																					
17													0.05								
18																					
19										0.13		0.07						0.04			
19.2																					
20															0.11	0.12	0.07		0.02	0.08	0.07
20.4																					
20.9																					
21														0.10							
21.5																					
22																					
22.8																					
23.2																					

Lake Merced
South - Pistol
Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.07	0.03	0.08	0.07	0.17	0.05	0.03	0.04	0.02	0.01	0.04	0.03	0.10	0.20	0.09	0.18	0.09	0.07
5	0.08	0.03	0.09	0.08	0.17	0.05	0.03	0.01	0.02	0.01	0.02	0.03	0.09	0.21	0.09	0.16	0.12	0.08
6																		
10	0.11	0.05	0.07	0.06	0.18	0.04	0.03	0.03		***0.005***	0.03	0.03	0.05	0.24	0.12	0.19	0.09	0.08
12																		
15	0.02	0.07	0.11	0.08	0.20	0.05	0.01	0.04	0.01	***0.005***	0.04	0.03	0.10	0.16	0.11	0.15	0.03	0.09
16																		
17																		
18																		
18.2																		0.13
18.5														0.16				
18.9																	0.16	
19					0.16													
20	0.08	0.05		0.08		0.02						0.04						
20.1													0.11					
20.6															0.12			
20.8																0.18		
21			0.10				0.02			0.01								
21.5											0.05							
22								0.07										

Lake Merced
South -
Pump Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**	**Orth P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.02	0.03	0.07	0.06	0.20	0.01	***0.005***	0.06	0.04	***0.005***	***0.005***	0.04	0.08	0.19	0.08	0.13	0.10	0.07
5	0.01	0.04	0.09	0.08	0.18	0.03	0.01	0.04	0.04	0.04	***0.005***	0.05	0.08		0.08	0.17	0.11	0.05
10	0.005	0.06	0.09	0.07	0.20	0.05	***0.005***	0.05	0.04	***0.005***	0.01	0.04	0.09	0.23	0.07	0.14	0.12	0.06
12																		
15	0.06	0.11	0.10	0.08	0.16	0.01	***0.005***	0.07	0.04	***0.005***	0.01	0.07	0.10	0.17	0.07	0.16	0.16	0.06
16																		
17																		
18					0.16													
19																		
19.2																	0.210	
20																		
20.4																		0.05
20.9														0.18				
21	***0.005***		0.08	0.06					0.04	***0.005***		0.07						
21.5																0.20		
22		0.10				0.02	0.01	0.06										
22.8															0.08			
23.2											0.02							

Lake Merced
North

Depth	15-May-97 Tot P	10-Sep-97 Tot P	3-Dec-97 Tot P	16-Mar-98 Tot P	8-Jul-98 Tot P	23-Sep-98 Tot P	17-Mar-99 Tot P	21-Jun-99 Tot P	15-Sep-99 Tot P	8-Dec-99 Tot P	21-Mar-00 Tot P	21-Jun-00 Tot P	9-Aug-00 Tot P	19-Dec-00 Tot P	7-Mar-01 Tot P	20-Jun-01 Tot P	1-Oct-01 Tot P	18-Dec-01 Tot P	5-Mar-02 Tot P	30-Apr-02 Tot P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.09	0.30	***0.005***	0.09	0.21		0.17		0.28	0.32	0.17	0.29	0.29	0.26	0.20	0.50	0.31	0.18	0.16	0.20
5	0.11	0.31	0.01	0.08	0.22		0.17		0.26	0.31	0.17	0.29	0.30	0.26	0.22	0.40	0.32	0.18	0.18	0.22
10	0.11	0.33	***0.005***	0.10	0.22		0.16		0.32	0.29	0.14	0.29	0.29	0.26	0.22	0.39	0.34	0.19	0.17	0.20
14									0.31	0.32				0.25			0.35			
15	0.10	0.41	0.02	0.12	0.28		0.15					0.30	0.33		0.23	0.52		0.19	0.18	0.25
16																				
17																				
17.4																				
17.5																				
18											0.13									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97 Tot P	10-Sep-97 Tot P	3-Dec-97 Tot P	16-Mar-98 Tot P	8-Jul-98 Tot P	23-Sep-98 Tot P	17-Mar-99 Tot P	21-Jun-99 Tot P	15-Sep-99 Tot P	8-Dec-99 Tot P	21-Mar-00 Tot P	21-Jun-00 Tot P	9-Aug-00 Tot P	19-Dec-00 Tot P	7-Mar-01 Tot P	20-Jun-01 Tot P	1-Oct-01 Tot P	18-Dec-01 Tot P	5-Mar-02 Tot P	30-Apr-02 Tot P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.06		***0.005***	0.07	0.19		0.19		0.22	0.27	0.22	0.30	0.32	0.25	0.25	0.34	0.36	0.16	0.10	0.19
5	0.07		***0.005***	0.08	0.19		0.19		0.24	0.27	0.24	0.29	0.30	0.27	0.24	0.41	0.30	0.18	0.16	0.19
9																	0.23			
10	0.07		***0.005***	0.08	0.23		0.20		0.23	0.30		0.32	0.44	0.20	0.24	0.45		0.13	0.17	0.19
11																				
12																				
13											0.15									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.28	0.23	0.26	0.13	0.10	0.29	0.33	0.19	0.31	0.28	0.21	0.03	0.05	0.05	0.21	0.14	0.20		0.24	0.17
5	0.28	0.25	0.27	0.12	0.14	0.31	0.32	0.22	0.29	0.31	0.21	0.03	0.04	0.05	0.15	0.13	0.26	0.23	0.25	0.18
10	0.29	0.25	0.27	0.15	0.14	0.32	0.33	0.21	0.33	0.28	0.20	0.02	0.13	0.03	0.20	0.19	0.22		0.28	0.24
14																				
15	0.27	0.22	0.26	0.15	0.10	0.36	0.41	0.21	0.32	0.28	0.18	0.07	0.12	0.05	0.12	0.18	0.21	0.29	0.30	0.22
16																0.23				
17										0.29			0.05				0.26			
17.4																				
17.5																				
18												0.07		0.07				0.24	0.30	0.19
18.8																				
19															0.13					
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.23	0.19	0.21	0.14	0.10	0.24	0.36	0.21	0.26	0.20	0.24	0.09	0.07	0.09	0.48	0.28	0.20	0.26	0.15	0.24
5	0.18	0.23	0.20	0.13	0.11	0.35	0.34	0.22	0.28	0.20	0.24	0.09	0.07	0.08	0.41	0.21	0.18	0.23	0.21	0.21
9																				
10	0.22	0.27	0.20	0.13	0.14	0.34	0.38	0.19	0.22	0.20	0.26	0.11	0.08	0.11	0.20	0.24	0.18	0.29	0.15	0.16
11																				
12																				
13										0.21		0.09	0.02		0.24	0.24	0.15	0.27	0.16	
13.8																				
14														0.21						0.18
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.18	0.15	0.15	0.35	0.36	0.34	0.25	0.19	0.30	0.31	0.18	0.16	0.26	0.37	0.39	0.29	0.37	0.52	0.31
5	0.18	0.18	0.18	0.33	0.26	0.31	0.27	0.18	0.23	0.32	0.16	0.14	0.29	0.40	0.40	0.18	0.32	0.52	0.33
10	0.20	0.18	0.16	0.29	0.32	0.31	0.26	0.18	0.32	0.37	0.17	0.23	0.24	0.40	0.39	0.19	0.33	0.52	0.33
14																			
15	0.24	0.19	0.20	0.31	0.29	0.38	0.26	0.20	0.30	0.31	0.17	0.15	0.26		0.44	0.18	0.32	0.52	0.32
16																			
17																			
17.4														0.40					
17.5															0.40				
18	0.29					0.32				0.39									
18.8													0.24						0.30
19		0.16	0.26	0.30	0.29		0.25	0.19	0.29		0.15								
19.3																		0.50	
19.9																	0.29		
20																0.17			
20.6												0.16							

Lake Merced
North East

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.19	0.23	0.23	0.27	0.24	0.27	0.25	0.19	0.34	0.31	0.12	0.14	0.22	0.34	0.36	0.14	0.30	0.46	0.29
5	0.21	0.12	0.22	0.26	0.27	0.27	0.25	0.19	0.26	0.32	0.11	0.12	0.25	0.35	0.33	0.14	0.27	0.46	0.29
9																			
10	0.20	0.12	0.20	0.24	0.30	0.25	0.27	0.17	0.35	0.33	0.12	0.13	0.31	0.37	0.35	0.16	0.21	0.48	0.32
11																			
12																			
13	0.14					0.30							0.25	0.39					
13.8																		0.52	
14		0.18		0.24	0.30					0.28									
14.1															0.34				
14.7																0.16			0.28
15			0.23				0.24	0.15	0.30		0.12						0.19		
15.8												0.11							

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.08	0.25	0.03	0.05	0.08		0.07	0.18	0.16	0.25	0.19	0.18	0.20	0.13	0.14	0.22	0.19	0.10	0.11	0.15
5	0.07	0.22	0.03		0.10		0.07	0.18	0.18	0.28	0.16	0.17	0.19	0.15	0.14	0.24	0.15	0.15	0.11	0.09
6				0.06																
10	0.08	0.24	0.04		0.10		0.08	0.14	0.18	0.25	0.18	0.18	0.18	0.16	0.13	0.26	0.13	0.11	0.11	0.13
12				0.07																
15	0.08	0.28	0.03		0.07		0.08	0.11	0.16	0.21				0.17	0.13	0.28	0.18	0.27	0.11	0.10
16	0.08	0.28																		
17																				
18				0.08								0.18	0.18							
18.2																				
18.5																				
18.9																				
19																				
20											0.17									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.08	0.25	0.02	0.05	0.07		0.07	0.17	0.17	0.18	0.20	0.18	0.16	0.16	0.13	0.24	0.19	0.13	0.11	0.11
5	0.07	***0.01***	0.02	0.05	0.13		0.08	0.18	0.17	0.16	0.19	0.18	0.18	0.19	0.13	0.24	0.19	0.12	0.10	0.12
10	0.06	0.24	0.04		0.09		0.07	0.15	0.14		0.18	0.18	0.18	0.16	0.14	0.25	0.19	0.09	0.12	0.12
12				0.05																
15	0.09	0.25	0.01		0.06		0.07	0.22	0.17					0.18	0.14	0.24	0.21	0.11	0.13	0.13
16																				
17																				
18				0.06								0.17								
19													0.18							
19.2																				
20											0.17									
20.4																				
20.9																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol
Range

Depth	18-Jun-02 Tot P	23-Aug-02 Tot P	23-Oct-02 Tot P	11-Feb-03 Tot P	14-May-03 Tot P	15-Jul-03 Tot P	30-Sep-03 Tot P	2-Dec-03 Tot P	27-May-04 Tot P	29-Aug-04 Tot P	27-Oct-04 Tot P	9-Dec-04 Tot P	9-Feb-05 Tot P	18-Apr-05 Tot P	23-Jun-05 Tot P	17-Aug-05 Tot P	28-Sep-05 Tot P	31-Oct-05 Tot P	29-Nov-05 Tot P	29-Dec-05 Tot P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.13	0.15	0.18	0.13	0.10	0.18	0.18	0.10	0.18	0.17	0.21	0.11	0.27	0.10	0.21	0.16	0.16	0.18	0.09	0.18
5	0.13	0.18	0.18	0.11	0.07	0.13	0.16	0.14	0.20	0.14	0.24	0.14	0.07	0.11	0.20	0.17	0.15	0.23	0.14	0.17
6																				
10	0.13	0.15	0.21	0.11	0.07	0.11	0.13	0.15	0.20	0.18	0.20	0.13	0.18	0.14	0.22	0.18	0.14	0.20	0.08	0.16
12																				
15	0.13	0.15	0.25	0.12	0.07	0.19	0.16	0.16	0.18	0.17	0.16	0.13	0.13	0.13	0.22	0.17	0.23	0.21	0.14	0.15
16																				
17												0.17	0.37							
18										0.16							0.21		0.06	
18.2																				
18.5																				
18.9																				
19																				0.18
20														0.19	0.11	0.18		0.17		
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

Depth	18-Jun-02 Tot P	23-Aug-02 Tot P	23-Oct-02 Tot P	11-Feb-03 Tot P	14-May-03 Tot P	15-Jul-03 Tot P	30-Sep-03 Tot P	2-Dec-03 Tot P	27-May-04 Tot P	29-Aug-04 Tot P	27-Oct-04 Tot P	9-Dec-04 Tot P	9-Feb-05 Tot P	18-Apr-05 Tot P	23-Jun-05 Tot P	17-Aug-05 Tot P	28-Sep-05 Tot P	31-Oct-05 Tot P	29-Nov-05 Tot P	29-Dec-05 Tot P
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.11	0.15	0.20	0.13	0.12	0.08	0.18	0.20	0.18	0.23	0.20	0.12	0.06	0.07	0.15	0.17	0.10	0.18	0.09	0.17
5	0.12	0.16	0.21	0.11	0.07	0.13	0.16	0.17	0.23	0.13	0.24	0.08	0.15	0.16	0.22	0.15	0.11		0.13	0.19
10	0.14	0.17	0.19	0.12	0.06	0.17	0.15	0.17	0.24	0.15	0.24	0.15	0.07	0.15	0.20	0.13	0.15	0.11	0.10	0.19
12																				
15	0.12	0.16	0.25	0.12	0.06	0.20	0.19	0.17	0.24	0.26	0.23	0.16	0.10	0.17	0.24	0.13	0.20	0.11	0.08	0.10
16																				
17													0.10							
18																				
19										0.19		0.11						0.10		
19.2																				
20															0.14	0.18	0.22		0.09	0.12
20.4																				
20.9																				
21														0.18						
21.5																				
22																				
22.8																				
23.2																				

Lake Merced
South - Pistol
Range

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0.16	0.07	0.17	0.18	0.19	0.20	0.15	0.08	0.09	0.10	0.12	0.10	0.09	0.19	0.27	0.14	0.21	0.21	0.12
5	0.16	0.10	0.18	0.19	0.19	0.23	0.14	0.09	0.16	0.11	0.10	0.11	0.10	0.15	0.25	0.15	0.19	0.25	0.12
6																			
10	0.13	0.21	0.09	0.10	0.19	0.21	0.12	0.06	0.12		0.09	0.08	0.11	0.19	0.30	0.17	0.19	0.32	0.11
12																			
15	0.13	0.15	0.18	0.14	0.16	0.24	0.13	0.07	0.15	0.10	0.08	0.08	0.08	0.15	0.17	0.17	0.21	0.30	0.11
16																			
17																			
18	0.15																		
18.2																			0.13
18.5															0.28				
18.9																		0.19	
19						0.16													
20		0.08	0.17		0.17		0.16						0.09						
20.1														0.17					
20.6																0.12			
20.8																	0.19		
21				0.13				0.09			0.10								
21.5												0.07							
22									0.17										

Lake Merced
South - Pump
Station

	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**	**Tot P**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.13	0.14	0.20	0.21	0.23	0.22	0.17	0.13	0.14	0.13	0.08	0.05	0.09	0.21	0.24	0.09	0.21	0.40	0.15
5	0.13	0.10	0.12	0.16	0.24	0.18	0.23	0.09	0.16	0.15	0.15	0.06	0.08	0.16		0.08	0.18	0.28	0.16
10	0.07	0.16	0.23	0.20	0.26	0.20	0.11	0.10	0.13	0.15	0.08	0.06	0.10	0.19	0.23	0.1	0.14	0.29	0.14
12																			
15	0.07	0.14	0.21	0.18	0.19	0.21	0.10	0.07	0.13	0.15	0.12	0.07	0.10	0.25	0.25	0.12	0.16	0.29	0.13
16																			
17																			
18						0.21													
19																			
19.2																		0.28	
20	0.08																		
20.4																			0.12
20.9															0.22				
21		0.06		0.19	0.15					0.12	0.07		0.12						
21.5																	0.20		
22			0.20				0.19	0.06	0.12										
22.8																0.11			
23.2												0.05							

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.10	0.10	*0.05*	0.11	*0.05*	0.09	*0.05*		*0.05*	0.10	0.13	0.11	0.12	0.12	0.13	0.13	0.09	0.10	*0.05*	
5	0.10	0.10	*0.05*	0.11	*0.05*	0.10	*0.05*		*0.05*	*0.05*	0.12	0.11	0.12	0.12	0.12	0.13	0.10	0.10	*0.05*	
10	0.10	0.10	*0.05*	0.11	*0.05*	0.08	*0.05*		*0.05*	*0.05*	0.12	0.11	0.12	0.12	0.13	0.12	0.08	0.10	*0.05*	
14									*0.05*	*0.05*				0.12			0.10			
15	0.10	0.10	*0.05*	0.11	*0.05*	0.10	*0.05*					0.11	0.12		0.12	0.12		0.10	*0.05*	
16																				
17																				
17.4																				
17.5																				
18											0.13									
18.8																				
19																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.10		*0.05*	*0.05*	*0.05*	0.08	*0.05*		*0.05*	*0.05*	0.12	0.10	0.11	0.12	*0.05*	*0.05*	0.08	0.10	*0.05*	
5	0.10		*0.05*	*0.05*	*0.05*	0.08	*0.05*		*0.05*	*0.05*	0.12	0.10	0.11	0.12	0.10	*0.05*	0.08	0.10	*0.05*	
9																	0.08			
10	*0.05*		*0.05*	*0.05*	*0.05*	0.08	*0.05*		*0.05*	*0.05*		0.10	0.10	0.12	*0.05*	*0.05*		0.10	*0.05*	
11																				
12																				
13											0.12									
14																				
14.1																				
15																				
15.8																				

Lake Merced
North

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.25	0.16	0.16	0.02	0.04	0.14	0.30	0.24	0.32	0.27	0.25	0.18	0.38	0.21	0.36	0.42	0.26	0.23	0.30	0.31	0.15
5	0.25	0.20	0.22	0.18	0.07	0.16	0.30	0.21	0.30	0.27	0.29	0.19	0.38	0.23	0.36	0.37	0.26	0.26	0.30	0.34	0.15
10	0.12	0.20	0.17	0.17	0.12	0.15	0.35	0.27	0.30	0.27	0.32	0.53	0.38	0.23	0.39	0.42	0.27	0.24	0.31	0.31	0.16
14																					
15	0.18	0.18	0.17	0.17	0.09	0.16	0.32	0.26	0.30	0.25	0.26	0.31	0.39	0.24	0.37	0.42	0.27	0.28	0.30	0.31	0.20
16																0.37					
17										0.29			0.42				0.29				
17.4																					
17.5																					
18												0.18		0.24				0.26	0.30	0.30	0.19
18.8																					
19															0.43						
20																					
20.6																					

Lake Merced
North East

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.22	0.17	0.09	0.17	0.09	0.16	0.28	0.19	0.31	0.29	0.27	0.13	0.37	0.23	0.42	0.15	0.27	0.28	0.30	0.30	0.25
5	0.16	0.18	0.13	0.16	0.10	0.18	0.26	0.23	0.33	0.30	0.27	0.12	0.37	0.23	0.39	0.15	0.29	0.26	0.31	0.32	0.22
9																					
10	0.15	0.18	0.12	0.15	0.12	0.13	0.27	0.22	0.32	0.30	0.28	0.14	0.37	0.22	0.41	0.15	0.27	0.24	0.32	0.30	0.24
11																					
12																					
13										0.26		0.17	0.37		0.46	0.18	0.30	0.27	0.32		0.24
14														0.25						0.32	
14.1																					
15																					
15.8																					

Lake Merced
North

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.25	0.25	0.27	0.16	0.24	0.23	0.09	0.14	0.15	0.23	0.24	0.20		
5	0.29	0.22	0.30	0.17	0.25	0.23	0.11	0.17	0.14	0.23	0.23	0.19		
10	0.28	0.25	0.36	0.18	0.25	0.25	0.12	0.15	0.18	0.25	0.26	0.28		
14														
15	0.39	0.23	0.33	0.16	0.25	0.25	0.16	0.20	0.18	0.24	0.29	0.38		
16														
17														
17.4														
17.5														
18					0.28				0.18					
18.8												0.31		
19	0.28	0.25	0.32	0.17		0.24	0.18	0.20		0.26				
20														
20.6											0.25			

Lake Merced
North East

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.30	0.29	0.25	0.28	0.24	0.32	0.36	0.12	0.14	0.24	0.13	0.14		
5	0.33	0.27	0.24	0.28	0.27	0.32	0.32	0.16	0.14	0.27	0.14	0.23		
9														
10	0.33	0.27	0.30	0.27	0.21	0.32	0.28	0.15	0.16	0.25	0.19	0.30		
11														
12														
13					0.19							0.27		
14	0.36		0.30	0.28					0.16					
14.1														
15		0.28				0.32	0.38	0.18		0.22				
15.8											0.18			

Lake Merced South - Pistol Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.40	0.40	0.40	0.36	0.3	0.27	0.28	0.33	0.33	0.33	0.30	0.38	0.30	0.31	0.26	0.29	0.27	0.30	0.23	NA
5	0.40	0.40	0.40		0.3	0.27	0.28	0.33	0.34	0.34	0.29	0.37	0.30	0.30	0.27	0.29	0.27	0.30	0.21	NA
6				0.36																
10	0.40	0.40	0.40		0.3	0.27	0.28	0.33	0.33	0.33	0.29	0.37	0.30	0.32	0.27	0.28	0.27	0.30	0.22	NA
12				0.36																
15	0.40	0.40	0.40		0.3	0.27	0.28	0.33	0.34	0.33				0.31	0.26	0.29	0.27	0.30	0.23	NA
16	0.40	0.40																		
17																				
18				0.36								0.37	0.30							
19																				
20											0.28									
21																				
21.5																				
22																				

Lake Merced South - Pump Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.40	0.40	0.40	0.36	0.3	0.26	0.28	0.33	0.33	0.33	0.29	0.39	0.30	0.31	0.28	0.28	0.26	0.30	0.22	
5	0.40	0.40	0.40	0.36	0.3	0.27	0.28	0.32	0.34	0.33	0.28	0.38	0.29	0.30	0.26	0.29	0.27	0.30	0.22	
10	0.40	0.40	0.40		0.3	0.27	0.28	0.33	0.34	0.33	0.29	0.38	0.29	0.30	0.26	0.30	0.27	0.30	0.22	
12				0.36																
15	0.40	0.40	0.40		0.3	0.27	0.29	0.32	0.33	0.33				0.31	0.26	0.29	0.27	0.30	0.23	
16																				
17																				
18				0.36								0.37								
19													0.30							
20											0.29									
21																				
22																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.47	0.32	0.27	0.51	0.39	0.23	0.52	0.47	0.54	0.55	0.50	0.66	0.46	0.47	0.57	0.40	0.36	0.47	0.52	0.51	0.42
5	0.45	0.33	0.31	0.44	0.37	0.25	0.53	0.47	0.55	0.45	0.52	0.66	0.47	0.47	0.54	0.40	0.37	0.47	0.53	0.48	0.40
6																					
10	0.36	0.32	0.28	0.46	0.37	0.27	0.55	0.47	0.53	0.46	0.52	0.59	0.46	0.47	0.57	0.42	0.37	0.48	0.55	0.46	0.42
12																					
15	0.37	0.32	0.35	0.47	0.34	0.29	0.52	0.50	0.53	0.46	0.52	0.57	0.46	0.46	0.56	0.47	0.39	0.47	0.55	0.52	0.41
16																					
17												0.58	0.52								
18										0.48							0.39		0.51		0.45
19																				0.47	
20														0.45	0.55	0.39		0.45			
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.27	0.36	0.33	0.49	0.36	0.25	0.55	0.47	0.53	0.46	0.52	0.35	0.46	0.46	0.68	0.41	0.39	0.51	0.41	0.37	0.48
5	0.27	0.34	0.32	0.48	0.35	0.28	0.55	0.49	0.54	0.48	0.52	0.35	0.47	0.47	0.60	0.40	0.40	0.48	0.43	0.34	0.50
10	0.37	0.34	0.35	0.48	0.37	0.25	0.54	0.49	0.53	0.46	0.50	0.37	0.48	0.50	0.60	0.40	0.43	0.49	0.43	0.37	0.50
12																					
15	0.36	0.33	0.35	0.49	0.35	0.30	0.57	0.47	0.51	0.48	0.49	0.35	0.50	0.49	0.62	0.37	0.41	0.48	0.43	0.38	0.51
16																					
17													0.43								
18																					
19										0.50		0.36						0.45			
20															0.61	0.38	0.41		0.45	0.38	0.49
21														0.49							
22																					
23.2																					

Lake Merced South - Pistol Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.39	0.44	0.31	0.32	0.38	0.34	0.39	0.35	0.45	0.41	0.25	0.34		
5	0.57	0.43	0.33	0.34	0.41	0.37	0.39	0.37	0.44	0.41	0.33	0.33		
6														
10	0.48	0.41	0.33	0.33	0.37	0.36	0.39	0.37		0.44	0.30	0.34		
12														
15	0.48	0.43	0.32	0.35	0.43	0.38	0.40	0.41	0.45	0.43	0.25	0.36		
16														
17														
18														
19					0.42									
20	0.40	0.42		0.32		0.39						0.34		
21			0.35				0.41			0.42				
21.5											0.26			
22								0.41						

Lake Merced South - Pump Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-	Fl^-
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.36	0.43	0.32	0.32	0.42	0.38	0.46	0.46	0.44	0.44	0.28	0.35		
5	0.43	0.44	0.33	0.34	0.43	0.40	0.46	0.42	0.47	0.45	0.27	0.38		
10	0.40	0.47	0.30	0.33	0.42	0.39	0.45	0.41	0.47	0.48	0.33	0.37		
12														
15	0.39	0.45	0.36	0.35	0.42	0.41	0.45	0.39	0.46	0.46	0.27	0.36		
16														
17														
18					0.48									
19														
20														
21	0.51		0.38	0.32					0.45	0.44		0.36		
22		0.44				0.38	0.44	0.39						
23.2											0.27			

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	9.5	9.1	10.2	7.7	9.7		7.7		9.6	8.7	7.3	8.7	8.2	20.8	6.9	7.9	12.1	5.8	7.9	7.5
5	9.8	9.3	15.4	8.2	9.7		8.0		9.9	13.2	7.2	9.9	8.1	17.1	6.9	7.4	12.8	5.9	8.3	6.8
10	9.2	9.2	12.3	8.4	9.4		8.2		9.6	8.8	7.3	9.2	8.3	23.9	7.1	7.8	14.5	5.9	9.1	6.7
14									9.5	7.4				24.4			12.8			
15	9.0	9.3	15.1	8.0	9.7		8.2					8.9	8.0		6.9	7.3		5.8	8.5	6.1
16																				
17																				
17.4																				
17.5																				
18											7.2									
18.8																				
19																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	7.9		7.0	6.6	8.4		7.4		7.9	15.6	6.6	8.2	7.1	19.6	6.1	9.6	***5.0***	4.4	7.0	5.3
5	7.7		7.9	6.7	8.2		7.3		8.5	4.8	6.7	8.0	9.3	35.6	6.7	8.6	***5.0***	4.5	7.6	5.5
9																	***5.0***			
10	7.3		7.3	6.8	8.3		7.7		8.1	61.1		9.3	7.4	19.9	6.5	7.7		4.5	6.5	5.4
11																				
12																				
13											6.4									
14																				
14.1																				
15																				
15.8																				

Lake Merced
North

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	7.6	9.2	8.7	7.6	7.6	6.4	6.9	6.6	7.1	8.7	7.3	7.9	10.8	19.5	12.5	8.1	9.6	9.0	7.1	
5	7.5	8.5	8.4	7.6	7.2	6.4	6.8	6.5	7.3	8.1	7.6	8.2	10.5	20.1	12.4	7.8	8.7	8.6	7.2	
10	7.5	8.6	10.4	7.5	7.6	6.2	7.0	6.8	7.2	8.5	7.7	8.9	10.9	19.8	12.8	7.6	8.5	8.7	7.4	
14																				
15	7.3		9.7	7.5	7.7	6.2	6.6	7.0	7.7	8.4	7.8	9.1	11.2	20.2	13.3	8.0	8.3	8.6	7.4	
16																				
17										9.2			6.8				7.5			
17.4																				
17.5																				
18												8.5						7.8	7.2	
18.8																				
19															12.3					
20																				
20.6																				

