April 2013

DRAFT
Environmental Impact Report

Volume 2 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

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5.6 TRANSPORTATION AND CIRCULATION

This section describes the transportation conditions within the vicinity of the proposed Project area (i.e., the existing roadway network, mass transit and non-motorized travel, air traffic patterns, and emergency access). The section presents an assessment of the transportation impacts associated with construction and operation of the Project, as well as identifies mitigation measures, as appropriate.

The transportation and circulation study area extends beyond the individual facility site boundaries and includes the roadways and intersections that could be affected by the proposed Project, particularly during construction (see Figure 2-1 [Project Vicinity Map], in Chapter 2, Introduction and Background and Figures 3-3, 3-4, and 3-5 [Project location maps] in Chapter 3, Project Description).

5.6.1 Setting

5.6.1.1 Regional and Local Roadways

The proposed Project involves construction of facilities within unincorporated San Mateo County (Broadmoor), the Town of Colma, and the cities of Daly City, South San Francisco, San Bruno, and Millbrae. U.S. Highway 101 (U.S. 101) and Interstate 280 (I-280) provide regional access. Interstate 380 (I-380) connects these two freeways mid-way through the San Francisco Peninsula. El Camino Real (State Route 82 or SR-82) also is a major north/south regional access route. Table 5.6-1 (Daily Traffic Volumes on Regional Roadways), presents the average daily traffic volumes on the regional freeways in the vicinity of the Project, including the percentage of trucks. As noted above, Figures 2-1, 3-3, 3-4, and 3-5 show the locations of these regional roadways in relation to the proposed facilities.

In San Mateo County, the City and County Association of Governments (C/CAG) is designated as the Congestion Management Agency, which adopts, formally amends, and readopts a Congestion Management Program (CMP) every two years. According to the 2011 San Mateo County CMP, El Camino Real in the Project area currently operates at level-of-service (LOS[1]) A; I-280 in the Project area operates at LOS A/B/&D (LOS A/B from State Route 1 [north] to State Route 1 [south] and LOS D from State Route 1 [south] to San Bruno Avenue); U.S. 101 operates at LOS C; and, Interstate 380 (I-380) operates at LOS F. Each freeway is in compliance with LOS standards established for the roadways by the CMP (C/CAG 2011).

[1] LOS is a qualitative description of a facility's performance based on average delay per vehicle, vehicle density, or volume-to-capacity ratios. Levels of service range from LOS A, which indicates free-flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

TABLE 5.6-1
Daily Traffic Volumes on Regional Roadways

Location	Annual Average Daily Traffic Volumes (All Vehicles, including Trucks)[(a)]	Annual Average Daily Traffic Volumes (Trucks only)[(b)]	Trucks as a Percentage of Annual Average Daily Traffic Volumes
El Camino Real – at Hickey Boulevard	25,000	495	2
El Camino Real – at I-380 Interchange	36,000	526	2
El Camino Real – at Center Street	21,100	612	3
US 101 – at I-380 Interchange	242,000	INA[(c)]	INA[(c)]
US 101 – at Millbrae Avenue Interchange	238,000	10,472	4
I-280 – at Junipero Sierra Interchange	226,000	2,757	1
I-280 – at Hickey Boulevard Interchange	179,000	1,629	1
I-280 – at Westborough Boulevard Interchange	185,000	1,480	1
I-280 – at San Bruno Avenue Interchange	104,000	2,465	2
I-380 – at I-280 Interchange	139,000	2,989	2
I-380 – at US 101 Interchange	159,000	4,277	3

Source: Caltrans 2010a, 2010b

Notes:

(a) Annual average daily traffic is the total volume for all movements and all lanes at a location for the year divided by 365 days.

(b) Truck traffic is defined by Caltrans as trucks with two or more axles. The two-axle class includes 1.5 ton trucks with dual rear tires and excludes pickups and vans with only four tires.

(c) INA – Information Not Available.

The facility sites would be served by various collector and arterial streets. Collector and arterial streets are generally low-to-medium speed and low-to-medium capacity roadways that provide connections between neighborhood areas, commercial centers, and regional highways. Table 5.6-2 (Characteristics of Local Access Roadways for Facility Sites), summarizes the roadway characteristics (i.e., access routes, number of travel lanes, types of bicycle facilities, and public transit routes) for the local roadways in the Project area that would be directly affected by Project construction activities. Figures 3-11 through 3-40 in Chapter 3, Project Description show the location of each of the facility sites in relation to the nearest local access roadways.

5.6.1.2 Transit Service

The San Mateo County Transit District (SamTrans) operates fixed-route and paratransit bus service in the Project area. In 2012, the SamTrans fixed-route bus system consisted of 49 routes (SamTrans 2012). Public transit in the Project area is also provided by Caltrain and Bay Area Rapid Transit (BART). Table 5.6-2

(Characteristics of Local Access Roadways for Facility Sites) indicates the bus routes near the facility sites. Table 5.6-2 shows the routes in the study area that could be affected by the Project, and Project Description Figures 3-3 through 3-5 illustrate the location of the proposed facility sites and the roadways included in the table.

TABLE 5.6-2
Characteristics of Local Access Roadways for Facility Sites

Local Roadway *(Project Well Facility Site Construction Access Route)*	**Jurisdiction**	**Number of Travel Lanes**	**Bicycle Facility?**	**Sidewalks?**	**On-street Parking?**	**Public Transit?** (Route #)	**Closest Proposed Facility Site**
Poncetta Drive *(Poncetta Drive to Sheffield Drive to John Daly Boulevard to I-280)*	Daly City	2	No	No	Yes	No	1
South Plaza Park Drive *(South Park Plaza Drive to Park Plaza Drive to John Daly Boulevard to I-280)*	Daly City & Unincorporated San Mateo County	2	Class III	Yes	Yes	No	2, 3, 4
87th Street *(87th Street to South Park Plaza Drive to Park Plaza Drive to John Daly Boulevard to I-280)*	Daly City & Unincorporated San Mateo County	2	No	Yes	Yes	Yes (SamTrans 24, 121, 122)	4
Coronado Avenue *(Coronado Avenue to Park Plaza Drive to John Daly Boulevard to I-280)*	Daly City & Unincorporated San Mateo County	2	No	No	Yes	No	Westlake Pump Station
B Street *(B Street to Hill Street to D Street to I-280 or El Camino Real, or Hill Street to San Pedro Road to Washington Street to I-280)*	Daly City	2	No	Yes	Yes	No	5
Hill Street *(Hill Street to D Street to I-280 or El Camino Real, or Hill Street to San Pedro Road to Washington Street to I-280)*	Daly City	2	No	Yes	Yes	Yes (SamTrans 121, 123)	5, 6
D Street *(D Street to I-280 or El Camino Real or D Street to Hill Street to San Pedro Road to Washington Street to I-280)*	Daly City & Unincorporated San Mateo County	2-3	No	Yes	Yes	Yes (SamTrans 121, 123)	6

TABLE 5.6-2
Characteristics of Local Access Roadways for Facility Sites

Local Roadway *(Project Well Facility Site Construction Access Route)*	**Jurisdiction**	**Number of Travel Lanes**	**Bicycle Facility?**	**Sidewalks?**	**On-street Parking?**	**Public Transit?** (Route #)	**Closest Proposed Facility Site**
Colma Boulevard *(Colma Boulevard to Junipero Serra Boulevard to I-280)*	Colma	4	No	Yes	No	No	7
Serramonte Blvd *(Serramonte Boulevard to I-280 or Serramonte Boulevard to Junipero Serra Boulevard to Hickey Boulevard to I-280)*	Colma	4	No	Yes	No	No	8
San Mateo County Flood Control District Access Road (not public) *(Mission Road to Lawndale Boulevard to State Highway 82 to Hickey Boulevard to I-280)*	South San Francisco	1	No	No	No	No	9
Camaritas Avenue *(Camaritas Avenue to Hickey Boulevard to I-280 or State Highway 82)*	South San Francisco	2	No	Yes	Yes	Yes (SamTrans 35, 133)	10
Antoinette Lane *(Antoinette Lane to Chestnut Avenue / Westborough Boulevard to El Camino Real or I-280)*	South San Francisco	2	II	Yes	Yes	No	11
Southwood Drive *(Southwood Drive to El Camino Real or Southwood Drive to West Orange to Westborough Boulevard to I-280)*	South San Francisco	2	No	Yes	Yes	No	12, 19 (Alt)
South Spruce Avenue *(South Spruce Avenue to El Camino Real to I-380)*	South San Francisco	4	Class III	Yes	No	Yes (SamTrans 133)	13

TABLE 5.6-2
Characteristics of Local Access Roadways for Facility Sites

Local Roadway *(Project Well Facility Site Construction Access Route)*	**Jurisdiction**	**Number of Travel Lanes**	**Bicycle Facility?**	**Sidewalks?**	**On-street Parking?**	**Public Transit?** (Route #)	**Closest Proposed Facility Site**
Huntington Avenue *(Huntington Avenue to South Spruce Avenue to El Camino Real to I-380)*	South San Francisco	4	Class III	Yes	No	Yes (SamTrans 133)	13
Sneath Lane *(Sneath Lane to I-280 or to El Camino Real to I-380)*	San Bruno	4	Class II	Yes	No	Yes (SamTrans 43)	14, 15
El Camino Real (SR-82) *(El Camino Real to East Millbrae Avenue to U.S. 101)*	Millbrae	6	Class III	Yes	No	Yes (SamTrans 390)	16
Hemlock Avenue *(Hemlock Avenue to Hillcrest Boulevard to El Camino Real to East Millbrae Avenue to U.S. 101)*	Millbrae	2	No	Yes	Yes	No	16
Collins Avenue *(Collins Avenue to Serramonte Boulevard to I-280 or to Serramonte Boulevard to Junipero Serra Boulevard to Hickey Boulevard to I-280)*	Colma	2	No	Yes	Yes	No	17 (Alt)
Alta Loma Drive *(Alta Loma Drive to Camaritas Avenue to Hickey Boulevard to I-280)*	South San Francisco	2	No	Yes	Yes	Yes (SamTrans 35, 133)	18 (Alt)

Sources: Google Earth 2010; SamTrans 2010

Notes:

II – Class II Bicycle Facility (striped bicycle lanes)

III – Class III Bicycle Facility (signed as bicycle routes)

SamTrans – San Mateo County Transit District

5.6.1.3 *Bicycle and Pedestrian Network*

Responsibilities for planning and maintaining bicycle facilities in the study area rest with San Mateo County and the individual jurisdictions. Class I bicycle facilities are completely separated from motor vehicle traffic, such as an off-street pathway. Class II bicycle facilities, or bicycle lanes, are portions of the roadway that are marked with a line for use by bicyclists. Class III bicycle facilities are signed as bicycle routes that allow shared use by bicycles and vehicles, but do not have bicycle lane markings on the pavement.

Table 5.6-2 (Characteristics of Local Access Roadways for Facility Sites) identifies bicycle routes located on roadways adjacent to the proposed facilities. The majority of these routes are Class III bicycle routes. El Camino Real is a Class III bicycle route in both South San Francisco and Millbrae. Other Class III bicycle routes include Park Plaza Drive in Daly City, and South Spruce and Huntington avenues in South San Francisco. Sneath Lane is a Class II bicycle lane in San Bruno.

In addition to these bicycle routes on public roadways, the Centennial Way Trail in South San Francisco– connecting the South San Francisco BART station to the San Bruno BART station mostly along the BART right-of-way – is a Class I bicycle and pedestrian trail. The Class I trail is located within 230 feet and 60 feet of the GSR Site 11 and Site 13 construction areas, respectively. The trail then becomes a Class II bicycle lane within Antoinette Lane, which is located within 75 feet of the Site 11 construction area.

The level of pedestrian facilities (e.g., sidewalks versus edge-of-road paths) and pedestrian volumes varies in the vicinity of the facility sites, but the predominant mode of travel in the area is by automobile.

5.6.1.4 *Existing Traffic Conditions*

Existing traffic conditions were identified along local roadways that would be directly affected by the construction and operational traffic generated under the proposed Project. Requests for available traffic count data for roadways in the vicinity of the proposed facility sites were submitted to Daly City, Colma, South San Francisco, San Bruno, and Millbrae. The majority of the traffic counts obtained were conducted between 2005 and 2010; however, the traffic counts for seven roadway segments (Antoinette Lane, Chestnut Avenue, Southwest Drive, West Orange Avenue, South Spruce Boulevard, Millbrae Avenue, and Hillcrest Boulevard) were taken prior to 2005. To more accurately reflect existing conditions, the traffic counts for these seven roadway segments were augmented to account for the percentage of population growth that has occurred in the jurisdiction in which the roadway is located between the year the count was taken and 2010. For example, the most recent traffic count available for Antoinette Lane near Site 11 was from 2002. Between 2002 and 2010, the City of South San Francisco experienced a five percent increase in population growth. Therefore, for purposes of this analysis, the traffic count for Antoinette Lane was increased by five percent (i.e., a one for one percentage increase with population growth).

To assign an existing LOS to the roadway segments, the existing roadway capacities were assigned based on the roadway types identified in the Highway Capacity Manual Special Report 209 (Transportation Research Board 1985), including two-lane local streets, two-lane collectors, two-lane lane arterials with left-turn lane, four-lane undivided arterial, four-lane divided arterial with left-turn lane, and six-lane divided arterial with left-turn lane. The volume-to-capacity (V/C) ratio for each roadway segment was then calculated and compared to the following roadway segment LOS definitions, as reported in Highway Capacity Manual (Transportation Research Board 1985).

Level of Service	Traffic Conditions	Upper Vehicle-to-Capacity Threshold
A	Little or no congestion	0.60
B	Small amount of traffic congestion	0.70
C	Average traffic congestion	0.80
D	High traffic congestion	0.90
E	Very high traffic congestion	1.00
F	Oversaturated, stop-and-go conditions	>1.00

Table 5.6-3 (Local Roadway Existing Level of Service Conditions), presents the existing traffic volumes, capacity, V/C ratios, and LOS for the local roadways. Based on the available traffic counts obtained from local jurisdictions, the majority of the roadway segments in the Project area currently operate at LOSs that are in compliance with local standards. Exceptions include one roadway segment that, based on the available traffic counts and assumed roadway capacities, currently operates below established local standards (noted with gray shading in Table 5.6-3). This roadway segment is further described below.

Millbrae Avenue from El Camino Real to Rollins Road – Millbrae Avenue is a major arterial roadway in Millbrae that provides regional access to El Camino Real and U.S. 101. Millbrae Avenue is a six-lane divided arterial (with left-turn lane) with an assigned vehicle capacity of 4,914 vehicles during the peak hour. Millbrae Avenue may be utilized by construction traffic to access Site 16 off of U.S. 101, with the direction of Project construction-related vehicle trips being inbound (westbound) during the A.M. peak period and outbound (eastbound) during the P.M. peak period. The traffic counts on the segment of Millbrae Avenue from El Camino Real to Rollins Road indicate that the roadway operates at an LOS F (i.e., V/C ratio > 1.0) in both the A.M. and P.M. peak hours, which exceeds Millbrae's general standard of LOS D for this roadway segment. During the P.M. peak hour, both the westbound and eastbound roadway segments operate at LOS F.

TABLE 5.6-3
Local Roadway Existing Level of Service Conditions

Local Roadway Segment	Project Facility Sites Served by the Roadway	Existing Traffic Volumes[a]		Roadway Capacity[b]	Volume to Capacity (V/C) Ratio		Roadway Level of Service (LOS)		Local LOS Standard[c]
		A.M. Peak	P.M. Peak		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Sheffield Drive south of John Daly Boulevard	1	449	525	1,092	0.41	0.48	A	A	C
Junipero Serra Boulevard from Pacific Plaza North Garage to John Daly Boulevard	1, 2, 3, 4, WLPS	2,765	2,765	4,914	0.56	0.56	A	A	C
John Daly Boulevard from I-280 to Sheffield Drive (total)	1, 2, 3, 4, WLPS	2,611	3,421	4,550	0.57	0.75	A	C	C
John Daly Boulevard from Sheffield Drive to Park Plaza Drive (total)	2, 3, 4, WLPS	2,015	2,810	4,550	0.44	0.62	A	B	C
Park Plaza Drive from John Daly Boulevard to Bel Mar Avenue	2, 3, 4, WLPS	789	1,039	1,638	0.48	0.63	A	B	C
Park Plaza Drive south of Southgate Avenue	2, 3, 4	572	785	1,092	0.52	0.72	A	C	C
Hill Street from San Pedro Road to B Street	5	187	248	1,092	0.17	0.23	A	A	C
D Street from Hill Street to Junipero Serra Boulevard	5, 6	802	881	3,276	0.24	0.27	A	A	C
San Pedro Road from Hill Street to Washington Street	5, 6	1,314	1,339	2,457	0.53	0.54	A	A	D
Washington Street from San Pedro Road to I-280	5, 6	874	1,099	2,457	0.36	0.45	A	A	D
F Street at El Camino Real	5, 6	296	378	1,092	0.27	0.35	A	A	D
Colma Boulevard from El Camino Real to Junipero Serra Boulevard	7	285	733	2,457	0.12	0.30	A	A	D
Junipero Serra Boulevard from Southgate Avenue to Serra Center	7	661	1,425	3,276	0.20	0.43	A	A	D
Junipero Serra Boulevard from Serra Center to Serramonte Boulevard	7	664	1,547	3,276	0.20	0.47	A	A	D
Serramonte Boulevard near El Camino Real	8	722	1,348	2,457	0.29	0.55	A	A	D

TABLE 5.6-3
Local Roadway Existing Level of Service Conditions

Local Roadway Segment	Project Facility Sites Served by the Roadway	Existing Traffic Volumes[a]		Roadway Capacity[b]	Volume to Capacity (V/C) Ratio		Roadway Level of Service (LOS)		Local LOS Standard[c]
		A.M. Peak	P.M. Peak		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Serramonte Boulevard from Collins Avenue to Shopping Center	8	844	1,238	2,457	0.34	0.50	A	A	D
Collins Avenue from Serramonte Boulevard to El Camino Real	17 (Alt)	240	276	1,092	0.22	0.25	A	A	D
Junipero Serra Boulevard from Serramonte Boulevard to Hickey Boulevard	7, 8, 17 (Alt)	808	1,440	2,457	0.33	0.59	A	A	D
Mission Road from El Camino Real to McLellan Drive	9	502	609	1,092	0.46	0.56	A	A	D
McLellan Drive from Mission Road to El Camino Real	9	905	594	2,457	0.37	0.24	A	A	D
Hickey Boulevard from El Camino Real to Camaritas Avenue	9	1,721	1,931	3,276	0.53	0.59	A	A	D
Hickey Boulevard from Crown Circle to Hilton Avenue	9, 10, 18 (Alt)	1,808	2,060	3,276	0.55	0.63	A	B	D
Camaritas Avenue near Hickey Boulevard	10, 18 (Alt)	510	454	1,092	0.47	0.42	A	A	D
Hickey Boulevard from Hilton Avenue to Junipero Serra Boulevard	9, 10, 18 (Alt)	1,798	2,020	2,457	0.73	0.82	C	D	D
Hickey Boulevard west of Junipero Serra Boulevard	9, 10, 18 (Alt)	1,590	1,876	3,276	0.49	0.57	A	A	D
Antoinette Lane north of Chestnut Avenue	11	112	120	1,092	0.10	0.11	A	A	D
Chestnut Avenue from Antoinette Lane to El Camino Real	11	2,655	2,594	3,276	0.81	0.79	D	C	D
Westborough Boulevard from Camaritas Avenue to Junipero Serra Boulevard	11, 12, 19 (Alt)	2,749	2,733	3,276	0.84	0.83	D	D	D
Southwood Drive from Fairway Drive to El Camino Real	12, 19 (Alt)	59	61	182	0.32	0.33	A	A	D

TABLE 5.6-3
Local Roadway Existing Level of Service Conditions

Local Roadway Segment	Project Facility Sites Served by the Roadway	Existing Traffic Volumes[a]		Roadway Capacity[b]	Volume to Capacity (V/C) Ratio		Roadway Level of Service (LOS)		Local LOS Standard[c]
		A.M. Peak	P.M. Peak		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
West Orange Avenue south of Westborough Boulevard	12, 19 (Alt)	760	680	1,092	0.70	0.62	B	B	D
West Orange Avenue at El Camino Real	12	600	917	1,092	0.55	0.84	A	D	D
Huntington Avenue from South Spruce Avenue to Noor Avenue	13	595	856	2,457	0.24	0.35	A	A	D
South Spruce Avenue from Huntington Avenue to El Camino Real	13	2,011	2,280	2,457	0.61	0.70	B	B	D
Sneath Lane from I-280 to El Camino Real	14, 15	1,634	1,634	3,276	0.50	0.50	A	A	D
Millbrae Avenue between El Camino Real and Rollins Road	16	5,572	6,196	4,914	1.13	1.26	F	F	D
Hillcrest Boulevard at Hemlock Avenue	16	298	298	1,092	0.27	0.27	A	A	A

Notes:

(a) Traffic data obtained from Daly City, Colma, South San Francisco, San Bruno, and Millbrae (Daly City 2005-2007; Colma 2005-2007; South San Francisco 1984-2010; Millbrae 1999-2003). Traffic counts for Antoinette Lane, Chestnut Avenue, Southwest Drive, and West Orange Avenue, South Spruce Boulevard, Millbrae Avenue, and Hillcrest Boulevard were taken prior to 2005. In order to more accurately reflect existing conditions, the traffic counts for these roadways were augmented to account for the percentage of population growth in the city in which the count was taken between the year of the count and 2010.

(b) Roadway capacities were assigned based on roadway types identified in *Highway Capacity Manual Special Report 209* (Transportation Research Board 1985), including two-lane local streets, two-lane collectors, two-lane lane arterials with left-turn lane, four-lane undivided arterial, four-lane divided arterial with left-turn lane, and six-lane divided arterial with left-turn lane.

(c) LOS standards are defined for roadways and intersections in Daly City, Colma, South San Francisco, San Bruno, and Millbrae General Plans (Colma 1999; Daly City 1987; Millbrae 1998; San Bruno 2009; South San Francisco 1999).

5.6.2 Regulatory Framework

5.6.2.1 Federal

There are no federal regulations that address transportation impacts associated with the proposed Project.

5.6.2.2 State and Local

Transportation analysis in California is guided by policies and standards set at the State level by the California Department of Transportation (Caltrans) for highway facilities under State jurisdiction, as well as by local jurisdictions. Any work or traffic control within the State right-of-way requires an encroachment permit issued by Caltrans. In addition, work that requires movement of oversized or excessive load vehicles on highway facilities requires a transportation permit by Caltrans.

Local jurisdictions regulate speed limits and other driving standards on local roadways, including hauling permits for oversized or excessive load vehicles on city streets. South San Francisco Municipal Code Section Chapter 11.32, *Truck Routes*, includes streets designated as traffic routes for vehicles exceeding a maximum gross weight of three tons, such as Spruce Avenue, Chestnut Avenue, Mission Road, El Camino Real, Hickey Boulevard, Hillside Boulevard, and Junipero Serra Boulevard. Town of Colma Municipal Code Section Chapter 6.03.070, *Truck Routes*, designates truck traffic routes for vehicles exceeding three tons, including El Camino Real, Junipero Serra Boulevard, and all other streets, except for F Street and Olivet Parkway. The truck restriction on F Street in Colma is intended for the portion of the roadway east of El Camino Real (Colma 2012).

The Daly City Municipal Code Section 10.60, *Load Limits*, establishes gross tonnage weight limits for several streets, none of which are on access routes to the proposed facility sites. The Daly City Municipal Code also encourages truck traffic to remain on major and minor arterials to the extent possible through hauling permits. Millbrae determines truck-hauling routes on a Project-specific basis in accordance with the Millbrae Municipal Code, Chapter 4.40 Section 010, *Maximum Gross Vehicle Weights on Streets*. The City of San Bruno and San Mateo County do not have designated truck routes; however, each jurisdiction regulates appropriate truck routes through hauling permits (San Bruno 2011; San Mateo 2011).

Caltrans and local jurisdiction policies generally assess the impacts of long-term, not short-term, traffic conditions. These policies generally suggest maintaining a specific LOS, as follows: LOS C (Daly City, Caltrans[2]), and LOS D (San Mateo County, Colma, South San Francisco, San Bruno, and Millbrae[3]) on

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[2] Caltrans endeavors to maintain an LOS at the transition of LOS C and LOS D on State highways. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than the appropriate target LOS, the existing measures of effectiveness should be maintained (Caltrans 2002).

[3] LOS standards vary throughout Millbrae. In the Project area, the LOS standard for El Camino Real and Millbrae Avenue in the morning peak hour is LOS D.

major streets during the peak periods of traffic flow. As noted in Section 5.6.1.1 (Regional and Local Roadways) the C/CAG is designated as the Congestion Management Agency in San Mateo County. The C/CAG adopts a CMP, which is formally amended and readopted every two years. The LOS standards for CMP roadways in the Project study area (U.S. 101, I-280, I-380, and El Camino Real) vary by roadway segment; LOS E for U.S. 101 and El Camino Real, LOS D and E for portions of I-280, and LOS F for I-380 (C/CAG 2011).

5.6.3 Impacts and Mitigation Measures

5.6.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on transportation and circulation if it were to:

- Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
- Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks.
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses.
- Result in inadequate emergency access.
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

5.6.3.2 Approach to Analysis

This impact assessment evaluates the potential for Project-specific, short-term, construction-related impacts on roadways resulting from construction-related changes in roadway capacities, and increased traffic delays either from increases in construction-related traffic or lane closures. Construction activities are also evaluated to determine whether they would result in impacts on emergency access, or result in safety hazards to vehicular traffic, bicyclists, or pedestrians. Long-term impacts associated with operation of the facilities are also addressed.

Construction of the Project is proposed to begin in June 2014 and be completed by the end of February 2016. General work hours would be between 7:00 a.m. and 7:00 p.m. Monday through Friday except for construction of wells, which would require continuous operation of the drilling equipment until the desired depth is achieved and the well is constructed. Therefore, well installation would require nighttime and weekend activity during drilling and other drilling-related activities (for up to seven consecutive days and nights) and during subsequent pump testing (for up to one continuous 48-hour period). If necessary, construction could also occur occasionally on Saturdays between the hours of 7:00 a.m. and 5:00 p.m., independent of well drilling (see Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]).

As described in Chapter 3, Project Description, Section 3.5.1.3 (Water Distribution and Utility Pipeline Installation), travel lane closures would be managed such that one travel lane would be kept open at all times to allow alternating traffic flow in both directions along affected roadways, and the contractor would be required to use steel plates or trench backfilling to restore vehicle access at the end of each workday. Table 5.6-4 (Location and Duration of Partial Roadway Closures) summarizes the location and duration of partial roadway closures used in the following sections for the purpose of analysis; only those proposed facility sites that would require lane closures are listed in the table. Impacts associated with pipeline installation are based on the anticipated installation production rates of 300 to 600 feet per week, as discussed in Chapter 3, Project Description, Section 3.5.1 (Construction Sequencing and Schedule). However, the duration of partial roadway closures for utility connections that extend perpendicularly from a site across a roadway were not estimated using the standard pipeline installation rates of 300 to 600 feet per week, because such connections take more time given the potential to encounter additional utilities, and the need to maintain through traffic. Therefore, it is conservatively assumed for this analysis that utility connections from a site to an existing pipeline within an adjacent roadway would take up to one week for installation of a single connection, and up to two weeks for connections of two or more utilities within the same area. However, in cases where the pipelines would encroach into only a small portion of the roadway (e.g., less than 10 feet at Site 18 [Alternate]), the duration of partial lane closures is estimated to be less than one week.

Increased congestion due to Project construction was evaluated by adding construction vehicle traffic to the current roadway volumes (see Section 5.6.1.4 [Existing Traffic Conditions]). Impacts of the Project on congestion were then assessed by comparing the predicted roadway volumes with the capacity of the roadway, and assigning an LOS based on the vehicle to capacity ratio. This predicted LOS was then compared to the local city and county congestion standards to determine if Project traffic would exceed local standards.

The reduction in roadway capacity through temporary lane closures at some sites could further increase congestion and delays for vehicles using the roadway. The actual impact of construction vehicle traffic on local and regional roadways would depend on the number and type of construction-related vehicles, the number of travel lanes on the roadways used as haul routes, existing traffic volumes on these roadways, road conditions, and other factors. Drivers would experience intermittent delays, particularly if they were traveling behind a construction truck. The impacts of construction traffic would be more noticeable in the immediate vicinity of the facility sites and less noticeable farther away on regional roadways.

TABLE 5.6-4
Location and Duration of Partial Roadway Closures

Site	Partial Travel Lane Closure	Pipelines and Utility Connections	Approximate Duration of Partial Travel Lane Closure
Site 4	Park Plaza Drive 87th Avenue and Park Plaza Drive Intersection	storm drain storm drain and electrical	1 week 1 week
Site 5 (Consolidated Treatment at Site 6)	B Street Hill Street D Street	storm drain and electrical proposed water connection proposed water connection	1 week 1 week 1 week
Site 5 (On-site Treatment)	B Street	storm drain proposed and alternate water connections, sanitary sewer, and electrical	1 week 2 weeks
Site 6 (On-site and Consolidated Treatment)	D Street	storm drain, sanitary sewer, and electrical	2 weeks
Site 7 (Consolidated Treatment at Site 6)	Colma Boulevard	storm drain and electrical	1 week
Site 7 (On-site Treatment)	Colma Boulevard	alternate water connection, storm drain, sanitary sewer, and electrical	2 weeks
Site 10	Camaritas Avenue	sanitary sewer	1 week
Site 12	Southwood Drive	storm drain and sanitary sewer	1 week
Site 13	South Spruce Avenue South Spruce / Huntington Intersection Huntington Avenue	proposed water connection or alternate water connection, storm drain, sanitary sewer, and electrical sanitary sewer proposed water connection	1 week 1 week 5 weeks
Site 14	Sneath Lane	proposed water connection	2 weeks
Site 15	Sneath Lane	proposed water connection, storm drain, sanitary sewer	4 weeks
Site 16	Hemlock Avenue	sanitary sewer	1 week
Site 17 (Alternate)	Collins Avenue	proposed water connection, sanitary sewer, storm drain, and electrical	1 week
Site 18 (Alternate)	Alta Loma Drive	alternate water connection	2 days
Site 19 (Alternate)	Southwood Drive	proposed water connection, storm drain, and electrical	2 weeks

Areas of No Project Impact

As explained below, the proposed Project would not result in impacts related to some of the above-listed significance criteria. The following criteria are not discussed further in the impact analysis, below, for the following reasons:

Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways. The LOS standards established by the C/CAG CMP are intended to regulate long-term impacts due to future operation of Projects and were not developed for temporary construction projects. Therefore, this significance criterion is not applicable to Project construction. According to the 2011 CMP, El Camino Real in the Project area currently operates at LOS A, U.S. 101 operates at LOS C, I-280 operates at LOS A/B/&D (LOS A/B from State Route 1 [north] to State Route 1 [south] and LOS D from State Route 1 [south] to San Bruno Avenue), and I-380 operates at LOS F, each of which is in compliance with LOS standards (C/CAG 2011).