Lake Merced
North East

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	6.6	7.9	7.6	6.6	7.4	5.6	6.2	6.1	7.6	7.8	6.2	7.6	12.1	20.0	17.2	8.7	9.5	9.4	8.4	
5	6.2	7.4	7.1	6.2	6.5	5.7	6.6	6.1	7.3	7.6	6.1	6.9	10.8	19.0	16.2	8.2	8.4	8.5	6.8	
9																				
10	6.5		6.9	6.1	6.8		6.4	6.2	9.1	8.6		7.0	6.0		15.0	8.3	7.5	6.8		
11																				
12																				
13										8.7		7.5	6.5		13.5	7.3	7.4	7.4		
14																				
14.1																				
15																				
15.8																				

Lake Merced
North

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	7.1	6.3	7.9	8.12	12.8	9.2	8.4	9.2	13.0	10.2	10.0	10.3	12.4		
5	7.4	6.6	7.8	9.40	10.6	8.5	7.5	9.3	10.9	10.9	10.0	10.1	12.4		
10	6.9	6.7	7.3	8.07	13.6	8.6	7.9	9.1	13.7	11.0	10.8	10.3	11.6		
14															
15	6.9	6.8	7.6	7.82	13.1	8.7	8.0	9.1	16.2	10.9	9.2	10.4	13.4		
16															
17															
17.4															
17.5															
18	7.4					9.8				13.7					
18.8													11.2		
19		6.7	7.7	8.07	10.3		8.2	8.6	12.3		10.7				
20															
20.6												9.7			

Lake Merced
North East

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	8.4	6.7	8.0	8.45	11.7	14.6	8.9	10.4	12.0	11.1	9.3	8.6	13.4		
5	7.8	6.2	7.5	9.28	14.0	10.7	7.7	8.2	10.8	12.2	7.3	10.0	11.6		
9															
10	6.7	6.3	7.8	5.80	9.9	9.7	7.6	8.6	9.9	11.7	8.2	9.9	9.9		
11															
12															
13	7.0					8.7							10.9		
14		6.4		8.25	10.0					10.7					
14.1															
15			7.8				8.2	8.7	9.6		8.2				
15.8												11.4			

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	6.2	15.4	8.2	5.9	6.7		5.6	7.1	7.5	9.6	5.8	7.5	6.6	16.3	5.1	7.6	10.2	5.0	6.4	5.9
5	6.5	12.7	7.5		6.8		5.9	6.5	7.5	8.9	6.0	7.3	6.6	27.0	5.9	7.0	***5.0***	5.4	6.9	6.3
6				7.1																
10	6.5	13.8	10.3		6.4		5.8	6.6	7.1	9.5	6.0	8.0	6.7	20.6	5.4	6.3	***5.0***	4.9	7.1	6.0
12				5.6																
15	6.4	10.0	8.3		6.5		7.0	6.5	9.2	9.7				15.4	5.9	5.3	***5.0***	4.7	6.5	
16	7.3																			
17																				
18				6.6								8.1	7.2							
19																				
20											6.3									
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	9.0	12.3	9.5	5.4	6.7		6.0	6.6	7.4	11.7	6.2	6.9	6.7	15.2	5.3	6.5	***5.0***	5.0	7.1	5.5
5	6.3	14.1	7.2	6.5	6.8		6.1	6.6	7.1	12.5	6.3	7.5	7.2	15.5	5.6	5.9	***5.0***	5.0	6.8	5.7
10	6.1	9.3	7.0		6.4		5.8	6.6	7.6	14.1	6.3	7.3	6.8	11.2	5.6	5.4	10.1	4.8	6.3	5.6
12				5.5																
15	6.3	9.8	9.5		6.5		6.4	6.4	7.6	10.8				16.4	5.6	5.8	***5.0***	4.7	6.1	5.7
16																				
17																				
18				6.2								6.6								
19													7.3							
20											6.2									
21																				
22																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol
Range

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	6.1	7.2	6.9	5.5	5.7	5.0	4.6	5.2	4.7	5.7	5.1	5.5	6.8	14.5	8.6	5.3	5.8	5.6	4.4	
5	6.3	7.1	7.2	5.6	5.7	5.1	4.8	4.7	4.7	5.7	4.8	5.2	7.2	18.0	10.4	5.0	5.7	5.3	4.4	
6																				
10	6.0	7.3	7.0	5.8	5.0	4.9	4.8	4.6	5.2	5.9	4.8	4.9	6.6	15.1	9.2	5.0	5.3	5.3	4.4	
12																				
15		6.8	7.2	5.4			4.8		4.6				7.2	13.4	8.7	5.4	5.4	5.8	4.2	
16																				
17												6.2	4.6							
18										6.1							5.4		4.0	
19																				
20																5.4		5.4		
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05
Depth	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC	TOC
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	5.6	7.3	7.1	5.5	4.6	4.8	4.2	4.6		5.5	5.9	5.0	6.2	10.8		6.0	5.7	4.9	4.3	
5	6.1	7.0	7.2	5.6	5.5	4.8	4.7	4.6	4.7	5.9	5.8	5.0	6.8	14.5		5.1	5.1	6.9	4.3	
10	6.0	7.1	3.5	5.5	4.8	4.3	5.3	4.5	4.5	5.6	5.6	5.6	6.1	13.7		5.8	5.2	5.5	4.4	
12																				
15	5.6	7.1	3.4	5.5	4.7	4.4	4.7	4.6	4.5	5.4	5.3	6.3	6.6	12.2		5.5	5.2	5.2	4.3	
16																				
17													4.4							
18																	5.2			
19										7.0		6.2						5.8		
20																			4.3	
21																				
22																				
23.2																				

Lake Merced
South - Pistol
Range

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	5.1	4.8	4.7	7.93	12.3	7.2	5.9	6.2	9.9	8.1	9.5	8.3	9.25		
5	***2.5***	4.4	5.0	6.98	8.9	6.9	5.3	6.1	8.1	7.8	10.0	7.0	8.98		
6															
10	***2.5***	4.2	5.2	8.22	8.8	6.8	7.2	6.1	18.6	7.0	9.0	8.9	9.16		
12															
15	***2.5***	4.3	4.8	7.21	10.2	6.0	5.4	6.0	13.9	7.1	9.3	8.6	8.89		
16															
17															
18	4.9														
19						5.9									
20		5.1	5.3		7.6		5.6						9.14		
21				6.33				7.9		7.7	9.5				
21.5												8.7			
22									8.0						

Lake Merced
South - Pump
Station

Depth	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***2.5***	4.2	4.7	8.38	8.6	7.3	7.3	7.1	10.0	10.6	8.0	9.3	8.56		
5	***2.5***	4.4	5.0	5.99	9.7	6.7	6.4	6.4	11.0	7.8	9.3	9.2	7.56		
10	***2.5***	4.3	5.2	6.59	11.0	6.3	5.4	6.4	7.4	8.4	8.2	7.1	8.56		
12															
15	5.3	4.5	4.8	6.01	9.6	5.9	5.4	6.4	7.6	7.5	8.6	9.1	8.94		
16															
17															
18						5.9									
19															
20	4.9														
21		4.7		6.68	7.6					7.6	7.9		7.37		
22			5.8				5.2	6.2	9.4						
23.2												7.5			

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.02		0.03	0.03	0.04	0.03	0.06	0.07	0.09	***0.005***	***0.005***	0.05	***0.005***	***0.005***
5																				
10							0.04		0.05	0.04		0.03	0.07	0.08	0.07	***0.005***	***0.005***	0.06	***0.005***	***0.005***
14																				
15																				
16																				
17																				
17.4																				
17.5																				
18											0.08									
18.8																				
19																				
20																				
20.6																				

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.04		0.05	0.05	0.06	0.05	0.07	0.10	0.08	***0.005***	***0.005***	0.04	***0.005***	***0.005***
5																				
9																	***0.005***			
10							0.08		0.07	0.07		0.48	0.09	0.10	0.10	***0.005***		0.05	0.01	***0.005***
11																				
12																				
13											0.17									
14																				
14.1																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.06	0.03	0.17	0.04	0.02	0.16	***0.005***	0.05	0.05	***0.005***	***0.005***	0.04	0.30
5																					
10	***0.005***	***0.005***	0.02		***0.005***	***0.005***	***0.005***	***0.005***	0.06				0.15	0.18		0.02	0.08	***0.005***			
14																					
15				***0.005***							0.25										
16																					
17										0.06											
17.4																					
17.5																					
18												0.13							***0.005***	***0.005***	0.10
18.8																					
19															***0.005***						
20																					
20.6																					

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.01	***0.005***	0.19	0.04	0.07	0.03	***0.005***	0.03	0.07	***0.005***	0.03	0.04	0.10
5																					
9																					
10	***0.005***	0.01	***0.005***	0.01	***0.005***	***0.005***	***0.005***	***0.005***	0.01		0.20		0.04	0.08		0.02	0.14	0.07			
11																					
12																					
13										0.02		0.07			***0.005***				0.02		0.20
14																				0.04	
14.1																					
15																					
15.8																					

Lake Merced
North

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.02	***0.005***	0.10	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.02	0.07	0.04	0.02		
5														
10														
14														
15														
16														
17														
17.4														
17.5														
18					***0.005***				0.04					
18.8												0.08		
19	0.02	***0.005***	0.04	***0.005***		***0.005***	0.03	***0.005***		0.09				
20														
20.6											0.07			

Lake Merced
North East

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.02	***0.005***	0.03	0.01	0.05	0.07	0.05	***0.005***	0.03	0.13	0.11	0.05		
5														
9														
10														
11														
12														
13					***0.005***							0.04		
14	0.04		0.03	0.02					0.03					
14.1														
15		***0.005***				0.05	0.04	***0.005***		0.19				
15.8											0.09			

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.02	0.01	0.05	0.05	0.05	0.01	0.05	0.07	0.06	***0.005***	***0.005***	0.02	***0.005***	***0.005***
5																				
6																				
10							0.03	0.02	0.14	0.05		0.02	0.08	0.08	0.08	***0.005***	***0.005***	0.04	***0.005***	0.02
12																				
15																				
16																				
17																				
18																				
19																				
20											0.14									
21																				
21.5																				
22																				

Lake Merced
South - Pump
Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.02	0.01	0.02	0.14	0.07	0.02	0.05	0.07	0.07	***0.005***	***0.005***	0.01	***0.005***	***0.005***
5																				
10							0.03	0.01	0.04	0.07		0.02	0.05	0.09	0.07	0.11	***0.005***	0.08	***0.005***	***0.005***
12																				
15																				
16																				
17																				
18																				
19																				
20											0.06									
21																				
22																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced South - Pistol Range

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	0.01	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.01	0.05	***0.005***	***0.005***	0.01	0.03
5																					
6																					
10	***0.005***	***0.005***	***0.005***		***0.005***	***0.005***	***0.005***	***0.005***	***0.005***				***0.005***	0.03		0.01	0.07	***0.005***			
12																					
15				0.02							***0.005***										
16																					
17												0.01									
18										***0.005***									***0.005***		0.07
19																				0.01	
20															***0.005***						
21																					
21.5																					
22																					

Lake Merced South - Pump Station

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	***0.005***	0.01	0.05	***0.005***	***0.005***	***0.005***	***0.005***
5																					
10	***0.005***	***0.005***	***0.005***		***0.005***	***0.005***	***0.005***	***0.005***	***0.005***				0.01	0.06		***0.005***	0.04	***0.005***			
12																					
15				***0.005***							***0.005***										
16																					
17																					
18																					
19										***0.005***		0.01									
20															***0.005***				***0.005***	***0.005***	0.07
21																					
22																					
23.2																					

Lake Merced
South - Pistol
Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.01	***0.005***	0.03	***0.005***	***0.005***	0.04	0.02	***0.005***	0.01	0.02	0.03	***0.005***		
5														
6														
10														
12														
15														
16														
17														
18														
19					***0.005***									
20	***0.005***	***0.005***		0.01		0.05						0.01		
21			0.05				***0.005***		0.01	0.03				
21.5											0.03			
22								***0.005***						

Lake Merced
South - Pump
Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**	**Fe**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	***0.005***	***0.005***	0.11	0.01	0.08	0.05	0.01	***0.005***	0.01	0.04	0.05	0.06		
5														
10														
12														
15														
16														
17														
18					***0.005***									
19														
20														
21	***0.005***		0.11	0.02					0.01	0.06		0.03		
22						0.07	0.04	***0.005***						
23.2											0.04			

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.07		0.15	0.10	0.25	0.20	0.13	0.10	0.05	0.13	0.14	0.08	0.09	0.10
5																				
10							0.07		0.17	0.10		0.19	0.13	0.11	0.06	0.13	0.13	0.08	0.12	0.10
14																				
15																				
16																				
17																				
17.4																				
17.5																				
17.8																				
18											0.33									
18.8																				
19																				
19.3																				
19.9																				
20																				
20.6																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.10		0.13	0.11	0.24	0.26	0.16	0.09	0.05	0.11	0.14	0.07	0.09	0.10
5																				
9																	0.26			
10							0.11		0.13	0.12		0.33	0.16	0.10	0.06	0.18		0.07	0.10	0.12
11																				
12																				
13											0.19									
13.8																				
14																				
14.1																				
14.7																				
15																				
15.8																				

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.11	***0.005***	0.11	0.05	0.08	0.09	0.22	0.08	0.23	0.18	0.17	0.04	0.04	0.03	0.06	0.18	0.07	0.16	0.08	0.07	0.05
5																					
10	0.11	***0.005***	0.12		0.09	0.12	0.21	0.08	0.24				0.04	0.03		0.17	0.12	0.17			
14																					
15				0.05							0.19										
16																					
17										0.21											
17.4																					
17.5																					
17.8																					
18												0.08							0.09	0.07	0.05
18.8																					
19															0.57						
19.3																					
19.9																					
20																					
20.6																					

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.13	0.18	0.11	0.08	0.15	0.15	0.17	0.12	0.14	0.16	0.12	0.05	0.07	0.12	0.11	0.21	0.11	0.15	0.07	0.13	0.08
5																					
9																					
10	0.14	0.20	0.09	0.08	0.17	0.27	0.19	0.11	0.17		0.12		0.06	0.09		0.21	0.17	0.10			
11																					
12																					
13										0.20		0.07			0.28				0.08		0.09
13.8																					
14																				0.16	
14.1																					
14.7																					
15																					
15.8																					

Lake Merced
North

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.04	0.07	0.17	0.20	0.29	0.08	0.22	0.13	0.06	0.07	0.14	0.07	0.09	0.145	0.02	0.13	0.085	0.07
5																		
10																		
14																		
15																		
16																		
17																		
17.4													0.39					
17.5																		
17.8														0.171				
18					0.36				0.34									
18.8												0.06						0.09
19	0.05	0.25	0.28	0.21		0.08	0.31	0.49		0.07								
19.3																		
19.9																0.18		
20															0.1			
20.6											***0.005***							

Lake Merced
North East

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.09	0.23	0.14	0.18	0.23	0.11	0.16	0.15	0.07	0.09	***0.005***	0.10	0.10	0.130	0.1	0.07	0.09	
5																		
9																		
10																		
11																		
12																		
13					0.18							0.12						
13.8																		
14	0.11		0.15	0.20					0.12									
14.1														0.138				
14.7															0.09			0.07
15		0.24				0.12	0.19	0.25		0.09						0.1		
15.8											***0.005***							

Lake Merced South - Pistol Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.03	0.05	0.11	0.05	0.12	0.10	0.11	0.06	0.02	0.03	0.04	0.04	0.03	0.04
5																				
6																				
10							0.04	0.05	0.13	0.07		0.13	0.12	0.06	0.02	0.03	0.04	0.05	0.03	0.04
12																				
15																				
16																				
17																				
18																				
18.2																				
18.5																				
18.9																				
19																				
20											0.11									
20.1																				
20.6																				
20.8																				
21																				
21.5																				
22																				

Lake Merced South - Pump Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf							0.03	0.05	0.11	0.08	0.13	0.09	0.10	0.06	0.02	0.03	0.04	0.04	0.03	0.04
5																				
10							0.03	0.05	0.11	0.09		0.10	0.10	0.06	0.02	0.04	0.05	0.05	0.03	0.04
12																				
15																				
16																				
17																				
18																				
19																				
19.2																				
20											0.13									
20.4																				
20.9																				
21																				
21.5																				
22																				
22.8																				
23.2																				

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
South - Pistol
Range

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.05	0.14	0.10	0.05	0.04	0.06	0.12	0.04	0.04	0.03	0.07	0.02	0.03	0.02	0.03	0.08	0.03	0.04	0.04	0.04	0.04
5																					
6																					
10	0.05	0.08	0.10		0.03	0.05	0.12	0.04	0.04				0.02	0.01		0.08	0.07	0.04			
12																					
15				0.05							0.07										
16																					
17												0.03									
18										0.05									0.04		0.04
18.2																					
18.5																					
18.9																					
19																				0.04	
20															0.14						
20.1																					
20.6																					
20.8																					
21																					
21.5																					
22																					

Lake Merced
South - Pump
Station

Depth	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.04	0.07	0.07	0.05	0.03	0.05	0.11	0.04	0.03	0.03	0.07	0.02	0.03	0.02	0.04	0.08	0.03	0.04	0.04	0.03	0.03
5																					
10	0.04	0.08	0.08		0.04	0.06	0.12	0.04	0.03				0.03	0.02		0.08	0.06	0.04			
12																					
15				0.05							0.08										
16																					
17																					
18																					
19										0.06		0.03									
19.2																					
20															0.18				0.04	0.03	0.03
20.4																					
20.9																					
21																					
21.5																					
22																					
22.8																					
23.2																					

Lake Merced
South - Pistol
Range

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.04	0.04	0.07	0.17	0.10	0.04	0.05	0.05	0.02	0.02	0.31	0.02	0.07	0.034	0.01	0.11	0.054	0.03
5																		
6																		
10																		
12																		
15																		
16																		
17																		
18																		
18.2																		0.03
18.5														0.061				
18.9																		
19					0.11													
20	0.03	0.04		0.19		0.04						0.01						
20.1													0.15					
20.6															0.01			
20.8																0.04		
21			0.10				0.04		0.03	0.02								
21.5											0.02							
22								0.06										

Lake Merced
South - Pump
Station

	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**	**Mn**
Ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Surf	0.03	0.03	0.07	0.18	0.13	0.04	0.03	0.06	0.01	0.02	0.03	0.03	0.08	0.046	0.01	0.03	0.051	0.03
5																		
10																		
12																		
15																		
16																		
17																		
18					0.30													
19																		
19.2																		
20																		
20.4																		0.03
20.9														0.040				
21	0.03		0.09	0.20					0.02	0.02		0.04	0.14					
21.5																0.06		
22						0.04	0.05	0.05										
22.8															0.05			
23.2											0.02							

Lake Merced
North

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Ft	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L
Surf	0.6	***0.25***	***0.25***	***0.25***	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.50	***0.25***	2.1	***0.025***	***0.25***	***0.25***
5	0.7	***0.25***	***0.25***																	
10	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.50	***0.25***	1.9	***0.025***	***0.25***	***0.25***
14																				
15	***0.25***	***0.25***	***0.25***																	
16																				

Lake Merced
North East

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Ft	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L
Surf	***0.25***		***0.25***	***0.25***	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.60	***0.25***	***0.25***	***0.025***	***0.25***	***0.25***
5	***0.25***		***0.25***																	
9																	***0.25***			
10	***0.25***		***0.25***	***0.25***	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.50	***0.25***		***0.025***	***0.25***	***0.25***
15																				
16																				

Lake Merced
South - Pistol
Range

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Ft	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L
Surf	0.7	***0.25***	0.6	1.9	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.70	***0.25***	***0.25***	***0.025***	0.9	***0.25***
5	0.8	***0.25***	0.6																	
6																				
10	0.7	***0.25***	0.6	2.0	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.70	***0.25***	***0.25***	***0.025***	0.8	***0.25***
15	0.9	***0.25***	0.6																	
16	0.8	***0.25***																		

Lake Merced
South -
Pump Station

Depth	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02
Ft	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L	MTBE ug/L
Surf	0.7	***0.25***	0.5	1.9	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.68	***0.25***	***0.25***	***0.025***	0.8	***0.25***
5	0.7	***0.25***	0.6																	
10	0.7	***0.25***	0.6	1.9	***0.25***				***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	***0.25***	0.68	***0.25***	***0.25***	***0.025***	0.8	***0.25***
15	0.8	***0.25***	0.6																	

Note: Bold, italicized formats indicate half the reported value for statistical purposes.

Lake Merced
North

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5																					
10	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25													
14																					
15																					
16									0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Lake Merced
North East

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5																					
9																					
10	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15																					
16																					

Lake Merced
South - Pistol
Range

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5																					
6																					
10	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15																					
16																					

Lake Merced
South -
Pump Station

	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	0.25	0.025	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5									0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
10	0.25	0.025	0.25	0.5	0.25	0.25	0.25	0.25													
15																					

Lake Merced
North

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*		
5													
10											*0.25*		
14													
15										*0.25*			
16	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*				

Lake Merced
North East

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	27-Dec-07	28-Mar-08	10-Jun-08		
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*		
5													
9													
10	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*		
15													
16													

Lake Merced
South - Pistol
Range

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	27-Dec-07	28-Mar-08	10-Jun-08		
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*		
5													
6													
10	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*		
15													
16													

Lake Merced
South -
Pump Station

Depth	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	27-Dec-07	28-Mar-08	10-Jun-08		
Depth	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**	**MTBE**
Ft	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*		
5	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*	*0.25*				
10										*0.25*	*0.25*		
15													

Lake Merced
North

Bacteriological Data (MPN)	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Total Coliform														
E. Coli														

Lake Merced
North East

Bacteriological Data (MPN)	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Total Coliform														
E. Coli														

Lake Merced
South - Pistol
Range

Bacteriological Data (MPN)	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Total Coliform														
E. Coli														

Lake Merced
South - Pump
Station

Bacteriological Data (MPN)	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Total Coliform														
E. Coli														

Lake Merced North

Bacteriological Data (MPN)	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04
Total Coliform				1109	1986	1300		1120	437	1120	756	2419	1733	>2419
E. Coli				34	14	17		62	63	13	6	9	22	19

Lake Merced North East

Bacteriological Data (MPN)	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04
Total Coliform				2419	>2419	>2419		1203	2419	2419	2419	2419	2419	>2419
E. Coli				13	36	11		25	11	7	7	10	15	12

Lake Merced South - Pistol Range

Bacteriological Data (MPN)	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04
Total Coliform				1203	1046	1120		649	436	344	770	2419	1986	197
E. Coli				15	14	6		336	22	15	26	48	53	4

Lake Merced South - Pump Station

Bacteriological Data (MPN)	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04
Total Coliform				1414	1120	1046		488	365	153	1203	2419	727	309
E. Coli				23	37	35		82	32	3	15	39	65	7

Lake Merced
North

Bacteriological Data (MPN)	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06
Total Coliform	7	11,000	>2419	>2419	124	354	1414	>2419	629	2419	579	691	179	2419	1986	510	>2420	>2420
E. Coli	135	200	35	2	33	25	26	5	4	20	18	8	21	17	46	7	5	20

Lake Merced
North East

Bacteriological Data (MPN)	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06
Total Coliform	>2419	8,130	2419	1120	2419	1046	1986	>2419	437	1986	>2419	>2419	>2419	914	2419	689	>2420	>2420
E. Coli	52	100	8	20	5	50	<1	5	1	13	38	1	10	2	34	3	5	5

Lake Merced
South - Pistol
Range

Bacteriological Data (MPN)	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06
Total Coliform	649	2690.0	2419	920	530.0	249.0	N/A	358	722	1733	755	501.0	921.0	1733.0	>2419	687.0	513	816
E. Coli	33	100.0	81	4	10.0	30.0	N/A	20	84	99	28	7.0	17.0	15.0	5.0	33.0	3	13

Lake Merced
South - Pump
Station

Bacteriological Data (MPN)	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06
Total Coliform	479	2260.0	1986	1986	420.0	299.0	109	110	687	1300	1300	436.0	816.0	1733.0	549.0	378.0	1300	687
E. Coli	23	100.0	99	2	20.0	10.0	16	12	37	78	56	13.0	29.0	13.0	11.0	41.0	18	59

Lake Merced
North

Bacteriological Data (MPN)	29-Mar-07	26-Jun-07	20-Aug-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Total Coliform	1553	96	>2419	437	272	516	>2420	534	961	1046	>2420
E. Coli	16	4	285	28	3	35	20	59	17	4	22

Lake Merced
North East

Bacteriological Data (MPN)	29-Mar-07	26-Jun-07	20-Aug-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Total Coliform	>2420	361	>2419	>2420	1986	2420	>2420	2420	>2420	579	1120
E. Coli	6	3	5	9	6	1	108	16	7	5	4

Lake Merced
South - Pistol
Range

Bacteriological Data (MPN)	29-Mar-07	26-Jun-07	20-Aug-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Total Coliform	1300.0	286	756	>2420	830	>2420	1120	727	530	517	961
E. Coli	47.0	5	34	91	11	33.0	37.0	27.0	11	15	10

Lake Merced
South - Pump
Station

Bacteriological Data (MPN)	29-Mar-07	26-Jun-07	20-Aug-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Total Coliform	1120.0	284	866	***2420***	1414		914	411	173	260	>2420
E. Coli	93.0	12	10	81	7		75	24	4	7	17

Lake
Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.							1,769		3,258	938	1,749	6,995	2,492	1,414	1,183	3,250	5,293	2,191	1209	4523	6,231
5																					
10							2,312		3,131	2,003	1,166	5,997	2,332	1,863	1,206	2,647	5,427	1,863	663	3853	5,963

Lake
Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.							2,834		4,085	1,126	1,983	2,117	1,956	1,956	2,013	3,082	3,953	2,827	1089	2198	3,853
5																					
10							2,908		3,333	1,172	1,869	2,090	2,660	1,863	1,997	2,580	3,886	1,668	1283	2198	3,035

Lake
Merced
South -
Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.							1,360	2,054	3,852	1,045	1,467	2,405	2,144	972	600	1,179	2,278	1,206	472	1266	~1600*
5																					
10							1,347	2,032	3,493	1,065	1,320	2,486	2,050	817	553	1,132	2,345	1,407	429	1240	N/A

Lake
Merced
South -
Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.							1,253	2,016	6,705	1,253	1,769	3,719	2,144	737	700	1,199	2,613	1,655	442	1374	1,554
5																					
10							1,474	2,118	5,233	1,079	1,621	2,573	1,923	864	683	1,085	2,546	1,206	402	1280	1,467

Lake Merced North

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	1,943	3260	1219	6,834	4,389	4,221	2435	650	2117	4288	851	1146	1099	1293	4858	5461	2385	2874	2198	3,317	9,514
5																					
10	2,312	2358	1441	6,499	4,556	3,551	2147	637	1923	4523	1698	1501	1025	1407	5327	3987	2720	2171	3229	3,219	5,561

Lake Merced North East

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	1,997	2422	1528	3,082	2,399	5,729	2569	1,374	1816	2714	1491	2332	3417	1179	2982	3719	2412	1876	4255	2,389	2,352
5																					
10	1,910	2152	1635	3,618	2,204	3,886	2335	1,585	1695	2613	1521	2372	3243	1347	3819	3276	2955	1970	3920	2,750	4,757

Lake Merced South - Pistol Range

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	2,472	1,826	750	2,144	2,278	2,915	1,782	1,183	N/A	1534	1695	985	1360.1	1635	2258	4824.0	2559	1467	1186	1,350	7,973
5																					
10	2,184	1,836	858	1,702	1,977	3,109	1,394	1,116	2358	2030	992	911	1206.0	1970	1956	4924.5	2486	1387	1367	1,273	2,178

Lake Merced South - Pump Station

	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	2,513	2,191	757	2,037	2,064	3,109	1,374	1,226	2841	1923	995	1072	1139.0	1829	1809	4422.0	2640	1387	1079	1,554	2,131
5																					
10	2,298	2,334	750	2,037	2,023	2,325	1,732	1,484	2486	1461	905	992	1058.6	2231	2137	4891.0	2613	1367	1427	1,065	2,037

Lake
Merced
North

	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	4167	2117		4248	3162	1080	3377	4074	2137
5					3109	1072	3292	3404	2131
10	4308	2171		4020					

Lake
Merced
North East

	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	2466	2265		3886	2061	1166	2442	3176	3618
5					1560	1110	2602	2908	3430
10	2312	2760		3417					

Lake
Merced
South -
Pistol
Range

	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	2586.2	929	1376.9	1420	2117	777	1276	2533	1414
5					2262	683	1265	2452	1160
10	3430.4	1063	1450.6	1313					

Lake
Merced
South -
Pump
Station

	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**	**Algal Biomass**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	3001.6	990	1363.5	1487	2841	683	1260	2131	1809
5					3832	563	1284	1997	1487
10	3229.4	1142	1373.5	1394					

Lake Merced
North

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Depth							**Chlorophyll a**		**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft							☞g/L		µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
Surf.							26.4		48.6	14.0	26.1	104.4	37.2	21.1	17.7
5															
10							34.5		46.7	29.9	17.4	89.5	34.8	27.8	18.0

Lake Merced
North East

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Depth							**Chlorophyll a**		**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft							☞g/L		µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
Surf.							42.3		61.0	16.8	29.6	31.6	29.2	29.2	30.1
5															
10							43.4		49.8	17.5	27.9	31.2	39.7	27.8	29.8

Lake Merced
South - Pistol
Range

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Depth							**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft							☞g/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
Surf.							20.3	30.7	57.5	15.6	21.9	35.9	32.0	14.5	9.0
5															
10							20.1	30.3	52.1	15.9	19.7	37.1	30.6	12.2	8.3

Lake Merced
South - Pump
Station

	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01
Depth							**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft							☞g/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
Surf.							18.7	30.1	100.1	18.7	26.4	55.5	32.0	11.0	10.5
5															
10							22.0	31.6	78.1	16.1	24.2	38.4	28.7	12.9	10.2

Lake Merced
North

	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	mg/L	mg/L	ppb	ppb	mg/L	ppb	mg/L	µg/L	ppb	µg/L	ppb	µg/L	µg/L	µg/L
Surf.	48.5	79.0	32.7	18.1	67.5	93.0	29.0	48.7	18.2	102.0	65.5	63.0	36.4	9.7	31.6
5															
10	39.5	81.0	27.8	9.9	57.5	89.0	34.5	35.2	21.5	97.0	68.0	53.0	32.1	9.5	28.7

Lake Merced
North East

	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	mg/L	mg/L	ppb	ppb	mg/L	ppb	mg/L	µg/L	ppb	µg/L	ppb	µg/L	µg/L	µg/L
Surf.	46.0	59.0	42.2	16.3	32.8	57.5	29.8	36.2	22.8	46.0	35.8	85.5	38.4	20.5	27.1
5															
10	38.5	58.0	24.9	19.2	32.8	45.3	28.5	32.1	24.4	54.0	32.9	58.0	34.9	23.7	25.3

Lake Merced
South - Pistol
Range

	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	mg/L	mg/L	ppb	ppb	mg/L	ppb	mg/L	µg/L	ppb	µg/L	ppb	µg/L	µg/L	µg/L
Surf.	17.6	34.0	18.0	7.1	18.9	~24*	36.9	27.3	11.2	32.0	34.0	43.5	26.6	17.7	N/A
5															
10	16.9	35.0	21.0	6.4	18.5	N/A	32.6	27.4	12.8	25.4	29.5	46.4	20.8	16.7	35.2

Lake Merced
South - Pump
Station

	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	mg/L	mg/L	ppb	ppb	mg/L	ppb	mg/L	µg/L	ppb	µg/L	ppb	µg/L	µg/L	µg/L
Surf.	17.9	39.0	24.7	6.6	20.5	23.2	37.5	32.7	11.3	30.4	30.8	46.4	20.5	18.3	42.4
5															
10	16.2	38.0	18.0	6.0	19.1	21.9	34.3	34.8	11.2	30.4	30.2	34.7	25.9	22.2	37.1

Lake Merced
North

	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	64.0	12.7	9.9	3.3	17.7	41.1	36.6	7.7	24.2	45.4	17.1	16.4	19.3	72.5	81.5
5															
10	67.5	25.4	10.6	3.6	14.6	39.7	28.2	7.2	26.6	42.0	22.4	15.3	21.0	79.5	59.5

Lake Merced
North East

	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	40.5	22.3	16.0	27.8	26.7	51.0	27.7	6.4	31.2	77.5	34.8	51.0	17.6	44.5	55.5
5															
10	39.0	22.7	15.8	22.1	24.1	46.4	34.1	7.4	31.1	42.8	35.4	48.4	20.1	57.0	48.9

Lake Merced
South - Pistol
Range

	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	22.9	25.3	7.6	12.8	30.3	21.8	23.7	5.4	19.7	29.4	14.7	20.3	24.4	33.7	72.0
5															
10	30.3	14.8	7.0	13.0	32.1	21.6	23.3	4.8	21.4	32.2	13.6	18.0	29.4	29.2	73.5

Lake Merced
South - Pump
Station

	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05	29-Dec-05	23-Jan-06	01-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	28.7	14.9	7.0	13.7	27.1	19.5	27.0	4.7	26.7	30.2	16.0	17.0	27.3	27.0	66.0
5															
10	21.8	13.5	7.0	14.5	27.7	23.5	26.0	4.8	19.9	34.5	14.8	15.8	33.3	31.9	73.0

Lake Merced
North

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**		**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	35.6	42.9	32.8	49.5	142.0	62.2	31.6		63.4	47.2	16.1	50.4	60.8	31.9
5										46.4	16.00	49.1	50.8	31.8
10	40.6	32.4	48.2	48.1	83.0	64.3	32.4		60.0					

Lake Merced
North East

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**		**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	36.0	28.0	63.5	35.7	35.1	36.8	33.8		58.0	30.8	17.4	36.4	47.4	54.0
5										23.3	16.6	38.8	43.4	51.2
10	44.1	29.4	58.5	41.1	71.0	34.5	41.2		51.0					

Lake Merced
South - Pistol
Range

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	38.2	21.9	17.7	20.2	119.0	38.6	13.9	20.6	21.2	31.6	11.6	19.0	37.8	21.1
5										33.8	10.2	18.9	36.6	17.3
10	37.1	20.7	20.4	19.0	32.5	51.2	15.9	21.7	19.6					

Lake Merced
South - Pump
Station

	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**	**Chlorophyll a**
Ft	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Surf.	39.4	20.7	16.1	23.2	31.8	44.8	14.8	20.4	22.2	42.4	10.2	18.8	31.8	27.0
5										57.2	8.4	19.2	29.8	22.2
10	39.0	20.4	21.3	15.9	30.4	48.2	17.0	20.5	20.8					

Plankton Count - Dominant Species (>98% of total population)

Lake Merced North

15-May-97			10-Sep-97			3-Dec-97			16-Mar-98			8-Jul-98			17-Mar-99		
Organism	No./cuM	No./mL	Organism	No./cuM	No./mL	Organism	No./cuM	No./mL	Organism	No./cuM	No./mL	Organism	No./cuM	No./mL	Organism	No./m^3	No./mL
Oscillatoria	160,000,000	160	Oscillatoria	320,000,000	320	Oscillatoria	1,200,000,000	1,200	Oscillatoria	410,000,000	410	Oscillatoria (1:100 dilution)	1,500,000,000	1,500	Oscillatoria	1,100,000,000	1,100
Anabaena	15,000,000	15	Anabaena	280,000	0.280	Copepod	19,000	0.019	Mougeotia	4,100,000	4.100	Anabaena	10,000,000	10	Anabaena	1,000,000	1
Melosira	8,000,000	8	Melosira	41,000	0.041	Rotifer	19,000	0.019	Nauplius	86,000	0.086	Copepod	89,000	0.089	Spirulina	440,000	0.440
Spondylosium	4,000,000	4	Copepod	41,000	0.041	Cladoceran	19,000	0.019	Copepod	35,000	0.035	Rotifer	13,000	0.013	Rotifer	230,000	0.230
Nauplius Larva	95,000	0.095	Nauplius Larva	25,000	0.025	**Total**	1,200,057,000	1,200	**Total**	414,221,000	414	Nauplius	13,000	0.013	Closterium	140,000	0.140
Rotifer	68,000	0.068	**Total**	320,387,000	320							**Total**	1,510,115,000	1,510	Copepoda	92,000	0.092
Copepod	55,000	0.055													Mougeotia	23,000	0.023
Fragilaria	55,000	0.055													Epithemia	23,000	0.023
Total	187,273,000	187													**Total**	1,101,948,000	1,102

Lake Merced North East

15-May-97			10-Sep-97			3-Dec-97			16-Mar-98			8-Jul-98			17-Mar-99		
Organism	No./cuM	No./mL				Organism	No./cuM	No./mL	Organism	No./cuM	No./mL	Organism	No./cuM	No./mL	Organism	No./m^3	No./mL
Oscillatoria	430,000,000	430				Oscillatoria	370,000,000	370	Osciilatoria	240,000,000	240	Oscillatoria (1:100 dilution)	1,700,000,000	1,700	Oscillatoria	2,200,000,000	2,200
Melosira	22,000,000	22				Mougeotia	3,400,000	3	Rotifer	130,000	0	Anabaena	1,300,000	1	Rotifer	180,000	0
Anabaena	15,000,000	15				Ankistrodesmus	870,000	1	Anabaena	78,000	0	Copepod	140,000	0	Closterium	78,000	0
Spondylosium	7,400,000	7				Copepod	310,000	0	Copepod	65,000	0	Nauplius	60,000	0	Nauplius	52,000	0
Rotifer	100,000	0				Rotifer	85,000	0	**Total**	240,273,000	240	**Total**	1,701,500,000	1,702	Cladoceran	52,000	0
Copepod	100,000	0				Cladoceran	56,000	0							Mougeotia	52,000	0
Total	474,600,000	475				**Total**	374,721,000	375							Synedra	26,000	0
															Anabaena	26,000	0.026
															Total	2,200,466,000	2,200

Lake Merced North

21-Jun-99

15-Sep-99

Organism	No./m^3	No./mL
Oscillatoria	1,900,000,000	1,900
Anabaena	1,800,000	2
Gomphosphaeria	770,000	1
Mougeotia	640,000	1
Anacystis	470,000	0.470
Closterium	430,000	0.430
Spirulina	210,000	0.210
Mallomonas	170,000	0.170
Naviculoid Diatom	130,000	0.130
Scenedesmus	85,000	0.085
Tetraedron	85,000	0.085
Fragilaria	85,000	0.085
Paramecium	43,000	0.043
Pediastrum	43,000	0.043
Cladoceran	43,000	0.043
Selenastrum	43,000	0.043
Total	1,905,047,000	1,905

8-Dec-99

Organism	No./m^3	No./mL
Oscillatoria	1,100,000,000	1,100
Mougeotia	410,000	0.410
Closterium	170,000	0.170
Rotifer	69,000	0.069
Naviculoid Diatom	69,000	0.069
Cymbella	69,000	0.069
Copepoda	34,000	0.034
Mallomonas	34,000	0.034
Scenedesmus	34,000	0.034
Coelastrum	34,000	0.034
Anabaena	34,000	0.034
Total	1,100,957,000	1,101

21-Mar-00

Organism	No./m^3	No./mL
Oscillatoria	1,800,000,000	1,800
Mougeotia	3,039,244	3
Melosira	1,823,546	2
Anabaena	1,823,546	2
Closterium	1,215,698	1.216
Fragilaria	607,849	0.608
Copepoda	607,849	0.608
Rhizolenia	607,849	0.608
Synedra	607,849	0.608
Closteridium	607,849	0.608
Total	1,810,941,278	1,811

21-Jun-00

Organism	No./m^3	No./mL
Oscillatoria	550,000,000	550
Anabaena	35,000,000	35
Melosira	8,200,000	8
Synedra	490,000	0.490
Mougeotia	230,000	0.230
Chlorella	210,000	0.210
Ankistrodesmus	110,000	0.110
Coelosphaerium	61,000	0.061
Scenedesmus	61,000	0.061
Rotifera	46,000	0.046
Copepoda	31,000	0.031
Nauplius	31,000	0.031
Navicula	31,000	0.031
Cymbella	15,000	0.015
Stephanodiscus	15,000	0.015
Closteriopsis	15,000	0.015
Total	626,000	595

Lake Merced North East

21-Jun-99

15-Sep-99

Organism	No./m^3	No./mL
Oscillatoria	1,300,000,000	1,300
Mougeotia	2,600,000	3
Anabaena	560,000	1
Anacystis	530,000	1
Closterium	450,000	0
Naviculoid Diatom	260,000	0
Ankistrodesmis	230,000	0
Copepoda	190,000	0
Nauplius	150,000	0
Cymbella	150,000	0
Fragilaria	110,000	0
Actinastrum	75,000	0
Pediastrum	38,000	0
Scenedesmus	38,000	0
Ostrocoda	38,000	0
Mallomonas	38,000	0
Rotifer	38,000	0
Total	525,000	1

8-Dec-99

Organism	No./m^3	No./mL
Oscillatoria	1,600,000,000	1,600
Closterium	690,000	1
Mougeotia	430,000	0
Nauplius	170,000	0
Synedra	130,000	0
Anabaena	130,000	0
Spirulina	87,000	0
Closteridium	87,000	0
Scenedesmus	43,000	0
Cymbella	43,000	0
Copepoda	43,000	0
Actinastrum	43,000	0
Rotifer	43,000	0
Coelosphaerium	43,000	0
Total	432,000	0

21-Mar-00

Organism	No./m^3	No./mL
Oscillatoria	3,100,000,000	3,100
Melosira	8,200,000	8
Mougeotia	5,700,000	6
Synedra	3,300,000	3
Anabaena	2,400,000	2
Gleocystis	820,000	1
Total	3,120,420,000	3,120

21-Jun-00

Organism	No./m^3	No./mL
Oscillatoria	1,300,000,000	1,300
Anabaena	16,000,000	16
Melosira	6,900,000	7
Ankistrodesmus	860,000	1
Synedra	740,000	1
Mougeotia	520,000	1
Chlorella	360,000	0
Cymbella	140,000	0
Scenedesmus	120,000	0
Fragilaria	72,000	0
Polypleblepharides	48,000	0
Coelosphaerium	48,000	0
Stephanodiscus	48,000	0
Gomphoneis	24,000	0
Closterium	24,000	0
Closteriopsis	24,000	0
Total	1,325,928,000	1,326

Lake Merced North

9-Aug-00

Organism	No./m^3	No./mL
Oscillatoria	1,900,000,000	1,900
Melosira	6,600,000	7
Anabaena	2,800,000	3
Ankistrodesmus	280,000	0.280
Coelosphaerium	170,000	0.170
Nauplius	130,000	0.130
Mougeotia	87,000	0.087
Rotifera	43,000	0.043
Closteriopsis	22,000	0.022
Stephanodiscus	22,000	0.022
Staurastrum	22,000	0.022
Copepoda	22,000	0.022
Pediastrum	22,000	0.022
Scenedesmus	22,000	0.022
Total	842,000	1,910

19-Dec-00

Organism	No./m^3	No./mL
Oscillatoria (20/1 dilution)	1,600,000,000	1,600
Melosira	1,400,000	1.400
Mougeotia	1,100,000	1.100
Closterium	370,000	0.370
Anabaena	250,000	0.250
Ankistrodesmus	250,000	0.250
Scenedesmus	120,000	0.120
Naviculoid Diatom	120,000	0.120
Copepoda	120,000	0.120
Total	1,603,730,000	1,604

7-Mar-01

Organism	No./m^3	No./mL
Oscillatoria	1,800,000,000	1,800
Melosira	1,600,000	2
Rotifera	300,000	0.300
Scenedesmus	250,000	0.250
Ankistrodesmus	220,000	0.220
Closterium	190,000	0.190
Copepoda	82,000	0.082
Anabaena	55,000	0.055
Synedra	55,000	0.055
Nauplius	55,000	0.055
Cymbella	27,000	0.027
Ceratium	27,000	0.027
Total	1,802,861,000	1,803

20-Jun-01

Organism	No./m^3	No./mL
Oscillatoria	1,200,000,000	1,200
Anabaena	14,000,000	14
Melosira	1,600,000	2
Synedra	1,200,000	1
Ankistrodesmus	160,000	0.160
Closterium	110,000	0.110
Fragilaria	90,000	0.090
Copepoda	45,000	0.045
Staurastrum	22,000	0.022
Cyclotella	22,000	0.022
Nauplius	22,000	0.022
Coelosphaerium	22,000	0.022
Total	1,217,293,000	1,217

1-Oct-01

Organism	No./m^3	No./mL
Oscillatoria	2,700,000,000	2,700
Melosira	970,000	1
Anabaena	600,000	1
Closterium	340,000	0.340
Ankistrodesmus	300,000	0.300
Coelosphaerium	150,000	0.150
Copepoda	150,000	0.150
Scenedesmus	75,000	0.075
Nauplius	38,000	0.038
Rotifera	38,000	0.038
Total	2,702,661,000	2,703

Lake Merced North East

9-Aug-00

Organism	No./m^3	No./mL
Oscillatoria	1,800,000,000	1,800
Melosira	10,000,000	10
Anabaena	3,300,000	3
Ankistrodesmus	1,600,000	2
Mougeotia	280,000	0
Closterium	250,000	0
Nauplius	140,000	0
Scenedesmus	110,000	0
Synedra	84,000	0
Rotifera	84,000	0
Cymbella	56,000	0
Ophiocytium	56,000	0
Coelosphaerium	56,000	0
Closteriopsis	56,000	0
Navicula	56,000	0
Copepoda	28,000	0
Nematoda	28,000	0
Total	1,816,184,000	1,816

19-Dec-00

Organism	No./m^3	No./mL
Oscillatoria (20/1 dilution)	1,400,000,000	1,400
Mougeotia	4,100,000	4
Melosira	1,600,000	2
Ankistrodesmus	570,000	1
Closterium	460,000	0
Cyclotella	230,000	0
Anacystis	110,000	0
Rotifera	110,000	0
Nauplius	110,000	0
Naviculoid Diatom	110,000	0
Zygnema	110,000	0
Gloeocystis	110,000	0
Stephanodiscus	110,000	0
Total	1,407,730,000	1,408

7-Mar-01

Organism	No./m^3	No./mL
Oscillatoria	4,800,000,000	4,800
Ankistrodesmus	730,000	0.730
Rotifera	380,000	0.380
Melosira	270,000	0.270
Synedra	190,000	0.190
Staurastrum	120,000	0.120
Scenedesmus	77,000	0.077
Nauplius	38,000	0.038
Closterium	38,000	0.038
Stephanodiscus	38,000	0.038
Copepoda	38,000	0.038
Total	4,801,919,000	4,802

20-Jun-01

Organism	No./m^3	No./mL
Oscillatoria	2,000,000,000	2,000
Anabaena	12,000,000	12
Melosira	4,800,000	5
Synedra	2,700,000	3
Ankistrodesmus	1,100,000	1.100
Closterium	400,000	0.400
Cyclotella	400,000	0.400
Ophiocytium	130,000	0.130
Copepoda	130,000	0.130
Nauplius	100,000	0.100
Fragilaria	67,000	0.067
Rotifera	67,000	0.067
Sphaerocystis	33,000	0.033
Staurastrum	33,000	0.033
Scenedesmus	33,000	0.033
Total	2,021,993,000	2,022

1-Oct-01

Organism	No./m^3	No./mL
Oscillatoria	2,600,000,000	2,600
Melosira	4,100,000	4
Ankistrodesmus	1,900,000	2
Rotifera	160,000	0.160
Nauplius	120,000	0.120
Cymbella	120,000	0.120
Closterium	120,000	0.120
Copepoda	120,000	0.120
Anabaena	41,000	0.041
Aphanizomenon	41,000	0.041
Total	2,606,722,000	2,607

Appendix K

Lake Merced North

18-Dec-01

Organism	No./m³	No./mL
Oscillatoria	1,100,000,000	1,100
Melosira	2,000,000	2
Ankistrodesmus	230,000	0.230
Closterium	210,000	0.210
Anabaena	100,000	0.100
Fragilaria	63,000	0.063
Copepoda	21,000	0.021
Epithemia	21,000	0.021
Nauplius	21,000	0.021
Total	1,102,666,000	1,103

5-Mar-02

Organism	No./m³	No./mL
Oscillatoria (50:1 dil)	960,000,000	960
Anabaena	380,000	0.380
Nauplius	230,000	0.230
Rotifera	140,000	0.140
Ankistrodesmus	110,000	0.110
Synedra	67,000	0.067
Copepoda	67,000	0.067
Stephanodiscus	45,000	0.045
Closterium	45,000	0.045
Mallomonas	23,000	0.023
Staurastrum	23,000	0.023
Cladocera	23,000	0.023
Scenedesmus	23,000	0.023
Fragilaria	23,000	0.023
Anacystis	23,000	0.023
Total	961,222,000	961

30-Apr-02

Organism	No./m³	No./mL
Oscillatoria	1,300,000,000	1,300
Anabaena	82,000,000	82
Melosira	17,000,000	17
Ankistrodesmus	1,100,000	1
Closterium	980,000	1
Cyclotella	46,000	0.046
Copepoda	46,000	0.046
Nauplius	23,000	0.023
Fragilaria	23,000	0.023
Staurastrum	23,000	0.023
Ceratium	23,000	0.023
Rotifera	23,000	0.023
Epithemia	23,000	0.023
Total	1,401,310,000	1,401

18-Jun-02

Organism	No./m³	No./mL
Oscillatoria	580,000,000	580
Anabaena	19,000,000	19
Melosira	3,500,000	4
Synedra	400,000	0.400
Closterium	290,000	0.290
Ankistrodesmus	230,000	0.230
Copepoda	90,000	0.090
Cyclotella	90,000	0.090
Nauplius	72,000	0.072
Rotifera	18,000	0.018
Total	603,690,000	604

23-Aug-02

Organism	No./m³	No./mL
Oscillatoria(50:1dil)	1,000,000,000	1,000
Anabaena	1,100,000	1
Mougeotia	1,000,000	1
Melosira	310,000	0.310
Rotifera	280,000	0.280
Coelosphaerium	280,000	0.280
Nauplius	130,000	0.130
Copepoda	100,000	0.100
Closterium	77,000	0.077
Cladocera	26,000	0.026
Anacystis	26,000	0.026
Gloeocystis	26,000	0.026
Navicula	26,000	0.026
Scenedesmus	26,000	0.026
Total	1,006,814,000	1,007

Lake Merced North East

18-Dec-01

Organism	No./m³	No./mL
Oscillatoria	1,800,000,000	1,800
Melosira	6,300,000	6
Ankistrodesmus	1,500,000	2
Closterium	300,000	0.300
Rotifera	130,000	0.130
Fragilaria	67,000	0.067
Staurastrum	67,000	0.067
Nauplius	34,000	0.034
Total	1,808,398,000	1,808

5-Mar-02

Organism	No./m³	No./mL
Oscillatoria (50:1 dil)	1,800,000,000	1,800
Melosira	1,900,000	2
Rotifera	660,000	0.660
Closterium	540,000	0.540
Ankistrodesmus	370,000	0.370
Nauplius	250,000	0.250
Stephanodiscus	210,000	0.210
Copepoda	170,000	0.170
Anacystis	83,000	0.083
Anabaena	42,000	0.042
Synedra	42,000	0.042
Scenedesmus	42,000	0.042
Gloeocystis	42,000	0.042
Total	1,804,351,000	1,804

30-Apr-02

Organism	No./m³	No./mL
Oscillatoria	1,900,000,000	1,900
Melosira	73,000,000	73
Anabaena	7,500,000	8
Closterium	1,600,000	2
Ankistrodesmus	1,200,000	1.200
Rotifera	340,000	0.340
Copepoda	300,000	0.300
Coelosphaerium	110,000	0.110
Nauplius	75,000	0.075
Scenedesmus	75,000	0.075
Cymbella	37,000	0.037
Epithemia	37,000	0.037
Synedra	37,000	0.037
Total	1,984,311,000	1,984

18-Jun-02

Organism	No./m³	No./mL
Oscillatoria	3,500,000,000	3,500
Anabaena	18,000,000	18
Melosira	16,000,000	16
Synedra	820,000	0.820
Ankistrodesmus	620,000	0.620
Closterium	270,000	0.270
Rotifera	140,000	0.140
Staurastrum	100,000	0.100
Nauplius	100,000	0.100
Copepoda	34,000	0.034
Total	3,536,084,000	3,536

23-Aug-02

Organism	No./m³	No./mL
Oscillatoria (20:1 dil)	1,300,000,000	1,300
Melosira	2,100,000	2
Mougeotia	1,500,000	2
Anabaena	690,000	0.690
Ankistrodesmus	240,000	0.240
Closterium	180,000	0.180
Cladocera	120,000	0.120
Rotifera	120,000	0.120
Mallomonas	90,000	0.090
Synedra	90,000	0.090
Copepoda	90,000	0.090
Coelosphaerium	90,000	0.090
Ceratium	30,000	0.030
Nauplius	30,000	0.030
Cymbella	30,000	0.030
Scenedesmus	30,000	0.030
Pinnularia	30,000	0.030
Total	1,305,460,000	1,305

Lake Merced North

23-Oct-02

Organism	No./m³	No./mL
Oscillatoria	1,500,000,000	1,500
Melosira	3,100,000	3
Anabaena	2,700,000	3
Closterium	500,000	0.500
Ankistrodesmus	150,000	0.150
Nauplius	88,000	0.088
Copepoda	59,000	0.059
Scenedesmus	29,000	0.029
Total	1,506,626,000	1,507

11-Feb-03

Organism	No./m³	No./mL
Oscillatoria	1,700,000,000	1,700
Melosira	3,200,000	3
Ankistrodesmus	130,000	0.130
Closterium	130,000	0.130
Copepoda	25,000	0.025
Nauplius	25,000	0.025
Cymbella	25,000	0.025
Rotifera	25,000	0.025
Scenedesmus	25,000	0.025
Total	1,703,585,000	1,704

14-May-03

Organism	No./m³	No./mL
Oscillatoria	1,600,000,000	1,600
Melosira	3,600,000	4
Anabaena	1,500,000	2
Synedra	710,000	0.710
Ankistrodesmus	630,000	0.630
Closterium	490,000	0.490
Cyclotella	220,000	0.220
Scenedesmus	110,000	0.110
Rotifera	82,000	0.082
Cymbella	27,000	0.027
Staurastrum	27,000	0.027
Fragilaria	27,000	0.027
Total	1,607,423,000	1,607

15-Jul-03

Organism	No./m³	No./mL
Oscillatoria	1,400,000,000	1,400
Anabaena	7,400,000	7
Melosira	900,000	0.900
Ankistrodesmus	230,000	0.230
Closterium	120,000	0.120
Copepoda	100,000	0.100
Nauplius	84,000	0.084
Rotifera	63,000	0.063
Stephanodiscus	63,000	0.063
Scenedesmus	42,000	0.042
Synedra	42,000	0.042
Spirolina	21,000	0.021
Total	1,409,065,000	1,409

30-Sep-03

Organism	No./m³	No./mL
Oscillatoria	980,000,000	980
Anabaena	1,400,000	1.400
Melosira	290,000	0.290
Closterium	150,000	0.150
Copepoda	77,000	0.077
Nauplius	46,000	0.046
Rotifera	31,000	0.031
Epithemia	31,000	0.031
Synedra	31,000	0.031
Cymbella	15,000	0.015
Scenedesmus	15,000	0.015
Total	982,086,000	982

Lake Merced North East

23-Oct-02

Organism	No./m³	No./mL
Oscillatoria	2,300,000,000	2,300
Melosira	3,400,000	3
Anabaena	1,300,000	1.300
Closterium	760,000	0.760
Ankistrodesmus	610,000	0.610
Copepoda	230,000	0.230
Nauplius	150,000	0.150
Rotifera	110,000	0.110
Synedra	38,000	0.038
Cymbella	38,000	0.038
Ophiocytium	38,000	0.038
Total	2,306,674,000	2,307

11-Feb-03

Organism	No./m³	No./mL
Oscillatoria	1,700,000,000	1,700
Melosira	1,800,000	2
Ankistrodesmus	220,000	0.220
Rotifera	220,000	0.220
Nauplius	190,000	0.190
Closterium	160,000	0.160
Synedra	120,000	0.120
Cymbella	31,000	0.031
Total	1,702,741,000	1,703