Operation and maintenance of the well facilities would, at most, require one maintenance visit per day on average when the wells are operating and, at maximum, one chemical delivery every two- to three-week period for wells with treatment facilities (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]). Therefore, when wells are operating, up to two trips per day could occur for sites with chemical treatment facilities (one for equipment checks and one for chemical delivery, given that different chemicals may require delivery on different trucks). During years with average and above-average precipitation (i.e., "normal" and "wet" years, respectively), the wells would typically be turned off, and regular exercising would be conducted on a weekly or monthly basis (see Chapter 3, Project Description, Section 3.8.3 [Maintenance]). The addition of one to two trips per day when the wells are operating would not have a long-term impact on LOS of CMP roadways in the Project area. Consequently, Project operation would not conflict with the approved CMP.

Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks. The proposed Project would not result in a change in traffic patterns, because it would not involve construction of structures tall enough to affect air traffic patterns. The maximum height of the proposed well facilities would be 15.5 feet (i.e., 15'-6") above finished grade. Therefore, the Project would have no impact with respect to a change in air traffic patterns that could result in safety risks. The Project proposes only ground-based travel; therefore, Project construction and operation would have no impact with respect to air traffic levels.

Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses. This significance criterion is intended to address facility siting and design impacts and does not apply to temporary construction impacts. Therefore, this significance criterion is not applicable to Project construction activities and is only evaluated as it relates to long-term operational impacts.

Result in inadequate long-term emergency access. As described above, operation and maintenance of the well facilities would, at most, require one maintenance visit per day on average when the wells are operating and, at maximum, one chemical delivery every two- to three-week period for wells with treatment facilities The proposed Project would not result in inadequate emergency access, because no roadway closures would occur during operation of the Project, and there would be no disruptions to emergency access to on-site well facilities or off-site roadways. Therefore, no impact would occur to emergency access from long-term operation of the Project, and emergency access and is only discussed as it relates to Project construction activities.

5.6.3.3 Summary of Impacts

Table 5.6-5 (Summary of Impacts – Transportation and Circulation), presents a summary of the Project's transportation and circulation impacts.

TABLE 5.6-5
Summary of Impacts – Transportation and Circulation

Sites	Construction			Operations	Cumulative
	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.	Impact TR-2: The Project would temporarily impair emergency access to adjacent roadways and land uses during construction.	Impact TR-3: The Project would temporarily decrease the performance and safety of public transit, bicycle, and pedestrian facilities during construction.	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.	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.
Site 1	LS	NI	NI	LS	LS
Site 2	LS	LSM	LS	LS	LSM
Site 3	LS	NI	LS	LS	LS
Site 4	LSM	LS	LS	LS	LSM
Westlake Pump Station	LS	NI	NI	LS	LS
Site 5 (Consolidated Treatment and On-site options)	LSM	LSM	LS	LS	LSM
Site 6	LSM	LS	LS	LS	LSM
Site 7 (Consolidated Treatment and On-site options)	LSM	LS	LS	LS	LSM
Site 8	LS	NI	NI	LS	LS
Site 9	LS	NI	NI	LS	LS
Site 10	LSM	LS	LS	LS	LSM
Site 11	LS	NI	NI	LS	LS
Site 12	LSM	LS	LSM	LS	LSM

TABLE 5.6-5
Summary of Impacts – Transportation and Circulation

Sites	Construction			Operations	Cumulative
	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.	**Impact TR-2: The Project would temporarily impair emergency access to adjacent roadways and land uses during construction.**	**Impact TR-3: The Project would temporarily decrease the performance and safety of public transit, bicycle, and pedestrian facilities during construction.**	**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.**	**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.**
Site 13	LSM	LSM	LSM	LS	LSM
Site 14	LSM	LS	LSM	LS	LSM
Site 15	LSM	LS	LSM	LS	LSM
Site 16	LS	LS	LS	LS	LS
Site 17 (Alternate)	LSM	LS	LS	LS	LSM
Site 18 (Alternate)	LSM	LS	LS	LS	LSM
Site 19 (Alternate)	LSM	LS	LSM	LS	LSM

Notes:

NI = No Impact

LS = Less than Significant

LSM = Less than Significant with Mitigation

5.6.3.4 *Construction Impacts and Mitigation Measures*

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. (Less than Significant with Mitigation)

Construction Traffic

Construction of the Project would result in short-term increases in construction-related vehicle trips on area roadways. Construction of each facility and its associated pipelines and utilities would result in vehicle trips by construction workers commuting to and from facility sites, haul-truck trips associated with the disposal of excavation materials, and material and equipment deliveries. The number of construction-related vehicles traveling to and from facility sites would vary on a daily basis. The greatest number of construction-generated vehicle trips would generally occur at the well facilities with treatment and filtration facilities, because these facilities are larger and require more materials to construct.

Haul truck trips and materials delivery trips would occur during daytime hours, from 7:00 a.m. to 7:00 p.m., Monday through Friday. If necessary, construction work could occasionally occur on Saturdays between the hours of 7:00 a.m. and 5:00 p.m. In addition, the nature of well installation requires continuous operation of the drilling equipment until the desired well depth is achieved to avoid the risk of the drill hole collapsing during construction (see Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]). Therefore, well installation would also require nighttime and weekend activity during drilling and other drilling-related activities (for up to seven consecutive days and nights) and during pump testing (for one continuous 48-hour period). The duration of construction for both well drilling and facility construction is estimated as 16 months for most individual facilities, with an overall 21-month period for construction of all wells and well facilities. Well drilling and facility construction would be completed in clusters with approximately four sites being constructed at approximately the same time in each cluster, with a total of four clusters required to complete construction of the Project (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). In some cases, construction of wells within separate clusters would overlap. For example, construction traffic associated with Sites 1, 3, and 4 in Cluster A would overlap with construction traffic associated with Sites 2 and the Westlake Pump Station in Cluster D. The analysis below accounts for these overlaps.

The first major phase of construction (production well), would last approximately six weeks and would include site preparation, pilot hole drilling, bore hole drilling, and testing. The second major phase of construction (well facility construction), would require a 14-month construction period for sites with well facilities. Sites with a fenced enclosure would require a three-month construction period, except for Site 2 (one-month construction period) and Site 3 (two, three-month construction periods). This phase would involve site preparation and grading, on-site pipeline installation, building construction, installing well pumps, and landscaping, and site restoration. Well facility construction may overlap with the third major phase of construction (utility pipelines).

Table 5.6-6 (Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase) summarizes the maximum daily construction trips for each well facility site and construction cluster on a daily basis. The maximum daily construction trips for each facility would range from eight to 23 daily trips.

TABLE 5.6-6
Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase[(a)]

Site	General Location	Jurisdiction	Highest Volume Construction Phase	Maximum Hauling Truck Trips[(b)]	Maximum Material and Equipment Delivery Trips[(b)]	Maximum Worker Trips[(b)]	Maximum Daily Trips[(c)]
Construction Cluster A							
Site 1	Poncetta Drive	Daly City	Facility + Pipeline	3	7	16	26
Site 3[(d)]	Plaza Park Drive	Daly City	Well Drilling	6	4	5	15
Site 4[(e)]	Plaza Park Drive	Daly City	Facility + Pipeline	17	4	4	25
Site 7 (Consolidated Treatment at Site 6)[(d)]	Colma Boulevard	Colma	Well Drilling	6	4	5	15
Total				32	19	30	81
Construction Cluster B with Alternate Site							
Site 12	Southwood Drive	South San Francisco	Facility + Pipeline	3	7	16	26
Site 14	Sneath Lane	San Bruno	Facility + Pipeline	3	7	16	26
Site 15	Sneath Lane	San Bruno	Facility + Pipeline	1	7	16	24
Site 16	Hemlock Avenue	Millbrae	Facility + Pipeline	1	7	16	24
Site 19 (Alternate)[(d)]	Southwood Drive	South San Francisco	Well Drilling	6	4	5	15
Total				14	32	69	115
Construction Cluster C with Alternate Site							
Site 9	El Camino Real or Mission Road	South San Francisco	Facility + Pipeline	1	7	16	24
Site 10	Camaritas Avenue	South San Francisco	Facility + Pipeline	5	7	16	28
Site 11	Antoinette Lane	South San Francisco	Facility + Pipeline	1	7	16	24
Site 13	South Spruce Avenue/ Huntington Avenue	South San Francisco	Facility + Pipeline	1	7	16	24

TABLE 5.6-6

Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase[a]

Site	General Location	Jurisdiction	Highest Volume Construction Phase	Maximum Hauling Truck Trips[b]	Maximum Material and Equipment Delivery Trips[b]	Maximum Worker Trips[b]	Maximum Daily Trips[c]
Site 18 (Alternate)	Alta Loma Drive	South San Francisco	Facility + Pipeline	3	7	16	26
Total				11	35	80	126
Construction Cluster D with Alternate Site							
Site 2[e]	Plaza Park Drive	Daly City	Facility + Pipeline	2	4	4	10
Site 5 (Consolidated Treatment at Site 6)[d]	B Street	Daly City	Well Drilling	0	4	5	9
Site 6 (Consolidated Treatment at Site 6)	D Street	Daly City	Facility + Pipeline	4	7	16	27
Site 8	Serramonte Blvd.	Colma	Facility + Pipeline	4	7	16	27
Westlake Pump Station[d]	Coronado Avenue	Daly City	Well Drilling	0	4	5	9
Site 17 (Alternate)	Collins Avenue	Colma	Facility + Pipeline	3	7	16	26
Total				14	33	61	108

Notes:

(a) The highest volume period varies. It occurs either during the removal of well cutting or during the overlap of well facility construction and utility pipeline installation.

(b) The three columns for Maximum Hauling Trips, Maximum Material and Equipment Delivery Trips, and Maximum Worker Trips are taken from Tables 3-8 (Estimated Daily Worker and Construction Equipment Trips for Well Facilities Construction) and 3-10 (Construction Soil Material Haul Amounts and Anticipated Haul Truck Trips) in Chapter 3, Project Description, for the highest volume construction phase listed in the fourth column of Table 5.6-6 (Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase).

(c) This column sums the highest daily truck volume, material and equipment delivery trucks, and worker trips to provide an estimate of the maximum daily trips.

(d) For the Westlake Pump Station and wells with fenced enclosures, the peak daily material and deliveries during the Well Drilling construction phase are estimated to be half that for well facilities with buildings.

(e) For wells with fenced enclosures, the peak daily construction workers during the Facility + Pipeline construction phase are estimated to be a quarter of that for well facilities with buildings, and the peak daily material and equipment deliveries are estimated to be half that for well facilities with buildings.

The haul routes used during off-site disposal of excavated materials, and delivery of concrete and other materials would be a combination of regional roadways (e.g., El Camino Real, U.S. 101, I-280, and I-380), major arterials, local arterials, and residential streets, depending on the geographic location of the construction activity. The SFPUC or its contractor(s) would be required to use truck routes approved by local jurisdictions as stated in conditions of approval for the hauling permits. The location of the disposal site for excavated materials would depend on the type of material to be disposed. Non-hazardous spoil would likely be disposed of at Allied Waste Ox Mountain Sanitary Landfill in Half Moon Bay (accessed via U.S. 101 or I-280 to SR 92). Excavated materials and construction debris found to contain hazardous materials (estimated to be less than one percent of overall spoil) would be disposed of at a licensed disposal site (see Section 5.17, Hazards and Hazardous Materials). Potential hazardous material disposal sites include Waste Management's Kettleman Hills Disposal Site in Kettleman City, CA and ECDC Environmental in East Carbon, UT.

Traffic impacts were analyzed during the construction period with the highest volume of trips as shown in Table 5.6-6 (Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase) which would generate the greatest amount of additional vehicles on area roads per day during construction. Table 5.6-7 (Peak Hour Construction Trips) presents the peak hour construction vehicle trips for local roadways, accounting for construction-related vehicles from different sites that would use the same local roadways. All workers are assumed to arrive during the A.M. peak hour and depart during the P.M. peak hour. For hauling trips, the highest daily truck volumes presented in Table 5.6-6 for either hauling or material and equipment delivery trips were used and were distributed evenly through an eight-hour work day. For this analysis, the total peak hour trips reported in Table 5.6-7 are assumed to occur both in the A.M. and P.M. peak hours.

The impact of the construction-related traffic on local roadways was quantitatively assessed using V/C ratios and the LOS impact thresholds of the local jurisdictions. Table 5.6-8 (Local Roadway Project Level of Service), presents the projected LOS of the roadway segments in the Project vicinity, with and without Project-generated vehicle trips (the gray shading highlights those segments with unacceptable LOS).

TABLE 5.6-7

Peak Hour Construction Trips

Local Roadway Segment	Facility Sites Contributing Construction Traffic to Roadway Segment	Peak Hour Worker Trips[(a)]	Peak Hour Haul Trips[(b)]	Total Peak Hour Trips[(c)]
Sheffield Drive south of John Daly Boulevard	1	16	2	18
Junipero Serra Boulevard from Pacific Plaza North Garage to John Daly Boulevard	1, 2, 3, 4, WLPS	34	7	41
John Daly Boulevard from I-280 to Sheffield Drive	1, 2, 3, 4, WLPS	34	7	41
John Daly Boulevard from Sheffield Drive to Park Plaza Drive	2, 3, 4, WLPS	18	6	24
Park Plaza Drive from John Daly Boulevard to Bel Mar Avenue	2, 3, 4, WLPS	18	6	24
Park Plaza Drive south of Southgate Avenue	2, 3, 4	13	5	18
Hill Street from San Pedro Road to B Street	5	5	1	6
D Street from Hill Street to Junipero Serra Boulevard	5, 6	21	2	23
F Street at El Camino Real	5, 6	21	2	23
San Pedro Road from Hill Street to Washington Street	5, 6	21	2	23
Washington Street from San Pedro Road to I-280	5, 6	21	2	23
Colma Boulevard from El Camino Real to Junipero Serra Boulevard	7	5	2	7
Junipero Serra Boulevard from Southgate Avenue to Serra Center	7	5	2	7
Junipero Serra Boulevard from Serra Center to Serramonte Boulevard	7	5	2	7
Serramonte Boulevard near El Camino Real	8	16	2	18
Serramonte Boulevard from Collins Avenue to Shopping Center	8	16	2	18
Collins Avenue from Serramonte Boulevard to El Camino Real	17 (Alt)	16	2	18
Junipero Serra Boulevard from Serramonte Boulevard to Hickey Boulevard	7, 8, 17 (Alt)	37	4	41
Mission Road from El Camino Real to McLellan Drive	9	16	1	17
McLellan Drive from Mission Road to El Camino Real	9	16	1	17

TABLE 5.6-7

Peak Hour Construction Trips

Local Roadway Segment	Facility Sites Contributing Construction Traffic to Roadway Segment	Peak Hour Worker Trips[(a)]	Peak Hour Haul Trips[(b)]	Total Peak Hour Trips[(c)]
Hickey Boulevard from El Camino Real to Camaritas Avenue	9	16	1	17
Hickey Boulevard from Crown Circle to Hilton Avenue	9, 10, 18 (Alt)	48	4	52
Camaritas Avenue near Hickey Boulevard	10, 18 (Alt)	32	2	34
Hickey Boulevard from Hilton Avenue to Junipero Serra Boulevard	9, 10, 18 (Alt)	48	4	52
Hickey Boulevard west of Junipero Serra Boulevard	9, 10, 18 (Alt)	48	4	52
Antoinette Lane north of Chestnut Avenue	11	16	1	17
Chestnut Avenue from Antoinette Lane to El Camino Real	11	16	1	17
Westborough Boulevard from Camaritas Avenue to Junipero Serra Boulevard	11, 12, 19 (Alt)	37	4	41
Southwood Drive from Fairway Drive to El Camino Real	12, 19 (Alt)	21	3	24
West Orange Avenue south of Westborough Boulevard	12, 19 (Alt)	21	3	24
West Orange Avenue at El Camino Real	12	16	2	18
Huntington Avenue from South Spruce Avenue to Noor Avenue	13	16	1	17
South Spruce Avenue from Huntington Avenue to El Camino Real	13	16	1	17
Sneath Lane from I-280 to El Camino Real	14, 15	32	3	35
Millbrae Avenue between El Camino Real and Rollins Road	16	16	1	17
Hillcrest Boulevard at Hemlock Avenue	16	16	1	17

Notes:

(a) Peak hour worker trips assumes all workers from facility sites contributing construction traffic to a local roadway segment would arrive and depart during the A.M. and P.M. peak hours.

(b) For hauling trips, the hauling truck trips and material and equipment delivery trips presented in Table 5.6-6 (Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase) are added together and then distributed evenly through an eight-hour work day.

(c) For this analysis, total peak hour trips are assumed to occur both in the A.M. and P.M. peak hours.

TABLE 5.6-8

Local Roadway Project Level of Service

Roadway Segment	Closest Project Facility Sites	Existing[a]				Existing plus Project[b]				Local LOS Standard[c]
		V/C Ratio		LOS		V/C Ratio		LOS		
		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Sheffield Drive south of John Daly Boulevard	1	0.41	0.48	A	A	0.43	0.5	A	A	C
Junipero Serra Boulevard from Pacific Plaza North Garage to John Daly Boulevard	1, 2, 3, 4, WLPS	0.56	0.56	A	A	0.57	0.57	A	A	C
John Daly Boulevard from I-280 to Sheffield Drive	1, 2, 3, 4, WLPS	0.57	0.75	A	C	0.58	0.76	A	C	C
John Daly Boulevard from Sheffield Drive to Park Plaza Drive	2, 3, 4, WLPS	0.44	0.62	A	B	0.45	0.62	A	B	C
Park Plaza Drive from John Daly Blvd to Bel Mar Avenue	2, 3, 4, WLPS	0.48	0.63	A	B	0.50	0.65	A	B	C
Park Plaza Drive south of Southgate Avenue	2, 3, 4	0.52	0.72	A	C	0.54	0.74	A	C	C
Hill Street from San Pedro Road to B Street	5	0.17	0.23	A	A	0.18	0.23	A	A	C
D Street from Hill Street to Junipero Serra Boulevard	5, 6	0.24	0.27	A	A	0.25	0.28	A	A	C
San Pedro Road from Hill Street to Washington Street	5, 6	0.53	0.54	A	A	0.54	0.55	A	A	C
Washington Street from San Pedro Road to I-280	5, 6	0.36	0.45	A	A	0.37	0.46	A	A	C
F Street at El Camino Real	5, 6	0.27	0.35	A	A	0.29	0.37	A	A	D
Colma Blvd from El Camino Real to Junipero Serra Boulevard	7	0.12	0.30	A	A	0.12	0.30	A	A	D
Junipero Serra Boulevard from Southgate Avenue to Serra Center	7	0.20	0.43	A	A	0.20	0.44	A	A	D
Junipero Serra Boulevard from Serra Center to Serramonte Boulevard	7	0.20	0.47	A	A	0.20	0.47	A	A	D

TABLE 5.6-8

Local Roadway Project Level of Service

Roadway Segment	Closest Project Facility Sites	Existing[a]				Existing plus Project[b]				Local LOS Standard[c]
		V/C Ratio		LOS		V/C Ratio		LOS		
		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Serramonte Boulevard near El Camino Real	8	0.29	0.55	A	A	0.30	0.56	A	A	D
Serramonte Boulevard from Collins Avenue to Shopping Center	8	0.34	0.50	A	A	0.35	0.51	A	A	D
Collins Avenue from Serramonte Boulevard to El Camino Real	17 (Alt)	0.22	0.25	A	A	0.24	0.27	A	A	D
Junipero Serra Boulevard from Serramonte Boulevard to Hickey Boulevard	7, 8, 17 (Alt)	0.33	0.59	A	A	0.35	0.60	A	A	D
Mission Road from El Camino Real to McLellan Drive	9	0.46	0.56	A	A	0.48	0.57	A	A	D
McLellan Drive from Mission Road to El Camino Real	9	0.37	0.24	A	A	0.38	0.25	A	A	D
Hickey Boulevard from El Camino Real to Camaritas Avenue	9	0.53	0.59	A	A	0.53	0.59	A	A	D
Hickey Boulevard from Crown Circle to Hilton Avenue	9, 10, 18 (Alt)	0.55	0.63	A	B	0.57	0.64	A	B	D
Camaritas Avenue near Hickey Boulevard	10, 18 (Alt)	0.47	0.42	A	A	0.50	0.45	A	A	D
Hickey Boulevard from Hilton Avenue to Junipero Serra Boulevard	9, 10, 18 (Alt)	0.73	0.82	C	D	0.75	0.84	C	D	D
Hickey Blvd west of Junipero Serra Boulevard	9, 10, 18 (Alt)	0.49	0.57	A	A	0.50	0.59	A	A	D
Antoinette Lane north of Chestnut Avenue	11	0.10	0.11	A	A	0.12	0.13	A	A	D
Chestnut Avenue from Antoinette Lane to El Camino Real	11	0.81	0.79	D	C	0.82	0.80	D	C	D
Westborough Boulevard from Camaritas Avenue to Junipero Serra Boulevard	11, 12, 19 (Alt)	0.84	0.83	D	D	0.85	0.85	D	D	D

TABLE 5.6-8

Local Roadway Project Level of Service

Roadway Segment	Closest Project Facility Sites	Existing[a]				Existing plus Project[b]				Local LOS Standard[c]
		V/C Ratio		LOS		V/C Ratio		LOS		
		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Southwood Drive from Fairway Drive to El Camino Real	12, 19 (Alt)	0.32	0.33	A	A	0.45	0.47	A	A	D
West Orange Avenue south of Westborough Boulevard	12, 19 (Alt)	0.70	0.62	B	B	0.72	0.65	C	B	D
West Orange Avenue at El Camino Real	12	0.55	0.84	A	D	0.57	0.86	A	D	D
Huntington Avenue from South Spruce Avenue to Noor Avenue	13	0.24	0.35	A	A	0.25	0.36	A	A	D
South Spruce Avenue from Huntington Avenue to El Camino Real	13	0.61	0.70	B	B	0.62	0.70	B	B	D
Sneath Lane from I-280 to El Camino Real	14, 15	0.50	0.50	A	A	0.51	0.51	A	A	D
Millbrae Avenue between El Camino Real and Rollins Road	16	1.13	1.26	F	F	1.14	1.26	F	F	D
Hillcrest Boulevard at Hemlock Avenue	16	0.27	0.27	A	A	0.29	0.29	A	A	A

Notes:

(a) As reported in Table 5.6-3 (Local Roadway Existing Level of Service Conditions).

(b) V/C and LOS for local segments when total peak hour trips from Table 5.6-7 (Peak Hour Construction Trips) is added to the existing traffic volumes for local roadways presented in Table 5.6-3.

(c) LOS standards defined for roadways and intersections in Daly City, Colma, South San Francisco, San Bruno and Millbrae general plans.

Sites 1 through 15, 17 (Alternate), 18 (Alternate), 19 (Alternate), and Westlake Pump Station

As shown in Table 5.6-8 (Local Roadway Project Level of Service), the roadway segments in the vicinity of Sites 1 through 15, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station (see Figures 3-11 through 3-36, and 3-38 through 3-40) currently operate at acceptable LOSs during the A.M. and P.M. peak periods and the addition of construction vehicles would not substantially affect the peak-hour conditions or degrade the roadway segments to a lower LOS standard. Because the roadway segments in the vicinity of these sites have sufficient capacity to accommodate the temporary increase in construction traffic, and because the roadway segments would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from construction traffic at these sites would be *less than significant*.

Site 16

Construction of Site 16 (see Figure 3-37) would contribute up to 17 trips in the A.M. and P.M. peak hour on Millbrae Avenue from El Camino Real to Rollins Road, a segment of roadway that, based on traffic counts, currently operates at LOS F conditions during both the A.M. and P.M. peak hours. The direction of Project construction-related vehicle trips would be in-bound (i.e., westbound) during the A.M. peak period and out-bound (i.e., eastbound) during the P.M. peak period. Of the 17 trips during the peak hours, 16 of the trips would be construction worker vehicles and one trip would be a haul truck. The addition of 17 trips would represent an approximately 0.3 percent increase in traffic volumes along this roadway segment during the A.M. and P.M. peak periods. As shown in Table 5.6-8 (Local Roadway Project Level of Service), the results of the quantitative LOS analysis indicate that the addition of up to 17 construction-generated trips during both the A.M. and P.M. peak hours would not substantially affect baseline traffic levels on Millbrae Avenue. The V/C ratio would increase by .01 during the A.M. peak hour and would not result in a detectable increase during the P.M. peak hour. Although the roadway currently operates at LOS F during peak hours, the Project's contribution of construction traffic would be temporary and would not substantially affect the baseline traffic levels because the Project contribution would be negligible and barely perceptible; i.e., there would be no noticeable delay or increase in congestion given the small amount of trips added to the roadway during Project construction. Therefore, the temporary impact from construction traffic along this roadway segment would be *less than significant*.

Impact Conclusion: Less than Significant

Travel Lane Closures

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

Sites 3, 8, 9, 11, and Westlake Pump Station

Construction activities for Sites 3, 9, 11, and the Westlake Pump Station would not extend into adjacent roadways and would not require temporary lane closures (see Figures 3-12, 3-23, 3-27, and 3-13, respectively). Construction activities at Site 8 would extend into the Kohl's Department Store parking lot, but would not extend into any public roadways and would not require temporary lane closures (see

Figure 3-22). Therefore, since there would be no lane closures associated with construction activities for Sites 3, 8, 9, 11, and the Westlake Pump Station, and there would be *no impact* at these sites.

Impact Conclusion: No Impact

Sites 1, 2, and 16

Site 1

Construction of the alternate water connection to the Daly City water system at Site 1 would extend approximately 75 feet into the end of Poncetta Drive (see Figure 3-11) and, as a result, may require a partial closure of the roadway. However, Poncetta Drive ends at the facility site and construction activities would not block traffic along any portion of Poncetta Drive. Construction of the proposed water connection pipeline (to the SFPUC transmission pipeline) would not require lane closures. The portion of Poncetta Drive that would be temporarily closed would be at the end of the roadway and would not affect access to the Westlake Village Apartment residences, parking, or garbage dumpsters.

Site 2

Construction activities at Site 2 would extend along the sidewalk on the east side of Park Plaza Drive (see Figure 3-12). However, construction would not extend into the adjacent roadway. Construction would require trenching across a 20-foot private access road that leads to the maintenance facility of the Lake Merced Golf Club; however, this would not affect roadway capacity because it is not a public roadway, receives only minimal maintenance related traffic, and construction across the road could be completed within one day, assuming installation of pipelines at a rate of approximately 300 to 600 feet per week (see Section 3.5.1 [Construction Sequencing and Schedule]).

Site 16

Site 16 would require temporary partial closure of Hemlock Avenue (see Figure 3-37). However, Hemlock Avenue is not a through street at this location; therefore, construction would not affect through traffic. Because there would not be any construction within traffic lanes adjacent to these sites and travel lane closures would not be needed, potential impacts on traffic, relative to a temporary reduction in roadway capacity, increased traffic delays, or traffic safety hazards due to traffic lane closures would be *less than significant* at these sites.

Impact Conclusion: Less than Significant

Sites 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 (Alternate), 18 (Alternate), and 19 (Alternate)

Construction activities at Sites 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 (Alternate), 18 (Alternate), and 19 (Alternate) would require construction activities within the public right-of-way and temporary alternating travel lane closures. A summary of the travel lane closures for each of these sites is described in Table 5.6-4 (Location and Duration of Partial Roadway Closures). As described in Chapter 3, Project Description, Section 3.5.1.3 (Water Distribution and Utility Pipeline Installation), travel lane closures would be managed such that one travel lane would be kept open at all times to allow alternating traffic flow in both directions along affected roadways. Each closure is evaluated for impacts on traffic relative to temporary reductions in roadway capacity, increased traffic delays, or traffic safety hazards. Impacts relative to safety or performance of public transit, bicycle, or pedestrian facilities are evaluated under Impact TR-3, below.

Underground pipeline and electrical installation that requires work to be performed within paved streets would use the open trench construction method. As indicated in Chapter 3, Project Description, Section 3.5.1 (Construction Sequencing and Schedule), pipeline construction would proceed at approximately 300 to 600 feet per week. Construction within streets could result in a temporary reduction in the number, or in the available width, of travel lanes, and, as a result, vehicles (including transit) using the affected roadways could encounter increased congestion and delays.

Within paved streets, the amount of roadway needed for construction would depend on where the pipelines would be located and whether on-street parking is currently provided; either two travel lanes, or one travel lane and a parking lane, would be needed to accommodate the construction zone. Some roadway segments would have sufficient pavement width outside of the construction zone to accommodate two-way traffic flow (e.g., Park Plaza Drive, South Spruce Avenue, Huntington Avenue, Alta Loma Drive). At some sites, pipeline connections would be installed across an entire roadway or intersection (e.g., B Street, Hill Street, D Street, Colma Boulevard, Camaritas Avenue, Southwood Drive, South Spruce Avenue, Sneath Lane, Collins Avenue, Southwood Drive). However, partial lane closures would result in additional vehicle delay when alternate one-way traffic operations are required, and some drivers might shift to other, potentially less convenient routes to access their destination, thereby increasing traffic on those roadways. Regardless, traffic would be delayed as it travels past the construction zone. At some locations, it could be necessary to temporarily interrupt traffic flow in both directions to facilitate construction vehicle turning movements into and out of the facility sites. These impacts would typically occur only during the day, because the contractor would be required to use steel plates or trench backfilling to restore vehicle access at the end of each workday, as discussed in further detail for each site, below, and as discussed in Chapter 3, Project Description, Section 3.5.1.3 (Water Distribution and Utility Pipeline Installation).

Site 4

Site 4 would be located just east of and adjacent to Park Plaza Drive in Daly City (see Figure 3-12). Construction of pipelines would require partial lane closures along an approximately 350-foot stretch of the parking and northbound travel lane of Park Plaza Drive from the northern end of 87th Street. As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), the partial lane closure along Park Plaza Drive would be needed for up to one week for installation of the storm drain. In addition, a partial lane closure at the intersection of 87th Avenue and Park Plaza Drive would be needed for up to one week for installation storm drain and electrical connections within the intersection.