14-May-03

Organism	No./m³	No./mL
Oscillatoria	1,700,000,000	1,700
Melosira	6,700,000	7
Anabaena	5,800,000	6
Closterium	790,000	0.790
Ankistrodesmus	400,000	0.400
Synedra	220,000	0.220
Fragilaria	110,000	0.110
Nauplius	85,000	0.085
Scenedesmus	85,000	0.085
Staurastrum	56,000	0.056
Cynbella	56,000	0.056
Copepoda	28,000	0.028
Ceratium	28,000	0.028
Rotifera	28,000	0.028
Total	1,714,386,000	1,714

15-Jul-03

Organism	No./m³	No./mL
Oscillatoria	1,900,000,000	1,900
Melosira	5,500,000	6
Anabaena	300,000	0.300
Closterium	240,000	0.240
Rotifera	180,000	0.180
Ankistrodesmus	150,000	0.150
Synedra	150,000	0.150
Copepoda	89,000	0.089
Staurastrum	30,000	0.030
Nauplius	30,000	0.030
Navicula	30,000	0.030
Ophiocytium	30,000	0.030
Stephanodiscus	30,000	0.030
Sphaerocystis	30,000	0.030
Total	1,906,789,000	1,907

30-Sep-03

Lake Merced North

2-Dec-03			27-May-04		29-Aug-04		27-Oct-04		9-Dec-04		9-Feb-05		18-Apr-05	
Organism	**No./m^3**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	890,000,000	890	Melosira	18	Coelosphaerium	60	Oscillatoria	100	Oscillatoria	24	Asterionella	140	Oscillatoria	9.1
Anabaena	440,000	0.440	Oscillatoria	5	Fragilaria	14	Anabaena	88	Anabaena	9.6	Oscillatoria	140	Ceratium	0.83
Mougeotia	128,719	0.129	Ceratium	3.7	Anabaena	4.4	Fragilaria	11	Coelosphaerium	0.77	Anabaena	8.2	Anabaena	0.54
Nauplius	100,000	0.100	Sphaerocystis	1.1	Melosira	1.9	Stephanodiscus	3.5	Melosira	0.44	Stephanodiscus	3.4	Sphaerocystis	0.38
Ankistrodesmus	100,000	0.100	Anabaena	0.55	Aphanizomenon	1.5	Melosira	1.1	Stephanodiscus	0.2	Closterium	1.3	Synedra	0.064
Rotifera	77,000	0.077	Copepoda	0.2	Asterionella	0.77	Coelosphaerium	0.7	Staurastrum	0.11	Melosira	0.61	Asterionella	0.064
Stephanodiscus	51,000	0.051	Synedra	0.18	Cyclotella	0.13	Rotifera	0.47	Closterium	0.11	Coelosphaerium	0.49	Coelosphaerium	0.048
Closterium	51,000	0.051	Fragilaria	0.13	Ceratium	0.077	Staurastrum	0.28	Asterionella	0.086	Ceratium	0.2	Cyclotella	0.024
Copepoda	26,000	0.026	Nauplius	0.18	Staurastrum	0.077	Nauplius	0.1	Cladocera	0.086	Synedra	0.14	Tabellaria	0.024
Mallomonas	26,000	0.026	Zygnema	0.05	Oscillatoria	0.051	Copepoda	0.073	Copepoda	0.071	Fragilaria	0.098	Copepoda	0.016
Staurastrum	26,000	0.026	Mallomonas	0.034	Gloeocystis	0.051	Cladocera	0.058	Fragilaria	0.057	Rotifera	0.039	Fragilaria	0.016
Cladocera	26,000	0.026	Staurastrum	0.034	Synedra	0.026	Sphaerocystis	0.029	Ceratium	0.057	Pediastrum	0.039	Stephanodiscus	0.016
Scenedesmus	26,000	0.026	Anacystis	0.017	Cladocera	0.026	Ceratium	0.014	Cyclotella	0.057	Staurastrum	0.039	Pediastrum	0.008
Fragilaria	26,000	0.026	Coelosphaerium	0.017	Closterium	0.026	Asterionella	0.014	Nauplius	0.028	Epithemia	0.02	Staurastrum	0.008
Anacystis	26,000	0.026	Total	29.192	Copepoda	0.026	Synedra	0.014	Synedra	0.028	**Total**	294.575	Melosira	0.008
Total	891,129,719	891			Total	83.06	Cymbella	0.014	Pediastrum	0.014			Desmidium	0.008
							Closterium	0.014	Rotifera	0.014			**Total**	11.154
							Total	205.38	**Total**	35.728				

Lake Merced North East

2-Dec-03			27-May-04		29-Aug-04		27-Oct-04		9-Dec-04		9-Feb-05		18-Apr-05	
Organism	**No./m^3**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	1,100,000,000	1,100	Oscillatoria	520	Oscillatoria	350	Oscillatoria	310	Oscillatoria	350	Oscillatoria	350	Oscillatoria	640
Anabaena	340,000	0.340	Melosira	2.3	Coelosphaerium	7.4	Anabaena	5.5	Anabaena	15	Asterionella	33	Anabaena	8.6
Nauplius	170,000	0.170	Anabaena	1.1	Anabaena	2.3	Stephanodiscus	4.4	Stephanodiscus	2.7	Stephanodiscus	4.3	Aphanizomenon	5.5
Melosira	140,000	0.140	Ceratium	0.4	Ceratium	2.1	Closterium	4.1	Synedra	0.61	Synedra	3.7	Stephanodiscus	1.5
Mougeotia	140,000	0.140	Rotifera	0.25	Melosira	1.4	Fragilaria	1	Closterium	0.52	Anabaena	0.59	Ceratium	0.77
Closterium	100,000	0.100	Synedra	0.15	Fragilaria	0.87	Synedra	0.78	Coelosphaerium	0.3	Closterium	0.51	Closterium	0.55
Rotifera	69,000	0.069	Closterium	0.13	Synedra	0.82	Melosira	0.64	Asterionella	0.26	Melosira	0.18	Asterionella	0.29
Stephanodiscus	69,000	0.069	Nauplius	0.1	Asterionella	0.46	Rotifera	0.36	Melosira	0.16	Rotifera	0.12	Melosira	0.27
Copepoda	69,000	0.069	Pennate Diatom	0.1	Ophiocytium	0.1	Asterionella	0.32	Nauplius	0.07	Coelosphaerium	0.1	Cyclotella	0.22
Coelosphaerium	69,000	0.069	Fragilaria	0.076	Copepoda	0.051	Coelosphaerium	0.11	Cladocera	0.07	Staurastrum	0.081	Staurastrum	0.18
Ankistrodesmus	34,000	0.034	Cladocera	0.076001	Closterium	0.051	Staurastrum	0.085	Staurastrum	0.047	Cladocera	0.061	Rotifera	0.18
Synedra	34,000	0.034	Anacystis	0.076002	Nauplius	0.051	Ceratium	0.085	Copepoda	0.047	Cymbella	0.041	Coelosphaerium	0.13
Scenedesmus	34,000	0.034	Sphaerocystis	0.076003	Cladocera	0.026	Cymbella	0.021	Rotifera	0.023	Ceratium	0.02	Fragilaria	0.11
Cyclotella	34,000	0.034	Coelosphaerium	0.05	**Total**	365.629	**Total**	327.401	Fragilaria	0.023	**Total**	392.703	Nauplius	0.11
Total	1,101,302,000	1,101.302	Copepoda	0.025					Ceratium	0.023			Synedra	0.088
			Zygnema	0.025					**Total**	369.853			Copepoda	0.066
			Total	524.934006									Sphaerocystis	0.044
													Total	658.608

Lake Merced North

23-Jun-05		17-Aug-05		28-Sep-05		31-Oct-05			29-Nov-05		29-Dec-05		23-Jan-06		1-Mar-06	
Organism	**No./mL**	**Organism**	**No./m3**	**Organism**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./mL**			**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria (20:1dil)	290	*Oscillatoria*	270	*Oscillatoria*	480	*Oscillatoria*	280,000,000	280	*Oscillatoria*	460	*Oscillatoria*	360	*Oscillatoria*	190	*Oscillatoria*	260
Anabaena	4	*Closterium*	17	*Anabaena*	24.000	*Anabaena*	2,100,000	2	*Closterium*	4.3					*Melosira*	16
Aphanizomenon	1	*Melosira*	3.1	*Ceratium*	5.100	*Ceratium*	860,000	1	*Synedra*	0.45					*Anabaena*	14
Stephanodiscus	0.47	*Anabaena*	2.8	*Nauplius*	4.800	*Cladoceran*	170,000	0.17	*Stephanodiscus*	0.36					*Closterium*	12
Melosira	0.36	*Ceratium*	0.37	*Rotifera*	0.250	*Nauplius*	130,000	0.13	*Ceratium*	0.34					*Asterionella*	4.3
Nauplius	0.17	*Stephanodiscus*	0.21	Copepoda	0.170	*Rotifer*	77,000	0.08	*Melosira*	0.34					**Total**	306
Fragilaria	0.13	Copepoda	0.093	Cladocera	0.084	*Copepod*	58,000	0.06	Copepoda	0.23						
Copepoda	0.13	Nauplius	0.093	*Mallomonas*	0.084	**Total**	283,395,000	283	Rotifera	0.18						
Closterium	0.13	*Ankistrodesmus*	0.093	***Total***	514.000				Nauplius	0.16						
Rotifera	0.086	*Synedra*	0.093						*Anabaena*	0.14						
Ceratium	0.021	Rotifera	0.046						*Coelosphaerium*	0.11						
Nitzschia	0.021	*Epithemia*	0.023						Cladocera	0.09						
Scenedesmus	0.021	*Staurastrum*	0.023						*Pediastrum*	0.023						
Total	296.539	Cladocera	0.023						*Asterionella*	0.023						
		Pediastrum	0.023						*Ophiocytium*	0.023						
		Total	293.99						**Total**	466.769						

Lake Merced North East

23-Jun-05		17-Aug-05		28-Sep-05		31-Oct-05			29-Nov-05		29-Dec-05		23-Jan-06		1-Mar-06	
Organism	**No./mL**	**Organism**	**No./m3**	**Organism**	**No./mL**	**Organism**	**No./m3**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria (20:1 dil)	40	*Oscillatoria*	650	Oscillatoria	590	*Oscillatoria*	290,000,000	290	*Oscillatoria*	450	*Oscillatoria*	430	*Asterionella*	160	*Oscillatoria*	500
Anabaena	14	*Melosira*	6.3	Anabaena	3.1	*Ceratium*	1,700,000	2	*Closterium*	7.0			*Ceratium*	19	*Synedra*	5.9
Aphanizomenon	2.1	*Closterium*	5.0	Melosira	1.7	*Anabaena*	1,300,000	1	*Ceratium*	1.2			*Oscillatoria*	5.1	**Total**	506
Melosira	0.47	*Anabaena*	0.76	Rotifer	0.34	*Melosira*	700,000	1	*Stephanodiscus*	0.220			*Cyclotella*	1.3		
Rotifera	0.26	*Stephanodiscus*	0.55	Ceratium	0.26	*Ankistrodesmus*	690,000	1	Rotifera	0.190			*Copepoda*	1.3		
Closterium	0.26	*Synedra*	0.45	Nauplius	0.26	*Nauplius*	200,000	0.20	Nauplius	0.160			*Cladocera*	1.3		
Fragilaria	0.21	*Ceratium*	0.24	Copepoda	0.087	Rotifera	86,000	0.09	Cladocera	0.160			**Total**	188		
Stephanodiscus	0.21	Nauplius	0.21	**Total**	596	*Stephanodiscus*	86,000	0.09	*Asterionella*	0.064						
Nauplius	0.13	Rotifera	0.17			Cladocera	29,000	0.03	*Copepoda*	0.064						
Copepoda	0.064	*Sphaerocystis*	0.17			**Total**	294,791,000	295	*Pediastrum*	0.032						
Sphaerocystis	0.064	Copepoda	0.10						**Total**	918.020						
Ceratium	0.043	*Fragilaria*	0.034													
Asterionella	0.043	*Pinnularia*	0.034													
Coelosphaerium	0.043	*Asterionella*	0.034													
Dinobryon	0.021	**Total**	664													
Total	57.918															

Lake Merced North

26-Apr-06		14-Jun-06		24-Aug-06		25-Oct-06		20-Dec-06		29-Mar-07		26-Jun-07		20-Aug-07		27-Dec-07		28-Mar-08	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	320	*Oscillatoria*	490	*Oscillatoria*	230	*Oscillatoria*	680	*Oscillatoria*	1100	*Oscillatoria*	1300	*Oscillatoria*	1570	*Oscillatoria*	300			*Oscillatoria*	44
Anabaena	64													*Dictyosphaerium*	7.4			*Melosira*	4.6
Synedra	4.7													Total	307.4				49
Closterium	0.79																		
Total	389																		

Lake Merced North East

26-Apr-06		14-Jun-06		24-Aug-06		25-Oct-06		20-Dec-06		29-Mar-07		26-Jun-07		20-Aug-07		27-Dec-07		28-Mar-08	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	540	*Oscillatoria*	460	*Oscillatoria*	870	*Oscillatoria*	1100	*Oscillatoria*	1400	*Oscillatoria*	1680	*Oscillatoria*	270					*Oscillatoria*	4.7
																		Melosira	1.8
																		Total	6.5

Lake Merced North

10-Jun-08		24-Sep-08		4-Dec-08		24-Mar-09		4-Jun-09		22-Sep-09		15-Dec-09	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	128	*Oscillatoria*	22.8	*Oscillatoria*	160	*Oscillatoria*	410	*Oscillatoria*	990	*Oscillatoria*	1000	*Oscillatoria*	410

Lake Merced North East

10-Jun-08		24-Sep-08		4-Dec-08		24-Mar-09		4-Jun-09		22-Sep-09		15-Dec-09	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	74.6	*Oscillatoria*	29.4	*Oscillatoria*	120	*Oscillatoria*	610	*Oscillatoria*	1200	*Oscillatoria*	12000	*Oscillatoria*	550

Lake Merced South - Pistol Range

15-May-97		
Organism	**No./cuM**	**No./mL**
Oscillatoria	1,300,000,000	1,300
Anabaena	7,500,000	7.5
Ceratium	300,000	0.30
Copepoda	138,000	0.14
Staurastrum	138,000	0.14
Rotifera	79,000	0.079
Total	1,308,155,000	1,308

10-Sep-97		
Organism	**No./cuM**	**No./mL**
Oscillatoria	390,000,000	390
Anabaena	7,100,000	7
Total	397,100,000	397

3-Dec-97		
Organism	**No./cuM**	**No./mL**
Oscillatoria	1,000,000,000	1,000
Anabaena	1,200,000	1
Copepod	86,000	0
Rotifer	64,000	0
Ceratium	43,000	0
Total	1,001,393,000	1,001

16-Mar-98		
Organism	**No./cuM**	**No./mL**
Oscillatoria	540,000,000	540
Rotifer	130,000	0
Anabaena	78,000	0
Copepod	65,000	0
Total	540,273,000	540

8-Jul-98		
Organism	**No./cuM**	**No./mL**
Oscillatoria (1:50 dilution)	240,000,000	240
Ulothrix	13,000,000	13
Anabaena	1,200,000	1
Melosira	1,100,000	1
Nauplius	170,000	0
Copepod	150,000	0
Total	255,620,000	256

17-Mar-99		
Organism	**No./m^3**	**No./mL**
Oscillatoria	51,000,000	51
Mougeotia	110,000	0
Asterionella	840,000	1
Closterium	30,000	0
Nauplius	30,000	0
Spirulina	23,000	0
Copepoda	23,000	0
Actinastrum	15,000	0
Anabaena	15,000	0
Navicula	7,600	0
Fragilaria	7,600	0
Synedra	7,600	0
Anacystis	7,600	0
Staurastrum	7,600	0
Total	52,124,000	52

Lake Merced South - Pump Station

15-May-97		
Organism	**No./cuM**	**No./mL**
Oscillatoria	1,000,000,000	1,000
Anabaena	8,100,000	8
Ceratium	180,000	0
Copepod	39,000	0
Total	1,008,319,000	1,008

10-Sep-97		
Organism	**No./cuM**	**No./mL**
Oscillatoria	290,000,000	290
Anabaena	220,000	0
Dinobryon	56,000	0
Copepod	21,000	0
Total	290,297,000	290

3-Dec-97		
Organism	**No./cuM**	**No./mL**
Oscillatoria	1,000,000,000	1,000
Anabaena	620,000	1
Copepod	94,000	0
Rotifer	19,000	0
Total	1,000,733,000	1,001

16-Mar-98		
Organism	**No./cuM**	**No./mL**
Oscillatoria	87,000,000	87
Anabaena	28,000	0
Mougeotia	28,000	0
Rotifer	14,000	0
Total	87,070,000	87

8-Jul-98		
Organism	**No./cuM**	**No./mL**
Oscillatoria (1:50 dilution)	360,000,000	360
Ulothrix	7,900,000	8
Anabaena	2,000,000	2
Melosira	890,000	1
Copepod	90,000	0
Nauplius	90,000	0
Total	370,970,000	371

17-Mar-99		
Organism	**No./m^3**	**No./mL**
Oscillatoria	60,000,000	60
Mougeotia	130,000	0
Asterionella	100,000	0
Copepoda	46,000	0
Actinastrum	46,000	0
Spirulina	28,000	0
Nauplius	18,000	0
Rotifer	18,000	0
Closterium	18,000	0
Ankistrodesmus	18,000	0
Staurastrum	18,000	0
Ceratium	9,200	0
Anabaena	9,200	0
Synedra	9,200	0
Total	60,467,600	60

Appendix K

Lake Merced South - Pistol Range

21-Jun-99

Organism	No./m^3	No./mL
Oscillatoria	500,000,000	500
Mougeotia	2,500,000	3
Anabaena	2,000,000	2
Spirulina	320,000	0
Closteridium	230,000	0
Closterium	200,000	0
Scenedesmus	120,000	0
Gomphosphaeria	73,000	0
Rotifer	29,000	0
Copepoda	29,000	0
Navicula	14,000	0
Staurastrum	14,000	0
Synedra	14,000	0
Nauplius	14,000	0
Cymbella	14,000	0
Total	505,571,000	506

15-Sep-99

Organism	No./m^3	No./mL
Oscillatoria	450,000,000	450
Anabaena	8,900,000	9
Mougeotia	600,000	1
Spirulina	380,000	0
Mallomonas	220,000	0
Fragilaria	160,000	0
Anacystis	140,000	0
Copepoda	99,000	0
Staurastrum	99,000	0
Naviculoid Diatom	79,000	0
Gomphosphaeria	79,000	0
Cyclotella	40,000	0
Closterium	40,000	0
Nauplius	40,000	0
Actinastrum	20,000	0
Scenedesmus	20,000	0
Pinnularia	20,000	0
Tetraedron	20,000	0
Total	460,956,000	461

8-Dec-99

Organism	No./m^3	No./mL
Oscillatoria	868,706,613	869
Mougeotia	251,495	0
Spirulina	188,621	0
Anabaena	167,664	0
Scenedesmus	104,790	0
Closterium	62,874	0
Microcystis	62,874	0
Nauplius	41,916	0
Naviculoid Diatom	41,916	0
Actinastrum	20,958	0
Rotifer	20,958	0
Pinnularia	20,958	0
Cymbella	20,958	0
Copepoda	20,958	0
Total	869,733,552	870

21-Mar-00

Organism	No./m^3	No./mL
Oscillatoria	1,600,000,000	1,600
Melosira	2,900,000	3
Anabaena	2,500,000	3
Closterium	2,500,000	3
Mougeotia	1,800,000	2
Synedra	730,000	1
Scenedesmus	730,000	1
Microcystis	360,000	0
Nauplius	360,000	0
Staurastrum	360,000	0
Total	1,612,240,000	1,612

21-Jun-00

Organism	No./m^3	No./mL
Oscillatoria	370,000,000	370
Anabaena	11,000,000	11
Melosira	1,700,000	2
Mougeotia	320,000	0
Chlorella	160,000	0
Ankistrodesmus	150,000	0
Closterium	84,000	0
Closteriopsis	84,000	0
Nauplius	66,000	0
Copepoda	56,000	0
Navicula	56,000	0
Coelosphaerium	47,000	0
Scenedesmus	38,000	0
Coelastrum	19,000	0
Amphora	19,000	0
Dinobryon	9,400	0
Staurastrum	9,400	0
Cladocera	9,400	0
Pinnularia	9,400	0
Synedra	9,400	0
Total	383,846,000	384

Lake Merced South - Pump Station

21-Jun-99

Organism	No./m^3	No./mL
Oscillatoria	660,000,000	660
Anabaena	3,200,000	3
Mougeotia	1,900,000	2
Spirulina	550,000	1
Closteridium	280,000	0
Closterium	260,000	0
Scenedesmus	94,000	0
Copepoda	47,000	0
Navicula	47,000	0
Synedra	31,000	0
Anacystis	16,000	0
Gomphosphaeria	16,000	0
Epithemia	16,000	0
Pinnularia	16,000	0
Total	666,473,000	666

15-Sep-99

Organism	No./m^3	No./mL
Oscillatoria	590,000,000	590
Anabaena	23,000,000	23
Spirulina	1,300,000	1
Mougeotia	500,000	1
Gomphosphaeria	120,000	0
Ceratium	99,000	0
Anacystis	99,000	0
Ankistrodesmis	99,000	0
Closterium	79,000	0
Staurastrum	60,000	0
Cymbella	40,000	0
Nauplius	40,000	0
Mallomonas	40,000	0
Tetraedron	20,000	0
Copepoda	20,000	0
Fragilaria	20,000	0
Pinnularia	20,000	0
Actinastrum	20,000	0
Total	615,576,000	616

8-Dec-99

Organism	No./m^3	No./mL
Oscillatoria	1,060,499,160	1,060
Spirulina	362,449	0
Mougeotia	93,968	0
Microcystis	80,544	0
Anabaena	67,120	0
Naviculoid Diatom	53,696	0
Pinnularia	40,272	0
Gleocystis	13,424	0
Fragilaria	13,424	0
Total	1,061,224,058	1,061

21-Mar-00

Organism	No./m^3	No./mL
Oscillatoria	1,600,000,000	1,600
Melosira	3,100,000	3
Synedra	1,600,000	2
Anabaena	1,500,000	2
Scenedesmus	1,000,000	1
Mougeotia	1,000,000	1
Total	1,608,200,000	1,608

21-Jun-00

Organism	No./m^3	No./mL
Oscillatoria	330,000,000	330
Anabaena	12,000,000	12
Melosira	2,000,000	2
Coelosphaerium	110,000	0
Copepoda	99,000	0
Chlorella	99,000	0
Closterium	99,000	0
Ankistrodesmus	55,000	0
Fragilaria	44,000	0
Ceratium	44,000	0
Synedra	33,000	0
Nauplius	33,000	0
Rotifera	33,000	0
Navicula	33,000	0
Dinobryon	33,000	0
Polyblepharides	22,000	0
Staurastrum	22,000	0
Caloneis	11,000	0
Total	344,770,000	345

Lake Merced South - Pistol Range

9-Aug-00		
Organism	**No./m^3**	**No./mL**
Oscillatoria	1,300,000,000	1,300
Anabaena	5,500,000	6
Melosira	1,400,000	1
Ankistrodesmus	200,000	0
Coelosphaerium	180,000	0
Mougeotia	160,000	0
Closteriopsis	130,000	0
Actinastrum	110,000	0
Synedra	72,000	0
Copepoda	54,000	0
Scenedesmus	18,000	0
Amphora	18,000	0
Closterium	18,000	0
Total	1,307,860,000	1,308

19-Dec-00		
Organism	**No./m^3**	**No./mL**
*Oscillatoria** (dil 10x)	400,000,000	400
Mougeotia	600,000	1
Melosira	490,000	0
Closterium	330,000	0
Anacystis	270,000	0
Coelosphaerium	190,000	0
Anabaena	120,000	0
Pinnularia	62,000	0
Epithemia	62,000	0
Copepoda	41,000	0
Rotifera	41,000	0
Synedra	41,000	0
Nauplius	21,000	0
Ankistrodesmus	21,000	0
Navicula	21,000	0
Total	402,310,000	402

7-Mar-01		
Organism	**No./m^3**	**No./mL**
Oscillatoria	520,000,000	520
Melosira	3,800,000	4
Closterium	180,000	0
Anacystis	140,000	0
Synedra	120,000	0
Anabaena	53,000	0
Copepoda	35,000	0
Nauplius	35,000	0
Rotifera	35,000	0
Ankistrodesmus	18,000	0
Navicula	18,000	0
Cymbella	18,000	0
Cocconeis	18,000	0
Total	524,470,000	524

20-Jun-01		
Organism	**No./m^3**	**No./mL**
Oscillatoria	840,000,000	840
Anabaena	6,800,000	7
Melosira	2,200,000	2
Stephanodiscus	1,700,000	2
Cyclotella	1,100,000	1
Aphanizomenon	1,100,000	1
Dinobryon	470,000	0
Fragilaria	420,000	0
Anacystis	210,000	0
Coelosphaerium	150,000	0
Rotifera	130,000	0
Copepoda	95,000	0
Closterium	95,000	0
Staurastrum	76,000	0
Gloeocystis	76,000	0
Nauplius	57,000	0
Kirchneriella	38,000	0
Synedra	38,000	0
Synedra	38,000	0
Ceratium	19,000	0
Epithemia	19,000	0
Tetraedron	19,000	0
Total	854,850,000	855

1-Oct-01		
Organism	**No./m^3**	**No./mL**
Oscillatoria	1,300,000,000	1,300
Anabaena	8,600,000	9
Melosira	2,400,000	2
Coelosphaerium	240,000	0
Ankistrodesmus	96,000	0
Closterium	96,000	0
Rotifera	72,000	0
Ceratium	72,000	0
Copepoda	24,000	0
Scenedesmus	24,000	0
Total	1,311,624,000	1,312

Lake Merced South - Pump Station

9-Aug-00		
Organism	**No./m^3**	**No./mL**
Oscillatoria	1,300,000,000	1,300
Anabaena	7,300,000	7
Melosira	1,300,000	1
Coelosphaerium	270,000	0
Ankistrodesmus	200,000	0
Mougeotia	98,000	0
Synedra	39,000	0
Copepoda	20,000	0
Closteriopsis	20,000	0
Epithemia	20,000	0
Scenedesmus	20,000	0
Nauplius	20,000	0
Ceratium	20,000	0
Rotifera	20,000	0
Chlorella	20,000	0
Stephanodiscus	20,000	0
Staurastrum	20,000	0
Cymbella	20,000	0
Total	1,309,427,000	1,309

19-Dec-00		
Organism	**No./m^3**	**No./mL**
Oscillatoria (dil 10x)	450,000,000	450
Melosira	550,000	1
Mougeotia	450,000	0
Copepoda	130,000	0
Anacystis	130,000	0
Coelosphaerium	85,000	0
Closterium	85,000	0
Anabaena	64,000	0
Rotifera	43,000	0
Pinnularia	43,000	0
Cymbella	43,000	0
Navicula	43,000	0
Epithemia	43,000	0
Synedra	21,000	0
Ankistrodesmus	21,000	0
Total	451,751,000	452

7-Mar-01		
Organism	**No./m^3**	**No./mL**
Oscillatoria	570,000,000	570
Melosira	4,000,000	4
Closterium	190,000	0
Synedra	140,000	0
Scenedesmus	85,000	0
Anacystis	51,000	0
Ankistrodesmus	51,000	0
Anabaena	51,000	0
Nauplius	51,000	0
Fragilaria	34,000	0
Ophiocytium	17,000	0
Epithemia	17,000	0
Coelosphaerium	17,000	0
Staurastrum	17,000	0
Copepoda	17,000	0
Total	574,738,000	575

20-Jun-01		
Organism	**No./m^3**	**No./mL**
Oscillatoria (dil 50:1)	870,000,000	870
Anabaena	3,000,000	3
Melosira	2,100,000	2
Aphanizomenon	650,000	1
Fragilaria	550,000	1
Anacystis	450,000	0
Dinobryon	380,000	0
Cyclotella	280,000	0
Coelosphaerium	120,000	0
Kirchneriella	120,000	0
Copepoda	83,000	0
Navicula	50,000	0
Cymbella	50,000	0
Closterium	50,000	0
Ceratium	33,000	0
Staurastrum	33,000	0
Synedra	17,000	0
Nauplius	17,000	0
Rotifera	17,000	0
Pinnularia	17,000	0
Gloeocystis	17,000	0
Amphora	17,000	0
Scenedesmus	17,000	0

1-Oct-01		
Organism	**No./m^3**	**No./mL**
Oscillatoria	990,000,000	990
Melosira	1,800,000	2
Anabaena	590,000	1
Dictyosphaerium	540,000	1
Ankistrodesmus	280,000	0
Closterium	240,000	0
Rotifera	160,000	0
Cyclotella	71,000	0
Copepoda	47,000	0
Nauplius	47,000	0
Ophiocytium	24,000	0
Pinnularia	24,000	0
Total	993,823,000	994

Lake Merced South - Pistol Range

18-Dec-01

Organism	No./m^3	No./mL
Oscillatoria	820,000,000	820
Melosira	4,000,000	4
Closterium	220,000	0
Anabaena	160,000	0
Ankistrodesmus	160,000	0
Copepoda	69,000	0
Pinnularia	69,000	0
Fragilaria	52,000	0
Staurastrum	34,000	0
Synedra	17,000	0
Rotifera	17,000	0
Pediastrum	17,000	0
Scenedesmus	17,000	0
Total	824,832,000	825

5-Mar-02

Organism	No./m^3	No./mL
Oscillatoria (50:1 dil)	600,000,000	600
Anabaena	1,000,000	1
Dinobryon	400,000	0
Mougeotia	360,000	0
Stephanodiscus	130,000	0
Anacystis	110,000	0
Rotifera	95,000	0
Synedra	76,000	0
Nauplius	76,000	0
Spirulina	76,000	0
Melosira	38,000	0
Fragilaria	19,000	0
Navicula	19,000	0
Closterium	19,000	0
Ankistrodesmus	19,000	0
Total	602,437,000	602

30-Apr-02

Organism	No./m^3	No./mL
Oscillatoria	760,000,000	760
Melosira	4,100,000	4
Anabaena	2,600,000	3
Closterium	210,000	0
Ankistrodesmus	170,000	0
Rotifera	150,000	0
Copepoda	58,000	0
Nauplius	39,000	0
Dictyosphaerium	39,000	0
Total	767,366,000	767

18-Jun-02

Organism	No./m^3	No./mL
Oscillatoria	1,700,000,000	1,700
Melosira	7,300,000	7
Anabaena	1,600,000	2
Ankistrodesmus	230,000	0
Closterium	210,000	0
Cyclotella	150,000	0
Rotifera	130,000	0
Scenedesmus	85,000	0
Copepoda	85,000	0
Cymbella	64,000	0
Nauplius	64,000	0
Synedra	42,000	0
Pinnularia	21,000	0
Staurastrum	21,000	0
Cladocera	21,000	0
Total	1,710,023,000	1,710

23-Aug-02

Organism	No./m^3	No./mL
Oscillatoria (50:1 dil)	1,000,000,000	1,000
Anabaena	12,000,000	12
Melosira	1,100,000	1
Ankistrodesmus	280,000	0
Nauplius	190,000	0
Closterium	160,000	0
Stephanodiscus	140,000	0
Copepoda	120,000	0
Diatoma	92,000	0
Coelosphaerium	92,000	0
Navicula	92,000	0
Rotifera	69,000	0
Scenedesmus	69,000	0
Gloeocystis	69,000	0
Staurastrum	46,000	0
Synedra	46,000	0
Pinnularia	46,000	0
Fragilaria	23,000	0
Mallomonas	23,000	0
Cladocera	23,000	0
Dictyosphaerium	23,000	0
Oedogonium	23,000	0
Pediastrum	23,000	0
Total	1,014,749,000	1,015

Lake Merced South - Pump Station

18-Dec-01

Organism	No./m^3	No./mL
Oscillatoria	960,000,000	960
Melosira	2,800,000	3
Anabaena	780,000	1
Closterium	98,000	0
Copepoda	49,000	0
Epithemia	49,000	0
Ankistrodesmus	33,000	0
Staurastrum	33,000	0
Fragilaria	16,000	0
Nauplius	16,000	0
Rotifera	16,000	0
Total	963,890,000	964

5-Mar-02

Organism	No./m^3	No./mL
Oscillatoria	600,000,000	600
Anabaena	380,000	0
Mougeotia	380,000	0
Dinobryon	330,000	0
Melosira	180,000	0
Rotifera	160,000	0
Coelosphaerium	130,000	0
Stephanodiscus	120,000	0
Nauplius	82,000	0
Closterium	82,000	0
Anacystis	66,000	0
Spirulina	66,000	0
Ankistrodesmus	49,000	0
Kirchneriella	33,000	0
Fragilaria	16,000	0
Mallomonas	16,000	0
Copepoda	16,000	0
Total	602,106,000	602

30-Apr-02

Organism	No./m^3	No./mL
Oscillatoria	900,000,000	900
Melosira	6,900,000	7
Anabaena	3,700,000	4
Closteridium	530,000	1
Rotifera	100,000	0
Ankistrodesmus	100,000	0
Nauplius	79,000	0
Synedra	26,000	0
Copepoda	26,000	0
Staurastrum	26,000	0
Total	911,487,000	911

18-Jun-02

Organism	No./m^3	No./mL
Oscillatoria	2,500,000,000	2,500
Melosira	8,900,000	9
Ankistrodesmus	510,000	1
Cyclotella	400,000	0
Anabaena	280,000	0
Staurastrum	260,000	0
Closterium	230,000	0
Copepoda	170,000	0
Rotifera	140,000	0
Scenedesmus	110,000	0
Cymbella	57,000	0
Cladocera	57,000	0
Pinnularia	28,000	0
Total	2,511,142,000	2,511

23-Aug-02

Organism	No./m^3	No./mL
Oscillatoria (50:1 dil)	930,000,000	930
Anabaena	7,600,000	8
Melosira	330,000	0
Mougeotia	130,000	0
Coelosphaerium	100,000	0
Stephanodiscus	83,000	0
Synedra	67,000	0
Nauplius	67,000	0
Scenedesmus	50,000	0
Ankistrodesmus	50,000	0
Diatoma	50,000	0
Copepoda	33,000	0
Rotifera	33,000	0
Closterium	33,000	0
Sphaerocystis	33,000	0
Euglena	33,000	0
Ceratium	17,000	0
Anacystis	17,000	0
Navicula	17,000	0
Tetraedron	17,000	0
Ophiocytium	17,000	0
Total	938,777,000	939

Appendix K

Lake Merced South - Pistol Range

23-Oct-02			11-Feb-03			14-May-03			15-Jul-03			30-Sep-03		
Organism	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**
Oscillatoria	930,000,000	930	*Oscillatoria*	1,100,000,000	1,100	*Oscillatoria*	1,200,000,000	1,200	*Oscillatoria*	1,300,000,000	1,300	*Oscillatoria*	1,100,000,000	1,100
Anabaena	2,600,000	3	*Melosira*	3,100,000	3	*Melosira*	8,400,000	8	*Anabaena*	3,800,000	4	*Anabaena*	4,100,000	4
Melosira	780,000	1	*Closterium*	250,000	0	*Closterium*	490,000	0	*Melosira*	1,900,000	2	*Melosira*	190,000	0
Nauplius	280,000	0	Rotifera	130,000	0	*Synedra*	380,000	0	Copepoda	110,000	0	*Ceratium*	160,000	0
Rotifera	87,000	0	Copepoda	100,000	0	*Ankistrodesmus*	380,000	0	*Closterium*	61,000	0	*Closterium*	160,000	0
Closterium	65,000	0	*Cyclotella*	100,000	0	Rotifera	220,000	0	Nauplius	46,000	0	Copepoda	160,000	0
Epithemia	43,000	0	*Cymbella*	51,000	0	*Scenedesmus*	160,000	0	*Cymbella*	46,000	0	Rotifera	130,000	0
Synedra	22,000	0	Nauplius	25,000	0	Nauplius	82,000	0	Rotifera	30,000	0	Nauplius	53,000	0
Copepoda	22,000	0	*Synedra*	25,000	0	*Staurastrum*	55,000	0	*Staurastrum*	15,000	0	*Epithemia*	27,000	0
Ankistrodesmus	22,000	0	*Scenedesmus*	25,000	0	*Anabaena*	55,000	0	*Cyclotella*	15,000	0	**Total**	1,104,980,000	1,105
Scenedesmus	22,000	0	*Ankistrodesmus*	25,000	0	*Asterionella*	27,000	0	**Total**	1,306,023,000	1,306			
Pinnularia	22,000	0	**Total**	1,103,831,000	1,104	*Epithemia*	27,000	0						
Total	933,965,000	934				*Ceratium*	27,000	0						
						Copepoda	27,000	0						
						Total	1,210,330,000	1,210						

Lake Merced South - Pump Station

23-Oct-02			11-Feb-03			14-May-03			15-Jul-03			30-Sep-03		
Organism	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**	**Organism**	**No./m^3**	**No./mL**
Oscillatoria	1,100,000,000	1,100	*Oscillatoria*	1,100,000,000	1,100	*Oscillatoria*	980,000,000	980	*Oscillatoria*	700,000,000	700	*Oscillatoria*	550,000,000	550
Anabaena	4,800,000	5	*Melosira*	3,300,000	3	*Melosira*	5,200,000	5	*Anabaena*	7,400,000	7	*Anabaena*	3,800,000	4
Melosira	370,000	0	*Closterium*	160,000	0	*Anabaena*	320,000	0	*Melosira*	1,800,000	2	*Melosira*	430,000	0
Rotifera	110,000	0	Rotifera	110,000	0	*Ankistrodesmus*	230,000	0	*Ankistrodesmus*	75,000	0	*Ceratium*	220,000	0
Ankistrodesmus	65,000	0	*Cyclotella*	90,000	0	*Synedra*	110,000	0	*Closterium*	56,000	0	*Rotifera*	220,000	0
Cyclotella	43,000	0	Nauplius	45,000	0	Rotifera	85,000	0	Copepoda	56,000	0	*Nauplius*	140,000	0
Nauplius	43,000	0	*Ankistrodesmus*	45,000	0	Copepoda	64,000	0	*Staurastrum*	37,000	0	*Closterium*	68,000	0
Closterium	43,000	0	*Cymbella*	45,000	0	Nauplius	21,000	0	*Synedra*	37,000	0	*0*	45,000	0
Staurastrum	22,000	0	*Scenedesmus*	45,000	0	*Staurastrum*	21,000	0	*Cymbella*	19,000	0	*Synedra*	22,000	0
Copepoda	22,000	0	*Synedra*	45,000	0	*Scenedesmus*	21,000	0	Cladocera	19,000	0	**Total**	554,945,000	555
Epithemia	22,000	0	*Anabaena*	23,000	0	**Total**	986,072,000	986	Nauplius	19,000	0			
Ceratium	22,000	0	*Staurastrum*	23,000	0				*Cyclotella*	19,000	0			
Total	1,105,562,000	1,106	Copepoda	23,000	0				**Total**	709,537,000	710			
			Ophiocytium	23,000	0									
			Total	1,103,977,000	1,104									

Lake Merced South - Pistol Range

2-Dec-03

Organism	No./m^3	No./mL
Oscillatoria	660,000,000	660
Anabaena	540,000	1
Fragilaria	670,000	1
Mougeotia	200,000	0
Ankistrodesmus	98,000	0
Nauplius	74,000	0
Coelosphaerium	74,000	0
Closterium	74,000	0
Rotifera	49,000	0
Melosira	49,000	0
Cyclotella	49,000	0
Ceratium	25,000	0
Synedra	25,000	0
Cladocera	25,000	0
Pennate Diatom	25,000	0
Total	661,977,000	662

27-May-04

Organism	No./mL
Oscillatoria	505
Melosira	1.3
Anabaena	1.1
Stephanodiscus	0.35
Closterium	0.24
Ankistrodesmus	0.11
Pennate Diatom	0.11
Synedra	0.089
Scenedesmus	0.089
Coelosphaerium	0.067
Tetraedron	0.067
Staurastrum	0.044
Copepoda	0.044
Nauplius	0.044
Rotifera	0.044
Anacystis	0.044
Dinobryon	0.022
Asterionella	0.022
Total	508.786

29-Aug-04

Organism	No./mL
Oscillatoria	1600
Anabaena	11
Melosira	1.1
Copepoda	0.078
Closterium	0.078
Rotifera	0.026
Ankistrodesmus	0.026
Nauplius	0.026
Total	1612.334

27-Oct-04

Organism	No./mL
Oscillatoria	2100
Anabaena	4.7
Melosira	1.2
Ceratium	0.12
Rotifera	0.094
Fragilaria	0.031
Coelosphaerium	0.031
Scenedesmus	0.031
Closterium	0.031
Synedra	0.031
Nauplius	0.031
Total	2106.3

9-Dec-04

Organism	No./mL
Oscillatoria	1400
Melosira	0.33
Anabaena	0.14
Closterium	0.094
Copepoda	0.07
Rotifera	0.047
Coelosphaerium	0.024
Nauplius	0.024
Total	1400.729

9-Feb-05

Organism	No./mL
Oscillatoria	910
Melosira	0.92
Anabaena	0.19
Closterium	0.12
Coelosphaerium	0.073
Asterionella	0.073
Nauplius	0.024
Rotifera	0.024
Synedra	0.024
Total	911.448

18-Apr-05

Organism	No./mL
Oscillatoria	630
Melosira	5.4
Anabaena	5.3
Asterionella	1
Closterium	0.55
Synedra	0.26
Rotifera	0.16
Ankistrodesmus	0.065
Nauplius	0.032
Epithemia	0.032
Copepoda	0.032
Total	642.831

Lake Merced South - Pump Station

2-Dec-03

Organism	No./m^3	No./mL
Oscillatoria	700,000,000	700
Anabaena	250,000	0
Mougeotia	250,000	0
Melosira	250,000	0
Ankistrodesmus	230,000	0
Fragilaria	140,000	0
Nauplius	91,000	0
Closterium	91,000	0
Ankistrodesmus	68,000	0
Cladocera	23,000	0
Copepoda	23,000	0
Rotifera	23,000	0
Xanthidium	23,000	0
Pennate Diatom	23,000	0
Cyclotella	23,000	0
Total	701,508,000	702

27-May-04

Organism	No./mL
Oscillatoria (10:1)	440
Melosira	0.92
Anabaena	0.9
Stephanodiscus	0.26
Closterium	0.13
Copepoda	0.064
Rotifera	0.064
Anacystis	0.064
Dinobryon	0.043
Synedra	0.043
Nauplius	0.043
Coelosphaerium	0.043
Pennate Diatom	0.043
Tetraedron	0.043
Scenedesmus	0.043
Staurastrum	0.021
Ankistrodesmus	0.021
Spirogyra	0.021
Total	442.766

29-Aug-04

Organism	No./mL
Oscillatoria	1400
Anabaena	1.6
Melosira	1.3
Ankistrodesmus	0.12
Rotifera	0.093
Ceratium	0.093
Closterium	0.07
Synedra	0.023
Total	1403.299

27-Oct-04

Organism	No./mL
Oscillatoria	1900
Anabaena	3
Melosira	0.81
Ceratium	0.21
Rotifera	0.12
Closterium	0.09
Ankistrodesmus	0.06
Staurastrum	0.03
Copepoda	0.03
Stephanodiscus	0.03
Total	1904.38

9-Dec-04

Organism	No./mL
Oscillatoria	850
Melosira	0.27
Closterium	0.11
Anabaena	0.08
Coelosphaerium	0.027
Copepoda	0.027
Cymbella	0.027
Total	850.541

9-Feb-05

Organism	No./mL
Oscillatoria	1200
Melosira	1.2
Anabaena	0.17
Synedra	0.11
Coelosphaerium	0.083
Nauplius	0.083
Rotifera	0.055
Copepoda	0.055
Closterium	0.055
Ankistrodesmus	0.028
Scenedesmus	0.028
Total	1201.867

18-Apr-05

Organism	No./mL
Oscillatoria	500
Melosira	4.5
Anabaena	2.8
Asterionella	0.42
Closterium	0.29
Synedra	0.13
Rotifera	0.032
Copepoda	0.016
Epithemia	0.016
Coelosphaerium	0.016
Total	508.22

Lake Merced South - Pistol Range

23-Jun-05		17-Aug-05		28-Sep-05		31-Oct-05			29-Nov-05		29-Dec-05		23-Jan-06		1-Mar-06	
Organism	**No./mL**	**Organism**	**No./m3**	**Organism**	**No./mL**	**Organism**	**No./m3**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria (20:1 dil)	580	Oscillatoria	410	Oscillatoria	620	Oscillatoria	870,000,000	870	Oscillatoria	840	Oscillatoria	1100	Oscillatoria	940	Oscillatoria	830
Anabaena	25	Melosira	16	Anabaena	12	Anabaena	5,700,000	6	Melosira	11						
Aphanizomenon	13	Anabaena	3.5	Copepod	0.59	Rotifera	170,000	0.17	Anabaena	3						
Melosira	0.41	Closterium	0.32	Nauplius	0.39	Nauplius	83,000	0.08	Copepoda	0.082						
Stephanodiscus	0.22	Ceratium	0.065	Melosira	0.28	Ceratium	63,000	0.06	Closterium	0.055						
Coelosphaerium	0.12	Ankistrodesmus	0.043	Ceratium	0.19	Copepod	21,000	0.02	Ankistrodesmus	0.028						
Ceratium	0.059	Nauplius	0.043	Pediastrum	0.095	**Total**	876,078,988	876	Asterionella	0.028						
Closterium	0.059	Copepoda	0.022	**Total**	634				**Total**	854						
Mallomonas	0.039	**Total**	429.993													
Nauplius	0.039															
Scenedesmus	0.039															
Fragilaria	0.039															
Asterionella	0.039															
Cladocera	0.02															
Copepoda	0.02															
Rotifera	0.02															
Staurastrum	0.02															
Synedra	0.02															
Total	619.2															

Lake Merced South - Pump Station

23-Jun-05		17-Aug-05		28-Sep-05		31-Oct-05			29-Nov-05		29-Dec-05		23-Jan-06		1-Mar-06	
Organism	**No./mL**	**Organism**	**No./m3**	**Organism**	**No./mL**	**Organism**	**No./m3**		**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria (20:1 dil)	651.8251425	Oscillatoria	700	Oscillatoria	590	Oscillatoria	810		Oscillatoria	980	Oscillatoria	1200	Oscillatoria	1000	Oscillatoria	850
Anabaena	25.5122959	Melosira	18	Anabaena	6.5	Anacystis	140		Melosira	10						
Aphanizomenon	16.42412456	Anabaena	4	Nauplius	0.16	Melosira	11		Anabaena	3.4						
Melosira	0.350443625	Ceratium	0.28	Ceratium	0.16	Anabaena	8.1		Closterium	0.1						
Stephanodiscus	0.186903267	Closterium	0.17	Copepoda	0.082	Closterium	0.4		Nauplius	0.05						
Cyclotella	0.163540358	Copepoda	0.087	Melosira	0.082	Stephanodiscus	0.06		Asterionella	0.025						
Ceratium	0.14017745	Rotifera	0.065	**Total**	597	Rotifera	0.04		Epithemia	0.025						
Nauplius	0.070088725	Ankistrodesmus	0.065			Epithemia	0.04		Coelosphaerium	0.025						
Rotifera	0.070088725	Stephanodiscus	0.043			Copepoda	0.04		Ankistrodesmus	0.025						
Coelosphaerium	0.070088725	Coelosphaerium	0.022			Ophiocytium	0.02		**Total**	994						
Fragilaria	0.046725817	Asterionella	0.022			Nauplius	0.02									
Copepoda	0.046725817	Nauplius	0.022			**Total**	969.72									
Navicula	0.046725817	Epithemia	0.022													
Dinobryon	0.023362908	**Total**	722.798													
Cladocera	0.023362908															
Closterium	0.023362908															
Pinnularia	0.023362908															
Scenedesmus	0.023362908															
Total	695.0698858															

Lake Merced South - Pistol Range

26-Apr-06		14-Jun-06		24-Aug-06		25-Oct-06		20-Dec-06		29-Mar-07		26-Jun-07		20-Aug-07		27-Dec-07		28-Mar-08	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	1200	*Oscillatoria*	1300	*Oscillatoria*	1,000	*Oscillatoria*	1,700	*Oscillatoria*	840	*Oscillatoria*	430	*Oscillatoria*	510	*Oscillatoria*	790	*Oscillatoria*	630	*Oscillatoria*	35
Melosira	36	*Anabeana*	3.8																
Synedra	9.0	*Melosira*	2.5																
Asterionella	6.4	**Total**	1306.3																
Anabaena	6.4																		
Closterium	3.9																		
Fragilaria	1.3																		
Total	1263																		

Lake Merced South - Pump Station

26-Apr-06		14-Jun-06		24-Aug-06		25-Oct-06		20-Dec-06		29-Mar-07		26-Jun-07		20-Aug-07		27-Dec-07		28-Mar-08	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	970	*Oscillatoria*	730	*Oscillatoria*	1200	*Oscillatoria*	1,700	*Oscillatoria*	1000	*Oscillatoria*	400	*Oscillatoria*	550	NA		*Oscillatoria*	740	*Oscillatoria*	63
Melosira	44	*Anabaena*	3.4																
Anabaena	14	*Melosira*	2.3																
Synedra	6.4	**Total**	736																
Asterionella	4.8																		
Closterium	3.2																		
Total	1042																		

Lake Merced South - Pistol Range

10-Jun-08		24-Sep-08		4-Dec-08		24-Mar-09		4-Jun-09		22-Sep-09		15-Dec-09	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	35	*Oscillatoria*	52	*Oscillatoria*	76	*Oscillatoria*	320	*Oscillatoria*	630	*Oscillatoria*	1800	*Oscillatoria*	910

Lake Merced South - Pump Station

10-Jun-08		24-Sep-08		4-Dec-08		24-Mar-09		4-Jun-09		22-Sep-09		15-Dec-09	
Organism	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**	**Organism**	**No./mL**
Oscillatoria	17	*Oscillatoria*	54	*Oscillatoria*	340	*Oscillatoria*	430	*Oscillatoria*	750	*Oscillatoria*	1500	*Oscillatoria*	850

Lake Merced North

Secchi Disc	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02
Depth (feet)	2.0	1.2	1.5	2.0	1.0	1.0	2.0		1.0	1.0	1.5	1.0	1.0	1.0	1.5	1.0	1.0	1.0	2.0

Lake Merced North East

Secchi Disc	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02
Depth (feet)	2.5		3.3	2.0	1.5	1.5	1.0		1.0	1.0	1.2	1.5	1.5	1.0	1.0	1.0	1.0	1.0	2.0

Lake Merced South - Pistol Range

Secchi Disc	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02
Depth (feet)	1.7	1.0	1.5	2.0	2.5	1.5	2.5	1.5	1.0	1.0	1.4	1.5	1.5	2.5	2.5	1.0	1.0	1.5	2.5

Lake Merced South - Pump Station

Secchi Disc	15-May-97	10-Sep-97	3-Dec-97	16-Mar-98	8-Jul-98	23-Sep-98	17-Mar-99	21-Jun-99	15-Sep-99	8-Dec-99	21-Mar-00	21-Jun-00	9-Aug-00	19-Dec-00	7-Mar-01	20-Jun-01	1-Oct-01	18-Dec-01	5-Mar-02
Depth (feet)	1.7	1.0	1.5	2.0	2.5	1.5	2.5	1.5	1.0	1.0	1.8	1.5	1.5	2.0	2.5	1.0	1.0	1.5	2.0

Lake Merced North

Secchi Disc	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05
Depth (feet)	1.0	1.0	1.0	1.5	1.0	1.0	1.0		1.0	7.0	2.5	2.0	5.0	4.5	10.0		2.0	1.5	2.0	2.0

Lake Merced North East

Secchi Disc	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05
Depth (feet)	1.0	1.0	1.0	1.5	1.0	1.5	1.5	1.5	1.0	2.5	1.5	2.5	2.0	2.5	2.0		1.5	1.5	2.0	2.0

Lake Merced South - Pistol Range

Secchi Disc	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05
Depth (feet)	2.0	1.5	2.0	2.0	1.5	1.5	1.5	2.0	1.5	2.5	1.5	1.5	2.0	2.5	3.0	1.5	2.0	2.0	2.0	2.0

Lake Merced South - Pump Station

Secchi Disc	30-Apr-02	18-Jun-02	23-Aug-02	23-Oct-02	11-Feb-03	14-May-03	15-Jul-03	30-Sep-03	2-Dec-03	27-May-04	29-Aug-04	27-Oct-04	9-Dec-04	9-Feb-05	18-Apr-05	23-Jun-05	17-Aug-05	28-Sep-05	31-Oct-05	29-Nov-05
Depth (feet)	2.0	1.5	2.0	1.5	1.5	2.0	1.5	1.5	2.0	2.5	1.3	1.5	2.0	2.5	3.0	1.5	2.5	2.0	1.5	2.0

Lake Merced
North

Secchi Disc	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth (feet)	2.5	2.5	3.0		1.5	1.0	1.5	1.0	1.5	1.0	0.5	1.5	2.5	1.0	0.8	2.0	2.0	1.3	1.0	1.5

Lake Merced North
East

Secchi Disc	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth (feet)	1.5	1.5	1.5	6.5	1.5	1.0	1.5	1.5	1.5	1.0	0.5	2.5	3.0	1.0	0.5	2.0	2.0	1.5	1.0	1.5

Lake Merced
South - Pistol
Range

Secchi Disc	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth (feet)	2.0	2.0	2.0	2.0	1.5	1.5	1.5	2.5	2.5	1.5	1.5	2.0	3.0	2.0	1.2	1.8	2.5	2.0	1.3	2.0

Lake Merced
South - Pump
Station

Secchi Disc	29-Dec-05	23-Jan-06	1-Mar-06	26-Apr-06	14-Jun-06	24-Aug-06	25-Oct-06	20-Dec-06	29-Mar-07	26-Jun-07	20-Aug-07	27-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09	15-Dec-09
Depth (feet)	2.0	2.0	2.0	2.0	1.5	1.5	1.5	2.5	2.5	1.5	1.5	2.0	3.0	2.0	1.0	1.5	2.5	2.0	1.3	2.0

Lake Merced North

Depth	Br	Br	Br	Br
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
Surf	0.43	0.54	0.52	0.42
5	0.43	0.54	0.54	0.42
10	0.44	0.54	0.51	0.42
15	0.42	0.53	0.53	0.42

Lake Merced North East

Depth	Br	Br	Br	Br
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
0	0.39		0.49	0.35
5	0.39		0.48	0.35
10	0.38		0.48	0.35

Lake Merced South - Pistol Range

Depth	Br	Br	Br	Br
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
Surf	0.23	0.26	0.34	0.26
5	0.23	0.28	0.34	
6				0.26
10	0.23	0.29	0.33	
12				0.26
15	0.23	0.29	0.33	
16	0.22	0.32		
18				0.26

Lake Merced South - Pump Station

Depth	Br	Br	Br	Br
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
Surf	0.23	0.28	0.34	0.26
5	0.23	0.29	0.34	0.26
10	0.22	0.28	0.33	
12				0.26
15	0.23	0.26	0.33	
18				0.26

Lake Merced North

Depth	SO4	SO4	SO4	SO4
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
Surf	22	16	13	16
5	22	16	13	16
10	22	16	13	16
15	22	15	13	16

Lake Merced North East

Depth	SO4	SO4	SO4	SO4
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
0	30		23	26
5	30		23	26
10	30		22	26

Lake Merced South - Pistol Range

Depth	SO4	SO4	SO4	SO4
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
Surf	11	7.1	7.4	16
5	11	7.1	7.5	
6				16
10	11	6.8	7.5	
12				16
15	11	6.4	7.4	
16	11	6.4		
18				16

Lake Merced South - Pump Station

Depth	SO4	SO4	SO4	SO4
	15-May-97	10-Sep-97	03-Dec-97	16-Mar-98
Ft	mg/L	mg/L	mg/L	mg/L
Surf	11	7.0	7.6	16
5	11	6.9	7.5	16
10	11	6.8	7.6	
12				16
15	11	6.5	7.6	
18				16

Lake Merced North

	26-Jun-07	20-Aug-07	26-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09
Depth	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***
Btm	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***