The partial travel lane closure on Park Plaza Drive would result in a temporary reduction in roadway capacity; however, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Park Plaza Drive south of Southgate Avenue operates at LOS A during the A.M. peak hour and at LOS C during the P.M. peak hour. Therefore, Park Plaza Drive would have sufficient capacity to accommodate the temporary reduction in roadway capacity and, because the roadway segments would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

However, the partial closure of the intersection with 87th Street and Park Plaza Drive could have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way for this site would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by Daly City.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Park Plaza Drive and the intersection of Park Plaza Drive and 87th Street to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Park Plaza Drive and the 87th Street intersection would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones, and prescribing traffic detours (if needed) to reduce the potential impacts. As a result, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 4 to *less-than-significant* levels.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])[4]

Prior to construction, the SFPUC and its contractor(s) shall prepare and implement traffic control plans for each local jurisdiction in which construction would affect roadways and intersections. The traffic control plan shall be submitted to the applicable local jurisdiction for review as part of the encroachment permit process. Each contractor shall prepare a traffic control plan for the well facility sites under their contract, and where construction at well facility sites could occur within and/or across multiple streets in the same vicinity, the SFPUC and its construction contractors shall coordinate the traffic control plans to mitigate the impact of traffic disruption.

The traffic control plan shall include sufficient measures to address the overall Project construction, as well as appropriate site-specific measures, including measures to reduce potential impacts on traffic flows on roadways affected by Project construction activities. The traffic control plan shall comply with local jurisdiction and Caltrans requirements and be tailored to reflect site-specific traffic and safety concerns, as appropriate. The traffic control plan shall include, but not necessarily be limited to, the following measures as applicable to site-specific conditions:

[4] Impact TR-1 is not significant for Site 2, but it is included here because a Traffic Control Plan is required under Impact TR-2, which is discussed below.

<u>Traffic Controls</u>

- Circulation and detour plans shall be developed to minimize impacts on local street circulation. Haul routes that minimize truck traffic on local roadways and residential streets shall be utilized to the extent feasible. Flaggers and/or signage shall be used to guide vehicles through and/or around the construction zone.
- A public information program to advise motorists, nearby residents, and adjacent commercial establishments of the impending construction activities (e.g., media coverage, direct distribution of flyers to impacted properties, email notices, portable message signs, informational signs at the job sites) shall be developed and implemented.
- Truck routes designated by local jurisdictions shall be identified in the traffic control plan and shall be utilized to the extent feasible to minimize truck traffic on local roadways and residential streets that are not identified locally as designated haul routes.
- Lane closures shall be limited during peak hours to the extent feasible. In addition, outside of allowed working hours, or when work is not in progress, roads shall be restored to normal operations, with all trenches covered with steel plates.
- Roadside safety protocols shall be implemented, such as advance "Road Work Ahead" warning signs, and speed control (including signs informing drivers of State-legislated double fines for speed infractions in a construction zone) shall be provided to achieve required speed reductions for safe traffic flow through the work zone.
- Roadway rights-of-way shall be repaired or restored to their general pre-construction condition (or better) upon completion of construction.
- The traffic control plan shall also conform to applicable provisions of the State's *Manual of Traffic Controls for Construction and Maintenance Work Areas.*

<u>Private and Emergency Access</u>

- Access to driveways and private roads shall be maintained, as feasible, by using steel trench plates. If access must be restricted for brief periods (more than one hour), property owners shall be notified by the SFPUC in advance of such closures.
- At locations where the main access to a nearby property is blocked, the SFPUC shall be required to have ready at all times the means necessary to accommodate access by emergency vehicles to such properties, such as plating over excavations, short detours, and/or alternate routes.
- Construction shall be coordinated with facility owners or administrators of land uses that may be more significantly affected by traffic impacts, such as police and fire stations, transit stations, hospitals, ambulance providers, and schools. Emergency responders, and other more significantly affected facility owners and/or operators shall be notified by the SFPUC in advance of the timing, location, and duration of construction activities and the locations and durations of any temporary detours and/or lane closures.

Transit Controls

- Construction shall be coordinated with local transit service providers to arrange the temporary relocation of bus routes or bus stops in work zones, if necessary.
- Prior to construction activities, the SFPUC shall work with SamTrans and the City of South San Francisco to temporarily relocate the SamTrans bus stop located along the southbound lane of El Camino Real near West Orange Avenue. The temporary bus stop shall be located in an acceptable location that minimizes impacts to bus users and meets safety requirements.
- Prior to construction activities, the SFPUC shall work with SamTrans and the City of South San Francisco to temporarily relocate the SamTrans bus stop located in the pipeline construction zone along the northbound lane of Huntington Avenue. The temporary bus stop shall be located at an acceptable location that minimizes impacts to bus users and meets safety requirements.

Pedestrian and Bicycle Access

- Pedestrian and bicycle access and circulation shall be maintained during Project construction where safe to do so. If construction activities encroach on a bicycle lane, warning signs shall be posted that indicate bicycles and vehicles are sharing the lane.
- Detours shall be included for bicycles and pedestrians in all areas potentially affected by Project construction. Notices shall be provided to advise bicyclists and pedestrians of any temporary detours around construction zones.

Site 5

Site 5 would be located adjacent to, and just south of, B Street in Daly City (see Figures 3-14, 3-15, 3-18, and 3-19). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), Site 5 (On-site Treatment) would require partial lane closures along B Street for up to three weeks for installation of the proposed or alternate water connection pipeline, storm drain, and electrical lines. Installation of the storm drain pipeline at the site would occur within the curb and sidewalk on the south side of B Street, which would restrict parking, but would likely allow for continued two-way traffic flow along the approximately 300-foot lane closure. As shown in Table 5.6-4, Site 5 (Consolidated Treatment at Site 6) would require partial lane closures along B Street for up to one week, as well as along Hill Street and D Street for up to one week each for installation of the water connection pipeline from Site 5 to Site 6.

The travel lane closures on B Street, Hill Street, and D Street would result in a temporary reduction in roadway capacity; however, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Hill Street and D Street currently operate at LOS A conditions. Traffic counts were not available for B Street, though it is assumed to operate at similar LOS conditions as Hill Street given its isolated location and surrounding uses. Therefore, B Street, Hill Street, and D Street would have sufficient capacity to accommodate the temporary reduction in roadway capacity from the temporary lane closures and, because the roadway segments would continue to operate satisfactorily during construction, in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

However, the travel lane closures on B Street (required for both configurations of Site 5), Hill Street, and D Street could have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles, including the potential confusion of drivers where traffic is routed into the travel lane adjacent to the work zone. Construction activities within the public right-of-way for this site would be required to provide for continuity of vehicle traffic, reduce the potential for traffic accidents, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by Daly City.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on B Street, Hill Street, and D Street to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for these roadways would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 5 to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See above for a description)

Site 6

Site 6 would be located adjacent to D Street in Daly City (see Figures 3-14, 3-16, 3-18 and 3-20); traffic conditions would be the same for both Project options (On-site Treatment at Sites 5, 6, and 7 versus Consolidated Treatment for those sites at Site 6). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), construction of pipelines at Site 6 would require partial lane closures along D Street for approximately two weeks to accommodate installation of the storm drain, sanitary sewer, and electrical connections.

The travel lane closures on D Street would result in a temporary reduction in roadway capacity; however, as shown in Table 5.6-8 (Local Roadway Project Level of Service), D Street operates at LOS A conditions. Therefore, D Street would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway segments would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

However, the travel lane closures on D Street would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles, including the potential confusion of drivers where traffic is routed into the travel lane adjacent to the work zone. Construction activities within the public right-of-way of D Street would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by Daly City.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on D Street to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Site 6 would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones, and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 6 to *less-than-significant* levels.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See above for a description)

Site 7

Site 7 would be located adjacent to and just north of Colma Boulevard, which is a major thoroughfare between El Camino Real and Junipero Serra Boulevard, and is the access road for the 280 Metro Mall to the west (see Figures 3-14, 3-17, 3-18, and 3-21). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), Site 7 (On-site treatment) would require partial lane closures along Colma Boulevard for up to two weeks for installation of the alternate water connection, storm drain, sanitary sewer, and electrical lines. If the proposed water connection were implemented then Colma Boulevard would still be subject to lane closures for installation of the sanitary sewer and storm drain pipelines. For Site 7 (Consolidated Treatment at Site 6), construction would require partial lane closures along Colma Boulevard for up to one week for installation of a storm drain and electrical lines.

The travel lane closures on Colma Boulevard would result in a temporary reduction in roadway capacity; however, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Colma Boulevard currently operates at LOS A conditions. Therefore, Colma Boulevard would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant.*

However, the travel lane closures on Colma Boulevard would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles, including the potential confusion of drivers where traffic is routed into the travel lane adjacent to the work zone. Construction activities within the public right-of-way of Colma Boulevard would be required to provide for continuity of vehicle traffic, reduce the potential for traffic accidents, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by Colma.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Colma Boulevard to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Colma Boulevard would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones, and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 7 to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See above for a description)

Site 10

Site 10 would be located in the southwest corner of the intersection of Hickey Boulevard and Camaritas Avenue (see Figure 3-25). Pipeline construction would require the partial closure of an approximately 25-foot long section of the southbound lane of Camaritas Avenue and also partially affecting the northbound lane, as well as an egress/ingress to the Winston Manor shopping mall on the east side of Camaritas Avenue. As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), installation of the sanitary sewer at Site 10 would require partial lane closures along Camaritas Avenue for up to one week.

The travel lane closures on Camaritas Avenue would result in a temporary reduction in roadway capacity. However, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Camaritas Avenue near Hickey Boulevard currently operates at LOS A conditions. Therefore, Camaritas Avenue would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant.*

However, the travel lane closures on Camaritas Avenue would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of Camaritas Avenue would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by South San Francisco.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Camaritas Avenue to a *less-than-significant* level, which would be accomplished by requiring that the SFPUC and/or its contractor implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Camaritas Avenue would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 10 to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See above for a description)

Site 12

Site 12 would be located adjacent to Southwood Drive and El Camino Real (see Figures 3-29 and 3-30). The installation of pipelines for connection with the local sanitary sewer and storm drain would require a temporary closure of approximately 90 feet of the eastbound lane of Southwood Drive east of Fairway Drive. As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), partial lane closures along Southwood Drive would be needed for up to one week. In addition, installation of the pipeline to connect the well at Site 12 to the regional water system would require the closure of approximately 800 feet of the sidewalk south along El Camino Real to West Orange Avenue, though lane closures along El Camino Real itself would not be needed. Sidewalk closure would be required for the proposed water connection; however no such closures would be needed for the alternate water connection.

The travel lane closures on Southwood Drive would result in a temporary reduction in roadway capacity. However, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Southwood Drive near El Camino Real currently operates at LOS A conditions. Therefore, Southwood Drive would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

However, the travel lane closures on Southwood Drive would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of Southwood Drive would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by South San Francisco.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Southwood Drive to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Southwood Drive would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 12 to *less-than-significant* levels.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See above for a description)

Site 13

Site 13 would be located just south of, and adjacent to, South Spruce Avenue in South San Francisco (see Figures 3-31 and 32). Construction of water connection and sanitary sewer pipelines would require temporary closure of an approximately 300-foot stretch of the right-hand eastbound travel lane of South Spruce Avenue from Huntington Avenue to Site 13. The sanitary sewer would also connect to the west side of Huntington Avenue on South Spruce Avenue. The connection to the regional water system would also extend along Huntington Avenue from South Spruce Avenue to Noor Avenue, requiring temporary closure of an approximately 1,400-foot stretch of the right-hand northbound travel lane of Huntington Avenue.

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), partial lane closures along South Spruce Avenue would be needed for just over one week. Partial lane closures along Huntington Avenue would be needed for up to five weeks. In addition, partial lane closures at the intersection of South Spruce Avenue and Huntington Avenue would be needed for one week. If the alternate water connection pipeline (to California Water Service Company [Cal Water) were installed instead of the proposed connection (to San Bruno), then pipeline construction impacts would be limited to South Spruce Avenue and would result in temporary lane closure for approximately two weeks; Huntington Avenue would not be affected.

The travel lane closures on South Spruce Avenue and Huntington Avenue would result in a temporary reduction in roadway capacities. However, as shown in Table 5.6-8 (Local Roadway Project Level of Service), South Spruce Avenue and Huntington Avenue currently operate at LOS B and A conditions, respectively. Therefore, South Spruce Avenue and Huntington Avenue would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

However, the travel lane closures on South Spruce Avenue and Huntington Avenue would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of South Spruce Avenue and Huntington Avenue would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards and ensure worker safety in construction zones in accordance with local standards and specifications adopted by South San Francisco.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on South Spruce Avenue and Huntington Avenue to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for South Spruce

Avenue and Huntington Avenue would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 13 to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See above for a description)

Sites 14 and 15

Sites 14 and 15 would be located within the Golden Gate National Cemetery (GGNC) (see Figures 3-34, 3-35, and 3-36). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), pipeline construction to connect Site 14 to Site 15 (see Figure 3-34) would require a partial lane closure along Sneath Lane for up to two weeks. The partial travel lane closure would occur on the westbound portion of Sneath Lane. In addition, construction of the pipeline connecting Site 14 to Site 15 would also require the temporary closure of the southern entrance to the GGNC for approximately one to two days.

Pipeline construction for Site 15 (see Figures 3-34 and 3-36) connecting it to the storm drain and sewer systems would require partial lane closures along Sneath Lane for up to four weeks (see Table 5.6-4 [Location and Duration of Partial Roadway Closures]). Partial lane closures would be needed for both the westbound and eastbound lanes. Construction at Site 15 would also require the temporary closure of the southern entrance to the GGNC for approximately one to two days.

The travel lane closures on Sneath Lane would result in a temporary reduction in roadway capacity. However, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Sneath Lane currently operates at LOS A conditions. Therefore, Sneath Lane would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant.*

However, the travel lane closures on Sneath Lane would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of Sneath Lane would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards and ensure worker safety in construction zones in accordance with local standards and specifications adopted by San Bruno.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Sneath Lane to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Sneath Lane would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones, and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Sites 14 and 15 to *less-than-significant* levels.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See above for a description)

Site 17 (Alternate)

Site 17 (Alternate) would be located adjacent to Collins Avenue in Colma (see Figure 3-38). Pipeline installation would extend halfway into Collins Avenue, which would require a partial closure of the eastbound lane during construction of the water connection, sanitary sewer, and storm drain liness. As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), pipeline construction would require a partial lane closure along Collins Avenue for up to one week.

The travel lane closure on Collins Avenue would result in a temporary reduction in roadway capacity. However, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Collins Avenue operates at LOS A conditions. Therefore, Collins Lane would have sufficient capacity to accommodate the temporary reduction in roadway capacity from a temporary alternating lane closure and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

The travel lane closures on Collins Avenue would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of Collins Avenue would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by Colma.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Collins Avenue to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Collins Avenue would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 17 (Alternate) to *less-than-significant* levels.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See above for a description)

Site 18 (Alternate)

Site 18 (Alternate) would be located adjacent to Alta Loma Drive in South San Francisco (see Figure 3-39). If the alternate water connection at Site 18 (Alternate) were selected, it would require a partial closure of an approximately 25-foot stretch of the eastbound lane of Alta Loma Drive. As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), the partial lane closure along Alta Loma Drive would be needed for approximately two days to construct the alternate water connection pipeline (to Cal Water) whereas the proposed water connection pipeline (to the SFPUC) would not require lane closures in Alta Loma Drive. The alternating travel lane closure on Alta Loma Drive would result in a temporary reduction in roadway capacity. Traffic counts were not available for Alta Loma Drive, though it is assumed to operate at similar LOS conditions as Camaritas Avenue, given its location and surrounding land uses. As shown in Table 5.6-8 (Local Roadway Project Level of Service), Camaritas Avenue near Hickey Boulevard currently operates at LOS A conditions. Therefore, it is presumed that Alta Loma Drive would have sufficient capacity to accommodate the temporary reduction in roadway capacity from a temporary a lane closure and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant.*

However, the travel lane closures on Alta Loma Drive would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of Alta Loma Drive would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards and ensure worker safety in construction zones in accordance with local standards and specifications adopted by South San Francisco.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Alta Loma Drive to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Alta Loma Drive would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones, and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at Site 18 (Alternate) to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See above for a description)

Site 19 (Alternate)

Construction of the well at Site 19 (Alternate) would require partial lane closures along Southwood Drive for up to two weeks for installation of the water connection line from the well at Site 19 (Alternate) to a treatment facility location at Site 12 and to install a storm drain and electrical line (see Table 5.6-4

[Location and Duration of Partial Roadway Closures]). The rest of the installation of the pipeline to connect the well at Site 19 (Alternate) to the regional water system would be the same as with Site 12.

The travel lane closures on Southwood Drive would result in a temporary reduction in roadway capacities. However, as shown in Table 5.6-8 (Local Roadway Project Level of Service), Southwood Drive near El Camino Real currently operates at LOS A conditions. Therefore, Southwood Drive would have sufficient capacity to accommodate the temporary reduction in roadway capacity from temporary lane closures and, because the roadway would continue to operate satisfactorily during construction in accordance with local LOS standards, the temporary impact from travel lane closures at this site would be *less than significant*.

However, the travel lane closures on Southwood Drive would have a *significant* impact on traffic relative to the potential for construction within the right-of-way to result in an increase in traffic safety hazards for vehicles sharing the road with construction vehicles. Construction activities within the public right-of-way of Southwood Drive would be required to provide for continuity of vehicle traffic, reduce the potential for traffic hazards, and ensure worker safety in construction zones in accordance with local standards and specifications adopted by South San Francisco.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would still be required to reduce the potential impact of increased traffic safety hazards resulting from travel lane closures on Southwood Drive to a *less-than-significant* level, which would be accomplished by requiring the SFPUC and/or its contractor to implement a traffic control plan to reduce potential impacts on traffic flows and safety hazards during construction activities. The traffic control plan for Southwood Drive would minimize the potential impact of lane closures on traffic and safety hazards by providing for continuity of vehicle traffic, ensuring worker and vehicle safety within construction zones and prescribing traffic detours (if needed) to reduce the potential impacts. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on traffic at 19 (Alternate) to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See above for a description)

Impact Conclusion: Less than Significant with Mitigation

Impact TR-2: The Project would temporarily impair emergency access to adjacent roadways and land uses during construction. (Less than Significant with Mitigation)

Construction activities associated with the Project would be conducted primarily on sites within the SFPUC right-of-way. However, as discussed under Impact TR-1, some construction activities would cross or be within public roadways and could require temporary lane closures. Temporary travel lane closures, including the extent and duration of closures, are summarized previously in Impact TR-1.

Pipeline construction within or adjacent to public roadways that would result in a reduction in travel lanes or partial roadway closures could result in delays for emergency response vehicles or temporarily block access to driveways and cross-streets along the pipeline route. At facility sites that would require partial road closures, but would not affect access to properties, the travel lane closures could result in delays for emergency response vehicles where such vehicles are routed into the travel lane adjacent to the work zone. These impacts would only occur during the day when construction is ongoing because vehicle access would be restored at the end of each workday through the use of steel trench plates or trench backfilling (see Chapter 3, Project Description, Section 3.5.1.3 [Water Distribution and Utility Pipeline Installation]).

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

Sites 1, 3, 8, 9, 11, and Westlake Pump Station

Construction at Sites 1, 9, and the Westlake Pump Station would not require travel lane closures or prevent access to adjacent land uses. At Site 3, Ben Franklin Intermediate School is accessed from Stewart Avenue, which would not be affected during construction. Construction at Site 8 would temporarily limit access to the back of the Kohl's Department Store during installation of the electrical conduit for up to two days (see Figure 3-22 and Table 5.6-1 [Daily Traffic Volume on Regional Roadways]). Customers, delivery vehicles, and emergency vehicles would continue to access the store through the front entrance, and circulation around either side of the store would remain available during trenching for installation of the underground electrical connection. Access to Site 11 would occur adjacent to a BART ventilation structure. However, access to the structure from adjacent roadways would not be impeded during construction at Site 11, as can be seen in Figure 3-28. As a result, no impacts would occur relative to emergency access and access to adjacent land uses during construction for Sites 1, 3, 8, 9, 11, and the Westlake Pump Station during construction; *no impact* would occur.

Impact Conclusion: No Impact

Sites 4, 6, 7, 10, 12, 14, 15, 16, 17 (Alternate), 18 (Alternate), and 19 (Alternate)

Site 4

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), a partial lane closure along Park Plaza Drive would be needed for up to one week for installation of the storm drain. A partial lane closure at the intersection of 87th Avenue and Park Plaza Drive would also be needed for up to one week for storm drain and electrical connections. The temporary lane closures along Park Plaza Drive at Site 4 would not block emergency access to surrounding residences, which are accessed by White Street and portions of 87th Street and Nimitz Drive that would not be affected by construction (see Figure 3-12). Although construction of the well at Site 4 would occur on Garden Village Elementary School property, the school is accessed via Village Lane, which would not be affected during construction. The potential impact of partial lane closures on emergency vehicles using Park Plaza Drive or traveling through the intersection of Park Plaza Drive and 87th Avenue would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 6

Construction at Site 6 would require partial lane closures along D Street for connection of pipelines (see Figure 3-16 and 3-20) under either option (i.e., On-site treatment at Site 6, or with Consolidated Treatment at Site 6). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), construction of storm drains, electrical lines, and water connection pipelines at Site 6 would require partial lane closures along D Street for approximately one week. The partial lane closures would not block emergency access to surrounding land uses during construction. The potential impact of partial lane closures on emergency vehicles using D Street would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 7

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), on-site treatment at Site 7 (see Figure 3-21) would require partial lane closures along Colma Boulevard for up to two weeks. Construction of storm drain and electrical lines at Site 7 (with Consolidated Treatment at Site 6) would require partial lane closures along Colma Boulevard for up to one week (see Figure 3-17). The partial lane closures would not block emergency access to surrounding land uses during construction. Access to the retail area west of Site 7 would not be affected by construction activities, given that construction activities would only affect the two westbound lanes, and left-hand eastbound lanes, of Colma Boulevard. The entrance to the Woodlawn Memorial Park occurs from El Camino Real and would be unaffected by construction at Site 7. Access to the Greenlawn Memorial Park occurs immediately across Colma Boulevard from Site 7. Access would be maintained during installation of the pipeline in the roadway and during all other phases of construction at the site, given that construction activities would not completely obstruct the driveway at this location. Access to the Greenlawn Memorial Park maintenance building would also be maintained during construction of the well facility, given that it has a driveway that lies outside of the proposed construction area boundary. The potential impact of partial lane closures on emergency vehicles using Colma Boulevard would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 10

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), construction of sanitary sewer pipelines at Site 10 would require partial lane closures along Camaritas Avenue for up to one week (see Figure 3-25). The partial lane closure would not block emergency access to surrounding land uses during construction. Ingress to and egress from the Winston Manor shopping center across Camaritas Avenue would not be affected by construction. This shopping center is also accessible from Hickey Boulevard and El Camino Real, which would remain unobstructed by Project construction. The potential impact of partial lane closures on emergency vehicles using Camaritas Avenue would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 12

Site 12 would be located adjacent to Southwood Drive and El Camino Real (see Figures 3-29 and 3-30). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), Site 12 would require partial lane closures along Southwood Drive for up to one week. The partial lane closures would not block emergency access to surrounding land uses during construction. Access to nearby properties by residents or emergency responders would not be impeded given that they are accessed via Fairway Drive, which would remain unaffected by the Project. Access to the Garden Chapel Funeral Home would remain open during construction. The potential impact of partial lane closures on emergency vehicles using Southwood Drive would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 14

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), construction of the water connection pipeline from Site 14 to Site 15 (see Figure 3-34) would require a partial lane closure along Sneath Lane for up to two weeks. The partial travel lane closure would occur on the westbound portion of Sneath Lane. In addition, construction of the pipeline connecting Site 14 to Site 15 would also require the temporary closure of the southern entrance to the GGNC for approximately one to two days.

The partial lane closures would not block emergency access to surrounding land uses during construction. Although construction would affect the southern access to the GGNC, the main access to the cemetery, approximately 1,600 feet west of the construction boundary, would not be blocked and visitors and emergency vehicles could continue to access the cemetery via that entrance. In addition, the temporary roadway and lane closures on Sneath Lane would not completely impede access to properties south of Sneath Lane, given that their driveways are not located where the Project would need to trench across Sneath Lane. The potential impact of partial lane closures on emergency vehicles using Sneath Lane would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 15

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), construction of storm drain, sanitary sewer, and water connection pipelines for Site 15 (see Figures 3-34 and 3-36) would require partial lane closures along Sneath Lane for up to four weeks. Partial lane closures would be needed for both the westbound and eastbound lanes. Construction at Site 15 would also require the temporary closure of the southern entrance to the GGNC for approximately one to two days.

Similar to Site 14, the partial lane closures along Sneath Lane would not block emergency access to surrounding land uses during construction. Although construction would affect the southern access to the GGNC, the main access to the cemetery would not be blocked and visitors could continue to access the cemetery via that entrance. As a result, emergency access to the GGNC would not be completely impeded, especially given that the closure of the southern entrance would be temporary. In addition, the temporary roadway and lane closures on Sneath Lane would not completely impede access to properties south of Sneath Lane, given that their driveways are not located where the Project would need to trench across Sneath Lane. The potential impact of partial lane closures on emergency vehicles using Sneath Lane would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 16

Site 16 may require installation of an approximately 750-foot pipeline through the Orchard Supply Hardware parking lot if the alternate water connection were installed between the well at this site and El Camino Real (see Figure 3-37). Installation of the alternate water connection pipeline would temporarily limit access through a portion of the parking lot for approximately two weeks, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week. Customers and emergency responders would continue to have access to the store through the two front entrances on either side of the pipeline and circulation would remain available during trenching. Therefore, the impact on access to the Orchard Hardware Store would be *less than significant*. In addition, as shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), the connection to the sanitary sewer at Site 16 would require a partial lane closure along Hemlock Avenue for up to one week, and would include trenching within Hemlock Avenue on the back side of a multi-family residential complex. The potential impact of the partial lane closure on emergency vehicles using Hemlock Avenue would be of short duration and, as proposed, access through the construction area would be maintained at all times. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 17 (Alternate)

Construction at Site 17 (Alternate) would require construction within the eastbound lane of Collins Avenue (see Figure 3-38). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), pipeline construction would require a partial lane closure along Collins Avenue for up to one week to install sanitary sewer, storm drain, electrical lines, and the alternate or proposed water connection pipelines.

The partial lane closures would not block emergency access to surrounding land uses during construction. Access to Standard Plumbing Supply adjacent to Site 17 (Alternate) would be maintained during installation of the pipeline and during all other phases of construction at the site, given that the construction boundary would not completely obstruct the driveway at this location. The potential impact of partial lane closures on emergency vehicles using Collins Avenue would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 18 (Alternate)

Site 18 (Alternate) would be located adjacent to Alta Loma Drive in South San Francisco (see Figure 3-39). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), if the alternate connection at Site 18 (Alternate) is selected, it would require a partial lane closure along Alta Loma Drive for approximately two days. The partial lane closure would not block emergency access to surrounding land uses during construction, which are accessed on the north side of Alta Loma Drive and Del Monte Avenue, and which would therefore not be affected by construction. The potential impact of partial lane closures on emergency vehicles using Alta Loma Drive would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Site 19 (Alternate)

Site 19 (Alternate) would require construction of pipelines across Southwood Drive (see Figure 3-40). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), partial lane closures along Southwood Drive would be needed for up to two weeks. The partial lane closures would not block emergency access to surrounding land uses during construction. Access to nearby properties by residents or emergency responders would not be impeded given that they are accessed via Fairway Drive, which would remain unaffected by Project construction. Although construction would require temporary closure of portions of the Garden Chapel Funeral Home parking lot, the remaining portions of the parking lot would remain available to business patrons during construction. Access to the Our Redeemer's Lutheran Church is from a portion of Southwood Drive that would be unaffected by construction. The potential impact of partial lane closures on emergency vehicles using Southwood Drive would be of short duration and, as proposed, access through the construction area would be maintained at all times to allow traffic flow in both directions. Therefore, impacts related to impaired emergency access and access to adjacent land uses would be *less than significant*.

Impact Conclusion: Less than Significant

<u>Sites 2, 5, and 13</u>

Site 2

Construction activities at Site 2 would extend along the sidewalk on the east side of Park Plaza Drive (see Figure 3-12). Construction would not extend into the adjacent roadway, but would require trenching across a 20-foot private access road to the maintenance facility of the Lake Merced Golf Club. Construction across the road could be completed within one day, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week, as proposed. There are no alternate routes readily available to access the Lake Merced Golf Club maintenance facility in the event of an emergency and, therefore, the temporary closure of the access road during construction could result in a *significant* impact on emergency access, though only for one day.

However, Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact of blocked access to the Lake Merced Golf Club maintenance facility access road by requiring that access be maintained using steel trench plates and that the contractor have ready at all times the means necessary to accommodate access by emergency vehicles to this property, such as plating over excavations, short detours and/or alternate routes. Therefore, the impact on emergency access following mitigation would be *less than significant*.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See Impact TR-1 for a description)

Site 5

Site 5 would be located adjacent to, and just south of, B Street in Daly City (see Figures 3-15 and 3-19). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), Site 5 (On-site Treatment) would require partial lane closures along B Street for up to three weeks for installation of pipeline components. Installation of the storm drain pipeline at the site would occur within the curb and sidewalk on the south side of B Street, which would restrict parking, but would allow for continued two-way traffic flow.

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), Site 5 (Consolidated Treatment at Site 6) would require partial lane closures along B Street for up to three weeks, as well as along Hill Street and D Street for up to one week each (see Figures 3-14 and 3-15).

As described in Chapter 3, Project Description, Section 3.5.1.3 (Water Distribution and Utility Pipeline Installation), travel lane closures would be managed such that one travel lane would be kept open at all times to allow traffic flow in both directions. The potential impact on emergency access on B Street would, therefore, be *less than significant*, given that any such impact would be short-term and access through the construction area would be maintained.

The connection to the storm drain from Site 5 (for either configuration) would require trenching in front of the driveway to the residence adjacent to Site 5, which would block vehicle access during the day for approximately one day (based on the proposed rate of construction), resulting in a short-term but potentially *significant* impact on access to the adjacent residence at this site.

However, Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact of blocked access to the residence to a *less-than-significant* level by requiring that access be maintained using steel trench plates and that the contractor have ready at all times the means necessary to accommodate access by emergency vehicles to such properties, such as plating over excavations, short detours, and/or alternate routes. Therefore, the impact on emergency access following mitigation would be *less than significant*.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See Impact TR-1 for a description)

Site 13

Construction at Site 13 would require temporary alternating lane closures on segments of South Spruce Avenue and Huntington Avenue (see Figures 3-31 and 3-32). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), partial lane closures along South Spruce Avenue would be needed for just over one week. Partial lane closures along Huntington Avenue would be needed for up to five weeks. In addition, partial lane closures at the intersection of South Spruce Avenue and Huntington Avenue would be needed for one week.

Through traffic on South Spruce Avenue would not be blocked and the partial closure of the intersection would not impede access to any adjacent properties because they are accessed either via South Spruce Avenue or Huntington Avenue, but not via the intersection. Therefore, emergency access could occur along South Spruce Avenue during all phases of construction and along Huntington Avenue, up to its intersection with South Spruce Avenue. The potential impact on emergency access on the intersection of South Spruce Avenue and Huntington Avenue would, therefore, be *less than significant*, given that any such impact would be short-term and access through the construction area would be maintained, as proposed.