Lake Merced North East

	26-Jun-07	20-Aug-07	26-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09
Depth	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***
Btm	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***		***0.5***	***0.5***	***0.5***	***0.5***

Lake Merced South - Pistol Range

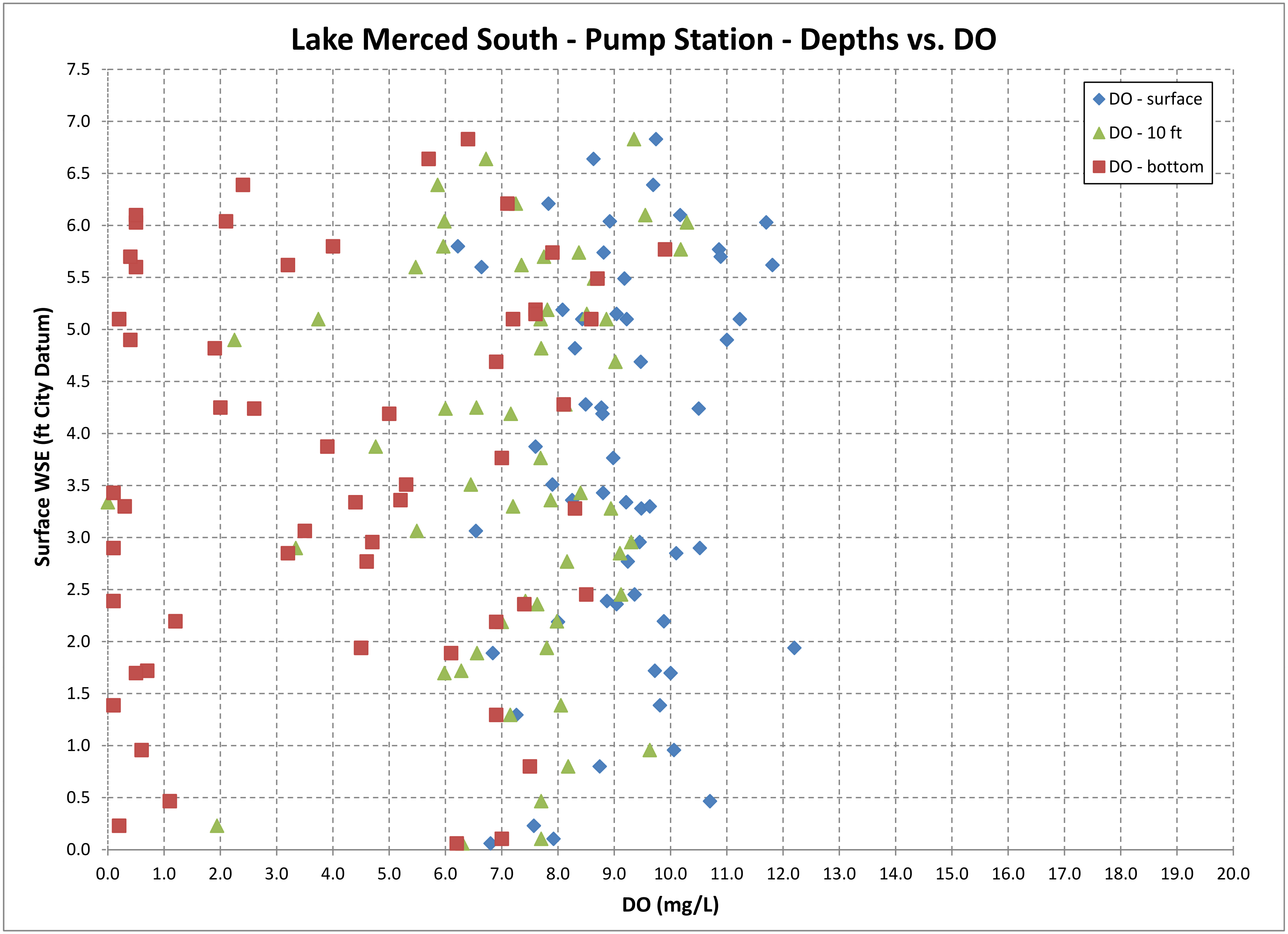
	26-Jun-07	20-Aug-07	26-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09
Depth	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***
Btm		***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	1.42	***0.5***	***0.5***	***0.5***

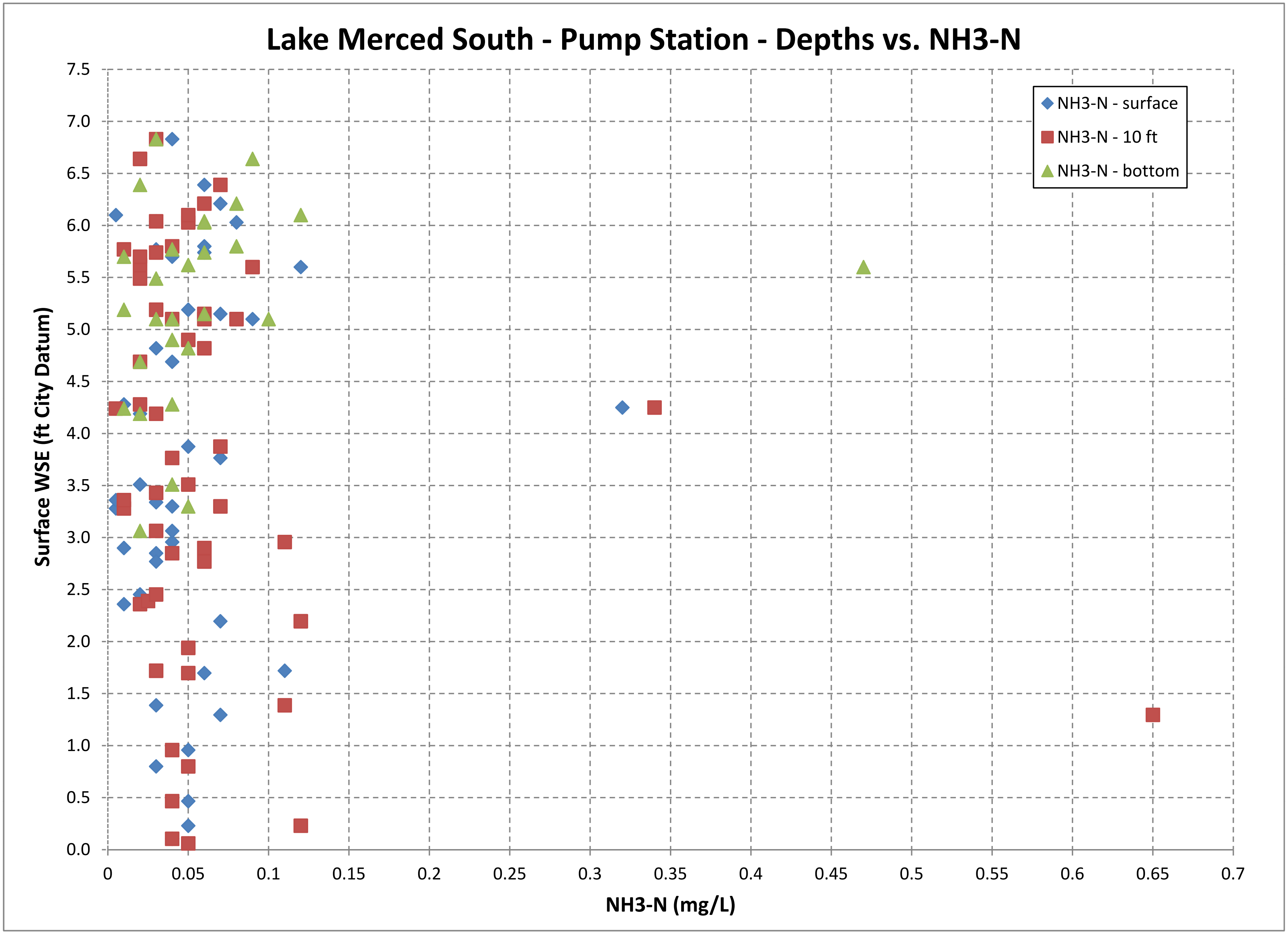
Lake Merced South - Pump Station

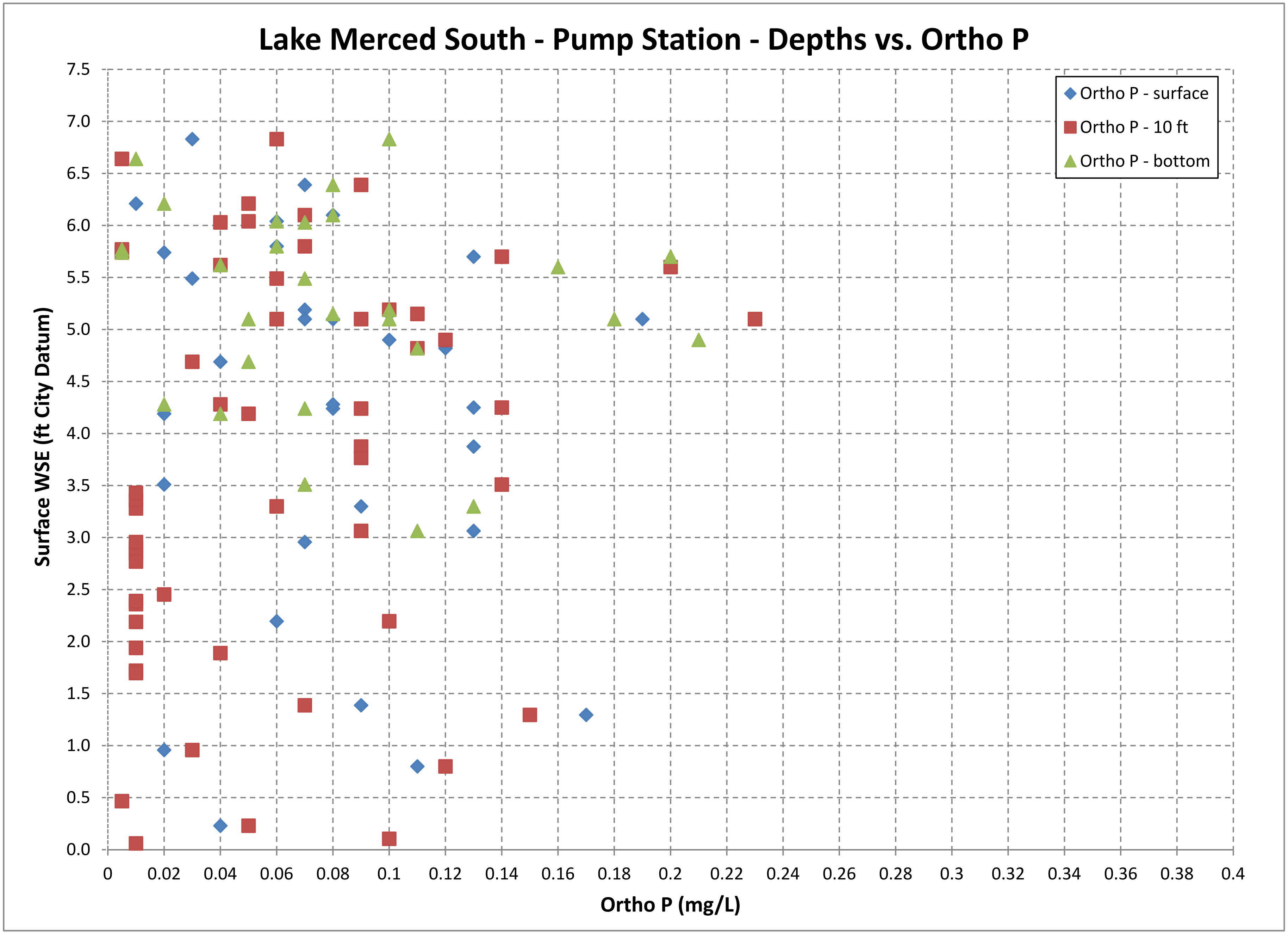
	26-Jun-07	20-Aug-07	26-Dec-07	28-Mar-08	10-Jun-08	24-Sep-08	4-Dec-08	24-Mar-09	4-Jun-09	22-Sep-09
Depth	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**	**Pb**
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surf	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***
Btm	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***	***0.5***

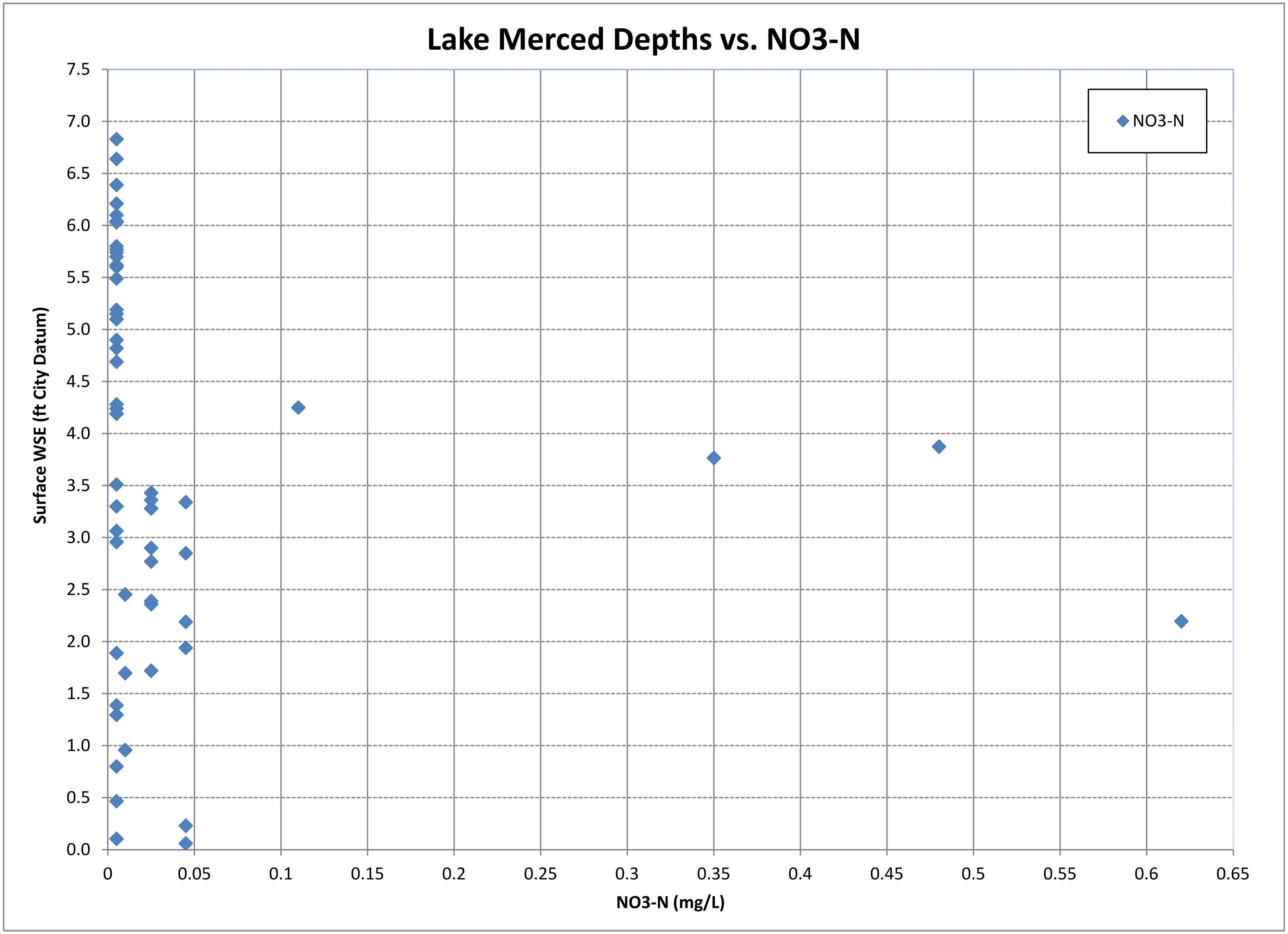
Note: Bold, italicized formats indicate half the reported value for statistical purposes.

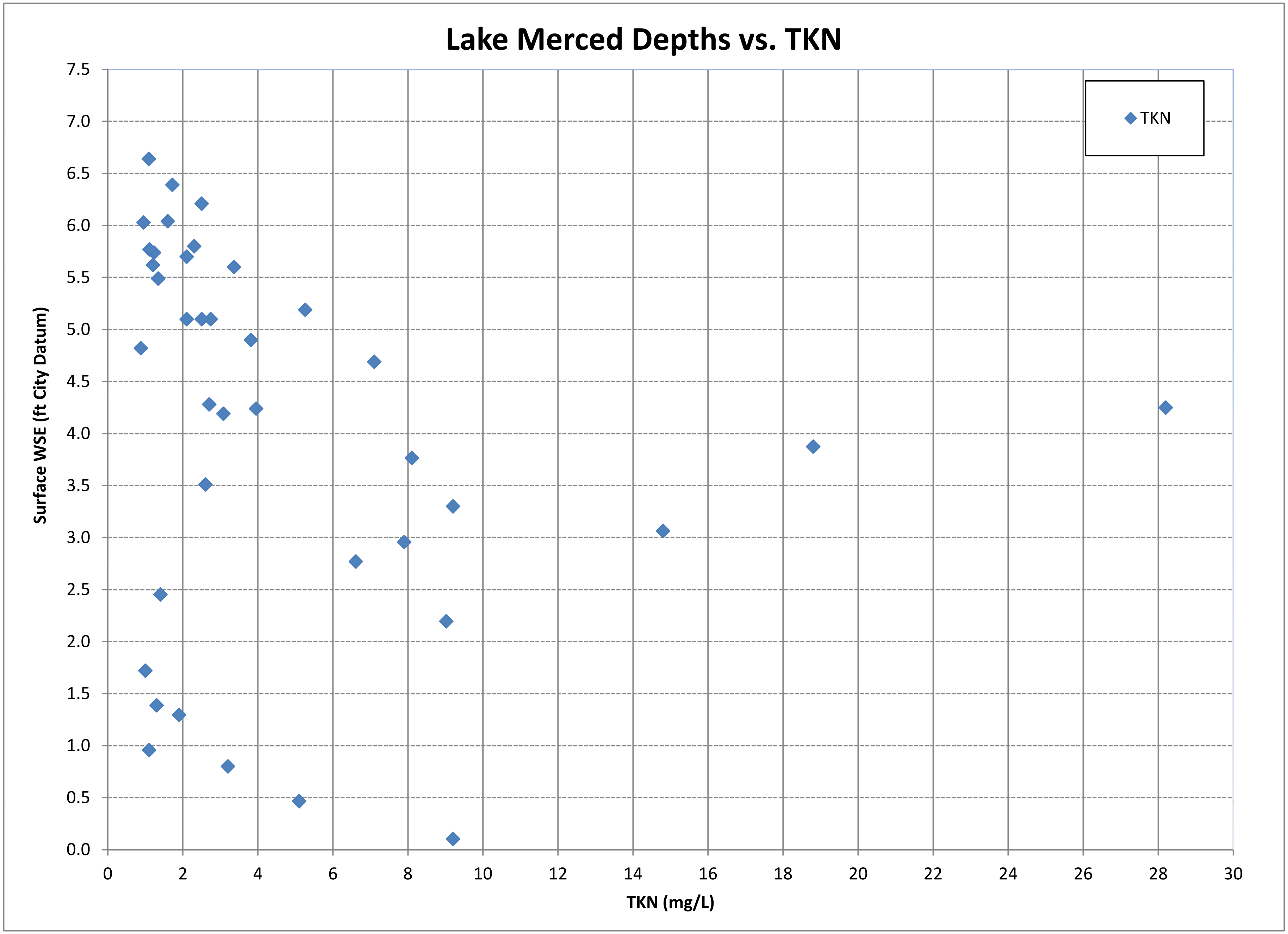
WATER QUALITY GRAPHS

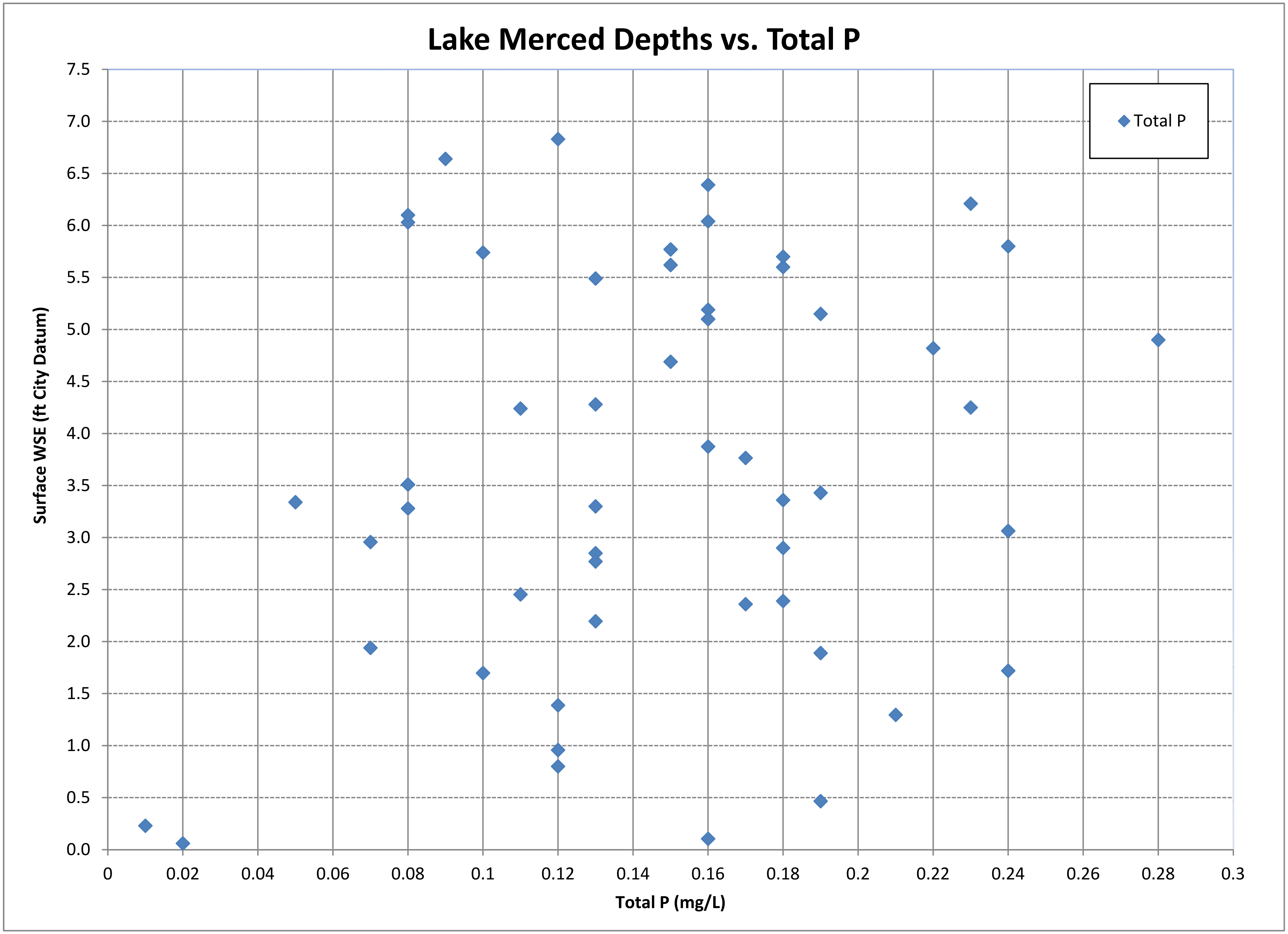

Lake Merced South - Pump Station - Depths vs. DO
Surface WSE (ft City Datum)
DO (mg/L)
DO - surface
DO - 10 ft
DO - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0

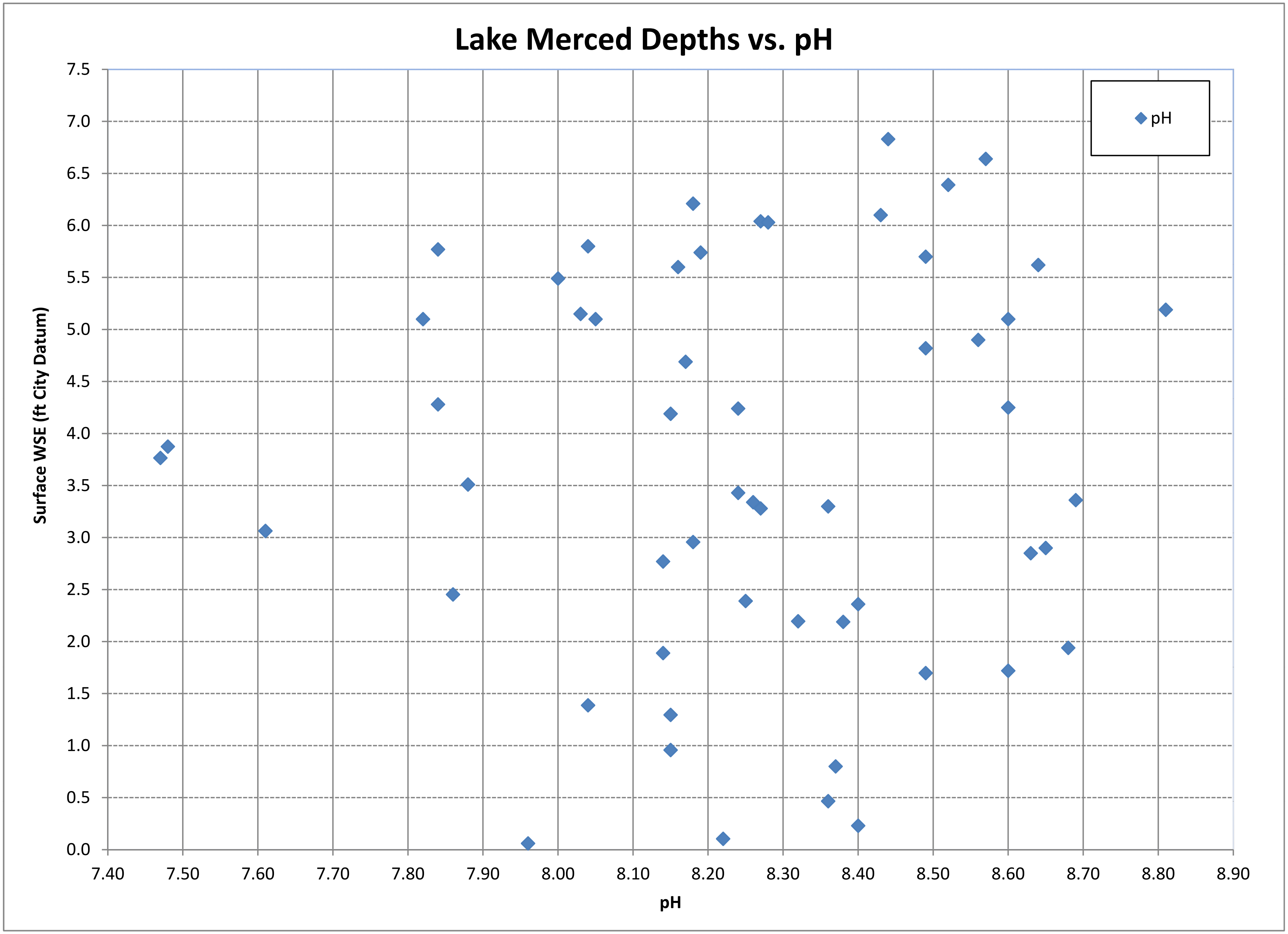

Lake Merced South - Pump Station - Depths vs. NH3-N
Surface WSE (ft City Datum)
NH3-N (mg/L)
NH3-N - surface
NH3-N - 10 ft
NH3-N - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7


Lake Merced South - Pump Station - Depths vs. Ortho P
Surface WSE (ft City Datum)
Ortho P (mg/L)
Ortho P - surface
Ortho P - 10 ft
Ortho P - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
0.34
0.36
0.38
0.4