In addition to the intersection crossing, temporary closure of a 300-foot stretch of the right-hand eastbound travel lane of South Spruce Avenue from Huntington Avenue to Site 13, and temporary closure of an approximately 1,400-foot stretch of the right-hand northbound travel lane of Huntington Avenue, would be needed. The pipeline would be installed near the curb on these roadways, leaving sufficient pavement width outside of the construction zone to accommodate two-way traffic flow along both South Spruce Avenue and Huntington Avenue. Therefore, emergency access through these roadway segments could occur during construction and the potential impact on emergency access at these locations would be *less than significant*, given that any such impact would be short-term and access around the construction would be possible. However, access to the businesses and offices along Huntington Avenue could be temporarily impacted during construction as installation of the pipeline may limit driveway access. In addition, access to a bank adjacent to Site 13, which only has one driveway off South Spruce Avenue, would also be temporarily blocked for approximately one day during pipeline installation associated with this site. Therefore, these impacts on access to adjacent properties could be *significant.*

However, Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact of blocked access to the businesses and offices along Huntington Avenue and South Spruce Avenue to a *less-than-significant* level by requiring that access be maintained using steel trench plates, and that the contractor have ready at all times the means necessary to accommodate access by emergency vehicles to such properties, such as plating over excavations, short detours, and/or alternate routes. Therefore, the impact on emergency access following mitigation would be *less than significant*.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See Impact TR-1 for a description)

Impact Conclusion: Less than Significant with Mitigation

Impact TR-3: The Project would temporarily decrease the performance and safety of public transit, bicycle, and pedestrian facilities during construction. (Less than Significant with Mitigation)

Because construction activities would temporarily alter the normal functionality of adjacent roadways, the potential exists for a decrease in the performance and safety of public transit, bicycle, and pedestrian facilities during construction of the Project, including potential for:

- Conflicts between construction vehicles (with slower speeds and wider turning radii than autos) and vehicles, bicyclists, or pedestrians using the roadways;
- Conflicts between the movement of traffic and construction activities, particularly where traffic is routed into the travel lane adjacent to the work zone;
- Confusion of drivers during alternating one-lane, two-way traffic operations;
- Confusion of bicyclists and pedestrians due to temporary alterations in bicycle and pedestrian circulation and on-street parking supply; and
- Distraction of drivers related to construction activities and nighttime lighting.

In general, construction contractors for any projects affecting public rights-of-way (e.g., roadways, sidewalks, and walkways) are required by local jurisdictions or the California Department of Transportation (Caltrans) to: provide for continuity of vehicle, pedestrian and bicycle traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Since work zone activities can disrupt mobility and access for bicyclists and pedestrians, and safe and convenient access would need to be maintained. Continuance of pedestrian and disabled access would be important on residential streets with sidewalks and where travel lanes and/or parking lane closures are anticipated.

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

<u>Sites 1, 8, 9, 11, and Westlake Pump Station</u>

Construction activities at Site 1 would extend approximately 75 feet into the end of Poncetta Drive (see Figure 3-11). However, Poncetta Drive ends at the facility site and does not have public transit, bicycle, or pedestrian facilities within the construction area boundary at Site 1. Construction activities at Sites 8, 9, 11, and the Westlake Pump Station would not require travel lane closures or affect public transit, bicycle, or pedestrian facilities, because no such facilities exist within the construction area boundary of these sites. A pedestrian and bicycle access pathway extends from the Verano Condominium complex on Mission Road to El Camino Real along the San Mateo County Flood Control Channel south and west of Site 9. The pathway is outside the construction area boundary and access would be unaffected by construction at Site 9. Therefore, there would be *no impacts* on public transit, bicycle or pedestrian facilities at these sites.

Impact Conclusion: No Impact

<u>Sites 2, 3, 4, 5, 6, 7, 10, 16, 17 (Alternate), and 18 (Alternate)</u>

Site 2

During the connection of Site 2 to the storm drain system (see Figure 3-12) approximately 200 feet of the sidewalk along the east side of Park Plaza Drive would be closed for up to one week, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week, as proposed. South Park Plaza Drive in this location is listed as a Class III bicycle route and, although construction would not encroach into the roadway at this location, construction activities would be close enough to the roadway that the bicycle access would likely be temporarily closed during installation of the pipeline. The potential impact on pedestrian and bicycle facilities at this location would be *less than significant*, given that any such impact would be short-term (approximately one week), would be performed during the summer when school is not in session (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), and because alternate sidewalk and bicycle access would continue to be available on the west side of Park Plaza Drive. In addition, there would be *no impact* on the performance or safety of public transit facilities at this location given that no public transit facilities or routes are located along Park Plaza Drive.

Site 3

Construction activities for Site 3 would not require work within the right-of-way, although construction traffic would enter and exit the site using a temporary access driveway just south of the intersection of Park Plaza Drive and Coronado/Palmcrest Avenue. The potential impact on pedestrian and bicycle facilities at this location would be *less than significant*, given that construction would be performed during the summer when school is not in session (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]) and because the sidewalk and bicycle access would continue to be available at this location. In addition, there would be *no impact* on the performance or safety of public transit facilities at this location given that no public transit facilities are located within the construction area boundary.

Site 4

During construction at Site 4 (see Figure 3-12), approximately 350 feet of the sidewalk along the east side of Park Plaza Drive starting at the intersection with 87th Street would be closed. In addition, installation of the storm drain pipeline and the buried electrical lines extending from Site 4 to a location approximately 200 feet south of the well site would require temporary alternating lane closures of the intersection and the existing pedestrian crosswalk on the east side of the intersection. The potential impact on pedestrian and bicycle facilities at this location would be *less than significant*, given that any such impact would be short-term (alternating lane closures are conservatively estimated to last one week), and because sidewalk, crosswalks, and bicycle access would continue to be available on the west side of Park Plaza Drive and the intersection with 87th Street. Although 87th Street is used as a bus route by SamTrans (Routes 24, 121, and 122) (SamTrans 2010), there would be *no impact* on the performance or safety of public transit facilities at this location, given that no bus stops are located within the construction area boundary and because access through the construction area would be maintained.

Site 5

Construction of Site 5 (On-site Treatment) would require the temporary closure of approximately 300 feet of the sidewalk on the south side of B Street for installation of a storm drain line for up to one week, assuming the installation of pipelines at a rate of 300 to 600 feet per week, as proposed. For Site 5 (Consolidated Treatment at Site 6) installation of the water connection pipeline to Site 6 would also require temporary closures of sidewalks on Hill Street approximately 400 feet southeast of Site 5 and along D Street approximately 600 feet southeast, during the construction period. The potential impact on pedestrian facilities at these locations would be *less than significant*, given that any such impact would be short-term (approximately one week each) and because sidewalks would continue to be available on the opposite side of the roadways. Construction activities would not affect bicycle facilities, because no such facilities exist along roadways within the construction area. Although Hill Street and D Street are used as routes by SamTrans (Routes 121 and 123) (SamTrans 2010), there would be no impact on the performance or safety of public transit facilities along these roadways, because no bus stops are located within the construction area, the roadways currently operate at acceptable levels of service (see Impact TR-1), and the roadways would remain open to vehicle travel during construction.

Site 6

It is conservatively assumed for this analysis that Site 6 (either with on-site treatment at Sites 5, 6, and 7 or consolidated treatment at Site 6) would require the temporary closure of approximately 30 feet of the eastbound lane of D Street near Hill Street for connection of an alternate water connection for up to one day, and an approximately 100-foot section of roadway and sidewalk near the Colma BART station for up two days, depending on the extent of utilities in the construction area. Pedestrians accessing the Colma BART station would not be affected by Project construction at Site 6, regardless of the treatment scenario, because access around the construction zone would be available. The potential impact on pedestrian facilities at these locations would, therefore, be *less than significant*, given that any such impact would be short-term (one day near Hill Street and up to two days near Colma BART station) and on a short segment of sidewalk. Construction activities would not affect bicycle facilities because no such facilities exist along D Street. Although D Street is used as a bus route for SamTrans Routes 121 and 123 (SamTrans 2010), the potential impact on the performance or safety of public transit facilities along D Street would be *less than significant*, because no bus stops are located within the construction area, D Street currently operates at acceptable levels of service (see Impact TR-1) and D Street would remain open to vehicle travel during construction.

Site 7

Construction of Site 7 (On-site Treatment) would require the temporary closure of two sections of sidewalk on the north side of Colma Boulevard, approximately 75 feet and 20 feet in length, respectively, as well as temporary lane closures. It is conservatively assumed for this analysis that the temporary closure of the sidewalk and alternating travel lane closures would be needed for up to two weeks depending on the extent of utilities in the construction area. The construction activities would not affect public transit or bicycle facilities because no such facilities are provided along this stretch of Colma Boulevard. The potential impact on pedestrian facilities at these locations would, therefore, be *less than* *significant*, given that any such impact would be short-term (approximately two weeks) and because pedestrian access around the construction zone would be available on the opposite side of the roadway.

Site 10

Pipeline construction at Site 10 would require the partial closure of an approximately 25-foot long section of sidewalk on the west side of Camaritas Avenue during installation of a sanitary sewer connection, which would also affect the existing pedestrian crosswalk across Camaritas Avenue. Although construction would affect the pedestrian crosswalk, an additional pedestrian crosswalk at the intersection of Camaritas Avenue and Hickey Boulevard (approximately 125 feet north of the construction boundary) would not be blocked and would provide pedestrian access. As a result, the potential impact on pedestrian facilities would be *less than significant*. The construction activities would not affect bicycle facilities because no such facilities are provided along this stretch of Camaritas Avenue.

Camaritas Avenue is used as a bus route by SamTrans (Routes 35 and 133) and bus stops exist on both the northbound and southbound lanes near the Project area (SamTrans 2010). The bus stops would not be affected as they are located outside of the construction area boundary. The potential impact on the performance and safety of the public transit system at this location would be *less than significant*, given that the bus stops are not located within the construction area boundary and Camaritas Avenue would remain open to vehicle travel during construction.

Site 16

The connection to the sanitary sewer at Site 16 would require trenching within Hemlock Avenue on the back side of a multi-family residential complex. As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), it is assumed for this analysis that work within Hemlock Avenue would be needed for approximately one week. The construction activities would not affect public transit or bicycle facilities because no such facilities exist within the construction area as noted in Table 5.6-2 (Characteristics of Local Access Roadways for Facility Sites). The potential impact on pedestrian access at this location would, therefore, be *less than significant*, given that any such impact would be short-term (approximately one week) and because pedestrian access would be available on the opposite side of the complex.

Site 17 (Alternate)

Pipeline installation at Site 17 (Alternate) would require temporary closure of 100 feet of sidewalk on the south side (eastbound lane) of Collins Avenue. It is conservatively assumed for this analysis that work within the sidewalk would be needed for up to one week, as noted in Table 5.6-4 (Location and Duration of Partial Roadway Closures). The construction activities would not affect public transit or bicycle facilities because no such facilities exist along Collins Avenue in the area of construction as noted in Table 5.6-2 (Characteristics of Local Access Roadways for Facility Sites). The potential impact on pedestrian facilities at this location would, therefore, be *less than significant*, given that any such impact would be short-term, and because the sidewalk on the north side of Collins Avenue would remain open for pedestrian access around the construction zone.

Site 18 (Alternate)

The alternate water connection at Site 18 (Alternate) would require a temporary closure of an approximately 25-foot stretch of sidewalk along the eastbound lane of Alta Loma Drive to connect utility pipelines (see Figure 3-39). As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), work within the sidewalk would be needed for up to two days. The potential impact on pedestrian facilities at this location would be *less than significant*, given that any such impact would be short-term and because the sidewalk along the westbound lane of Alta Loma Drive would remain open for pedestrian access around the construction zone. The construction activities would not affect bicycle facilities, because no such facilities exist along Alta Loma Drive in the area of construction as noted in Table 5.6-2 (Characteristics of Local Access Roadways for Facility Sites). Alta Loma Drive is used as a bus route by SamTrans (Routes 35 and 133) and bus stops exist on both the eastbound and westbound lanes near the Project area (SamTrans 2010). The bus stops would not be affected as they are located outside of the construction area boundary. The potential impact on the performance and safety of the public transit system at this location would be *less than significant*, given that the bus stops are not located within the construction area boundary and Alta Loma Drive would remain open to vehicle travel during construction.

Impact Conclusion: Less than Significant

<u>Sites 12, 13, 14, 15, and 19 (Alternate)</u>

Site 12

Installation of the connection with the local sanitary sewer and storm drain would require a temporary closure of the sidewalk on the south side of Southwood Drive. It is conservatively assumed for this analysis that the sidewalk closure would be needed for up to one week. The potential impact on pedestrian facilities at this location would be *less than significant*, given that any such impact would be short-term (approximately one week) and because sidewalk access would continue to be available on the north side of Southwood Drive. In addition, installation of the pipeline to connect the well at Site 12 to the regional water system would require the closure of approximately 800 feet of the sidewalk along the west side of El Camino Real from 300 feet south of Southwood Drive to West Orange Avenue. The temporary closure of the sidewalk would be needed for up to three weeks, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week. Therefore, the potential impact on pedestrian facilities along El Camino Real would be *less than significant*, given that any such impact would be short-term (approximately three weeks) and because sidewalk access would continue to be available on the east (opposite) side of El Camino Real. Construction activities along Southwood Drive would not affect bicycle or public transit facilities because no such facilities exist along Southwood Drive.

A SamTrans bus stop on southbound El Camino Real near West Orange Avenue would be located within the construction area boundary of the proposed water connection pipeline for Site 12 (see Figure 3-29). If the alternate water connection associated with Site 12 were constructed, there would be no impact to the bus stop on El Camino Real. However, if the proposed water connection were constructed, the impact on the performance and safety of public transit at this location would be *significant*, given that the bus stop would be directly impacted by construction and would need to be temporarily relocated during pipeline construction. There is an existing bus stop near Southwood Drive; therefore, a relocated bus stop, if one were required, would likely be sited on the south side of West Orange Avenue and used for up to three weeks.

Nevertheless, Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact of construction on the performance and safety of the southbound bus stop on El Camino Real near West Orange Avenue by requiring coordination with SamTrans and the City of South San Francisco to arrange the temporary relocation of the bus stop, as necessary. Given the presence of an existing bus stop near Southwood Drive, the likely area for temporary relocation of this bus stop, if needed, would be on the south side of West Orange Avenue. Therefore, the impact on the performance and safety of public transit at this location following mitigation would be *less than significant*.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See Impact TR-1 for a description)

Site 13

Construction of water and sewer pipelines would require temporary closure of an approximately 300-foot stretch of sidewalk, a Class III bicycle route, and the right-hand eastbound travel lane of South Spruce Avenue from Huntington Avenue to Site 13. The temporary closure along South Spruce Avenue would last up to one week, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week, as proposed. In addition, as shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), partial lane closures at the intersection of South Spruce Avenue and Huntington Avenue would be needed for up to one week, including the pedestrian crossing on the south side of the intersection. The connection to the regional water system would also extend along Huntington Avenue from South Spruce Avenue to Noor Avenue, requiring temporary closure of an approximately 1,400-foot stretch of sidewalk, a Class III bicycle route, and the right-hand northbound travel lane of Huntington Avenue. As shown in Table 5.6-4, the temporary closure along Huntington Avenue would last up to five weeks, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week, resulting in a short-term *significant* impact on bicycle and pedestrian facilities.

Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact on bicycle access in the northbound lane to a *less-than-significant* level by requiring that access be maintained during Project construction, where safe to do so. Warning signs would be posted that indicate bicycles and vehicles are sharing the lane, and detours would be provided for bicycles and pedestrians within construction areas, where safe to do so. Therefore, the impact on pedestrian and bicycle facilities following mitigation would be *less than significant*. In addition, a sidewalk, crosswalks, and bicycle access would continue to be available on the north side of South Spruce Avenue and west side of Huntington Avenue, and a Class I bicycle and pedestrian path is located to the east of the Project area, known as the Centennial Way Trail. Therefore, even if it is not safe to maintain bicycle and pedestrian access through the construction area along the northbound lane of Huntington Avenue, the impact would be *less than significant* given the availability of other access routes in the area around the construction zone.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See Impact TR-1 for a description)

South Spruce Avenue and Huntington Avenue are used as a bus route by SamTrans (Route 133) (SamTrans 2010). No bus stops would be impacted by construction on South Spruce Avenue. However, a bus stop on northbound Huntington Avenue would be located within the construction area boundary of the proposed water connection pipeline that would need to be temporarily relocated during construction. Therefore, the impact on the performance and safety of public transit at this location would be *significant*, given that the bus stop would be directly impacted by construction and would need to be relocated during the pipeline construction along Huntington Avenue.

However, Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact of construction on the performance and safety of the northbound bus stop on Huntington Avenue by requiring coordination with SamTrans and the City of South San Francisco to arrange the temporary relocation of the bus stop, as necessary. The impact on the performance and safety of public transit at this location following mitigation would therefore be *less than significant*.

Sites 14 and 15

As shown in Table 5.6-4 (Location and Duration of Partial Roadway Closures), pipeline construction at Site 14 and Site 15 (see Figure 3-34) would require a partial lane closure along Sneath Lane. The partial travel lane closure would include work within a 700-foot stretch of sidewalk and a Class II bicycle lane along the westbound travel lane of Sneath Lane for up two weeks, assuming the installation of pipelines at a rate of approximately 300 to 600 feet per week, as proposed, resulting in a short-term *significant* impact on bicycle and pedestrian facilities.

Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact on pedestrian and bicycle access in the westbound lane to a *less-than-significant* level by requiring that access be maintained during Project construction, where safe to do so. Warning signs would be posted that indicate bicycles and vehicles are sharing the lane, and detours would be provided for bicycles and pedestrians within construction areas. Therefore, the impact on emergency access following mitigation would be *less than significant*. In addition, a sidewalk and Class II bicycle lane would continue to be available along the eastbound travel lane of Sneath Lane.

Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])
(See Impact TR-1 for a description)

Although Sneath Lane is used as a bus route for SamTrans (Route 43) (SamTrans 2010), the potential impact on the performance or safety of public transit facilities along Sneath Lane would be *less than significant*, given that no bus stops are located within the construction area, the road currently operates at acceptable levels of service (see Impact TR-1), and Sneath Lane would remain open to vehicle travel during construction.

Site 19 (Alternate)

If Site 19 (Alternate) were selected for implementation, the entire width of Southwood Drive would need to be trenched to install the pipeline that would connect the well to the SFPUC water transmission system. It is conservatively assumed for this analysis that alternating travel lane closure on Southwood Drive would be needed for up to two weeks for construction of Site 19 (Alternate). If Site 19 (Alternate) were implemented, the potential impact on pedestrian facilities along Southwood Drive could be *significant*, given that sidewalk access on both sides of the roadway may be temporarily disrupted.

However, Mitigation Measure M-TR-1 (Traffic Control Plan) would reduce the impact of temporary sidewalk and pedestrian access along Southwood Drive by maintaining, where safe, pedestrian access and circulation and detours in areas affected by Project construction. Therefore, implementation of Mitigation Measure M-TR-1 would reduce potential impacts on pedestrian access along Southwood Drive to *less-than-significant* levels.

> ***Mitigation Measure M-TR-1: Traffic Control Plan (Sites 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17 [Alternate], 18 [Alternate], and 19 [Alternate])***
> (See Impact TR-1 for a description)

Impact Conclusion: Less than Significant with Mitigation

5.6.3.5 Operational Impacts and Mitigation Measures

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. (Less than Significant)

Operational Traffic

<u>All Sites</u>

As described in the Chapter 3, Project Description, Section 3.8.3 (Maintenance), during operation of the Project, each well station would be visited daily when wells are operating for routine equipment checks, for approximately 30 minutes each. During normal and wet years, the wells normally would be turned off, and regular exercising would be conducted on a weekly or monthly basis. As described in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types), the proposed chemical building storage capacity allows for the frequency of chemical delivery to occur on a two- to three-week period. Therefore, when wells are operating, up to two trips per day at most could occur for each site (i.e., one for equipment checks and one for chemical delivery, given that different chemicals may require delivery on different trucks), but the frequency of up to two trips per day to any one site would only occur once every two to three weeks.

As shown in Table 5.6-8 (Local Roadway Project Level of Service), the roadway segments in the vicinity of Sites 1 through 15, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station currently operate at acceptable levels of service during the A.M. and P.M. peak periods. The potential impact of up to two additional operational trips distributed throughout the day on local roadway segments in the vicinity of these sites would be *less than significant*, given that the maintenance trips would be so few compared to the existing volumes of vehicles using the roadways.

Maintenance and chemical deliveries for Site 16 would contribute up to two trips per day on Millbrae Avenue once every two to three weeks when the well is operating. As described in Section 5.6.1.4 (Existing Traffic Conditions), and previously under Impact TR-1, based on traffic counts, Millbrae Avenue from El Camino Real to Rollins Road currently operates at LOS F conditions during both the A.M. and P.M. peak hours. However, the potential impact of up to two additional daily operational trips per day on Millbrae Avenue would be *less than significant*, given that the trips would be distributed throughout the day and that, accordingly, they would not substantially affect the existing traffic levels of service or delays.

Impact Conclusion: Less than Significant

Public Transit, Bicycle, or Pedestrian Facilities

<u>All Sites</u>

Operation of the Project would not introduce any new users of alternative modes of transportation into the study area, nor would it conflict with policies promoting bus turnouts, bicycle racks, or with pedestrian and bicycle paths, because these well facilities would be set back away from the routes of any alternative transportation modes. Therefore, it would not cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes, and the potential impact would be *less than significant.*

Impact Conclusion: Less than Significant

Traffic Hazards or Incompatible Uses

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 14, 16, and Westlake Pump Station</u>

No new driveways onto a public roadway or any other traffic-related design feature would be constructed at Sites 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 14, 16, and the Westlake Pump Station. Therefore, *no impact* relative to increased traffic hazards would occur at these sites.

Impact Conclusion: No Impact

<u>Sites 6, 10, 13, 15, 17 (Alternate), 18 (Alternate), and 19 (Alternate)</u>

A new driveway would be constructed onto local roadways at Sites 6, 10, 13, 15, 17 (Alternate), 18 (Alternate), and 19 (Alternate). The potential impact of the new access points onto adjacent roadways would be *less than significant*, given that the access roads would be located perpendicular to the public roadways, would not result in sharp or blind curves or dangerous intersections and would be accessed by normal maintenance and chemical delivery trucks which would not be incompatible uses on the adjacent roadways.

Impact Conclusion: Less than Significant

5.6.3.6 Cumulative Impacts and Mitigation Measures

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. (Less than Significant with Mitigation)

The geographic scope for the analysis of cumulative impacts on transportation and circulation consists of the roadways affected by the proposed GSR Project and the areas in northern San Mateo County that use the same roadways as the Project.

Construction

Conflict with a plan or policy regarding performance of the traffic system

Most of the cumulative projects listed on Table 5.1-3 (Projects Considered for Cumulative Impacts), in Section 5.1, Overview, Section 5.1.7 (Cumulative Impacts) would result in construction-related incremental vehicle trip additions to the local roadways in northern San Mateo County if construction of these projects were to occur at the same time as construction of the GSR Project. For example, the SFPUC's Peninsula Pipelines Seismic Upgrade Project would, at its Colma and South San Francisco sites, as well as the Baden Valve Lot staging area (cumulative projects D-1, D-2, and D-3, respectively), use similar construction traffic routes as GSR Sites 8, 12, 17 (Alternate), and 19 (Alternate). The Daly City "A" Street Well Replacement Project (cumulative project C) could be constructed during the same timeframe as the GSR Project and may overlap with construction of GSR Sites 5, 6, and 7. The Cal Water Well Replacement SSF1-25 Project (cumulative project G) and the PG&E Transmission Pipeline Replacement Project in South San Francisco (cumulative project H) could overlap GSR construction at Sites 11, 12, and 19 (Alternate), and the construction access routes may be the same for both projects. In addition to the projects listed, it can be reasonably assumed that traffic volumes throughout the cumulative study area may increase slightly by the time GSR Project construction occurs in 2014 and 2015.

As described previously in Impact TR-1, the GSR Project would have *less-than-significant* impacts on the performance of the local roadway network, because proposed construction traffic volumes would be small (even during peak travel times) and because the local roadway system has available capacity for GSR Project-related construction trips.

To evaluate the cumulative effect of construction traffic on local roadways from the GSR Project plus cumulative projects with potentially overlapping construction schedules, the same methodology was applied as was utilized for the Project-specific analysis reported in Impact TR-1. Because data for construction traffic for the cumulative projects are not available, estimates of construction traffic taken from similar projects were utilized; see Table 5.6-9 (Cumulative Traffic Peak Hour Construction Trips), which lists cumulative projects that could contribute to cumulative traffic impacts on the same local roadway segments as the proposed GSR Project. In this analysis, Existing plus Project traffic volumes (without the effect of cumulative projects) were increased by the percentage of population growth between 2010 and 2015 as reported in the Association of Bay Area Governments (ABAG) 2009 Projections (ABAG 2009). The 2009 Projections are the most recent projections published by ABAG, and have been used in the San Mateo C/CAG *2011 Congestion Management Program*, the Metropolitan Transportation Commission's *Transportation Plan 2035* and the Bay Area Air Quality Management District's *Bay Area 2010 Clean Air Plan*. Both the *Transportation Plan 2035* and the *Bay Area 2010 Clean Air Plan* were subject to separate environmental review.

These future traffic volumes on roadways in the cumulative study area were compared to existing roadway capacities and a LOS was assigned to each V/C ratio (see Section 5.6.3.2 [Approach to Analysis] for further explanation of this methodology). Table 5.6-10 (Local Roadway Project plus Cumulative Projects Level of Service), presents the projected LOS of the roadway segments in the GSR Project vicinity with the addition of construction-related traffic from the GSR Project, cumulative projects and background growth in traffic volumes.

Table 5.6-10 (Local Roadway Project plus Cumulative Projects Level of Service), shows that most area roadways would continue to function at acceptable LOSs in the cumulative scenario, except for the segment of John Daly Boulevard from I-280 to Sheffield Drive (the gray shading in Table 5.6-10 highlights the segments with unacceptable LOS). As shown, this roadway segment is anticipated to operate at LOS C (V/C ratio 0.76) during the P.M. peak hour under Existing plus Project conditions, and at LOS D (V/C ratio 0.81) under the Existing plus Project plus Cumulative Projects scenario. Daly City currently employs a LOS C standard to determine impacts of new land uses on the City's roadway network and the need for intersection improvements. Under the City's Draft General Plan Update, for which a Draft EIR was circulated in October and November 2012, the City would employ a LOS D standard (Daly City 2012). Although Daly City may change its LOS standard in the future, this cumulative analysis conservatively uses the LOS C standard. Therefore, because the Existing plus Project plus Cumulative Projects scenario indicates that the segment of John Daly Boulevard from I-280 to Sheffield Drive would operate at LOS D, the temporary cumulative impact associated with construction-related traffic along this roadway segment would be *significant*.

In evaluating the direction of Project construction-related vehicle trips associated with the Project, it was determined that such trips would be westbound along John Daly Boulevard during the A.M. peak period and eastbound during the P.M. peak period. Traffic counts indicate that approximately 60 percent of traffic along John Daly Boulevard travels eastbound during the A.M. peak hour and westbound during the P.M. peak hour. Therefore, the contribution of the GSR Project and cumulative project traffic to these segments of John Daly Boulevard would be in the opposite direction of the peak traffic flows.

Additionally, an evaluation of existing plus cumulative traffic volumes (without the effect of the Project) indicates that the P.M. peak hour LOS for the segment of John Daly Boulevard from I-280 to Sheffield Drive would operate at LOS D (V/C ratio slightly above 0.80) without any contribution of traffic from the Project. With the addition of Project traffic to the cumulative scenario, the volume to capacity ratio of this segment during the P.M. peak hour would be increased to 0.81. However, the addition of Project construction traffic would not result in a change to a lower level of service (i.e., from LOS D to LOS E). Therefore, the construction traffic from the GSR Project would not make a considerable contribution to a significant cumulative traffic impact (*less than significant*).

Depending on the extent of overlap among the construction schedules for the projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) in Section 5.1, Overview, Section 5.1.7 (Cumulative Impacts), implementation of these projects together with the proposed GSR Project could result in a cumulative impact regarding a conflict with applicable plans or policies related to performance of the transportation system. However, these impacts would be temporary (only during construction) and small. For these reasons, the potential cumulative impact regarding a conflict with applicable plans or policies related to performance of the transportation system from construction-related activities would be (*less than significant)*.

TABLE 5.6-9

Cumulative Traffic Peak Hour Construction Trips[a]

Local Roadway Segment	Vista Grande Drainage Basin Improvement Project (B)[b]	Daly City "A" Street Well Replacement (C)[b]	Peninsula Pipelines Seismic Upgrade (D-1, D-2, and D-3)[b]	Holy Cross Cemetery Expansion (E)[b]	Mission & McLellan (F)[b]	Well Replacement SSF1-25 (Cal Water) (H)[b]	PG&E Transmission Pipeline Replacement (I)[b]	Centennial Village (J)[b]	Total Peak Hour Trips
Junipero Serra Boulevard from Pacific Plaza North Garage to John Daly Boulevard	20	---	---	---	---	---	---	---	20
John Daly Boulevard from I-280 to Sheffield Drive	20	---	---	---	---	---	---	---	20
John Daly Blvd from Sheffield Drive to Park Plaza Drive	20	---	---	---	---	---	---	---	20
D Street from Hill Street to Junipero Serra Boulevard	---	6	---	---	---	---	---	---	6
F Street at El Camino Real	---	6	---	---	---	---	---	---	6
Washington Street from San Pedro Road to I-280	---	6	---	---	---	---	---	---	6
Serramonte Boulevard near El Camino Real	---	---	12	---	---	---	---	---	12
Serramonte Boulevard from Collins Avenue to Shopping Center	---	---	12	---	---	---	---	---	12
Collins Avenue from Serramonte Boulevard to El Camino Real	---	---	12	---	---	---	---	---	12
Junipero Serra Boulevard from Serramonte Boulevard to Hickey Boulevard	---	---	12	---	---	---	---	---	12
Mission Road from El Camino Real to McLellan Drive	---	---	---	5	24	---	---	---	29
McLellan Drive from Mission Road to El Camino Real	---	---	---	5	24	---	---	---	29
Hickey Boulevard from El Camino Real to Camaritas Avenue	---	---	---	5	24	---	---	---	29
Hickey Boulevard from Crown Circle to Hilton Avenue	---	---	---	5	24	---	---	---	29

TABLE 5.6-9

Cumulative Traffic Peak Hour Construction Trips[a]

Local Roadway Segment	Vista Grande Drainage Basin Improvement Project (B)[b]	Daly City "A" Street Well Replacement (C)[b]	Peninsula Pipelines Seismic Upgrade (D-1, D-2, and D-3)[b]	Holy Cross Cemetery Expansion (E)[b]	Mission & McLellan (F)[b]	Well Replacement SSF1-25 (Cal Water) (H)[b]	PG&E Transmission Pipeline Replacement (I)[b]	Centennial Village (J)[b]	Total Peak Hour Trips
Hickey Boulevard from Hilton Avenue to Junipero Serra Boulevard	---	---	---	5	24	---	---	---	29
Hickey Blvd west of Junipero Serra Blvd	---	---	12	5	24	---	---	---	41
Chestnut Avenue from Antoinette Lane to El Camino Real	---	---	---	---	---	6	12	---	18
Westborough Boulevard from Camaritas Avenue to Junipero Serra Boulevard	---	---	12	---	---	6	12	---	30
West Orange Avenue south of Westborough Boulevard	---	---	12	---	---	---	---	---	12
Huntington Avenue from South Spruce Avenue to Noor Avenue	---	---	---	---	---	---	---	24	24
South Spruce Avenue from Huntington Avenue to El Camino Real	---	---	---	---	---	---	---	24	24

Notes:

(a) Peak hour construction vehicle trips for cumulative projects are based on conservative assumptions regarding project type. The trips reflect an assumed number of worker trips, material/equipment deliveries, and hauling trips that may typically arrive or depart during either the A.M. or P.M. peak hour.

(b) The letter notes the cumulative project number as identified in Table 5.1-3 (Projects Considered for Cumulative Impacts) in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, Section 5.1.7.2 (List of Relevant Projects).

TABLE 5.6-10

Local Roadway Project plus Cumulative Projects Level of Service

Roadway Segment	Closest Project Facility Sites	Existing plus Project[a]				Existing plus Project plus Cumulative Projects[b]				Local LOS Standard[c]
		V/C Ratio		LOS		V/C Ratio		LOS		
		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Junipero Serra Boulevard from Pacific Plaza North Garage to John Daly Boulevard	1, 2, 3, 4, WLPS	0.57	0.57	A	A	0.61	0.61	B	B	C
John Daly Boulevard from I-280 to Sheffield Drive	1, 2, 3, 4, WLPS	0.58	0.76	A	C	0.62	0.81	B	D	C
John Daly Blvd from Sheffield Drive to Park Plaza Drive	2, 3, 4, WLPS	0.45	0.62	A	B	0.48	0.66	A	B	C
D Street from Hill Street to Junipero Serra Boulevard	5, 6	0.25	0.28	A	A	0.27	0.29	A	A	C
Washington Street from San Pedro Road to I-280	5, 6	0.37	0.46	A	A	0.39	0.49	A	A	C
F Street at El Camino Real	5, 6	0.29	0.37	A	A	0.31	0.39	A	A	D
Serramonte Boulevard near El Camino Real	8	0.30	0.56	A	A	0.32	0.59	A	A	D
Serramonte Boulevard from Collins Avenue to Shopping Center	8	0.35	0.51	A	A	0.38	0.55	A	A	D
Collins Avenue from Serramonte Boulevard to El Camino Real	17 (Alt)	0.24	0.27	A	A	0.26	0.30	A	A	D
Junipero Serra Boulevard from Serramonte Boulevard to Hickey Boulevard	7, 8, 17 (Alt)	0.35	0.60	A	A	0.37	0.64	A	B	D
Mission Road from El Camino Real to McLellan Drive	9	0.48	0.57	A	A	0.52	0.63	A	B	D
McLellan Drive from Mission Road to El Camino Real	9	0.38	0.25	A	A	0.41	0.27	A	A	D
Hickey Boulevard from El Camino Real to Camaritas Avenue	9	0.53	0.59	A	A	0.57	0.63	A	B	D
Hickey Boulevard from Crown Circle to Hilton Avenue	9, 10, 18 (Alt)	0.57	0.64	A	B	0.60	0.68	A	B	D

TABLE 5.6-10

Local Roadway Project plus Cumulative Projects Level of Service

Roadway Segment	Closest Project Facility Sites	Existing plus Project[a]				Existing plus Project plus Cumulative Projects[b]				Local LOS Standard[c]
		V/C Ratio		LOS		V/C Ratio		LOS		
		A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	
Hickey Boulevard from Hilton Avenue to Junipero Serra Boulevard	9, 10, 18 (Alt)	0.75	0.84	C	D	0.80	0.90	C	D	D
Hickey Blvd west of Junipero Serra Blvd	9, 10, 18 (Alt)	0.50	0.59	A	A	0.54	0.63	A	B	D
Chestnut Avenue from Antoinette Lane to El Camino Real	11	0.82	0.80	D	C	0.86	0.84	D	D	D
Westborough Boulevard from Camaritas Avenue to Junipero Serra Boulevard	11, 12, 19 (Alt)	0.85	0.85	D	D	0.90	0.90	D	D	D
West Orange Avenue south of Westborough Boulevard	12, 19 (Alt)	0.72	0.65	C	B	0.76	0.69	C	B	D
Huntington Avenue from South Spruce Avenue to Noor Avenue	13	0.25	0.36	A	A	0.27	0.38	A	A	D
South Spruce Avenue from Huntington Avenue to El Camino Real	13	0.62	0.70	B	B	0.66	0.74	B	C	D

Notes:

(a) As reported in Table 5.6-8 (Local Roadway Project Level of Service).

(b) V/C and LOS for local segments when traffic counts are adjusted to account for year 2015 population projections and total peak hour trips from Table 5.6-9 (Cumulative Traffic Peak Hour Construction Trips) are added to the Existing plus Traffic volumes for local roadways presented in Table 5.6-8.

(c) LOS standards defined for roadways and intersections in Daly City, Colma, South San Francisco, San Bruno and Millbrae general plans.

Impair emergency access and create traffic hazards for alternative modes of transportation

Many of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would likely require temporary lane closures, for example, the PG&E Transmission Pipeline Replacement Project (cumulative project H) would require lane closures in El Camino Real adjacent to the proposed water connection pipeline route from GSR Site 12, which would be located in the sidewalk along the same block of El Camino Real.

Although lane closures would be over short segments (e.g., 25-foot to 1,400-foot stretches) and temporary (e.g., two days to five weeks), the proposed GSR Project would have a *significant* impact on emergency access as identified previously in Impact TR-2. As discussed in the analysis for TR-2, construction at GSR Sites 2, 5, and 13 may temporarily block emergency access to individual businesses during construction. Therefore, cumulative impacts related to emergency access during construction would be *significant* and the GSR Project's contribution to this cumulative impact could be cumulatively considerable.

However, as discussed previously in Impact TR-2 and Impact TR-3, the GSR Project's impacts related to maintenance of emergency access and the safety of pedestrians and bicyclists during construction would be reduced to a *less-than-significant* level with implementation of Mitigation Measure M-TR-1 (Traffic Control Plan) (see Impact TR-2 for description). In addition, implementation of Mitigation Measure M-C-TR-1 (Coordinate Traffic Control Plan with other SFPUC Construction Projects) would ensure that the SFPUC and its contractor coordinate with other SFPUC construction projects in the region to avoid or minimize impacts on emergency access and on the safety of pedestrians and bicyclists during construction of the GSR Project. With implementation of this mitigation measure, the GSR Project's contribution to cumulative impacts related to impairing emergency access and hazards for alternative modes of transportation during construction would not be cumulatively considerable (*less than significant with mitigation*).

> ***Mitigation Measure 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])***
> Prior to construction, the SFPUC and its contractors shall coordinate with other SFPUC construction projects in the region and update traffic control plans to avoid overlapping construction schedules or, if not practical, to minimize impacts to congestion, emergency access, and alternative modes of transportation.

Operation

Of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), the two infill development projects, the Mission & McLellan Project (cumulative project F) near Site 9 and Centennial Village Project (cumulative project I) near Site 13, may generate additional traffic near the proposed GSR Project's facility sites, although both cumulative projects would be, at least partially, replacing existing uses. Given the existing traffic volumes and intersection conditions in these areas (see Table 5.6-10 [Local Roadway Project plus Cumulative Projects Level of Service]), the presence of adequate ingress and egress, and the lack of permanent conflict with public transit or other alternative modes of transportation, no significant operational cumulative traffic impact is anticipated to occur (*less than significant*).

5.6.4 References

Association of Bay Area Governments (ABAG). 2009. *Projections and Priorities 2009, Building Momentum, San Francisco Bay Area Population, Household and Job Forecasts*. August.

California Department of Transportation (Caltrans). 2002. *Caltrans Guide for the Preparation of Traffic Impact Studies*. December.

Caltrans. 2010a. *2010 Annual Average Daily Truck Traffic on the California State Highway System*.

Caltrans. 2010b. *2010 Traffic Volumes on the California State Highway System*.

City/County Association of Governments of San Mateo County (C/CAG). 2011. *Final Congestion Management Program.* November.

Colma, Town of. 1999. *Town of Colma General Plan.*

Colma, Town of. 2005-2007. *Traffic Count Data.*

Colma, Town of. 2012. Personal Communication, Michael Laughlin, April 3, 2012.

Daly City, City of. 1987. *City of Daly City General Plan, Housing, Land Use & Circulation Elements.*

Daly City, City of. 2005-2007. *Traffic Count Data.*

Daly City, City of. 2012. *Daly City 2030, a Plan for the Future. Revised Draft.* October 10.

Millbrae, City of. 1998. *City of Millbrae General Plan 1998-2015.*

Millbrae, City of. 1999-2003. *Traffic Count Data.*

SamTrans. 2010. *Bus Route Map.*

SamTrans. 2012. *Bus Operations Information.* Website accessed January 31, 2013 at: http://www.samtrans.com/about/Bus_Operations_Information.html.

San Bruno, City of. 2009. *San Bruno General Plan.*

San Bruno, City of. 2011. Personal Communication, Marty Medina, Public Works Inspector, May 16, 2011.

San Mateo County, Public Works Department, Road Services Division. 2011. Personal Communication, Mark Marelich, May 16, 2011.

South San Francisco, City of. 1984-2010. *Traffic Count Data.*

South San Francisco, City of. 1999. *South San Francisco General Plan.*

Transportation Research Board. 1985. *Highway Capacity Manual Special Report 209.*

5.7 NOISE AND VIBRATION

This section evaluates the potential noise and vibration impacts that could result from implementation of the GSR Project, both with regard to temporary impacts during construction and long-term impacts from operation. The section describes the existing noise environment, presents relevant noise and vibration regulations and standards, identifies sensitive receptors to noise that could be affected by the Project, evaluates the potential effects of Project construction and operation on these receptors, and identifies mitigation measures as appropriate.

The Project area is defined as 19 potential well sites (only 16 of which would be operated) and the Westlake Pump Station, which are located within the City of Daly City, the community of Broadmoor in unincorporated San Mateo County, the Town of Colma, and the cities of South San Francisco, San Bruno, and Millbrae (refer to Figures 3-4, 3-5, and 3-6, as well as 3-11 through 3-40, in Chapter 3, Project Description). The study area for noise and vibration includes noise-sensitive land uses located within and/or adjacent to the proposed facility sites that have the potential to be adversely affected by noise or vibration.

5.7.1 Setting

5.7.1.1 Characteristics of Noise

Sound is a phenomenon occurring in a medium (such as air or water) that results from pressure waves caused by a vibrating object and is the objective cause of hearing. The manner in which sound travels through this medium is influenced by the physical properties of the medium. The amount of energy in the sound is proportional to the pressure generated in the medium. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound; the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity over one million times within the range of human hearing, a logarithmic scale is used to keep sound pressure numbers at a convenient and manageable range. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called “A-weighting,” expressed as “dBA.” The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Each 10-decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. All sound levels discussed in this report utilize the A-weighting scale. Tables 5.7-1 (Definitions of Acoustical Terms) and 5.7-2 (Typical A-Weighted Sound Levels) provide background information regarding noise terminology.

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity for a generalized land use type. Some general guidelines are as follows: sleep disturbance may occur at levels above 35 dBA, interference with human speech begins at around 60 dBA, and hearing damage may result from prolonged exposure to noise levels in excess of 85 to 90 dBA (U.S. EPA 1974).

Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called L_{eq}) that represents the acoustical energy of a given measurement. $L_{eq}(24)$ is the steady-state energy level measured over a 24-hour period. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration. Since the sensitivity to noise increases during the evening and at night because excessive noise interferes with the ability to sleep, 24-hour descriptors were developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a 5 dBA penalty added to noise levels during evening hours (i.e., 7:00 p.m. - 10:00 p.m.) and a 10 dBA penalty addition to noise levels during night hours (10:00 p.m. - 7:00 a.m.). Another 24-hour noise descriptor, called the day-night noise level (L_{dn}), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10:00 p.m. and 7:00 a.m., L_{dn} does not add the evening 5-dBA penalty. In practice, the L_{dn} and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources. Table 5.7-1 (Definitions of Acoustical Terms), provides definitions of sound metrics and other terminology used in this chapter. Table 5.7-2 (Typical A-Weighted Sound Levels), summarizes typical A-weighted sound levels for different noise sources.

For a sound source that produces a constant sound, the L_{eq} will equal L_{max}. A sound source that varies over time will have an L_{min} value and an L_{max} value over a given period of time. The L_{eq} value for that given period of time will not be a mathematical mean or average, but will be greater than the L_{min} value but less than the L_{max} value. The actual L_{eq} value will depend on the nature of the source.

Since decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces a noise level of 70 dBA when it passes an observer, two cars passing simultaneously would not produce 140 dBA. Rather, they would combine to produce 73 dBA (Caltrans 1998). When combining sound levels, Table 5.7-3 (Decibel Addition), may be used to approximate the combined result.

TABLE 5.7-1
Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A logarithmic unit that is used to describe the amplitude of sound.
Sound Pressure Level, dB	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (micro Newtons per square meter), where one Pascal is the pressure resulting from a force of one Newton exerted over an area of one square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz (hertz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sounds are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of five decibels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
L_{01}, L_{10}, L_{50}, $L_{90,}$	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
L_{max}, L_{min}	The A-weighted maximum and minimum noise levels during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Illingworth & Rodkin, Inc. 2012

TABLE 5.7-2
Typical A-Weighted Sound Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet	100	
Gas lawnmower at three feet	90	
Diesel truck at 50 feet at 50 mph	80	Food blender at three feet
Noisy urban area, daytime	70	Vacuum cleaner at 10 feet
Commercial area	65	Normal speech at three feet
Heavy traffic at 300 feet	60	Large business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
	30	Library
Quiet rural nighttime	20	Bedroom at night, concert hall (background)
	10	Broadcast/recording studio

Source: Caltrans 1998, modified by GHD

TABLE 5.7-3[(a)]
Decibel Addition

When the Decibel Values Differ by:	Add this Amount to the Higher Value:
0 or 1 dB	3 dB
2 or 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0 dB

Source: Caltrans 1998

Note:

(a) The following are some examples of how this is table is used. If two sound sources are 50 and 58 dB, they differ by 8 dB and would therefore add up to 59 dB (58 dB plus 1 dB). If two sound sources are 64 dB and 67 dB, they differ by three and would therefore add up to 69 dB (67 dB plus 2 dB).

5.7.1.2 Characteristics of Groundborne Vibration

Operation of heavy construction equipment, particularly pile driving and other impact devices (e.g., pavement breakers), causes groundborne vibration. Vibration from operation of this type of equipment can result in effects ranging from annoyance of people to damage of structures. Vibration amplitudes will decrease with increasing distance as the energy dissipates. The rate of dissipation varies depending upon the soil composition.

If great enough, the energy transmitted through the ground as vibration can result in damage ranging from small noticeable cracks that do not affect the soundness of structures, to damage that affects the structural integrity of the building. To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec). A freight train passing at 100 feet can cause vibrations of 0.1 in/sec PPV, while a strong earthquake can produce vibrations in the range of 10 in/sec PPV.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. Table 5.7-4 (Vibration Levels for Construction Equipment), summarizes typical vibration levels measured at a distance of 25 feet from various pieces of construction equipment. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions. PPV_{ref} is the reference PPV from Table 5.7-4.

$$PPV = PPV_{ref} \times (25/\text{Distance})^{1.1}$$

Table 5.7-5 (Human Response to Construction Vibration), summarizes typical human annoyance response to construction vibration. Table 5.7-6 (Potential Vibration-induced Damage Thresholds for Buildings), summarizes potential building damage thresholds for various building types. Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities. With the exception of pile driving, damage caused by construction vibration is unusual because vibration levels are below the damage thresholds at a distance of approximately 25 feet from the equipment.

Groundborne noise occurs when groundborne vibration causes the ground surface and structures to radiate audible acoustical energy. It is primarily an issue for underground rail systems.

TABLE 5.7-4
Vibration Levels for Construction Equipment

Equipment	Inches per second PPV at 25 feet
Vibratory roller for compaction	0.210
Caisson drilling[(a)]	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: FTA 2006

Note:

(a) Vibration from a well drilling rig is similar to that of a caisson drilling rig.

TABLE 5.7-5
Human Response to Construction Vibration

	Maximum PPV (in/sec)[a]	
Human Response	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.10
Severe	2.0	0.4

Source: Caltrans 2004

Note:

(a) Transient sources, such as blasting, create a single isolated vibration event. Continuous/Frequent Intermittent Sources include, among other equipment, pogo-stick compactors, crack-and-seat equipment, and vibratory compaction equipment.

TABLE 5.7-6
Potential Vibration-induced Damage Thresholds for Buildings

	Maximum PPV (in/sec)[a]	
Structure and Conditions	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans 2004

Note:

(a) Transient sources, such as blasting, create a single isolated vibration event. Continuous/Frequent Intermittent Sources include, among other equipment, pogo-stick compactors, crack-and-seat equipment, and vibratory compaction equipment.

5.7.1.4 Sensitive Noise Receptors

The study area for noise includes noise-sensitive land uses located within and/or adjacent to the proposed facility sites that have the potential to be adversely affected by noise. This section identifies those noise-sensitive land uses.

People in residences, motels and hotels, schools, libraries, religious institutions, hospitals, nursing homes, auditoriums, natural areas, parks, and some outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise impacts on these sensitive land uses are deemed more significant than those for less sensitive uses. Sensitive receptors in the vicinity of the proposed Project include residences, schools, religious facilities, and cemeteries.

Active parks, golf clubs, and playgrounds are not as sensitive to noise as residences, schools, or cemeteries, because the levels of background noise at parks, golf clubs, school playgrounds are elevated due to active recreational and sports uses. Open space or outdoor recreation areas that are used for passive recreational activities, such as picnicking, would be noise-sensitive uses if the noise environment is considered to contribute to the recreational experience (see Section 5.11, Recreation, for a discussion of impacts on recreational resources).

Sensitive receptors located adjacent to, or near, each facility site are listed in Table 5.7-7 (Summary of Nearby Sensitive Receptors).[1] For each receptor, the approximate distance to key components of the Project from both the nearest sensitive receptor building or gravesite and the nearest sensitive receptor property line is given. Sensitive receptors that occur within 25 feet of construction activity are listed as "<25." For the purposes of this analysis, it is assumed that the construction noise source would not be less than 25 feet from a given receptor, because it is infeasible to have multiple pieces of construction equipment operating within such close proximity.

[1] Distances listed in Table 5.7-7 (Summary of Nearby Sensitive Receptors), differ from distances listed in Section 5.1, Land Use, Table 5.2-1 (Land Uses in the Vicinity of Facility Sites), because noise measurements are taken for specific analysis purposes as explained in Section 5.7.3.2 (Approach to Analysis) below, whereas the land use measurements are taken from the closest boundary of the construction zone to the closest edge of the land use, including parking areas for the land use.

TABLE 5.7-7
Summary of Nearby Sensitive Receptors

Site	Nearby Sensitive Receptor	Distance to the Nearest Sensitive Receptor Building or Gravesite (feet)			Distance to the Nearest Sensitive Receptor Property Line (feet)		
		From the Construction Activity Center (not including Pipelines)	From the Nearest Proposed Pipeline	From the Proposed Well or Well Facility	From the Construction Activity Center (not including Pipelines)	From the Nearest Proposed Pipeline	From the Proposed Well or Well Facility
Site 1	Multi-family Residential	90	40	50	60	Within	30
Site 2	Multi-family Residential	325	140	325	320	135	320
	Garden Village Elementary School	350	275	350	150	<25	150
Site 3	Single-family Residential	90	110	90	85	105	85
	Ben Franklin Intermediate School	250	200	250	Within	Within	Within
Site 4	Single-family Residential	75	<25	75	25	<25	25
	Garden Village Elementary School	425	250	425	100	30	100
WLPS	Multi-family Residential	75	No pipelines	<25	50	No pipelines	<25
Site 5 (Consolidated Treatment at Site 6)	Single-family Residential	50	25	50	40	<25	40
Site 6 (Consolidated Treatment at Site 6)	Cemetery	325	275	275	200	<25	200
	Multi-family Residential	600	500	555	400	365	455

TABLE 5.7-7
Summary of Nearby Sensitive Receptors

Site	Nearby Sensitive Receptor	Distance to the Nearest Sensitive Receptor Building or Gravesite (feet)			Distance to the Nearest Sensitive Receptor Property Line (feet)		
		From the Construction Activity Center (not including Pipelines)	From the Nearest Proposed Pipeline	From the Proposed Well or Well Facility	From the Construction Activity Center (not including Pipelines)	From the Nearest Proposed Pipeline	From the Proposed Well or Well Facility
Site 7 (Consolidated Treatment at Site 6)	Cemetery	60	50	60	35	<25	30
Site 5 (On-site Treatment)	Single-family Residential	50	25	35	40	<25	25
Site 6 (On-site Treatment)	Cemetery	325	275	275	200	200	200
	Multi-family Residential	600	500	555	400	400	455
Site 7 (On-site Treatment)	Cemetery	60	50	40	35	<25	<25
Site 8	Cemetery	500	460	470	475	435	445
	Senior Care Facility	600	450	630	600	450	630
Site 9	Trailer Court	75	25	30	70	<25	25
Site 10	Single-family Residential	250	180	250	220	175	220
Site 11	Single-family Residential	400	315	390	385	300	375
Site 12	Funeral Home	80	<25	50	45	<25	20
	Single-family Residential	140	80	130	110	60	90

TABLE 5.7-7
Summary of Nearby Sensitive Receptors

Site	Nearby Sensitive Receptor	Distance to the Nearest Sensitive Receptor Building or Gravesite (feet)			Distance to the Nearest Sensitive Receptor Property Line (feet)		
		From the Construction Activity Center (not including Pipelines)	From the Nearest Proposed Pipeline	From the Proposed Well or Well Facility	From the Construction Activity Center (not including Pipelines)	From the Nearest Proposed Pipeline	From the Proposed Well or Well Facility
Site 13	Single-family Residential	290	105	260	240	70	210
	Extended Stay Hotel	>1,000	80	>1,000	>1,000	25	>1,000
Site 14	Cemetery	25	<25	<25	25	<25	<25
	Single-family Residential	100	100	80	40	50	25
Site 15	Cemetery	100	30	60	Within	Within	Within
	Multi-family Residential	750	250	715	700	150	665
Site 16	Multi-family Residential	115	35	115	85	<25	85
Site 17 (Alternate)	Cemetery	200	200	180	150	150	130
	Senior Care Facility	500	425	490	435	385	425
Site 18 (Alternate)	Single-family Residential	35	<25	25	<25	<25	<25
Site 19 (Alternate)	Church and preschool	50	30	80	25	<25	45
	Single-family Residential	115	80	120	65	45	65

5.7.1.5 *Existing Noise Environment*

The GSR Project would be located within the City of Daly City, the community of Broadmoor in unincorporated San Mateo County, the Town of Colma, and the cities of South San Francisco, San Bruno and Millbrae. Noise survey data were collected on behalf of the San Francisco Planning Department in April 2009 by Wilson, Ihrig & Associates, Inc. (WIA) and in October 2009 by Illingworth & Rodkin, Inc. (I&R).

Table 5.7-8 (Summary of Measured Noise Levels at Representative Sites - April and October 2009), summarizes existing measured noise levels. The measurement locations were selected by WIA and I&R to characterize baseline noise levels at sensitive receptors potentially affected by noise from Project construction and operation. In April 2009, WIA conducted measurements of the existing noise environment at four locations adjacent to proposed well facility sites. Noise was measured in consecutive one-hour intervals over a six-day period from April 21 to April 28, 2009 at sensitive receptors near Sites 1, 5, 6, and 16. These locations were selected to document the noise environments at receptors near the sites that could already be affected by elevated noise levels under current conditions.

In October 2009, I&R conducted a noise monitoring survey and well site visits to observe conditions and further quantify the existing noise environment. The measurement locations were selected at sensitive receptors near the facility sites throughout the Project area. The noise monitoring survey included short-term (10-minute duration) measurements at Well Site 16 where a long-term measurement was also made and seven additional sites where short-term measurements were conducted. Major noise sources noted were traffic on I-280 and local roadways, Bay Area Rapid Transit (BART), Caltrain, and jet aircraft operating at San Francisco International Airport.

Noise measurements were not conducted at Sites 7, 8, 11, 13, 15, and 17 (Alternate), because the noise environment can be appropriately characterized by measurements at other representative sites. Noise levels at Sites 7, 8, and 17 (Alternate) would result primarily from vehicle traffic on El Camino Real. Therefore, noise measurements at Site 12, adjacent to El Camino Real, are presumed to be representative of noise levels at Sites 7, 8, and 17 (Alternate) for purposes of this analysis. Noise levels at Site 15 result primarily from aircraft flyovers and local traffic. Therefore, daytime ambient noise levels are presumed to be in the range of 60 to 70 dBA L_{eq} for purposes of this analysis, as characterized by ambient measurements at Site 14, which is within a similar noise setting (cemetery) and is in close proximity to Site 15.

At Site 11, the closest receptors are residences across El Camino Real, located behind a row of commercial buildings. Daytime noise levels at these receptors are presumed, for purposes of this analysis, to range from 60 to 65 dBA L_{eq} and nighttime noise levels are estimated to range from 50 to 55 dBA L_{eq} based on the projected noise contour map contained in the City of South San Francisco's General Plan (South San Francisco 1999). The General Plan concludes that projected traffic increases on U.S. 101, I-280, and major arterials within South San Francisco should not have an appreciable impact on noise levels in the City. The number of railroad trains passing through is not expected to change significantly and BART will remain underground. Aircraft noise may decrease slightly, and industrial noise may decrease due to an expected shift toward office-based uses.

TABLE 5.7-8
Summary of Measured Noise Levels at Representative Sites - April and October 2009

Site	Nearby Street (City)	Land Uses	Noise Environment	Noise (dBA)	
				Typical Daytime L_{eq}	Typical Nighttime L_{eq}
1	Poncetta Drive (Daly City)	Residential/ Golf Club	I-280 traffic	70	60 – 65
2, 4	Park Plaza Drive (San Mateo County)	School/ Residential	Local Traffic	59	INA[(a)]
3	End of White Street (San Mateo County)	Residential	Local Traffic	55	INA[(a)]
5	B Street (Daly City)	Residential	I-280/Junipero Serra Boulevard	62 – 65	55 – 57
6	D Street (Daly City)	Cemetery	Colma BART Station	64 – 66	50 – 55
9	Adjacent to the Treasure Island Trailer Court (South San Francisco)	Residential/ Commercial	Aircraft/ Local Traffic	59	INA[(a)]
12	El Camino Real (South San Francisco)	Funeral Home/ Residential	Aircraft/ Local Traffic	58	INA[(a)]
14	Greenwood Drive (San Bruno)	Residential	Aircraft/ Local Traffic	68	INA[(a)]
16	Hemlock Avenue (Millbrae)	Residential	Caltrain - Probable nighttime freight activity	56 – 68	52 – 65
10, 18 (Alt)	Alta Loma Drive (South San Francisco)	Residential	Local Traffic	61	INA[(a)]
19 (Alt)	Southwood Drive (South San Francisco)	Residential / Church and preschool	Aircraft/ Local Traffic	64	INA[(a)]

Source: WIA and Illingworth & Rodkin, Inc. 2009

Note:
(a) Information Not Available

Noise levels can be assumed to be substantially the same as they were projected to be because traffic is the major contributor to the noise environment, and because traffic levels along El Camino Real have not changed substantively since completion of the City of South San Francisco General Plan. For example, the 2011 Caltrans traffic volumes for El Camino Real north and south of Westborough Boulevard/Chestnut Avenue are less than the volumes that were reported as existing in the City of South San Francisco General Plan (Caltrans 2012). Similarly, daytime noise levels at the residential receptors closest to Site 13 are estimated to range from 60 to 65 dBA L_{eq} and nighttime noise levels are estimated to range from 50-55 dBA L_{eq} based on the local General Plan.

5.7.2 Regulatory Framework

5.7.2.1 Federal

No federal standards related to noise and vibration would be applicable to the Project.

5.7.2.2 State

No State standards related to noise and vibration would be applicable to the Project. However, the California Department of Transportation (Caltrans) has published guidelines for evaluating the potential vibration impact from construction as presented in Tables 5.7-5 (Human Response to Construction Vibration) and 5.7-6 (Potential Vibration-induced Damage Thresholds for Buildings) (Caltrans 2004).

5.7.2.3 Local

At the local level, noise is addressed through implementation of general plan policies, including noise and land use compatibility guidelines, and through enforcement of noise ordinances. General plan policies provide guidelines for determining whether a noise environment is appropriate for a proposed or planned land use. Noise ordinances regulate sources, such as mechanical equipment and amplified sounds, as well as prescribed hours of heavy equipment operation such as for construction. There are no local ordinances or policies regulating vibration that are applicable to the Project. As such, the local regulatory standards are evaluated only for noise.

Following is a description of the noise regulations for the local jurisdictions within which the Project would be located. Construction noise limits are discussed first, followed by operational noise limits.

Construction Noise Limits

City of Daly City

The Municipal Code of Daly City does not have specific restrictions on construction noise. Sections 9.22.010 and 9.22.030 of Title 9: Public Peace, Morals, and Welfare of the Municipal Code (Daly City n.d.) address disturbance of the peace and include no quantitative noise limits. As specified in Section 9.22.030 Noise, "between the hours of 10:00 p.m. and 6:00 a.m. of the following day, no person shall cause, create or permit any noise, music, sound, or other disturbance upon his property which may be heard by, or which noise disturbs or harasses, any other person beyond the confines of the property, quarters or apartment from which the noise, music, sound, or disturbance emanates" (Daly City n.d.). The Daly City General Plan Noise Element does not provide any additional criteria for the evaluation of construction noise impacts, though it references the Municipal Code hours (Daly City 1989).