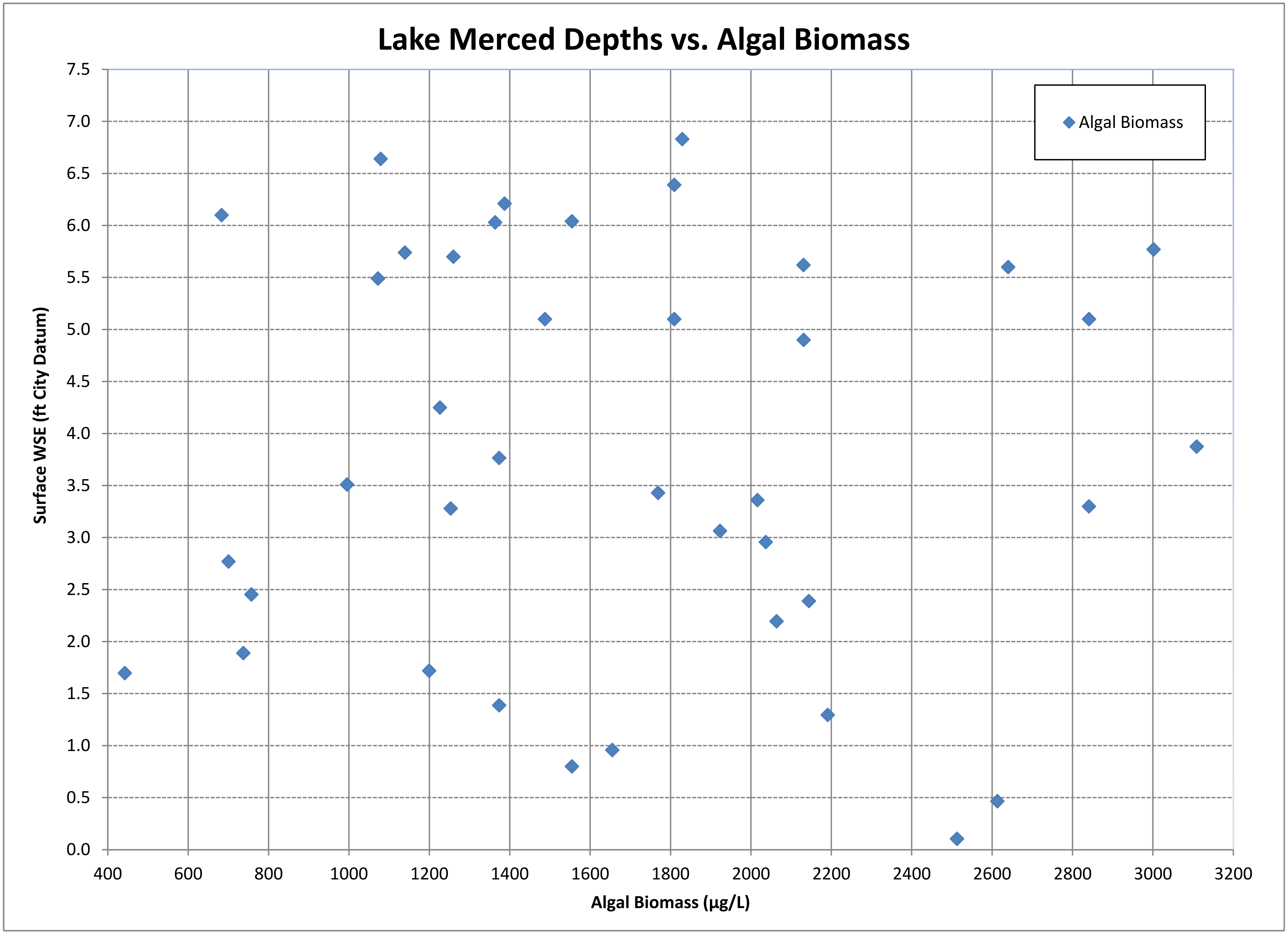

Lake Merced Depths vs. NO3-N
Surface WSE (ft City Datum)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
NO3-N (mg/L)
NO3-N

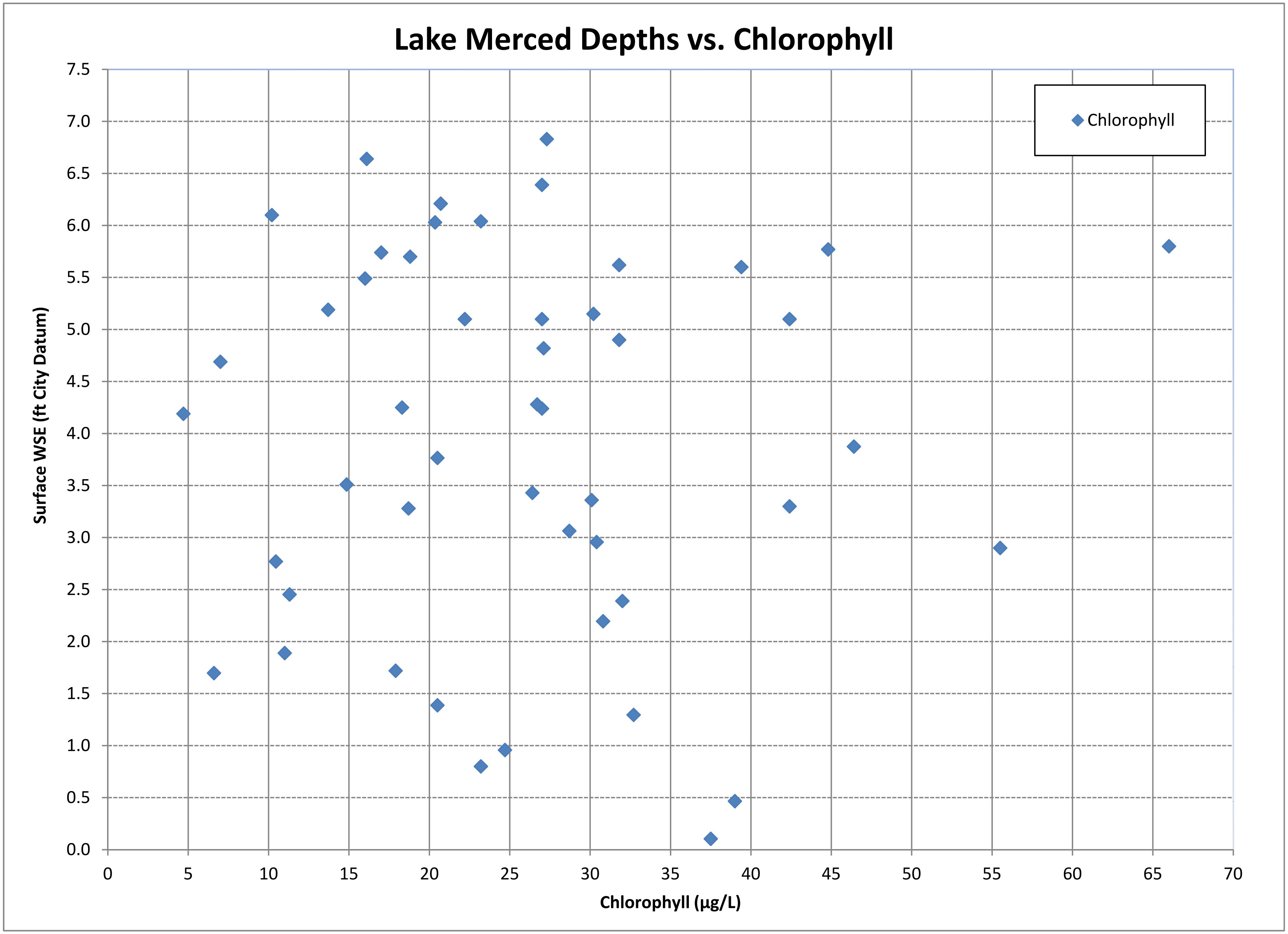

Lake Merced Depths vs. TKN
Surface WSE (ft City Datum)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TKN (mg/L)
TKN

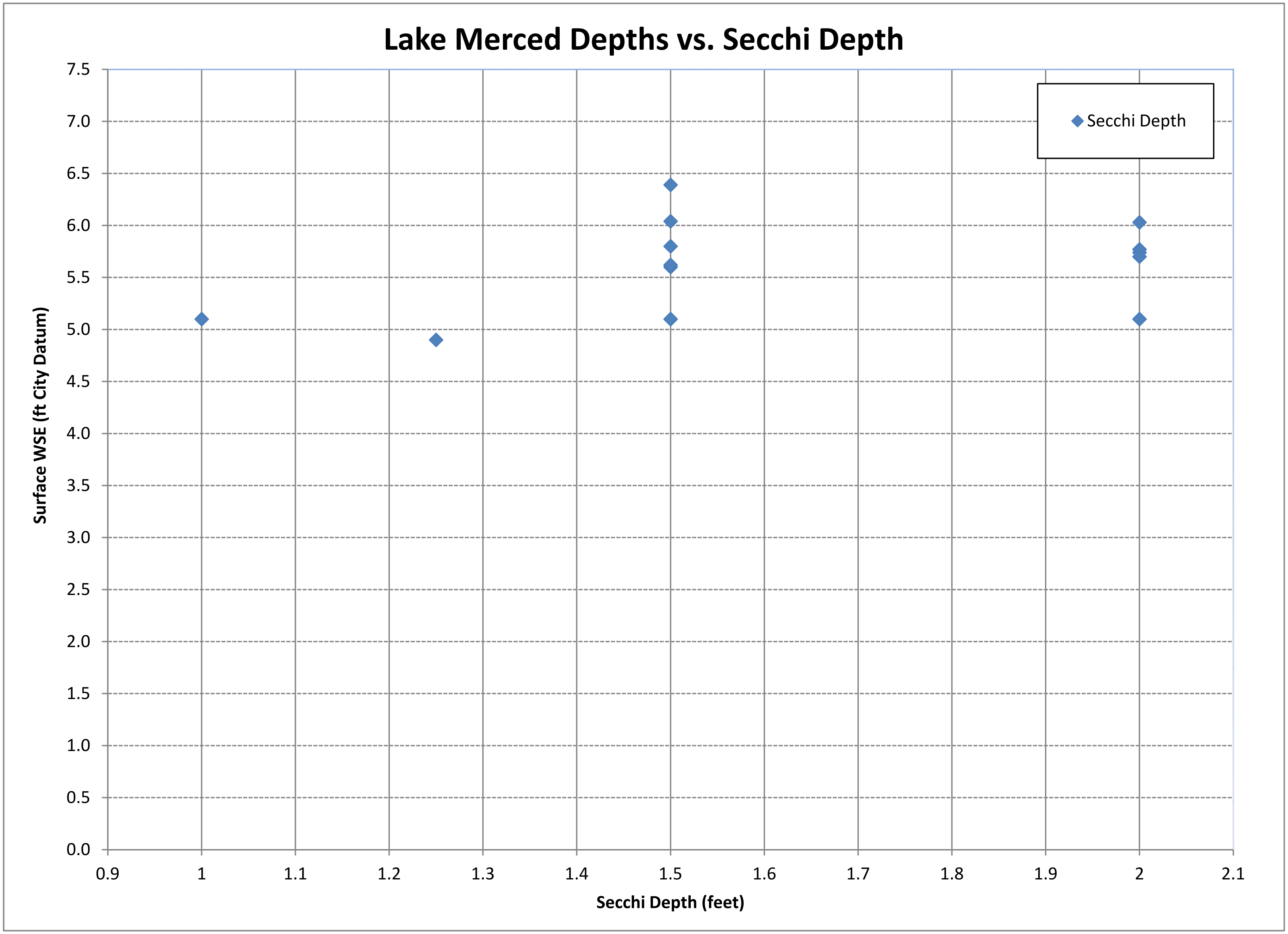

Lake Merced Depths vs. Total P
Surface WSE (ft City Datum)
Total P (mg/L)
Total P
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3

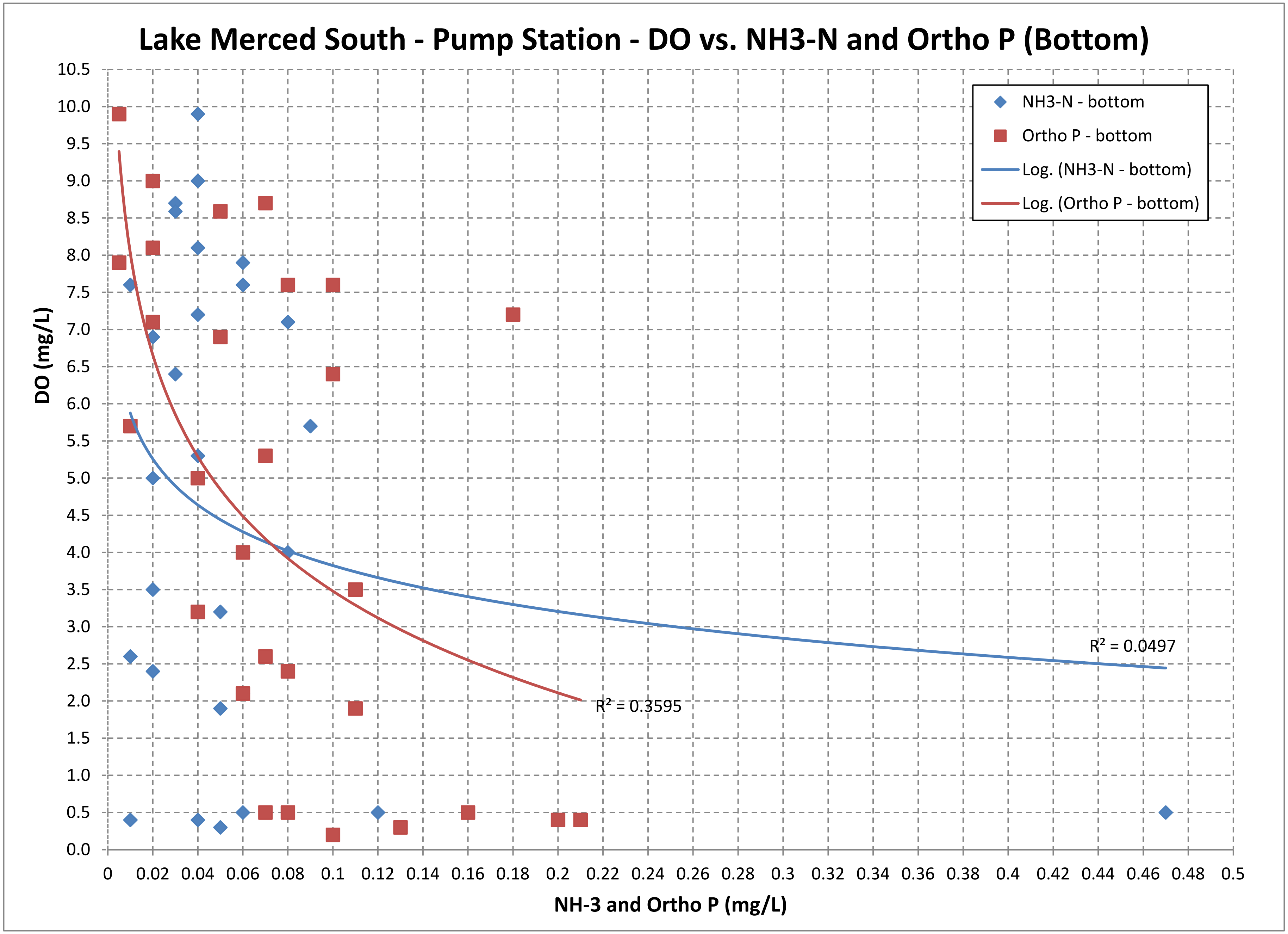


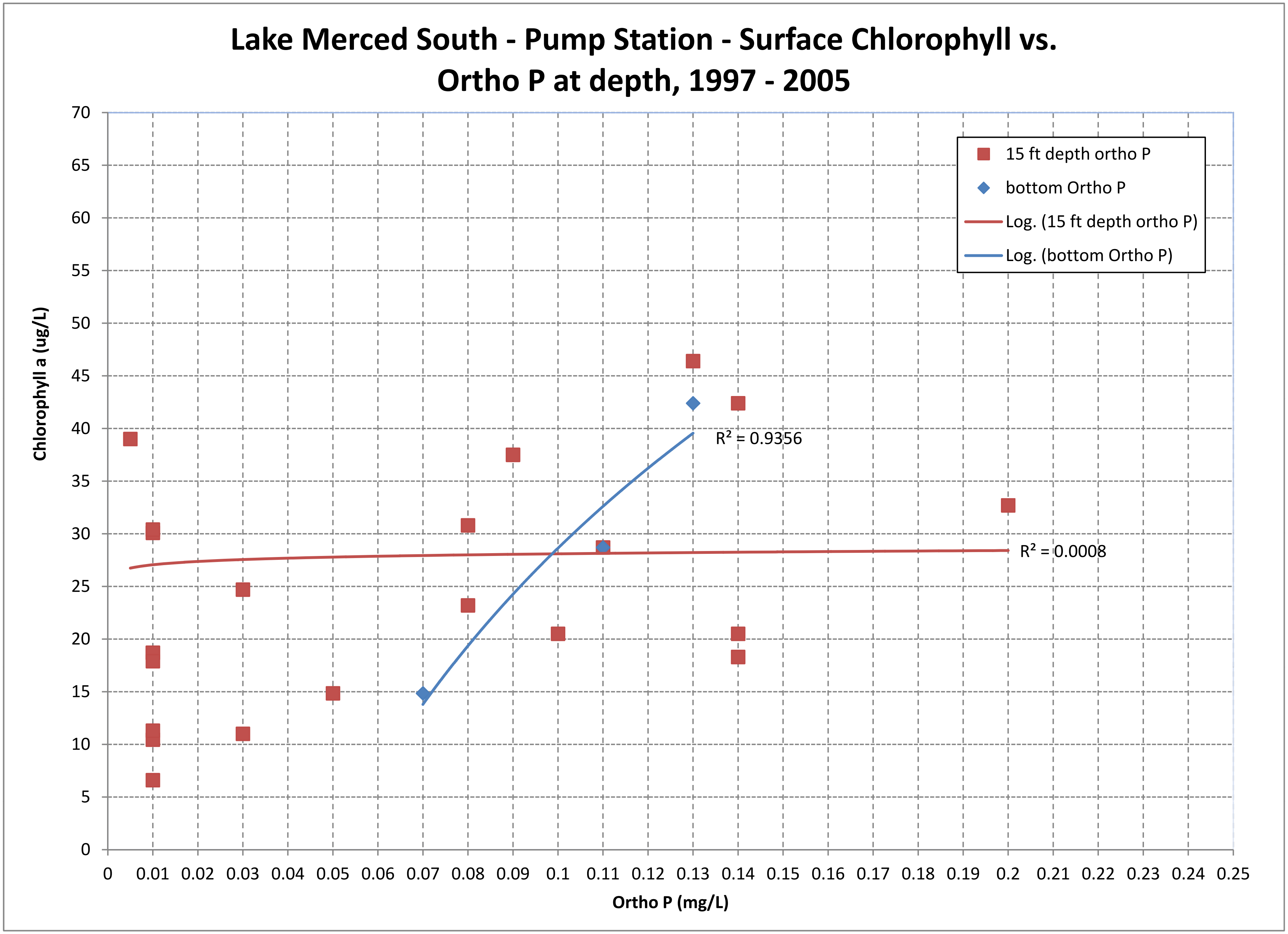
Lake Merced Depths vs. pH
Surface WSE (ft City Datum)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
7.40
7.50
7.60
7.70
7.80
7.90
8.00
8.10
8.20
8.30
8.40
8.50
8.60
8.70
8.80
8.90
pH
pH

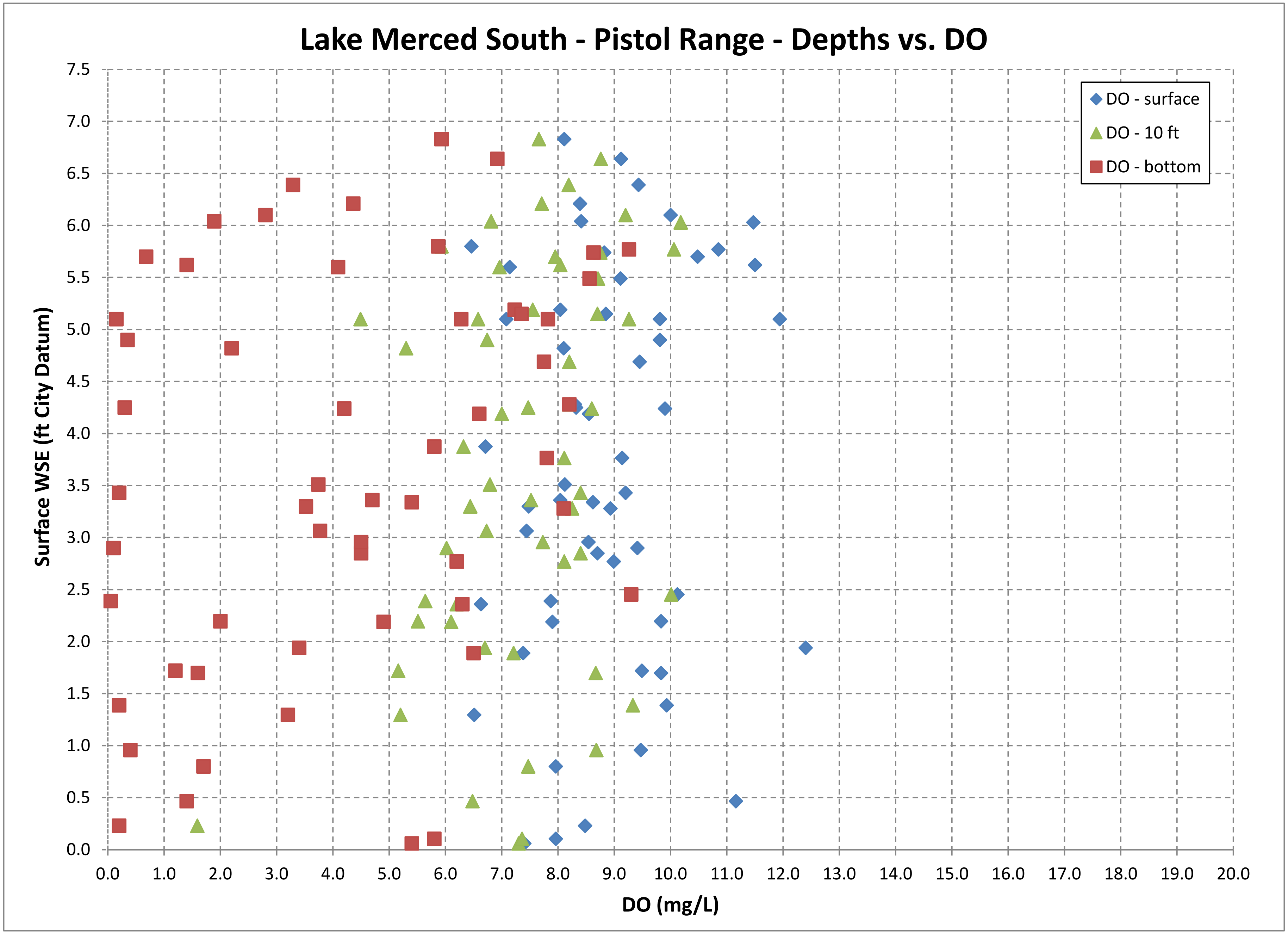

Lake Merced Depths vs. Algal Biomass
Algal Biomass
Surface WSE (ft City Datum)
Algal Biomass (µg/L)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200

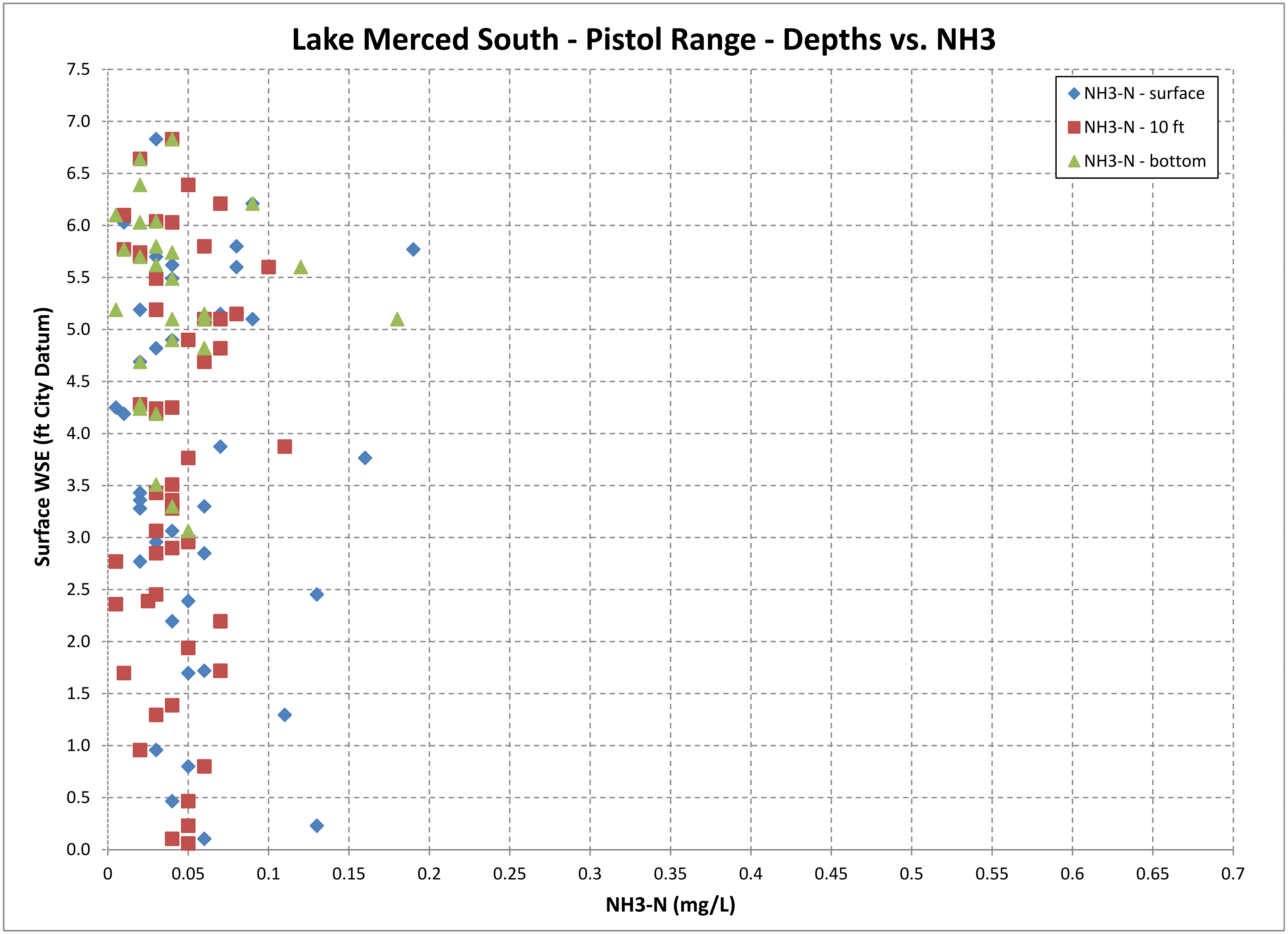

Lake Merced Depths vs. Chlorophyll
Chlorophyll
Surface WSE (ft City Datum)
Chlorophyll (µg/L)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