County of San Mateo

In Chapter 4.88 (Noise Control), Section 4.88.360(e) of the San Mateo County Code (San Mateo County n.d.), construction noise is specifically exempt from the provisions of the ordinance noise limits (Table 5.7- 11 [San Mateo County General Noise Level Limits]), except for construction activity that occurs between the hours of 6:00 p.m. and 7:00 a.m. Monday through Friday; between 5:00 p.m. and 9:00 a.m. on Saturdays; and at any time on Sundays, Thanksgiving, or Christmas. Construction at night and on Sundays and holidays is not prohibited, but is subject to the noise limits listed and explained in Table 5.7-11. The L_{eq} for a time-varying source (such as construction activity) representative of the maximum noise environment that would still comply with the County ordinance exterior noise level standard is 57 dBA during the nighttime (WIA 2009). Section 4.88.380 of the San Mateo County Noise Ordinance states: "Whenever, for the good of the public, a government agency, public utility, or private utility determines a project must be done before 7:00 a.m., or after 6:00 p.m., or weekends, and so states in its contract, change order(s), or bid documents, said work shall be exempted from this chapter" (San Mateo County n.d.).

The San Mateo County General Plan Noise Element does not provide specific criteria for the evaluation of construction noise impacts (San Mateo County 1986a, 1986b).

Town of Colma

Section 5.04.120 of the Town of Colma Municipal Code (Colma n.d.) regulates construction noise within residential zones, and within 500 feet of residential zones. No person shall operate equipment that exceeds a noise level of 85 dBA measured at a distance of 25 feet from the source during the hours of 7:00 a.m. to 8:00 p.m. Monday through Friday (weekend and holiday hours of 10:00 a.m. to 6:00 p.m.), or 60 dBA at a distance of 25 feet from the source during the hours of 8:00 p.m. to 7:00 a.m. Monday through Friday (weekend and holidays hours 6:00 p.m. to 10:00 a.m.), unless a permit has been obtained from the Building Official. The Code also states that construction hours within all non-residential zoning districts shall be assigned on a project-by-project basis by the Building Official, based on evaluation of potential noise-related impacts on surrounding uses. The Town of Colma General Plan does not have any additional policies regarding construction noise (Colma 1999).

City of South San Francisco

The City of South San Francisco Municipal Code, Chapter 8.32 Noise Regulations, Section 8.32.050 (South San Francisco n.d.) exempts construction noise for activities authorized with a valid city permit from the maximum permissible sound levels (Table 5.7-9 [South San Francisco Noise Level Standards]) in Section 8.32.030 during the hours of 8:00 a.m. to 8:00 p.m. Monday through Friday (excluding holidays), 9:00 a.m. through 8:00 p.m. on Saturdays, and 10:00 a.m. to 6:00 p.m. on Sundays and holidays. However, each individual piece of construction equipment is limited to a maximum noise level of 90 dBA at a distance of 25 feet from the source or 90 dBA at the property plane. During other times, the noise limits in Table 5.7-9 would apply. The South San Francisco General Plan does not have any policies regarding construction noise (South San Francisco 1999).

TABLE 5.7-9
South San Francisco Noise Level Standards[(a)]

Affected Land Use Category	Time	Noise Level L_{50} dBA[(b)]
Single-family and Duplex Residential Uses	7:00 a.m. – 10:00 p.m. 10:00 p.m. – 7:00 a.m.	60 50
Multi-family Residential Uses or Mixed Use	7:00 a.m. – 10:00 p.m. 10:00 p.m. – 7:00 a.m.	60 55
Commercial Uses	7:00 a.m. – 10:00 p.m. 10:00 p.m. – 7:00 a.m.	65 60
Industrial Uses	Anytime	70

Source: City of South San Francisco Municipal Code, Chapter 8.32 (South San Francisco n.d.).

Notes:

(a) If the measured ambient level for any area is higher than the standard, then the ambient shall be the base noise level standard.

(b) For noise generated for more than 30 minutes in any hour. Adjustments to these levels may be allowed for noise of a shorter duration as follows: (1) noise standard plus 5 dB for no more than 15 minutes in any hour; (2) noise standard plus 10 dB for no more than five minutes in any hour; (3) noise standard plus 15 dB for no more than one minute in any hour; (5) noise standard plus 20 dB for any period of time.

City of San Bruno

Section 6.16.070 of the City of San Bruno Municipal Code requires that construction noise within any residential zone or within 500 feet of a residential zone be limited to 85 dBA as measured at 100 feet from the source between 7:00 a.m. and 10:00 p.m., or 60 dBA at 100 feet from the source between 10:00 p.m. and 7:00 a.m (San Bruno n.d.). The City of San Bruno Director of Public Works may grant a permit for construction work outside of these limits (Section 6.16.070). The San Bruno General Plan, Chapter 7, Health and Safety Element, Policy HS 38, requires developers to "mitigate noise exposure to sensitive receptors from construction activities" (San Bruno 2009).

City of Millbrae

The City of Millbrae Community Preservation Ordinance Section 6.–5.05.F.9 limits construction to the hours of 7:30 a.m. to 7:00 p.m. Monday through Friday; 8:00 a.m. to 6:00 p.m. on Saturdays; and 9:00 a.m. to 6:00 p.m. on Sundays and holidays, unless otherwise authorized by the city (Millbrae n.d.). The Millbrae General Plan has a policy regulating construction hours to reduce noise between 7:00 p.m. and 7:00 a.m (Millbrae 1998).

Construction Noise Limits Summary

Table 5.7-10 (Summary of Local Noise Regulations Pertaining to Construction), summarizes the local noise regulations and standards that pertain to construction. Time and noise limits specified in these ordinances are used to define significance of the Project's noise increases. This table summarizes construction time and decibel limits within each jurisdiction.

TABLE 5.7-10
Summary of Local Noise Regulations Pertaining to Construction

Jurisdiction	Construction Time Limits			Construction Noise Limit
	Weekdays	Saturdays	Sundays/ Holidays[a]	
City of Daly City[b]	6:00 a.m. to 10:00 p.m.	6:00 a.m. to 10:00 p.m.	6:00 a.m. to 10:00 p.m.	No noise limits specified
County of San Mateo[c]	7:00 a.m. to 6:00 p.m.	9:00 a.m. to 5:00 p.m.	Non-exempt[a]	Nighttime noise limit, 57 dBA L_{eq}. Construction noise outside of allowed hours is exempt if governmental agency determines it is for the good of the public.
Town of Colma[d]	7:00 a.m. to 8:00 p.m.	10:00 a.m. to 6:00 p.m.	10:00 a.m. to 6:00 p.m.[a]	In residential zones, daytime construction is limited to 85 dBA at 25 feet from the noise source. Nighttime construction is limited to 60 dBA at 25 feet from the noise source.
City of South San Francisco[e]	8:00 a.m. to 8:00 p.m.	9:00 a.m. to 8:00 p.m.	10:00 a.m. to 6:00 p.m.[a]	For daytime construction, any single piece of equipment is limited to 90 dBA at 25 feet or at the property plane. Maximum nighttime noise is limited to the L_{50} standards shown in Table 5.7-9.
City of San Bruno[f]	7:00 a.m. to 10:00 p.m. (daytime) 10:00 p.m. to 7:00 a.m. (nighttime)			Individual equipment limited to 85 dBA L_{max} at 100 feet (daytime) or 60 dBA L_{max} at 100 feet (nighttime) in residential zones or within 500 feet of residential zones.
City of Millbrae[g]	7:30 a.m. to 7:00 p.m.	8:00 a.m. to 6:00 p.m.	9:00 a.m. to 6:00 p.m.[a]	No noise limits specified

Notes:

(a) Applicable to holidays where noted.
(b) Daly City Municipal Code Section 9.22.030 (Daly City n.d.).
(c) San Mateo County Code Chapter 4.88 (Noise Control), Section 4.88.360(e) (San Mateo County n.d.).
(d) Town of Colma Municipal Code Section 5.04.120 (Colma n.d.).
(e) Time and noise limits specified in South San Francisco Municipal Code, Chapter 8.32, Sections 8.32.030 and 8.32.050 (South San Francisco n.d.). Construction activities are allowed during these hours if each piece of equipment produces a noise level of 90 dBA or less at 25 feet or at the property plane (any point in space above the boundary).
(f) San Bruno Municipal Code, Title 6, Chapter 6.16, Section 6.16.070 specifies noise regulations for construction (San Bruno n.d.).
(g) City of Millbrae Community Preservation Ordinance Section 6-5.05.F.9 (Millbrae n.d.).

Operational Noise Limits

Operational noise is also regulated by or subject to general plan policies of the jurisdictions within which the proposed facility sites would be located. Following is a discussion of these regulations and general plan policies by jurisdiction, followed by a summary in Table 5.7-12 (Summary of Local Noise Regulations and General Plan Policies Pertaining to Operations).

City of Daly City

The Daly City General Plan specifies policies related to operational-related noise levels (Daly City 1989). Policy 1.2 directs that the Noise and Land Use Compatibility Guidelines shall be used to assess the effect of noise. For land uses near the facility sites, this is summarized below.

- CNEL of 60 dBA (53 dBA L_{eq}) for single-family residential,
- CNEL of 65 dBA (58 dBA L_{eq}) for multi-family residential and schools,
- CNEL of 70 dBA (63 dBA L_{eq}) for office and commercial uses, and
- CNEL of 75 dBA (68 dBA L_{eq}) for golf courses.

The Daly City Municipal Code does not set quantitative standards for noise levels during Project operations.

County of San Mateo

The operational noise limits set by the San Mateo County Noise Ordinance (San Mateo County Code Section 4.88) (San Mateo County n.d.) are summarized in Table 5.7-11 (San Mateo County General Noise Level Limits). This table indicates the noise levels that may be exceeded for the cumulative time shown. The ordinance has specific cumulative time limits on a range of noise levels for any one-hour period, which are divided into five categories. In addition, the corresponding noise level for each cumulative time limit category is 5 dBA lower at night, as compared to daytime hours. Operational noise resulting from the Project would result from the steady operation of the above ground pump stations. For steady noise, the limits in Category 1 are equivalent to the L_{eq} and are appropriate limits to use as thresholds.

TABLE 5.7-11
San Mateo County General Noise Level Limits[a]

Category	Cumulative Number of Minutes[b] (in any one-hour time period)	Daytime on Weekdays[c] (dBA)	Nighttime[c], Sundays and Holidays (dBA)
1	30	55	50
2	15	60	55
3	5	65	60
4	1	70	65
5	0	75	70

Source: County of San Mateo Noise Ordinance (San Mateo County n.d.)

Notes:

(a) In the event the measured background noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted in 5 dBA increments so as to encompass the background noise level.

(b) This refers to the number of minutes in any one hour that the specified noise level can be exceeded. For example, a noise at 55 dBA would be allowed to occur during any one hour period for up to a total of 30 minutes during the daytime, but only up to a total of 15 minutes at night, whether continuous or not.

(c) The daytime limits are applicable from 7:00 a.m. to 10:00 p.m. and the nighttime limits are applicable from 10:00 p.m. to 7:00 a.m.

In cases where the measured background noise level exceeds the applicable noise level standard, the Noise Ordinance requires that the applicable standard shall be adjusted upward in 5 dBA increments until it exceeds the background noise level; in this manner the Noise Ordinance standard would be 1 to 4 dBA higher than ambient noise levels. Also, the Ordinance requires that each of the noise level standards specified above must be reduced by 5 dBA for simple tonal noise, consisting primarily of speech or music, or for recurring or intermittent impulsive noise.

The San Mateo County General Plan does not have quantitative policies limiting noise levels (San Mateo County 1986a, 1986b).

Town of Colma

The Colma General Plan Noise Element indicates that the noise environment for residences, motels and hotels, schools, sports, and parks is normally acceptable at 60 dBA (CNEL), whereas noise environments from 60 to 70 dBA (CNEL) fall into the “conditionally acceptable” range for these land uses (Colma 1999). For cemeteries, noise environments up to 65 dBA (CNEL) are normally acceptable, with noise environments from 65 to 70 dBA (CNEL) falling into the conditionally acceptable range (Colma 1999). Per the Colma General Plan Noise Element, conditionally acceptable exceedances of the normally acceptable noise ranges require a detailed acoustic study to set forth design features that will reduce exterior noise levels. The Town of Colma Municipal Code does not include noise standards related to operational noise of the Project.

City of South San Francisco

Section 8.32.030 of the South San Francisco Municipal Code (South San Francisco n.d.) sets forth the maximum permissible sound levels as shown in Table 5.7-9 (South San Francisco Noise Level Standards). In the South San Francisco General Plan, Policy 9-I-7 requires the control of noise at its source through site design, building design, landscaping, hours of operation, and other techniques, for new noise-generating land uses. The General Plan Noise Element indicates that the noise environment for residences is satisfactory up to 65 dBA (CNEL), whereas noise environments from 65 to 70 dBA (CNEL) would require analysis of noise reduction techniques (South San Francisco 1999).

City of San Bruno

The San Bruno General Plan indicates that single-family residential noise environments up to 60 dBA L_{dn} are normally acceptable; multi-family residential and motel noise environments up to 65 dBA L_{dn} are normally acceptable; commercial, park, school, church, and hospital noise environments up to 70 dBA L_{dn} are normally acceptable; and cemetery and industrial noise environments up to 75 dBA L_{dn} are normally acceptable (San Bruno 2009). For noise environments above these levels, new development in such areas is required to implement a detailed analysis including noise reduction requirements and noise insulation features to be included in the design. Section 6.16.060 of the San Bruno Municipal Code (San Bruno n.d.) states that:

> No person shall operate any machinery, equipment, pump, fan, air conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property plane of any property to exceed the ambient base noise level by more than ten decibels. However, during the period of 7:00 a.m. to 10:00 p.m. the ambient noise level may be exceeded by 20 decibels for a period not to exceed 30 minutes during any 24-hour period.

The Code establishes the baseline noise levels for residences at 60 dBA during the daytime and 45 dBA during the nighttime. Therefore, the Noise Ordinance prohibits daytime noise levels above 70 dBA and nighttime noise levels above 55 dBA when measured at residential uses.

City of Millbrae

The Millbrae General Plan Noise Element indicates that residential, school, church, and commercial noise environments up to 60 dBA (L_{dn} or CNEL) are normally acceptable. Park noise environments are normally acceptable up to 65 dBA. Conditionally acceptable exceedances of the normally acceptable noise ranges require new development in such areas to implement noise insulation features in the Project design (Millbrae 1998). The Millbrae Municipal Code and Community Preservation Ordinance do not have quantitative standards for noise levels (Millbrae n.d.).

TABLE 5.7-12
Summary of Local Noise Regulations and General Plan Policies Pertaining to Operation

Jurisdiction	Summary of Local Noise Regulations and General Plan Policies pertaining to Operation[(a)]
City of Daly City	CNEL of 60 dBA (53 dBA L_{eq}) for single-family residential, 65 dBA (58 dBA L_{eq}) for multi-family residential; 70 dBA (63 dBA L_{eq}) for office and commercial uses; 75 dBA (68 dBA L_{eq}) for golf clubs
County of San Mateo	55 dBA L_{eq} weekday daytime; 50 dBA L_{eq} during the nighttime and on weekends
Town of Colma	CNEL of 60dBA (53 dBA L_{eq}) for residential and parks; 65 dBA (58 dBA L_{eq}) for cemeteries
City of South San Francisco	60 – 70 dBA L_{eq} during the daytime; 50 – 70 L_{eq} during the nighttime[(b)]
City of San Bruno	L_{dn} of 60 dBA (54 dBA L_{eq}) for single-family residential uses; 65 dBA (59 dBA L_{eq}) for multi-family residential uses; 70 dBA (66 dBA L_{eq}) for commercial uses and parks; 75 dBA (69 dBA L_{eq}) for cemeteries and industrial uses. Noise Ordinance: 70 dBA daytime and 55 dBA nighttime at residential uses
City of Millbrae	L_{dn} or CNEL of 60 dBA (54 dBA L_{eq}) for residential uses, schools, churches, and commercial uses; 65 dBA (59 dBA L_{eq}) for parks

Notes:

(a) Given that operational noise is assumed to be continuous, the L_{eq} has been substituted in place of other noise level metrics (e.g., L_{50}), where appropriate.

(b) See Table 5.7-8 (Summary of Measured Noise Levels at Representative Sites - April and October 2009) for each type of affected land use.

Groundborne Vibration

The City of Daly City, County of San Mateo, Town of Colma, City of San Bruno, and City of South San Francisco do not have an ordinance or any general plan policies that regulate groundborne vibration.

The Municipal Code, Section 6.25.050 for the City of Millbrae prohibits, "emanation of noise or vibrations on a continuous and regular basis of such a loud, unusual, unnecessary, penetrating, lengthy or untimely nature as to unreasonably disturb, annoy, injure or interfere with or endanger the comfort, repose, health, peace, safety or welfare of users of neighboring property" (Millbrae n.d.).

5.7.3 Impacts and Mitigation Measures

5.7.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on noise and vibration if it were to:

- Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, expose people residing or working in the area to excessive noise levels.
- For a project located in the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.
- Be substantially affected by existing noise levels.

5.7.3.2 Approach to Analysis

The noise and vibration impact assessment evaluates short-term impacts associated with construction of the Project. It also assesses long-term operational impacts (e.g., those resulting from operation of the well facilities). The impact discussion analyzes substantial increases in ambient noise levels in the vicinity of the facility sites. In addition, this assessment uses local noise standards and applicable daytime exceptions as the basis for significance thresholds related to "established" noise standards. The assessment of potential noise impacts was conducted using information on existing ambient noise levels and the anticipated noise that would be produced during construction and operation of the Project. The assessment of vibration impacts was conducted using information on anticipated vibration during construction and operation of the Project.

For the purposes of this analysis, only construction noise is considered under the criterion that addresses temporary or periodic increase in ambient noise. Periodic noise increases are defined herein as intermittent or short-term, and only construction activities are consistent with this definition. Although the well facilities would only operate in dry years, in Take Years the well pumps could be operated continuously. Operation of well facilities is thus conservatively considered to result in a permanent increase in ambient noise levels; operation is thus not considered as a periodic increase in noise.

In a departure from the general organization of this EIR's other analysis sections, any applicable mitigation measures are presented at the end of each impact discussion, rather than following the discussion of each facility site or group of sites. Most of the noise mitigation measures apply to the majority of the facility sites. Therefore, it is more efficient to present and discuss the measure once, rather than with each site and referring the reader back to the measure's original discussion in the section.

Construction Noise

For construction noise, the potential for impacts was assessed by considering several factors, including the proximity of Project-related noise sources to noise-sensitive land uses (i.e., sensitive receptors), typical noise levels associated with construction equipment, the potential for construction noise levels to interfere with daytime and nighttime activities, the duration that sensitive receptors would be affected, and whether proposed activities would occur outside the construction time limits or noise limits established in local ordinances. For operational noise, the potential for impacts was assessed by evaluating the noise generation potential of proposed facilities, proximity of sensitive receptors, and the potential for operational noise to remain within the established local noise ordinance limits at the nearest receptors. Each impact discussion evaluates impacts on sensitive receptors at each facility site.

For both construction and operational noise, a "substantial" noise increase can be defined as an increase in noise levels to that which causes interference with activities normally associated with established nearby land uses during the day and/or night. As documented by the existing noise surveys prepared for this analysis, the existing daytime noise environment in some Project areas exceeds 65 dBA L_{eq}. In some areas, the existing nighttime noise environment exceeds 55 dBA L_{eq}; but in most areas, the nighttime noise is 50 L_{eq} or less, as is typical of urban environments. To be conservative, the local noise limits were not adjusted upward based on the ambient noise level. One indicator that noise could interfere with daytime activities normally associated with residential land uses (for example) would be speech interference; whereas, an indicator that noise could interfere with nighttime activities normally associated with residential uses would be sleep interference. This analysis, therefore, uses the following criteria to define whether a temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the project would be substantial:

> **Speech Interference.** Speech interference is an indicator of an impact on daytime and evening activities typically associated with residential land uses, but which is also applicable to other similar land uses that are sensitive to excessive noise levels. Therefore, a speech interference criterion, in the context of impact duration and time of day, is used to identify substantial increases in ambient noise levels.

Noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the building were to exceed 45 to 60 dBA[2]. A typical building can reduce noise levels by 25 dBA with the windows closed (U.S. EPA 1974). This noise reduction could be maintained only on a temporary basis in some cases, since it assumes windows must remain closed at all times. Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 70 dBA (L_{eq}) adjacent to a building would maintain an acceptable interior noise environment of 45 dBA. It should be noted that such noise levels would be sporadic rather than continuous in nature, because different types of construction equipment would be used throughout the construction process. Therefore, an exterior noise level of 70 dBA L_{eq} with windows closed during peak noise periods is used as the threshold for substantial construction noise.

Sleep Interference. Based on available sleep criteria data, an interior nighttime level of 35 dBA is considered acceptable (U.S. EPA 1974). Assuming a 25 dBA reduction from a residential structure with the windows closed, an exterior noise level of 60 dBA adjacent to the building would maintain an acceptable interior noise environment of 35 dBA. Even with windows open, a typical house achieves an approximately 15-dBA reduction and, therefore, an exterior noise level of 50 dBA (L_{eq}) would be required to maintain an acceptable interior noise environment of 35 dBA. This nighttime threshold would apply equally to construction and operation of the Project.

The duration of exposure at any given noise-sensitive receptor is one consideration in determining an impact's significance. For example, this analysis generally assumes that temporary construction noise that occurs during the day for a relatively short period of time would not be significant. In addition, this analysis assumes that most people of average sensitivity that live in suburban or urban environments are accustomed to a certain amount of construction activity from time to time to maintain existing infrastructure. Therefore, for the purposes of this analysis, temporary exposure to construction noise during the daytime would not be considered to result in a substantial temporary increase in ambient noise levels if it is for durations of two weeks or less. As indicated in Chapter 3, Project Description, Section 3.5.1 (Construction Sequencing and Schedule) pipeline construction is proposed to proceed at 300 to 600 feet per week[3]. As a result, this analysis assumes that, in most cases, any particular sensitive receptor along a pipeline route or underground electrical work would not be subject to pipeline construction noise for more than two weeks.

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[2] For indoor noise environments, the highest noise level that permits relaxed conversation with 100 percent intelligibility throughout the room is 45 dBA. Speech interference is considered to become intolerable when normal conversation is precluded at three feet, which occurs when background noise levels exceed 60 dBA.

[3] For example, a residence with an 80-foot frontage would be affected by noise over the threshold of 70 dBA when pipeline construction is within 200 feet of the residence in either direction. At a rate of 300 feet per week (the slowest rate), pipeline construction noise would exceed the threshold for up to five to eight working days.

Similarly, fenced enclosure construction, as proposed at Sites 2, 3, 4, 5 (Consolidated Treatment at Site 6), 7 (Consolidated Treatment at Site 6), and 19 (Alternate), is anticipated to occur over one month at Site 2; over six months at Site 3 (during two summer seasons), and over four months at the remaining sites. Noise-generating activities with substantial equipment use would occur in three phases: site preparation, foundation, and paving. Noise from on-site pipeline installation and production well installation are analyzed separately. The most intensive work phase would be site preparation, when equipment could operate up to eight hours per day for a period of five working days. For both the foundation (10 days) and paving (four days) phases, equipment would operate no more than one to two hours per day. As a result, this analysis assumes that temporary exposure to construction noise during the daytime, due to construction of a fenced enclosure, would not be considered to result in a substantial temporary increase in ambient noise levels.

The alternate water connection pipelines would have the same or less impact as the impacts associated with other project facilities (i.e., alternate pipelines are not closer to sensitive receptors than are other project facilities).

This analysis also assumes that cemeteries are sensitive to noise during the day primarily when outdoor graveside services are being performed. However, as described in Chapter 3, Project Description, Section 3.5.1 (Construction Sequencing and Schedule), the SFPUC proposes to temporarily stop construction to accommodate graveside services, and would coordinate with the cemeteries to accomplish this. For the occasional individual small group that may be visiting the cemeteries for anything other than a formal burial ceremony, this analysis assumes that any construction-related noise impacts would be less than significant, due to the very limited exposure, lasting only as long as their visit.

Operational Noise

The analysis of operational noise is based on the following aspects of the Project proposal regarding well facility design and construction (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]):

- Standard construction methods would be used that include weatherproofing all wall/roof junctions to minimize cracks and gaps in the exterior building construction.
- Standard weatherproofed steel doors would be included in the building.
- The roof would be a standard built-up roof using roofing materials with sound reducing qualities.
- A limited amount of sound absorbing material would be included inside the enclosures to minimize a reverberant[4] buildup of noise.

[4] Reverberant sounds are sound waves that bounce off of multiple surfaces before reaching the listener, but arrive at the listener's ears quite a bit later than early reflected sound.

Noise generated by the well pumps during operation would be continuous over long periods during dry years when the Project wells would be operated. In such instances, the pump noise would occur both during the day and night. The dominant sound transmission path from inside to outside the well facility buildings would be through the louvers or other ventilation paths. Acoustical louvers would be used to reduce noise transmission (see Section 3.4.2.2 [Well Facility Types]). The orientation of the louvers at each well facility is not known at this time, so the analysis conservatively assumes that louvers would be oriented in the direction of the noise-sensitive receptor. At well facilities that would have only a fenced enclosure, a submersible pump would be used to minimize noise (see Section 3.4.2.3 [Well Pumps]).

Residential land uses are sensitive to noise day and night. Because the well pumps would generate the same level of noise during both the daytime and nighttime, and nighttime noise limits are more restrictive than daytime limits, the sleep interference threshold constitutes the most restrictive threshold for operational noise. Similarly, at facility sites within local jurisdictions that have adopted applicable noise limits, the nighttime limits are also used as the impact threshold. At other land uses, such as schools, that are not sensitive to noise at night, daytime thresholds for speech interference and daytime ordinance limits are the impact thresholds.

Groundborne Vibration

The Caltrans guidelines for vibration listed in Table 5.7-5 (Human Response to Construction Vibration), and Table 5.7-6 (Potential Vibration-induced Damage Thresholds for Buildings), are the basis for the significance criteria for annoyance and potential building damage. No fragile buildings have been identified near proposed construction areas, but older structures exist (refer to Section 5.5, Cultural and Paleontological Resources, Impact CR-1, Site 15). Based on Caltrans guidance, this analysis establishes 0.25 in/sec PPV as the significance threshold for construction vibration to avoid damage to buildings from vibration sources. Also based on Caltrans guidance, this analysis establishes 0.1 in/sec PPV as the significance threshold for annoyance (the level at which vibration would be strongly perceptible). The SFPUC Water System Improvement Program (WSIP) has established criteria for groundborne vibration. The criterion for onset of damage to buildings is 0.2 in/sec PPV. The criterion for annoyance due to nighttime operations is 0.012 in/sec PPV. The WSIP criteria are conservative given that they are lower than those of Caltrans and other agencies.

Areas of No Project Impact

As explained below, the Project would not result in impacts related to four of the significance criteria listed in Section 5.7.3.1 (Significance Criteria). In addition, one issue related to noise levels caused by the well facilities collectively would not result in impacts during either construction or operation at any of the sites. These four criteria and the collective impacts of the well facilities will not be discussed further in the impact analysis for the following reasons:

Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels due to operation of the proposed Project. There would be no significant sources of groundborne vibration or groundborne noise associated with operation of the proposed Project, because well pumps are mounted so as to prevent vibration, and no other components of the well facility would generate vibration. Therefore, operation of the proposed Project would have no impact related to the exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise.

Result in exposure of persons to or generation of excessive groundborne noise levels. As noted above, groundborne noise occurs when groundborne vibration causes the ground surface and structures to radiate audible acoustical energy. It is primarily an issue for underground rail systems and is not a concern for the type of construction proposed by the Project.

For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, expose people residing or working in the area to excessive noise levels due to construction or operation of the Project. Sites 9, 10, 11, 12, 13, 14, 15, 16, 18 (Alternate), and 19 (Alternate) are located within the San Mateo County Airport Land Use Plan (ALUP) for the San Francisco International Airport (SFO) (C/CAG 1996). Sites 12, 13, 14, 15, 16, and 19 (Alternate) would be located within two miles of SFO. Construction workers could be exposed to airport-related noise from aircraft passing overhead. However, the exposure would be limited to the duration of construction, airport-related noise levels would generally be much lower than construction-related noise levels, and it is assumed for purposes of this analysis that construction workers would be required to use OSHA-mandated ear protection as necessary while on the job, regardless. In addition, many jurisdictions and land uses (e.g., residential areas, schools, parks, etc.) within the study area are already affected by overflight noise. Based on the noise measurement survey conducted by I&R, aircraft overflight noise levels in the Project area range from 59 to 89 dBA L_{max}. Airport noise contours show a maximum CNEL of 73.1 dBA (SFO n.d.). Nevertheless, the Project would not result in a permanent increase in the number of people exposed to aircraft overflight noise within the SFO ALUP because the Project would not cause additional people to move into the area (refer to Section 5.4, Population and Housing), and it is assumed that the construction workers that would be temporarily exposed to the overflight noise in the Project area would be using ear protection as required. Similarly, it is assumed for purposes of this analysis that maintenance workers that would be intermittently exposed to the overflight noise in the Project area would be required to use ear protection if necessitated by the ambient noise levels. However, it should be noted that OSHA does not require hearing protection for noise levels less than 90 dBA (OSHA, Occupational Safety and Health Standards, Subpart: G, Occupational Health and Environmental Control, Standard Number: 1910.95). Based on the airport noise contours described above, ambient noise levels associated with aircraft activity are not expected to result in exposure of maintenance workers to excessive noise levels.

For a project located in the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels due to construction or operation of the Project. No private airstrips are in the Project vicinity. Therefore, the Project would not expose people working on the Project to excessive noise levels from a private airstrip.

Be substantially affected by existing noise levels due to operation of the Project. The proposed Project is a water utility project and would not be affected by existing noise levels. Since the Project is not a noise-sensitive land use, this criterion would not apply.

For construction and operation of the well facilities collectively. If a given sensitive receptor were located in close proximity to multiple sites, and some portion of the construction schedule were to occur simultaneously at one or more sites in close proximity to each other (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), the simultaneous noise exposure due to this potential overlap in construction activities would not increase noise levels above those reported for the individual facilities. This is because each of the facilities would be sufficiently far apart that sensitive receptors that would experience noise from two or more facilities at once would not experience an increase in noise levels due to the simultaneous construction or operation of the facilities, as indicated below.

- For Sites 2, 3, and 4, there would be no increase as a result of construction of the three sites concurrently at the most affected receptors. The construction noise levels at the most affected receptors resulting from activities at the nearest site would be more than 10 dBA higher than construction noise levels resulting from activities at the other sites, which would not cause a perceptible increase in the combined noise exposure because the noise heard in the foreground would not be perceptibly amplified by the noise in the background due to the distances and noise levels involved. When calculating the combined noise level from two sources, if one source produces a noise level 10 dBA or greater than the other source, the noise from the quieter source would not result in a perceptible difference in total noise level (see Table 5.7-3 [Decibel Addition]).
- For Sites 12 and 19 (Alternate) there would be no increase as a result of construction of the two sites concurrently at the most affected receptors. The construction noise levels at the most affected receptors resulting from activities at the nearest site would be more than 10 dBA higher than construction noise levels resulting from activities at the other site, which thus would not cause an increase in the combined noise exposure.
- Sites 14 and 15 would be approximately 1,000 feet apart, and the construction noise levels at the most affected receptors resulting from activities at the nearest site would be more than 10 dBA higher than construction noise levels resulting from activities at the other site, which thus would not cause an increase in the combined noise exposure.
- Sites 9 and 10 would be over 1,500 feet apart, and the construction noise levels at the most affected receptors resulting from activities at the nearest site would be more than 10 dBA higher than construction noise levels resulting from activities at the other site, which thus would not cause an increase in the combined noise exposure.
- Sites 10 and 18 (Alternate) would be approximately 750 feet apart, and the construction noise levels at the most affected receptors resulting from activities at the nearest site would be more than 10 dBA higher than construction noise levels resulting from activities at the other site, which thus would not cause an increase in the combined noise exposure.

- Sites 5 and 6 would be over 1,000 feet apart, and there are no sensitive receptors in between the two sites that could be affected by both sites.
- For Site 8 and Site 17 (Alternate), the senior care facility would be located approximately 600 feet from Site 8 and 500 feet from Site 17 (Alternate). Because this noise sensitive land use is located at a similar distance from both sites, there is the potential for an increase in construction noise levels if the work were to occur simultaneously. However, because a large Kohl's Department Store building would be located between Site 8 and the senior care facility, there would be no increase in noise levels as a result of constructing Site 8 and Site 17 (Alternate), as the existing building would provide more than a 10 dBA noise reduction.

As a result, potential noise impacts from simultaneous construction or operation of the facilities is not anticipated to occur and is not discussed further.

5.7.3.3 Summary of Impacts

Table 5.7-13 (Summary of Impacts – Noise and Vibration), provides a summary of potential impacts related to noise and their significance determinations.

TABLE 5.7-13

Summary of Impacts – Noise and Vibration

Site	Construction				Operations	Cumulative
	Impact NO-1: Project construction would result in noise levels in excess of local standards.	**Impact NO-2: Project construction would result in excessive groundborne vibration.**	**Impact NO-3: Project construction would result in a substantial temporary increase in ambient noise levels.**	**Impact NO-4: Project construction would not result in a substantial temporary increase in ambient noise levels along construction haul routes.**	**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.**	**Impact C-NO-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise.**
Site 1	SUM	LS	SUM	LS	LSM	LSM
Site 2	NI	LS	LS	LS	NI	LS
Site 3	LSM	LSM	SUM	LS	NI	LS
Site 4	SUM	LSM	SUM	LS	NI	LS
Westlake Pump Station	NI	LS	LS	LS	LSM	LSM
Site 5 (Consolidated Treatment at Site 6)	NI	LS	LSM	LS	NI	LS
Site 5 (On-site Treatment)	NI	LS	SUM	LS	LSM	LSM
Site 6	NI	LS	LS	LS	LS	LS
Site 7 (Consolidated Treatment at Site 6)	LS	LS	LS	LS	NI	LS
Site 7 (On-site Treatment)	LS	LS	LS	LS	LSM	LSM
Site 8	LSM	LS	LS	LS	LS	LSM

TABLE 5.7-13

Summary of Impacts – Noise and Vibration

Site	Construction				Operations	Cumulative
	Impact NO-1: Project construction would result in noise levels in excess of local standards.	Impact NO-2: Project construction would result in excessive groundborne vibration.	Impact NO-3: Project construction would result in a substantial temporary increase in ambient noise levels.	Impact NO-4: Project construction would not result in a substantial temporary increase in ambient noise levels along construction haul routes.	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.	Impact C-NO-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise.
Site 9	SUM	LS	SUM	LS	LSM	LSM
Site 10	LSM	LS	LSM	LS	LS	LS
Site 11	LSM	LS	LSM	LS	LS	LSM
Site 12	SUM	LSM	SUM	LS	LSM	SUM
Site 13	LSM	LS	LSM	LS	LS	LS
Site 14	LSM	LS	SUM	LS	NI	LS
Site 15	LS	LSM	LSM	LS	NI	LS
Site 16	SUM	LS	SUM	LS	LS	LS
Site 17 (Alternate)	LSM	LS	LSM	LS	LS	LSM
Site 18 (Alternate)	SUM	LSM	SUM	LS	LSM	LSM
Site 19 (Alternate)	SUM	LS	SUM	LS	NI	SUM

Notes:

NI = No Impact

LS = Less than Significant

LSM = Less than Significant with Mitigation

SUM = Significant and Unavoidable with Mitigation

5.7.3.4 Construction Impacts and Mitigation Measures

This introduction to construction impacts and mitigation measures includes information regarding the Project construction equipment, construction phasing, and duration of construction activities that is applicable to the four construction impacts that follow. For Sites 5 and 7 two options were addressed; consolidated treatment at Site 6, which would reduce the facilities needed at Sites 5 and 7, and on-site treatment at Sites 5 and 7, which would require construction of treatment facilities at those sites.

Construction noise levels would vary at any given receptor depending on construction timing, equipment type and duration of use, distance between the noise source and receptor, and the presence or absence of barriers between the noise source and the receptor. The perception of construction noise by a given sensitive receptor also varies depending on the existing noise levels and shielding.

Daily construction hours proposed for the Project would typically be between 7:00 a.m. and 7:00 p.m. Monday through Friday, except for construction of production wells. If necessary, construction work may occasionally occur on Saturdays between the hours of 7:00 a.m. and 5:00 p.m. (refer to Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]). Drilling of production wells would take place 24-hours per day for a period of up to seven consecutive days; pump testing would take place for one continuous 48-hour period.

Typical construction equipment generates maximum (worst-case) noise levels ranging from about 70 to 90 dBA L_{max} at a distance of 50 feet from the source (FHWA 2006). The rate of attenuation (i.e., reduction) is about 6 dBA for every doubling of distance from a point source (Harris 1991). Table 5.7-14 (Noise Levels and Assumed Operational Parameters for Construction Equipment), identifies reference noise levels for construction equipment expected to be used during construction. The table provides information regarding the approximate percentage of use during a typical hour and the typical maximum noise level (L_{max}) and equivalent noise level (L_{eq}) at 50 feet from the source based on information provided by the Federal Highway Administration (FHWA 2006). Table 5.7-15 (Construction Activities, Equipment, Duration, and Maximum Estimated Noise Levels at 50 feet from Noise Sources), identifies the various activities associated with construction of the proposed Project (including production well installation, well facility [building] construction, and pipelines), the equipment to be used, the duration of construction for each construction activity, and the estimated noise levels that would be generated during construction of each activity, as detailed in Chapter 3, Project Description.

TABLE 5.7-14
Noise Levels and Assumed Operational Parameters for Construction Equipment

Construction Equipment	Approximate Usage per Hour	Noise Level (dBA) at 50 feet		Daytime/Nighttime Usage
		L_{max}	L_{eq} (one hour)	
Backhoe	40%	78	74	Day
Front-End Loader	40%	79	75	Day
Drill Rig	100%	79	79	Day/Night
Concrete Mixer	40%	79	75	Day
Compactor	20%	83	76	Day
Crane	16%	81	73	Day
Dump/Haul Truck	40%	77	73	Day
Concrete Pump Truck	20%	81	75	Day
Excavator	40%	81	77	Day
Generator	50%	81	78	Day
Pickup Truck	40%	75	71	Day
Pumps	50%	81	78	Day/Night
Arc Welder	40%	74	70	Day

Source: FHWA 2006

TABLE 5.7-15

Construction Activities, Equipment, Duration, and Maximum Estimated Noise Levels at 50 feet from Noise Source

Project Components and Construction Activities	**Construction Vehicles and Equipment**	**Construction Duration**	**Maximum Estimated Noise Levels at 50 feet[(a)]**
Production Well Installation			
Site preparation Pilot hole drilling Bore hole drilling Pump testing	Construction equipment is expected to include: mounted drill rig on a support truck, cement truck, pump truck, trailers, and pickup trucks.	Well construction, development and testing would require approximately four to six weeks. Pump testing would occur for 12 to 48 hours continuously.	81 dBA L_{max} 82 dBA L_{eq}
Well Facility (Building) Construction			
Site preparation and grading On-site pipeline installation Building foundation Building construction Pump Installation Landscaping and site restoration	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. Diesel generators with self-contained fuel tanks may be used during construction.	14 months total	85 dBA L_{max} 87 dBA L_{eq}
Utility Pipelines			
Vegetation removal and grading or pavement cutting depending on the location Trench excavation and shoring to stabilize the sides of the trench if necessary Pipeline installation Trench backfilling and compacting Surface restoration	Construction equipment is expected to include: excavator, front-end loader, hauling trucks, compactor, asphalt trucks, arc welder. Diesel generators with self-contained fuel tanks may be used.	300 to 600 feet per week	83 dBA L_{max} 82 dBA L_{eq}

Source: SFPUC, Illingworth & Rodkin and FHWA 2006

Note:

(a) The L_{max} represents the maximum noise level generated by the loudest single piece of construction equipment.

For this analysis, the reference noise levels for each site were calculated using the FHWA Roadway Construction Noise Model, which assumes that all of the equipment could be operated simultaneously and at the hourly usage factors for each piece of equipment presented in Table 5.7-14 (Noise Levels and Assumed Operational Parameters for Construction Equipment) (FHWA 2006). The corresponding noise levels at receptors were then predicted based on the approximate distance between the nearest noise-sensitive receptors and the construction area. Standard methods for acoustical analysis of construction sites are based on the distance from the "acoustical center" or construction activity center of the site to the nearest noise-sensitive receptor, as was the case for this analysis. In other words, the proposed pieces of construction equipment are not modeled at the construction area boundary, but rather at the approximate center of the area in which most construction activity is likely to occur. Distances to the nearest receptor property line were used for predicting noise levels in comparison with standards established by general plans and local noise ordinances; whereas, distances to the nearest receptor buildings where people reside and sleep (e.g., residences and hotels) were used for predicting noise levels in comparison with speech and sleep disturbance criteria. In addition, in the cities of South San Francisco and San Bruno, to determine if noise levels exceeded local standards (Impact NO-1) maximum construction noise levels from the individual loudest piece of equipment were predicted at a distance of 25 feet in South San Francisco and 100 feet in San Bruno, per the respective noise ordinance requirements. Finally, in South San Francisco, for construction noise occurring outside allowable noise ordinance hours, the L_{50} noise level metric is used to assess construction noise impacts. For the purposes of this analysis, the L_{50}, which is defined as the noise level which is exceeded 50 percent of the measurement period (one hour for the City of South San Francisco), can be assumed to equal the predicted L_{eq} noise level when the construction activity is continuous (i.e., well drilling and pump testing).

Peak noise-generating daytime construction activities associated with the proposed Project would occur during construction of a well facility building. In the case of well facilities with only a fenced enclosure and with no existing test well, peak noise-generating daytime construction activities would instead occur during production well installation. Peak noise-generating nighttime construction activities would occur during production well installation, in areas where new wells are proposed. As discussed in Chapter 3, Section 3.5.3.1 (Construction Hours), drilling of a production well would occur continuously for about a week (seven consecutive days and nights) after the site has been cleared and prepared. In addition to well drilling, well pumping tests would be performed sequential to final well development for a continuous period of 48 hours. The type of equipment for the pump tests would include a portable submersible pump, truck or rig, and possibly a generator. Noise resulting from the proposed pumping tests would therefore not be louder than from production well installation.

In the case where a sensitive receptor is located relatively far from a well site, but close to pipeline installation, this is evaluated on a case-by-case basis for each facility site.

Construction noise levels due to the proposed Project are estimated in Table 5.7-16 (Conflicts with Local Noise Ordinances during Construction) for daytime construction and Table 5.7-17 (Conflicts with Local Noise Ordinances during Nighttime Construction – Noise Levels with Mitigation Measure M-NO-1 [Noise Control Plan]) for nighttime construction.

Impact NO-1: Project construction would result in noise levels in excess of local standards. (Significant and Unavoidable with Mitigation)

The City of Daly City and the City of Millbrae ordinances do not contain specific construction noise performance standards (i.e., quantified standards), whereas, the cities of South San Francisco and San Bruno, the Town of Colma, and the County of San Mateo have noise performance standards that are applicable to construction (see Table 5.7-10 [Summary of Local Noise Regulations Pertaining to Construction]).

Table 5.7-16 (Conflicts with Local Noise Ordinances during Construction), identifies the daytime noise levels, predicted at the closest sensitive receptor property line, for the two jurisdictions with daytime performance standards (cities of South San Francisco and San Bruno). Construction noise levels are estimated using the reference noise levels presented in Table 5.7-15 (Construction Activities, Equipment, Duration, and Maximum Estimated Noise Levels at 50 feet from Noise Source), by construction type, and the distance to the nearest sensitive receptor property line. Table 5.7-16, also identifies the nighttime noise levels, predicted at the closest sensitive receptor property line, for the four jurisdictions with nighttime performance standards (County of San Mateo, City of South San Francisco, Town of Colma, and City of San Bruno) at sites with proposed nighttime construction. The significance thresholds for the jurisdictions vary (see Table 5.7-10 [Summary of Local Noise Regulations Pertaining to Construction]).

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

<u>Sites 2, 5, 6, and Westlake Pump Station</u>

Sites 2, 5, 6, and the Westlake Pump Station would be located in the City of Daly City. As discussed in Section 5.7.2.3 (Local Regulations), noise in Daly City that disturbs any other person beyond the confines of the property between the hours of 10:00 p.m. and 6:00 a.m. is prohibited. The Daly City noise ordinance has no specific restrictions on daytime construction. Proposed well facility and pipeline construction at Sites 2, 5, 6, and the Westlake Pump Station would not occur between 10:00 p.m. and 6:00 a.m. and therefore would not conflict with the Daly City Noise Ordinance. No well drilling is proposed at Sites 2, 5, 6, or the Westlake Pump Station. Therefore, there would be no exceedance of the local daytime or nighttime noise standards. As a result, *no impact* would occur.

Impact Conclusion: No Impact

<u>Sites 7 and 15</u>

Site 7

Site 7 would be located in the Town of Colma. As noted above in Section 5.7.2.3 (Local Regulations), Colma's noise regulations state that no person shall operate equipment in residential areas or within a radius of 500 feet therefrom that exceeds a noise level of 85 dBA measured at a distance of 25 feet from the source during the hours of 7:00 a.m. to 8:00 p.m. Monday through Friday (weekend and holiday hours of 10:00 a.m. to 6:00 p.m.), or 60 dBA at a distance of 25 feet from the source during the hours of 8:00 p.m. to 7:00 a.m. Monday through Friday (weekend and holidays hours 6:00 p.m. to 10:00 a.m.) Under Colma's noise regulations, hourly limits in non-residential areas are decided on a project-by-project basis by the Building Official. Because hourly limits have not been set by the Building Official for construction of the Project in this area, the provisions of Colma's noise regulations relating to construction in residential areas or within a radius of 500 feet therefrom are used in this analysis to be conservative.

Neither option at Site 7 would be located in a residential zone or within 500 feet of a residential zone, and therefore construction at Site 7 would not conflict with the Colma noise ordinance. As a result, any noise impacts would be *less than significant*.

Site 15

Site 15 would be located in the City of San Bruno. As presented in Table 5.7-10 (Summary of Local Noise Regulations Pertaining to Construction), the City of San Bruno sets L_{max} limits for individual pieces of equipment at 85 dBA at 100 feet during the day (i.e., 7:00 a.m. to 10:00 p.m.) and 60 dBA at 100 feet for nighttime (i.e., 10:00 p.m. to 7:00 a.m.) within any residential zone or within 500 feet of a residential zone. No construction work at the Site 15 well facility would be within any residential zones or within 500 feet of a residential zone, because the nearest residence would be located approximately 700 feet from the well facility. However, the pipeline route on Sneath Lane would be located within about 100 feet of the property line of a multi-family residence. Construction noise levels for individual pieces of equipment utilized for the Site 15 pipeline installation would be 77 dBA L_{eq}, which is below the standard for daytime (see Table 5.7-16 [Conflicts with Local Noise Ordinances during Construction]), and the pipeline would be constructed only during the daytime. Therefore, the impact of construction-related noise ordinance conflicts at Site 15 would be *less than significant*.

Impact Conclusion: Less than Significant

TABLE 5.7-16
Conflicts with Local Noise Ordinances during Construction

Site	Jurisdiction	Nearest Receptor	Approximate Distance to Property Line of Receptor (feet)	Daytime Construction (Well Drilling and Testing; Well Facility and Pipeline Construction)					Nighttime Construction (Well Drilling and Testing)	
				Loudest Daytime Activity	Predicted Noise Level at Property Line of Receptor[a] dBA L_{max}/L_{eq}	Conflict with Ordinance? (LSM/SUM)	Construction Outside of Allowable Daytime Hours: Would construction occur outside of allowable daytime hours? (Yes/No)	Construction Outside of Allowable Daytime Hours: Conflict with Ordinance? (LSM/SUM)	Predicted Noise Level at Property Line of Receptor dBA L_{max}/L_{eq}	Conflict with Ordinance? (LSM/SUM)
Site 1	Daly City	Multi-family Residential	90[b]	N/A	N/A[c]		No	No	77[b]	Yes (SUM)
Site 2	Daly City	Multi-family Residential	N/A	N/A	N/A[c]		No	No	No nighttime construction.	
Site 3	San Mateo County	Single-family Residential	85	Well Drilling and Testing	The County of San Mateo has no thresholds for daytime construction.		Yes	Yes (LSM)	77	Yes (LSM)
Site 4	San Mateo County	Single-family Residential	25	Well Drilling and Testing	The County of San Mateo has no thresholds for daytime construction.		Yes	Yes (LSM)	88	Yes (SUM)
WLPS	Daly City	Multi-family Residential	N/A	N/A	N/A[c]		No	No	No nighttime construction.	
Site 5 (Consolidated Treatment at Site 6)	Daly City	Single-family Residential	N/A	N/A	N/A[c]		No	No	No nighttime construction.	
Site 6	Daly City	Multi-family Residential	N/A	N/A	N/A[c]		No	No	No nighttime construction.	
Site 7 (Consolidated Treatment at Site 6)	Colma	Cemetery	N/A	N/A	N/A		No	No	Not a noise-sensitive receptor at night.	
Site 5 (On-site Treatment)	Daly City	Single-family Residential	N/A	N/A	N/A[c]		No	No	No nighttime construction.	
Site 6	Daly City	Multi-family Residential	N/A	N/A	N/A[c]		No	No	No nighttime construction.	
Site 7 (On-site Treatment)	Colma	Cemetery	N/A	N/A	N/A[d]		No	No	Not a noise-sensitive receptor at night.	
Site 8	Colma	Cemetery	25[e]	Well Facility	91	Yes (LSM)	Yes	Yes (LSM)	Not a noise-sensitive receptor at night.	
Site 9	South San Francisco	Trailer Court	<25	Well Facility	91/89[f]	Yes (LSM)	Yes	Yes (LSM)	79	Yes (SUM)
Site 10	South San Francisco	Single-family Residential	220	Well Facility	91/74[f]	Yes (LSM)	Yes	Yes (LSM)	No nighttime construction.	

TABLE 5.7-16
Conflicts with Local Noise Ordinances during Construction

Site	Jurisdiction	Nearest Receptor	Approximate Distance to Property Line of Receptor (feet)	Daytime Construction (Well Drilling and Testing; Well Facility and Pipeline Construction)					Nighttime Construction (Well Drilling and Testing)	
				Loudest Daytime Activity	Predicted Noise Level at Property Line of Receptor[a] dBA L_{max}/L_{eq}	Conflict with Ordinance? (LSM/SUM)	Construction Outside of Allowable Daytime Hours: Would construction occur outside of allowable daytime hours? (Yes/No)	Construction Outside of Allowable Daytime Hours: Conflict with Ordinance? (LSM/SUM)	Predicted Noise Level at Property Line of Receptor dBA L_{max}/L_{eq}	Conflict with Ordinance? (LSM/SUM)
Site 11	South San Francisco	Single-family Residential	385	Well Facility	91/69[f]	Yes (LSM)	Yes	Yes (LSM)	64	Yes (LSM)
Site 12	South San Francisco	Funeral Home	<25	Well Facility	91/89[f]	Yes (LSM)	Yes	Yes (LSM)	Not a noise-sensitive receptor at night and funeral home opens at 9:00 a.m.	
		Single-family Residential	60	Well Facility	91/81[f]	Yes (LSM)	Yes	Yes (LSM)	75	Yes (LSM)
Site 13	South San Francisco	Extended Stay Hotel	25	Pipeline	91/89[f]	Yes (LSM)	Yes	Yes (LSM)	No nighttime construction.	
Site 14	San Bruno	Single-family Residential	100[g]	Well Facility	79	No	No	No	76	Yes (LSM)
Site 15	San Bruno	Multi-family Residential	100[g]	Pipeline	77	No	No	No	N/A[h]	
Site 16	Millbrae	Multi-family Residential	85	Well Drilling and Testing	Millbrae has no thresholds for daytime construction.		Yes	Yes (LSM)	77	Yes (SUM)
Site 17 (Alternate)	Colma	Cemetery	25[d]	Well Facility	93	Yes (LSM)	Yes	Yes (LSM)	Not a noise-sensitive receptor at night.	
Site 18 (Alternate)	South San Francisco	Single-family Residential	<25	Well Facility	91/93[f]	Yes (LSM)	Yes	Yes (LSM)	88	Yes (SUM)
Site 19 (Alternate)	South San Francisco	Church	<25	Pipeline	89/89[f]	No	Yes	Yes (LSM)	Not a noise-sensitive receptor at night.	
		Single-family Residential	65	Pipeline	89/80[f]	No	Yes	Yes (LSM)	80	Yes (SUM)

Notes:

(a) Approximate distance from construction activity center or pipeline installation to nearby noise sensitive property line, based on aerial photo information from Google Earth ™ and using ArcGIS ™, see Table 5.7-7 (Summary of Nearby Sensitive Receptors). L_{max}/L_{eq} evaluated at the property line of the closest sensitive receptor per ordinance requirements of respective local jurisdiction.

(b) As predicted at the nearest receptor building, where a disturbance could occur, per the City of Daly City noise ordinance.

(c) Daly City does not have thresholds for daytime construction. For information regarding Project noise levels from daytime construction, see Impact NO-3 below.

(d) Neither option at Site 7 would be located in a residential zone or within 500 feet of a residential zone; therefore, construction at Site 7 would not conflict with the Colma noise ordinance.

(e) The Town of Colma standards are enforced at 25 feet from construction equipment.

(f) Predicted noise levels are displayed as "noise level at a distance of 25 feet"/ "noise level at nearest receptor property line" for sites within the City of South San Francisco.

(g) The City of San Bruno standards are enforced at 100 feet from construction equipment

(h) Site 15 nighttime construction work is not in a residential zone or within 500 feet of a residential zone.

For purposes of determining conflicts with local noise standards, cemeteries are considered a sensitive receptor, but there are no noise thresholds applicable to cemeteries.

LSM = Less than significant with mitigation

SUM = Significant and unavoidable with mitigation

N/A = Not Applicable

Sites 3, 8, 10, 11, 13, 14, and 17 (Alternate)

Site 3 would be located in unincorporated San Mateo County. The standards for the County of San Mateo are discussed in Section 5.7.2.3 (Local Regulations). As presented in Table 5.7-10 (Summary of Local Noise Regulations Pertaining to Construction), San Mateo County only exempts construction from the noise limits from the hours of 7:00 a.m. to 6:00 p.m. on weekdays, and 9:00 a.m. to 5:00 p.m. on Saturdays. Even though the Project may be exempt from noise ordinance limitations (per section 4.88.380 of the San Mateo County Noise Ordinance), this exemption from the hourly restrictions on construction would not apply to nighttime construction or on Sundays and holidays. Instead, this analysis presumes that for nighttime, Sundays, and holidays, the L_{eq} for a time-varying source (such as construction activity) representative of the maximum noise environment, that would still comply with the County ordinance exterior noise level standard, is 57 dBA (WIA 2009). Therefore, 57 dBA is presumed to be the construction noise limit at all times on Sunday and holidays. Well facility (exclusive of well drilling and pump testing) and pipeline construction at Site 3 is proposed to occur outside of hours when construction noise is exempt from ordinance noise limits (i.e., from 6:00 p.m. to 7:00 p.m. on weekdays and occasionally from 7:00 a.m. to 9:00 a.m. on Saturdays) and would thereby result in the exposure of persons to, or in the generation of, noise levels in excess of standards established in the local noise ordinance during these hours. As a result, the impact of noise from this construction outside allowable hours would be *significant*. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) (see page 5.7-44) would limit construction of the well facility (except well drilling and pump testing) and pipeline construction to the allowable daytime hours noted above. Therefore, with implementation of Mitigation Measure M-NO-1, this portion of the noise impact at Site 3 would be reduced to *less-than-significant* levels.

For Site 3, the estimated maximum noise level resulting from well drilling and pump testing that would occur day and night would be 77 dBA L_{eq}, which is above the nighttime standard of 57 dBA L_{eq} (see Table 5.7-16 [Conflicts with Local Noise Ordinances during Construction]). However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would require that the maximum noise level at Site 3 for well drilling and pump testing be limited to 57 dBA L_{eq}, which would not exceed the nighttime standard. Therefore, with implementation of Mitigation Measure M-NO-1 this portion of the noise impact would be reduced to *less-than-significant* levels.

Sites 8 and 17 (Alternate) would be located in the Town of Colma. As noted above in Section 5.7.2.3 (Local Regulations), Colma's noise regulations state that no person shall operate equipment in residential areas or within a radius of 500 feet therefrom that exceeds a noise level of 85 dBA measured at a distance of 25 feet from the source during the hours of 7:00 a.m. to 8:00 p.m. Monday through Friday (weekend and holiday hours of 10:00 a.m. to 6:00 p.m.), or 60 dBA at a distance of 25 feet from the source during the hours of 8:00 p.m. to 7:00 a.m. Monday through Friday (weekend and holidays hours 6:00 p.m. to 10:00 a.m.) Under Colma's noise regulations, hourly limits in non-residential areas are decided on a project-by-project basis by the Building Official. Because hourly limits would not have been set by the Town of Colma Building Official for construction of this Project in this area, the provisions of Colma's noise regulations relating to construction in residential areas or within a radius of 500 feet therefrom are used in this analysis to be conservative.

In addition, because daily construction hours would typically be between 7:00 a.m. and 7:00 p.m. Monday through Friday (and occasionally on Saturdays between the hours of 7:00 a.m. and 5:00 p.m.), construction at Sites 8 and 17 (Alternate) is proposed to occasionally occur outside of allowable hours (i.e., occasionally from 7:00 a.m. to 10:00 a.m. on Saturdays) and thereby result in the exposure of persons to, or in the generation of, noise levels in excess of standards established in the local noise ordinance during these hours. As a result, the impact of noise from construction outside allowable hours would be potentially *significant*. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would limit well facility (exclusive of well drilling and pump testing at Site 17 [Alternate]) and pipeline construction to the allowable daytime hours. Therefore, with implementation of Mitigation Measure M-NO-1, this impact at Sites 8 and 17 (Alternate) would be reduced to *less-than-significant* levels.

As shown in Table 5.7-16 (Conflicts with Local Noise Ordinances during Construction), estimated maximum daytime noise levels at Sites 8 and 17 (Alternate) at a distance of 25 feet would be 91 and 93 dBA L_{max}, respectively, due to well facility construction, which would exceed the daytime standard. As a result, the impact of daytime construction-related noise would be *significant*. Implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would reduce daytime noise levels to 81 and 83 dBA L_{max}, respectively, which would be below the daytime standard. Therefore, with implementation of Mitigation Measure M-NO-1, the impact of daytime well facility construction would be reduced to *less-than-significant* levels.

Well drilling would not be needed at Site 8, where there is an existing test well that would be converted to a production well, but well drilling and pump testing would be needed at Site 17 (Alternate). However, the well location for Site 17 (Alternate) is 500 feet from the nearest residential receptor, so noise regulations for nighttime construction would not be applicable to this site. Nighttime construction at Site 17 (Alternate) would thus have *less-than-significant* noise impacts.

Sites 10, 11, and 13 would be located in the City of South San Francisco. As presented in Table 5.7-10 (Summary of Local Noise Regulations Pertaining to Construction), South San Francisco limits construction to the hours of 8:00 a.m. to 8:00 p.m. on weekdays, 9:00 a.m. to 8:00 p.m. on Saturdays, and 10:00 a.m. to 6:00 p.m. on Sundays and holidays. The City of South San Francisco sets L_{max} daytime limits for any single piece of equipment at 90 dBA at 25 feet from the noise source or as measured at the property line. Construction that occurs outside of the allowable hours for the various days of the week is subject to the noise level performance standards presented in Table 5.7-9 (South San Francisco Noise Level Standards). Because daily construction hours are proposed to occur outside of allowable hours (i.e., from 7:00 a.m. to 8:00 a.m. on weekdays and occasionally from 7:00 a.m. to 9:00 a.m. on Saturdays, as well as 7:00 a.m. to 10:00 a.m. on Sundays and holidays), the Project would thereby result in the exposure of persons to, or in the generation of, noise levels in excess of standards established in the local noise ordinance during these hours. As a result, the impact of noise from construction outside allowable hours would be *significant*. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would limit construction of the well facility (except well drilling and pump testing) and pipeline construction to the allowable daytime hours noted above. Therefore, with implementation of Mitigation Measure M-NO-1, this impact at Sites 10, 11, and 13 would be reduced to *less-than-significant* levels. No well drilling and pump testing activities are proposed at Sites 10 and 13.

At Sites 10, 11, and 13, construction noise levels during allowable hours (8:00 a.m. to 8:00 p.m. Monday through Friday and 9:00 a.m. to 8:00 p.m. on Saturdays, as well as 10:00 a.m. to 6:00 p.m. on Sundays and holidays) would be 91 dBA L_{max}, which is above the threshold of 90 dBA L_{max} at a distance of 25 feet from the loudest single piece of equipment (see Table 5.7-16 [Conflicts with Local Noise Ordinances during Construction]). As a result, the impact of noise from construction during allowable hours would be *significant*. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) establishes a performance standard for the attenuation that would reduce construction-related noise levels by at least 5 dBA. Therefore, with implementation of Mitigation Measure M-NO-1, this impact would be reduced to *less-than-significant* levels at Sites 10, 11, and 13.