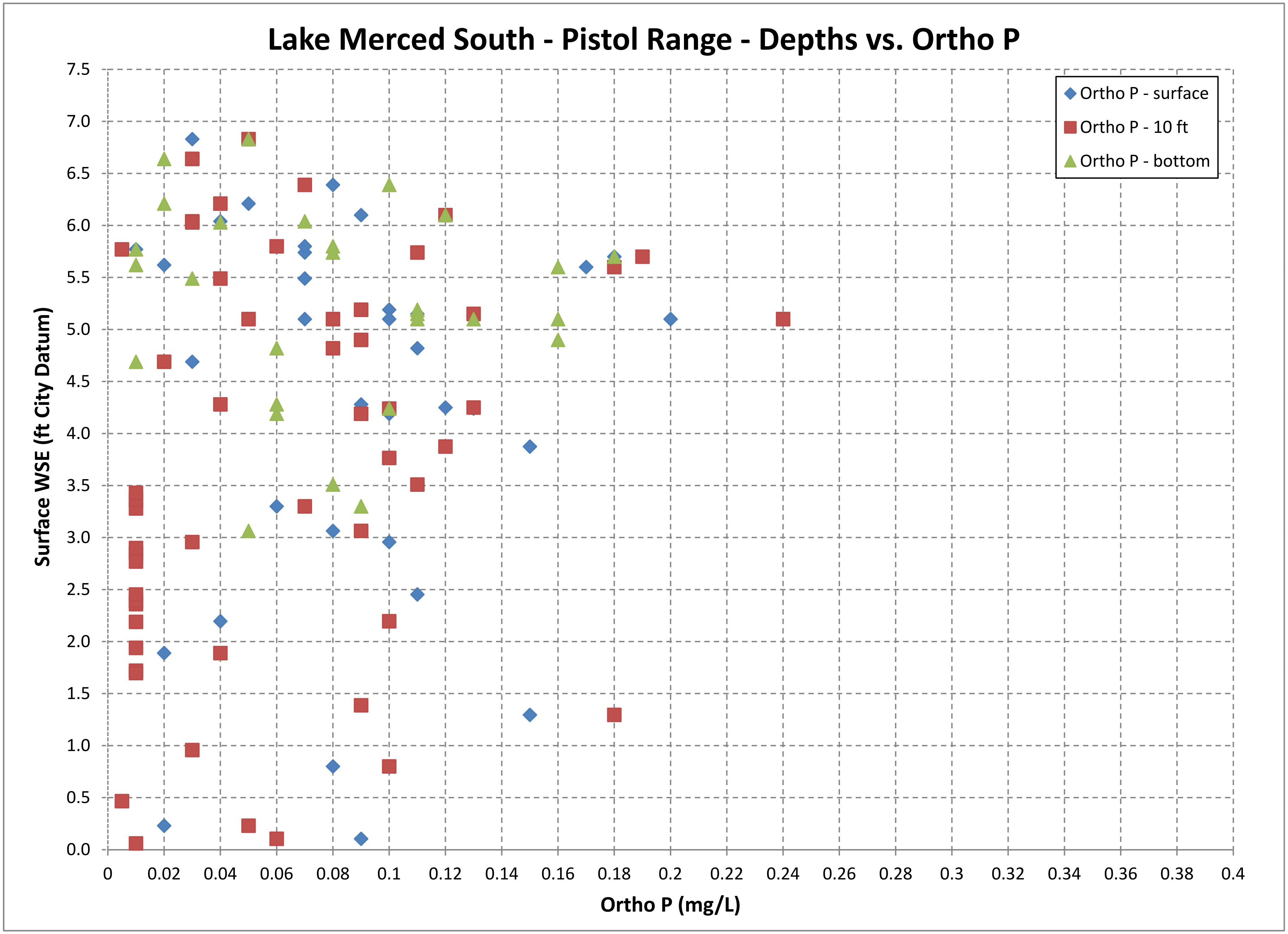

Lake Merced Depths vs. Secchi Depth
Secchi Depth
Surface WSE (ft City Datum)
Secchi Depth (feet)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1

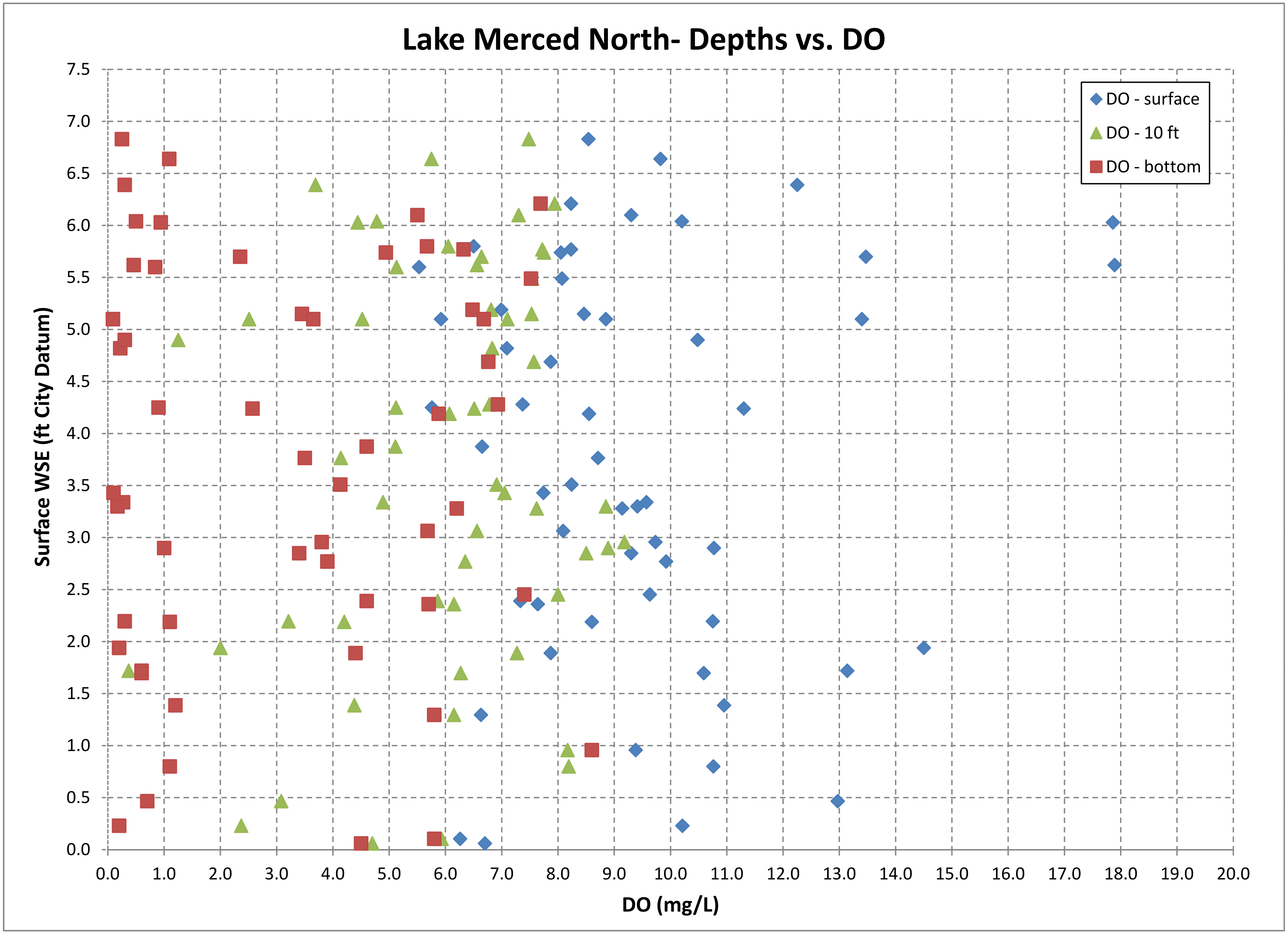

Lake Merced South - Pump Station - DO vs. NH3-N and Ortho P (Bottom)
DO (mg/L)
NH-3 and Ortho P (mg/L)
NH3-N - bottom
Ortho P - bottom
Log. (NH3-N - bottom)
Log. (Ortho P - bottom)
R² = 0.0497
R² = 0.3595
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28 0.3 0.32 0.34 0.36 0.38 0.4 0.42 0.44 0.46 0.48 0.5

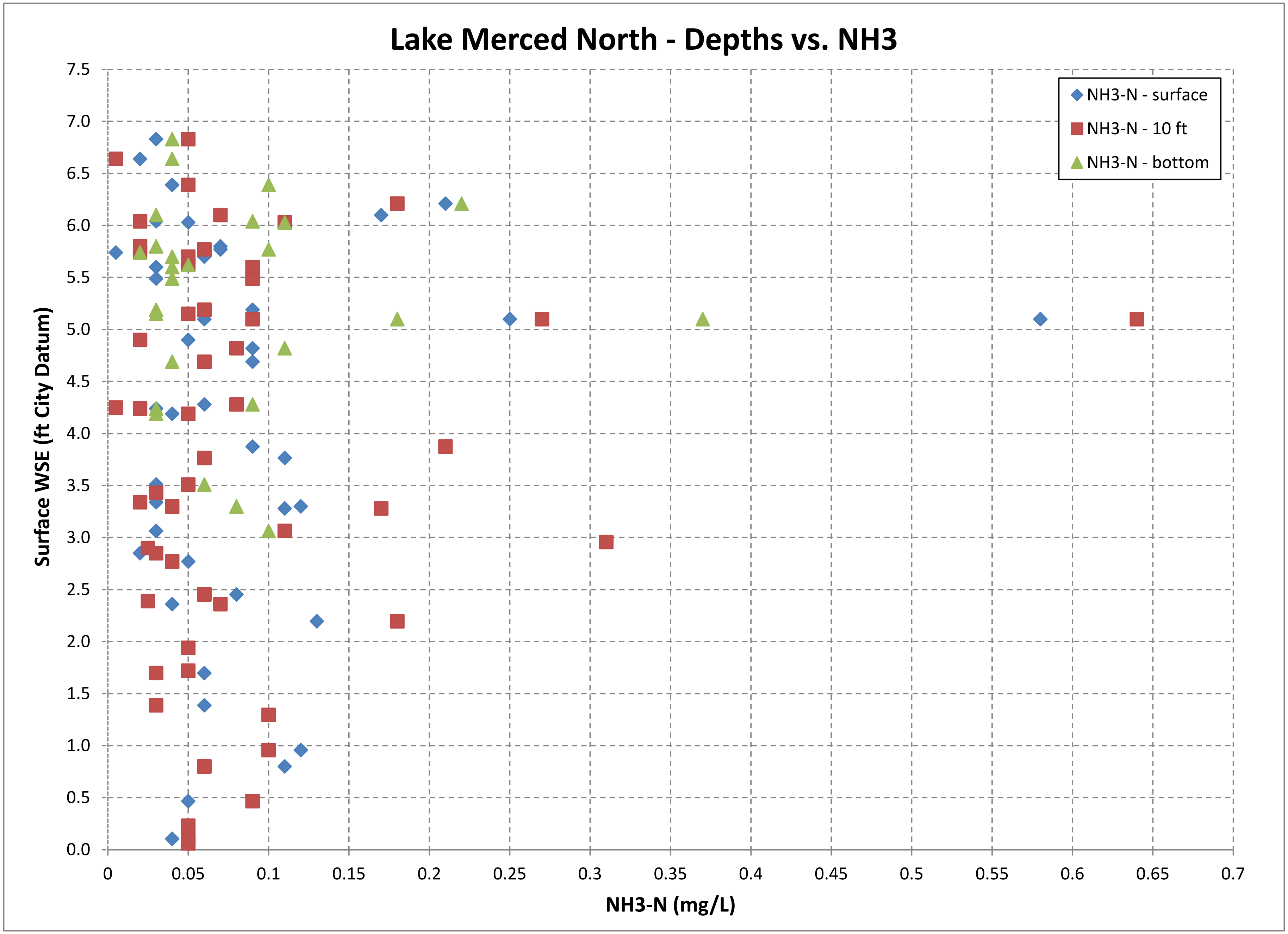

Lake Merced South - Pump Station - Surface Chlorophyll vs. Ortho P at depth, 1997 - 2005
Chlorophyll a (ug/L)
Ortho P (mg/L)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
0.13
0.14
0.15
0.16
0.17
0.18
0.19
0.2
0.21
0.22
0.23
0.24
0.25
15 ft depth ortho P
bottom Ortho P
Log. (15 ft depth ortho P)
Log. (bottom Ortho P)
R² = 0.9356
R² = 0.0008

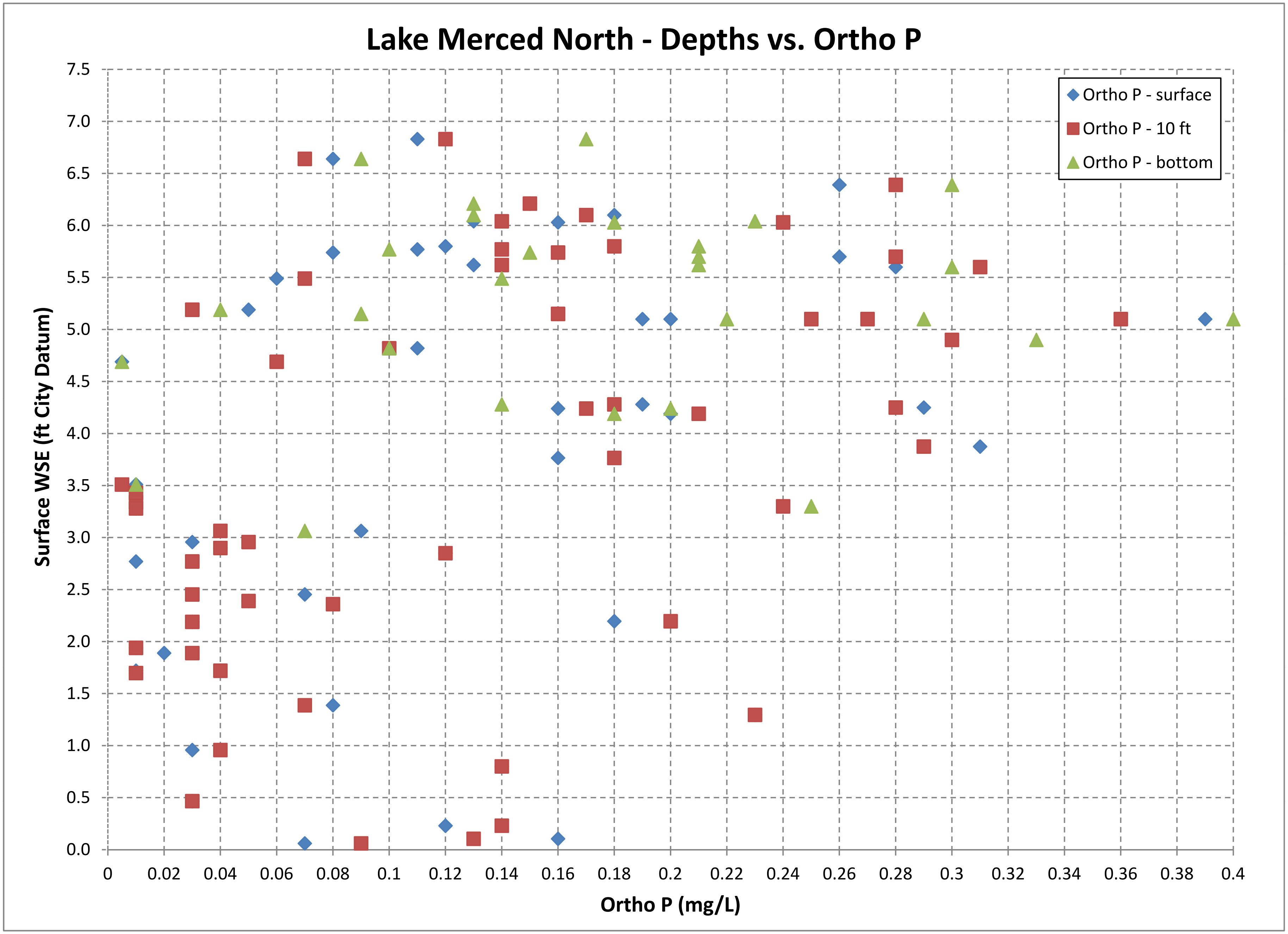

Lake Merced South - Pistol Range - Depths vs. DO
Surface WSE (ft City Datum)
DO (mg/L)
DO - surface
DO - 10 ft
DO - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0

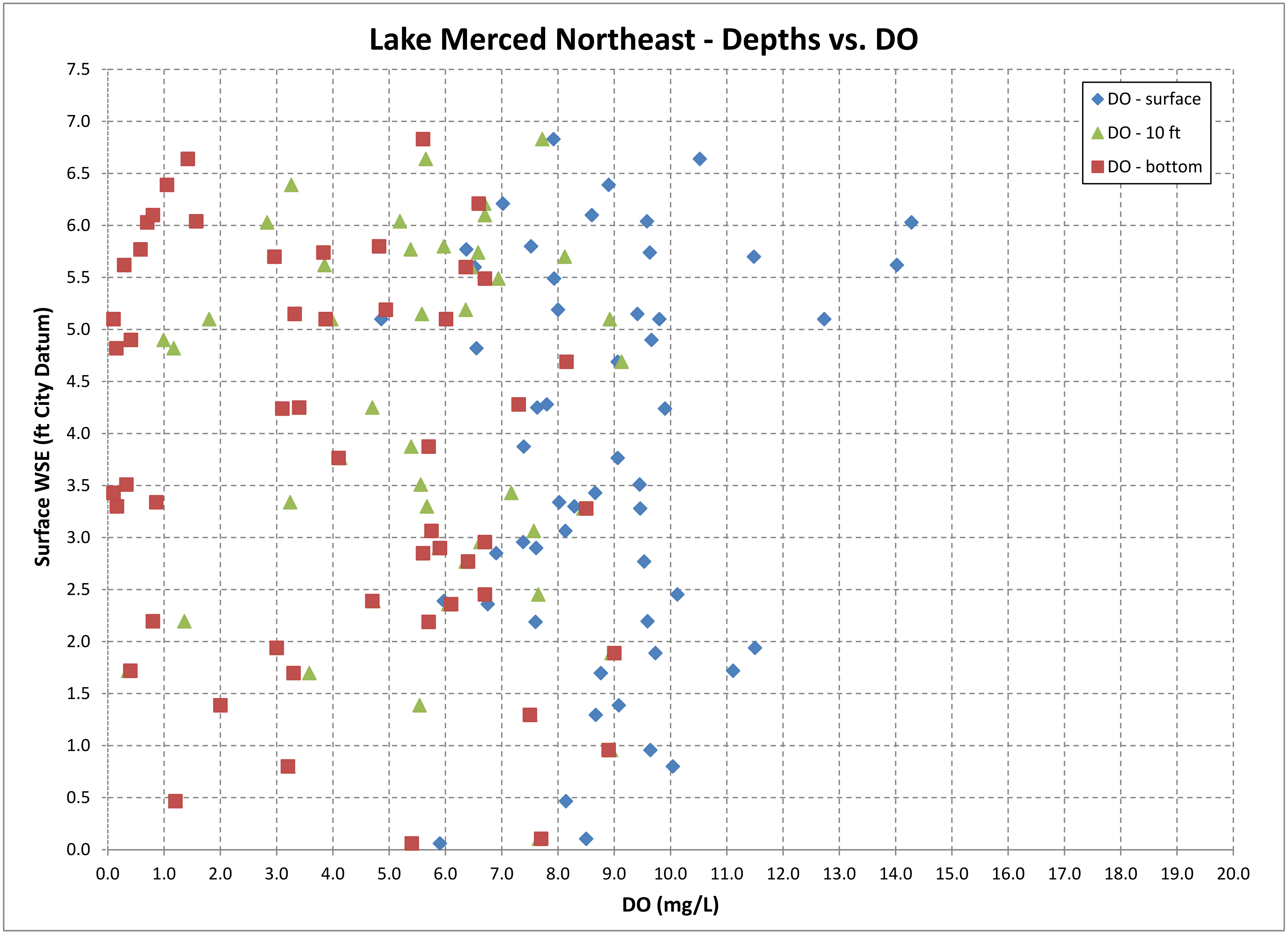

Lake Merced South - Pistol Range - Depths vs. NH3
Surface WSE (ft City Datum)
NH3-N (mg/L)
NH3-N - surface
NH3-N - 10 ft
NH3-N - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7

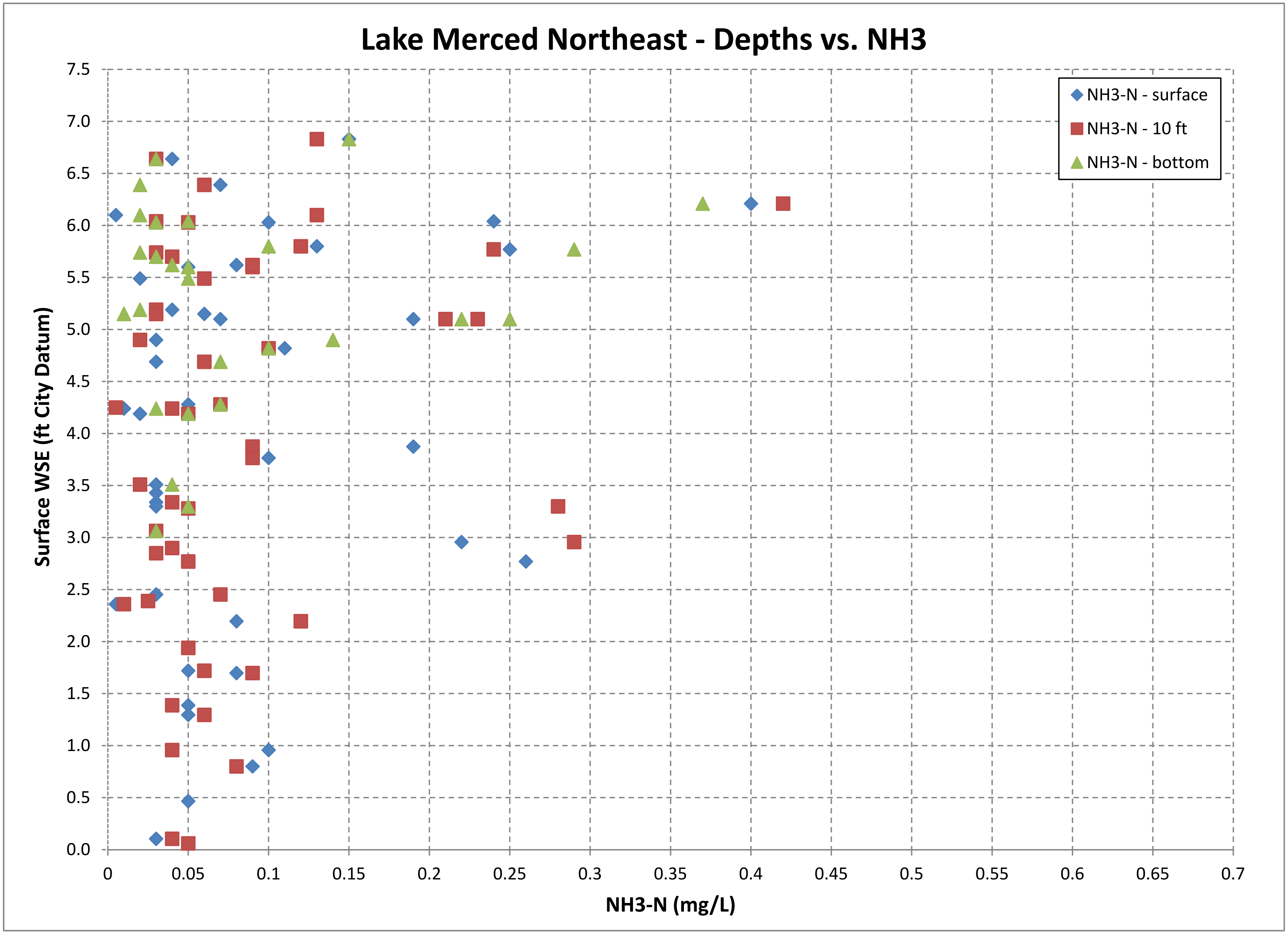

Lake Merced South - Pistol Range - Depths vs. Ortho P
Surface WSE (ft City Datum)
Ortho P (mg/L)
Ortho P - surface
Ortho P - 10 ft
Ortho P - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
0.34
0.36
0.38
0.4

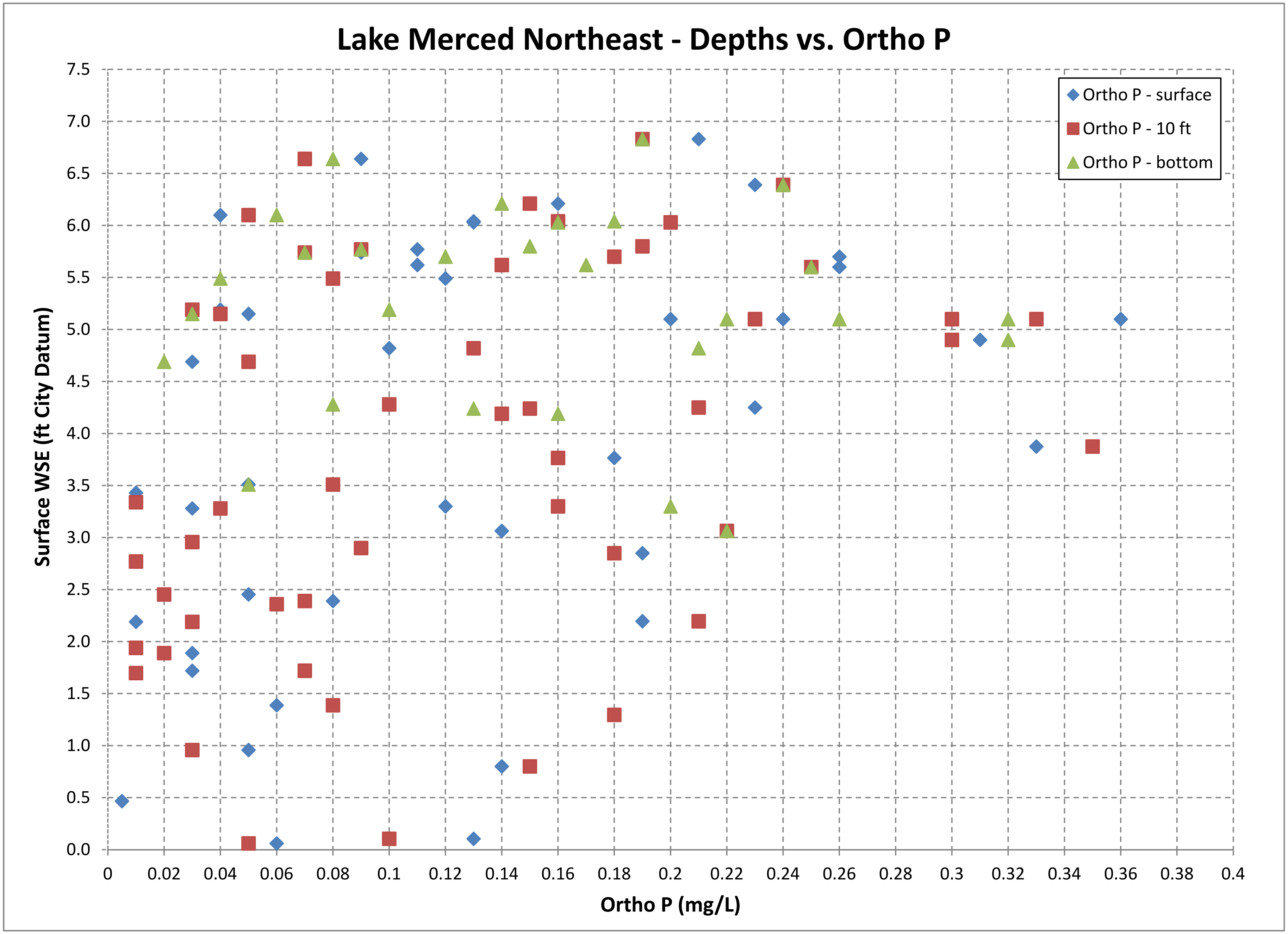

Lake Merced North- Depths vs. DO
DO - surface
DO - 10 ft
DO - bottom
Surface WSE (ft City Datum)
DO (mg/L)
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0


Lake Merced North - Depths vs. NH3
Surface WSE (ft City Datum)
NH3-N (mg/L)
NH3-N - surface
NH3-N - 10 ft
NH3-N - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7


Lake Merced North - Depths vs. Ortho P
Surface WSE (ft City Datum)
Ortho P (mg/L)
Ortho P - surface
Ortho P - 10 ft
Ortho P - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
0.34
0.36
0.38
0.4


Lake Merced Northeast - Depths vs. DO
Surface WSE (ft City Datum)
DO (mg/L)
DO - surface
DO - 10 ft
DO - bottom
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0


Lake Merced Northeast - Depths vs. NH3
Surface WSE (ft City Datum)
NH3-N (mg/L)
NH3-N - surface
NH3-N - 10 ft
NH3-N - bottom
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7


Lake Merced Northeast - Depths vs. Ortho P
Surface WSE (ft City Datum)
Ortho P (mg/L)
Ortho P - surface
Ortho P - 10 ft
Ortho P - bottom
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
0.34
0.36
0.38
0.4