With implementation of Mitigation Measure M-NO-1 (Noise Control Plan), there would be no construction activities outside of daytime hours as defined by the City of South San Francisco, except for well drilling at Site 11. Well drilling would require nighttime activity lasting up to seven consecutive days and subsequent pump-testing activities would last 24 to 48 hours. The estimated maximum noise levels resulting from well-drilling and pump-testing activities would be 64 dBA L_{50} at Site 11, which would exceed the nighttime standard for single-family residential (50 dBA L_{50}) by 14 dBA, and thus result in a *significant* noise impact. However, implementation of Mitigation Measure M-NO-1 establishes a performance standard for the attenuation that would reduce nighttime construction-related noise levels by at least 20 dBA (calculations on file with the San Francisco Planning Department). Therefore, with implementation of Mitigation Measure M-NO-1 this impact would be reduced to *less-than-significant* at Site 11 by limiting construction noise levels to the locally allowable limit for ongoing operational noise; i.e., even though construction at Site 11 would still be occurring outside of allowable hours for construction, the exposure of nearby noise-sensitive receptors to this noise would be reduced to the local limit for ongoing activities and thereby not result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance.

Site 14 would be located in the City of San Bruno. The standards for the City of San Bruno are discussed in Section 5.7.2.3 (Local Regulations). The estimated maximum noise level resulting from daytime construction measured at 100 feet would be 79 dBA L_{max} (see Table 5.7-16 [Conflicts with Local Noise Ordinances during Construction]). Therefore, construction-related noise levels at Site 14 during the day would be below the established standard (85 dBA L_{max}). The estimated maximum noise level resulting from construction at night would be 76 dBA L_{max} measured at 100 feet, which would be above the nighttime standard (60 dBA L_{max}), resulting in a *significant* noise impact. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would reduce the maximum noise level at Site 14 to 56 dBA L_{max}, which would be below the nighttime standard. Therefore, with implementation of Mitigation Measure M-NO-1, this impact would be reduced to *less-than-significant* levels.

Impact Conclusion: Less than Significant with Mitigation

<u>Sites 1, 4, 9, 12, 16, 18 (Alternate), and 19 (Alternate)</u>

Site 1 would be located in the City of Daly City. As discussed in Section 5.7.2.3 (Local Regulations), noise that disturbs any other person beyond the confines of the property between the hours of 10:00 p.m. and 6:00 a.m. is prohibited in Daly City. Nighttime well drilling and pump testing would be required at Site 1.

As a result, the impact of nighttime construction-related noise would be *significant*. The Project, by definition, requires nighttime construction for well drilling and testing, so no mitigation is available that would eliminate construction outside of Daly City's allowable hours. As a result, this impact would be *significant and unavoidable*, given that there is no feasible mitigation that would avoid continuous well drilling (see explanation in Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]).

Site 4 would be located in unincorporated San Mateo County. The standards for the County of San Mateo are discussed in Section 5.7.2.3 (Local Regulations). As presented in Table 5.7-10 (Summary of Local Noise Regulations Pertaining to Construction), San Mateo County exempts construction during the hours of 7:00 a.m. to 6:00 p.m. on weekdays, and 9:00 a.m. to 5:00 p.m. on Saturdays, from local noise limits. Even though the Project may be exempt from noise ordinance limitations (per section 4.88.380 of the San Mateo County Noise Ordinance), this exemption from the hourly restrictions on construction would not apply to nighttime construction or on Sundays and holidays. Instead, this analysis presumes that for nighttime, Sundays and holidays, the L_{eq} for a time-varying source (such as construction activity) representative of the maximum noise environment that would still comply with the County ordinance exterior noise level standard is 57 dBA (WIA 2009). Therefore, 57 dBA is presumed to be the construction noise limit at all times on Sunday and holidays. Well facility and pipeline construction at Site 4 is proposed to occur outside of hours when construction noise is exempt from ordinance noise limits (i.e., from 6:00 p.m. to 7:00 p.m. on weekdays and occasionally from 7:00 a.m. to 9:00 a.m. on Saturdays) and would thereby result in the exposure of persons to, or in the generation of, noise levels in excess of standards established in the local noise ordinance during these hours. As a result, the impact of noise from this construction outside allowable hours would be *significant*. Implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would limit construction of well facility (exclusive of well drilling and pump testing) and pipeline construction to the allowable daytime hours. Therefore, with implementation of Mitigation Measure M-NO-1, this portion of the noise impact at Site 4 would be reduced to *less-than-significant* levels.

For Site 4, the estimated maximum noise level resulting from well drilling and pump testing that would occur day and night would be 88 dBA L_{eq}, which is above the nighttime standard (57 dBA L_{eq}) by 31 dBA (see Table 5.7-16 [Conflicts with Local Noise Ordinances during Construction]). Implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would reduce the maximum noise levels at Site 4 to 68 dBA L_{eq}, which would still be above the nighttime standard. As a result, this portion of the noise impact would be *significant and unavoidable with mitigation*, given that no feasible mitigation is available to reduce noise levels further to an acceptable nighttime level, and well drilling must be continuous (see explanation in Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]).

Sites 9, 12, 18 (Alternate), and 19 (Alternate) would be located in the City of South San Francisco. As presented in Table 5.7-10 (Summary of Local Noise Regulations Pertaining to Construction), South San Francisco limits construction to the hours of 8:00 a.m. to 8:00 p.m. on weekdays, 9:00 a.m. to 8:00 p.m. on Saturdays, and 10:00 a.m. to 6:00 p.m. on Sundays and holidays. The City of South San Francisco sets L_{max} daytime limits for any single piece of equipment at 90 dBA at 25 feet from the noise source or as measured at the property line. Construction that occurs outside of the allowable hours for the various days of the week is subject to the noise level performance standards presented in Table 5.7-10. Because well-drilling and pump-testing activities lasting several days are proposed at Sites 9, 12, 18 (Alternate), and 19 (Alternate) and because daily construction hours for well facility and pipeline construction would typically be between 7:00 a.m. and 7:00 p.m. Monday through Friday (and occasionally on Saturdays between the hours of 7:00 a.m. and 5:00 p.m.), construction at Sites 9, 12, 18 (Alternate), and 19 (Alternate) would occur outside of allowable hours and thereby result in *significant* noise impacts. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) would limit well facility (exclusive of well drilling and pump testing) and pipeline construction to the allowable daytime hours (i.e., 8:00 a.m. to 8:00 p.m. Monday through Friday and 9:00 a.m. to 8:00 p.m. on Saturdays). Therefore, with implementation of Mitigation Measure M-NO-1 (Noise Control Plan), this portion of the noise impact (i.e., for well facility and pipeline construction) at Sites 9, 12, 18 (Alternate), and 19 (Alternate) would be reduced to *less-than-significant* levels.

Construction noise levels associated with well facility construction during allowable hours (i.e., 8:00 a.m. to 8:00 p.m. Monday through Friday and 9:00 a.m. to 8:00 p.m. on Saturdays) at Sites 9, 12, and 18 (Alternate) would be 91 dBA L_{max} at a distance of 25 feet from the loudest single piece of equipment, which is above the threshold of 90 dBA L_{max} at a distance of 25 feet from the loudest single piece of equipment (see Table 5.7-16 [Conflicts with Local Noise Ordinances during Construction]). As a result, the impact of noise from construction during allowable hours would be *significant*. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) establishes a performance standard for the attenuation that would reduce construction-related noise levels by at least 5 dBA. Therefore, with implementation of Mitigation Measure M-NO-1 construction noise levels during allowable hours (8:00 a.m. to 8:00 p.m. Monday through Friday and 9:00 a.m. to 8:00 p.m. on Saturdays) at Site 19 (Alternate) would be 89 dBA L_{max} due to pipeline installation, which is below the threshold of 90 dBA L_{max} at a distance of 25 feet from the loudest single piece of equipment, a *less-than-significant* impact.

In addition, however, well-drilling (lasting up to seven consecutive days) and subsequent pump-testing activities (lasting 24 to 48 hours) are proposed at Sites 9, 12, 18 (Alternate), and 19 (Alternate). The estimated highest L_{50} noise levels resulting from well-drilling and pump-testing activities would be 79 dBA L_{50} at Site 9, which would be above the nighttime standard for multi-family residential (55 dBA L_{50}) by 24 dBA; 75 dBA L_{50} at Site 12, which would be above the nighttime standard for single-family residential by 25 dBA; 88 dBA L_{50} at Site 18 (Alternate), which would be above the nighttime standard for single-family residential by 38 dBA; and 80 dBA L_{50} at Site 19 (Alternate), which would be above the nighttime standard for single-family residential by 30 dBA. However, even with implementation of Mitigation Measure M-NO-1 (Noise Control Plan) this impact would be *significant and unavoidable with mitigation* at Sites 9, 12, 18 (Alternate), and 19 (Alternate) where the standard before mitigation would be exceeded by more than 20 dBA (see nighttime noise levels with mitigation in Table 5.7-17 [Conflicts with Local Noise Ordinances during Nighttime Construction – Noise Levels with Mitigation Measure M-NO-1]), given that no feasible mitigation is available to reduce noise levels further to an acceptable nighttime level, and well drilling must be continuous (see explanation in Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]).

Site 16 would be located in the City of Millbrae and would be within 500 feet of a residential area. As discussed in Section 5.7.2.3 (Local Regulations), Millbrae's noise ordinance limits construction to the hours from 7:30 a.m. to 7:00 p.m. Monday through Friday, from 8:00 a.m. to 6:00 p.m. on Saturdays, and from 9:00 a.m. to 6:00 p.m. on Sundays and holidays within residential areas, unless otherwise authorized by the city. Well facility and pipeline construction at Site 16 is proposed to occur outside of allowable hours. As a result, the impact of noise from this construction outside allowable hours would be *significant*. However, implementation of Mitigation Measure M-NO-1 (Noise Control Plan) would limit well facility (excepting well drilling and pump testing) and pipeline construction to the allowable daytime hours. Therefore, with implementation of Mitigation Measure M-NO-1, this portion of the noise impact at Site 16 would be reduced to *less than significant*.

For Site 16, nighttime well drilling and pump testing would occur outside the hours allowed by the City of Millbrae. This impact would be *significant*. No feasible mitigation is available to eliminate nighttime construction, because well drilling must be continuous (see explanation in Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]). This impact would be *significant and unavoidable*.

Impact Conclusion: Significant and Unavoidable with Mitigation

Mitigation Measure M-NO-1 (Noise Control Plan) is followed by Tables 5.7-17 (Conflicts with Local Noise Ordinances during Nighttime Construction–Noise Levels with Mitigation Measure M-NO-1 [Noise Control Plan]) and 5.7-18 (Conflicts with Local Noise Ordinances during Daytime Construction – Noise Levels with Mitigation Measure M-NO-1 [Noise Control Plan]), which present whether the measures bring the impacts into compliance with the jurisdiction's noise ordinance.

Mitigation Measure 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])[5]

The SFPUC will limit well facility and pipeline construction as follows:

- For Site 1 in Daly City, the proposed construction hours for well facility and pipeline construction (i.e., exclusive of well drilling and pump testing) fall within the locally allowable construction hours and therefore may occur as proposed;
- For Sites 3 and 4 in the County of San Mateo, well facility (exclusive of well drilling and pump testing) and pipeline construction will be limited to the hours of 7:00 a.m. to 6:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturday, and shall be disallowed on Sundays and holidays;
- For Sites 9, 10, 11, 12, 13, 18 (Alternate), and 19 (Alternate) in the City of South San Francisco, well facility (exclusive of well drilling and pump testing at Sites 9, 11, 12, 18 [Alternate], and 19 [Alternate]) and pipeline construction will be limited to the hours of 8:00 a.m. to 8:00 p.m. Monday through Friday and 9:00 a.m. to 8:00 p.m. on Saturday and from 10:00 a.m. to 6:00 p.m. on holidays;
- For Sites 8 and 17 (Alternate), in the Town of Colma, well facility (exclusive of well drilling and pump testing at Site 17 [Alternate]) and pipeline construction will be limited

[5] Impact NO-1 is not significant for Sites 5 and 15, but they are included in the title of the Mitigation Measure because a Mitigation Measure M-NO-1 is required under Impact NO-3, which is discussed below.

to the hours of 7:00 a.m. to 8:00 p.m. Monday through Friday and 10:00 a.m. to 6:00 p.m. Saturday and from 10:00 a.m. to 6:00 p.m. on holidays; and

- For Site 16 in Millbrae, well facility (exclusive of well drilling and pump testing) and pipeline construction will be limited to the hours of 7:30 a.m. to 7:00 p.m. Monday through Friday, 8:00 a.m. to 6:00 p.m. on Saturdays and from 9:00 a.m. to 6:00 p.m. on holidays. The proposed construction hours (exclusive of well drilling and pump testing) from Monday to Friday fall within the locally allowable construction hours and therefore may occur as proposed.

The SFPUC will 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 following performance standards:

- For Sites 3 and 4, in unincorporated San Mateo County, well drilling and testing will be limited to 57 dBA L_{eq} at the property line of the nearest sensitive receptor;
- For Sites 8 and 17 (Alternate), in the Town of Colma, any single piece of construction equipment will be limited to 85 dBA L_{eq} at 25 feet during the day;
- For Sites 9, 10, 11, 12, 13, 18 (Alternate), and 19 (Alternate), exclusive of nighttime well drilling and pump testing -- in South San Francisco, daytime noise levels will be limited to 90 dBA L_{max} from 8:00 a.m. to 8:00 p.m. Monday to Friday and from 9:00 a.m. to 8:00 p.m. on Saturdays, measured at the property plane or at 25 feet from the loudest single piece of equipment;
- To the extent feasible, well drilling and pump testing at Sites 9, 11, 12, 18 (Alternate), and Sites 19 (Alternate) in South San Francisco that occurs between the hours of 8:00 p.m. and 10:00 p.m., Monday to Saturday, and from 6:00 p.m. and 10:00 p.m. on Sundays, L_{50} dBA noise levels will be limited to 60 dBA; from 10:00 p.m. to 7:00 a.m., Monday through Sunday, L_{50} dBA noise levels will be limited to 50 dBA; and from 7:00 a.m. to 8:00 a.m. Monday to Friday, from 7:00 a.m. to 9:00 a.m. on Saturdays and from 7:00 a.m. to 10:00 a.m. on Sundays and holidays, L_{50} dBA noise levels will be limited to 60 dBA; and
- For Site 14, in San Bruno, a single piece of construction equipment will be limited to 85 dBA L_{max} at 100 feet from 7:00 a.m. to 10:00 p.m. or to 60 dBA L_{max} at 100 feet from 10:00 p.m. to 7:00 a.m.

The contractor will determine the specific methods to meet the performance standards provided above. Specific measures that can be feasibly implemented to comply with these performance standards include, but are not limited to, the following:

- Best available noise control practices (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) shall be used for all equipment and trucks in order to minimize construction noise impacts.

- If impact equipment (e.g., jack hammers, pavement breakers, rock drills) is needed during Project construction, hydraulically or electric-powered equipment shall be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used. External jackets on the tools themselves shall also be used if available and feasible.
- To the extent consistent with applicable regulations and safety considerations, operation of vehicles requiring use of back-up beepers shall be avoided near sensitive receptors during nighttime hours and/or, the work sites shall be arranged in a way that avoids the need for any reverse motions of large trucks or the sounding of any reverse motion alarms during nighttime work. If these measures are not feasible, trucks operating during the nighttime hours with reverse motion alarms must be outfitted with SAE J994 Class D alarms (ambient-adjusting, or "smart alarms" that automatically adjust the alarm to 5 dBA above the ambient near the operating equipment).
- Stationary noise sources shall be located as far from sensitive noise receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used. Enclosure openings or venting shall face away from sensitive noise receptors.
- A designated project liaison shall be responsible for responding to noise complaints during the construction phases. The name and phone number of the liaison shall be conspicuously posted at construction areas and on all advanced notifications. This person shall take steps to resolve complaints, including periodic noise monitoring, if necessary. Results of noise monitoring shall be presented at regular Project meetings with the contractor. The liaison shall coordinate with the contractor to modify any construction activities that generate noise levels above the levels identified in the performance standards listed in this measure.
- A reporting program shall be required that documents complaints received, actions taken to resolve problems, and effectiveness of these actions.
- Locate equipment at the work area to maximize the distance to noise-sensitive receptors, and to take advantage of any shielding that may be provided by other on-site equipment.
- Operate the equipment mindful of the residential uses nearby, especially during the nighttime hours.
- Maintain respectful and orderly conduct among workers, including worker conversation noise during the nighttime hours.
- Maintain the equipment properly to minimize extraneous noise due to squeaking or rubbing machinery parts, damaged mufflers, or misfiring engines.
- Provide advance notice to nearby residents prior to starting work at each work site, with information regarding anticipated schedule, hours of operation and a Project contact person.

- Provide a minimum 24-hour advance notice to residents within 250 feet of the production well site prior to nighttime work involving drilling, drilling-related activities, pumping tests, or truck deliveries.
- Schedule work and deliveries to minimize noise-generating activities during nighttime hours at work sites (e.g., no deliveries or non-essential work).
- Utilize a temporary noise barrier placed as close to the receptor (e.g., along the residential property line) or to the work site (e.g., as close as 15 to 20 feet from the drill rig or loudest generating activity area) as possible.
- Utilize sound blankets.

TABLE 5.7-17
Conflicts with Local Noise Ordinances during Nighttime Construction – Noise Levels with Mitigation Measure M-NO-1 (Noise Control Plan)

	Nighttime Construction	
Site	**Predicted Noise Level with Mitigation** L_{max}/L_{eq}	**Remaining Conflict with Local Ordinance with Mitigation?**
Site 1	57	Yes
Site 3	57	No
Site 4	68	Yes
Site 9	59	Yes
Site 11	44	No
Site 12	55	Yes
Site 14	56	No
Site 16	57	Yes
Site 18 (Alternate)	68	Yes
Site 19 (Alternate)	60	Yes

TABLE 5.7-18
Conflicts with Local Noise Ordinances during Daytime Construction – Noise Levels with Mitigation Measure M-NO-1 (Noise Control Plan)

Site	Daytime Construction	
	Predicted Noise Level with Mitigation L_{max}/L_{eq}	Remaining Conflict with Local Ordinance with Mitigation?
Site 3	N/A	No
Site 4	N/A	No
Site 8	81	No
Site 9	81	No
Site 10	86	No
Site 11	81	No
Site 12	81	No
Site 13	86	No
Site 16	N/A	No
Site 17 (Alternate)	83	No
Site 18 (Alternate)	81	No
Site 19 (Alternate)	N/A	No

Note:
N/A = Not applicable, because mitigation only requires limits on hours of construction.

Impact NO-2: Project construction would result in excessive groundborne vibration. (Less than Significant with Mitigation)

The analysis of groundborne vibration associated with construction is based on the level of vibration generated by proposed construction equipment, as listed in Table 3-8 (Estimated Daily Worker and Construction Equipment Trips for Wells and Well Facilities Construction) in Chapter 3, Project Description. Table 5.7-4 (Vibration Levels for Construction Equipment) summarizes typical vibration levels generated by construction equipment proposed for use by the Project (FTA 2006).

A bulldozer would be used during site preparation; loaded trucks would be used to haul excess soil away after grading of sites and pipeline trenching; a drilling rig would be used to drill the production well; a compactor would be used after backfilling the pipeline trench. Because pipeline trench compaction (equivalent to a vibratory roller) would occur at each well facility site, the maximum vibration level at each site would be 0.210 in/sec PPV at a distance of 25 feet from the pipeline. As shown in Table 5.7-4 (Vibration Levels for Construction Equipment), all other activities would cause vibration levels of less than 0.1 in/sec PPV at a distance of 25 feet.

As discussed in Section 5.7.3.2 (Approach to Analysis), 0.20 in/sec PPV is the significance threshold for construction vibration that could cause damage to buildings. The maximum estimated vibration level resulting from pipeline installation (i.e., from vibratory compacting equipment) is 0.210 in/sec PPV at a distance of 25 feet. Following the recommendations in the Caltrans Guidance Manual (Caltrans 2004), pipeline construction occurring at distances of less than 27 feet from a structure could result in vibration levels approaching or possibly exceeding the damage threshold. The analysis also establishes 0.012 in/sec PPV as the significance threshold for annoyance caused by construction-related activities at night, however this threshold is considerably more conservative than the Caltrans annoyance threshold of 0.1 in/sec. Construction activities at night would be limited to drilling. The vibration level resulting from drilling is 0.089 in/sec PPV at a distance of 25 feet (Table 5.7-4 [Vibration Levels for Construction Equipment]). A maximum vibration level of 0.089 in/sec PPV at a distance of 25 feet is equivalent to 0.012 in/sec PPV level at 155 feet. The vibration source in this instance is the drill head, so the distance is actually the slant distance from the drill head to the residential structure. For example, if the residence is located 50 feet horizontally from the drilling operation, once the drilling has reached a depth of 147 feet the slant distance of 155 feet would be achieved. Alternatively, once the depth of the drilling has reached 155 feet ground level vibration would be below the threshold level everywhere.

The evaluation of impacts that follows discusses sites with less-than-significant impacts, followed by sites with significant impacts.

Nighttime Residential Annoyance Potential

<u>All Sites</u>

Residential receptors closest to Sites 1, 3, 4, 9, 12, 14, 16, 18 (Alternate), and 19 (Alternate) would be located within 155 feet of the nearest construction area where potential nighttime drilling would occur for well facility construction. Residential receptors closest to these sites could be exposed to vibration levels greater than 0.012 in/sec, thus exceeding the annoyance threshold (which is far more conservative than the Caltrans threshold of 0.1 in/sec). The annoyance threshold is consistent with the threshold used in the SFPUC WSIP Programmatic Environmental Impact Report (PEIR) and is highly conservative; vibration levels would only be expected to exceed the threshold for at most two nights until drilling is deep enough to reduce vibration levels. At all other sites, residential receptors would be located beyond 155 feet. Therefore, this temporary nighttime groundborne vibration impact would be *less than significant*.

Impact Conclusion: Less than Significant

Building Damage Potential

<u>Sites 1, 2, 5, 6, 7, 8, 9, 10, 11, 13, 14, 16, 17 (Alternate), 19 (Alternate), and Westlake Pump Station</u>

No buildings near these sites are located closer than 27 feet to the proposed pipeline trenches or to other sources of construction vibration (see Table 5.7-7 [Summary of Nearby Sensitive Receptors]). Therefore, vibration levels would be below 0.20 in/sec PPV at any nearby building and, as a result, they would also be less than the 0.25 in/sec PPV significance threshold for building damage. As a result, potential impacts from groundborne vibration would be *less than significant*.

Impact Conclusion: Less than Significant

Sites 3, 4, 12, 15, and 18 (Alternate)

At Sites 3, 4, 12, and 18 (Alternate), pipeline construction could occur closer than 25 feet to a structure. At Sites 3, 4, 12, 15, and 18 (Alternate) pipeline installation could, depending upon the final location of the trench, occur closer than 25 feet to a structure. Pipeline installation would take place adjacent to the nearest building, and vibration levels would be greater than 0.25 in/sec PPV (see Table 5.7-7 [Summary of Nearby Sensitive Receptors]), which could result in a *significant* vibration impact on the adjacent structure. However, Mitigation Measure M-NO-2 (Reduce Vibration Levels during Construction of Pipelines), requires that the construction of pipelines within 25 feet of the structures near Sites 3, 4, 12, 15, and 18 use either non-vibratory means of compaction or controlled low strength materials (CLSM) as backfill so that compaction is not necessary. Either of these pipeline construction methods would avoid significant vibration levels near the building. As a result, this groundborne vibration impact would be *less than significant with mitigation*.

> ***Mitigation Measure M-NO-2: Reduce Vibration Levels during Construction of Pipelines (Sites 3, 4, 12, 15, and 18 [Alternate])***
> The SFPUC shall require that the construction contractor not use vibratory compaction equipment within 25 feet of structures adjacent to Sites 3, 4, 12, 15, and 18 (Alternate). Non-vibratory compaction or controlled low strength materials (CLSM) backfill may be used in lieu of vibratory compaction equipment at these locations.

Impact Conclusion: Less than Significant with Mitigation

Impact NO-3: Project construction would result in a substantial temporary increase in ambient noise levels. (Significant and Unavoidable with Mitigation)

Noise impacts evaluated under Impact NO-1 (temporary noise levels in excess of local standards) and Impact NO-3 (temporary increase in ambient noise levels), evaluate the same daytime and nighttime noise impacts using different thresholds and slightly different methodologies. Instead of predicting construction-related noise levels at the nearest property line and comparing them with local noise ordinance standards (as in Impact NO-1), the analysis under Impact NO-3 predicts noise levels at the nearest building for comparison with speech and sleep interference thresholds. Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction) presents noise threshold exceedances for daytime construction (well drilling and testing; well facility and pipeline construction), and Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction) presents noise threshold exceedances for nighttime construction (well drilling and testing).

TABLE 5.7-19
Exceedance of Noise Thresholds – Daytime Construction

Site	Nearest Receptor	Approximate Distance from the Construction Activity Center (not including Pipelines) (feet)[a]	Approximate Distance from the Nearest Proposed Pipeline (feet)[a]	Loudest Construction Activity Type	Construction Noise Level at Receptor dBA (L_{eq})	Speech Interference Threshold Exceeded? (LSM/SUM) 70 dBA L_{eq}
Site 1	Multi-family Residential	90	40	Well Facility and Pipeline	86	Yes (SUM)
Site 2	Multi-family Residential	325	140	Pipeline	73	No[b]
	Garden Village Elementary School	350	275	Pipeline	67	No[b]
Site 3	Single-family Residential	90	110	Well Drilling and Pump Testing	77	Yes (LSM)
	Ben Franklin Intermediate School	250	200	Well Drilling and Pump Testing	68	No
Site 4	Single-family Residential	75	<25	Well Drilling and Pump Testing	78	Yes (LSM)
	Garden Village Elementary School	425	250	Well Drilling and Pump Testing	63	No
WLPS	Multi-family Residential	75	No pipelines	Upgrade inside existing building	50	No
Site 5 (Consolidated Treatment at Site 6)	Single-family Residential	50	25	Fenced Enclosure	81	Yes (LSM)
	Single-family Residential	50	25	Pipeline	88	No[b]

TABLE 5.7-19
Exceedance of Noise Thresholds – Daytime Construction

Site	Nearest Receptor	Approximate Distance from the Construction Activity Center (not including Pipelines) (feet)[a]	Approximate Distance from the Nearest Proposed Pipeline (feet)[a]	Loudest Construction Activity Type	Construction Noise Level at Receptor dBA (L_{eq})	Speech Interference Threshold Exceeded? (LSM/SUM) 70 dBA L_{eq}
Site 6 (Consolidated Treatment at Site 6)	Multi-family Residential	600	370	Well Facility and Pipeline	65	No
Site 7 (Consolidated Treatment at Site 6)	No nearby sensitive receptors					
Site 5 (On-site Treatment)	Single-family Residential	50	25	Well Facility and Pipeline	91	Yes (SUM)
Site 6 (On-site Treatment)	Multi-family Residential	600	500	Well Facility and Pipeline	65	No
Site 7 (On-site Treatment)	No nearby sensitive receptors					
Site 8	Senior Care Facility	600	450	Well Facility and Pipeline	65	No
Site 9	Trailer Court	75	25	Well Facility and Pipeline	83	Yes (SUM)
Site 10	Single-family Residential	250	180	Well Facility and Pipeline	75	Yes (LSM)

TABLE 5.7-19
Exceedance of Noise Thresholds – Daytime Construction

Site	Nearest Receptor	Approximate Distance from the Construction Activity Center (not including Pipelines) (feet)[a]	Approximate Distance from the Nearest Proposed Pipeline (feet)[a]	Loudest Construction Activity Type	Construction Noise Level at Receptor dBA (L_{eq})	Speech Interference Threshold Exceeded? (LSM/SUM) 70 dBA L_{eq}
Site 11	Single-family Residential	400	315	Well Facility and Pipeline	71	Yes (LSM)
Site 12	Funeral Home	80	<25	Well Facility and Pipeline	83	Yes (SUM)
	Single-family Residential	140	80	Well Facility and Pipeline	78	Yes (LSM)
Site 13	Single-family Residential	290	105	Well Facility and Pipeline	72	Yes (LSM)
	Extended Stay Hotel	>1,000	80	Pipeline	77	N/A[b]
Site 14	Single-family Residential	100	100	Well Facility and Pipeline	81	Yes (SUM)
Site 15	Multi-family Residential	750	250	Well Facility and Pipeline	69	No
Site 16	Multi-family Residential	115	35	Well Facility and Pipeline	80	Yes (LSM)
Site 17 (Alternate)	Senior Care Facility	500	425	Well Facility and Pipeline	67	No
Site 18 (Alternate)	Single-family Residential	35	<25	Well Facility and Pipeline	92	Yes (SUM)

TABLE 5.7-19
Exceedance of Noise Thresholds – Daytime Construction

Site	Nearest Receptor	Approximate Distance from the Construction Activity Center (not including Pipelines) (feet)[a]	Approximate Distance from the Nearest Proposed Pipeline (feet)[a]	Loudest Construction Activity Type	Construction Noise Level at Receptor dBA (L_{eq})	Speech Interference Threshold Exceeded? (LSM/SUM) 70 dBA L_{eq}
Site 19 (Alternate)	Church and Preschool	50	30	Well Drilling and Pump Testing	82	Yes (LSM)
	Single-family Residential	115	80	Well Drilling and Pump Testing	75	Yes (LSM)

Notes:

(a) Approximate distance to nearby noise sensitive receptor's building or property line is based on aerial photo information taken from Google Earth™ and using ArcGIS™.

(b) Impacts from pipeline construction located away from the well facility are not included in the table in most cases, because no single receptor would be exposed to substantial pipeline installation-related construction noise for more than two weeks. Therefore, the impact would be less than significant (as explained in the Section 5.7.3.2 [Approach to Analysis]).

LSM = Less than significant with mitigation

SUM = Significant and unavoidable with mitigation

TABLE 5.7-20

Exceedance of Noise Thresholds – Nighttime Construction

Site	Nearest Receptor	Approximate Distance from the Well[(a)]	Construction Noise Level at Receptor dBA (L_{eq})[(a)]	Sleep Interference Threshold Exceeded? (LSM/SUM 50 dBA L_{eq}
Site 1	Multi-family Residential	50	77	Yes (SUM)
Site 2	Multi-family Residential and School	325 and 350	No nighttime construction	
Site 3	Single-family Residential	90	77	Yes (SUM)
	Ben Franklin Intermediate School	250	School would not be in session.	
Site 4	Single-family Residential	75	78	Yes (SUM)
	Garden Village Elementary School	425	Not a noise sensitive receptor at night	
WLPS	Multi-family Residential	<25	No nighttime construction	
Site 5 (Consolidated Treatment at Site 6)	Single-family Residential	50	No nighttime construction	
Site 6 (Consolidated Treatment at Site 6)	Multi-family Residential	555	No nighttime construction	
Site 7 (Consolidated Treatment at Site 6)	No nearby sensitive receptors			
Site 5 (On-site Treatment)	Single-family Residential	35	No nighttime construction	
Site 6 (On-site Treatment)	Multi-family Residential	555	No nighttime construction	
Site 7 (On-site Treatment)	No nearby sensitive receptors			
Site 8	Senior Care Facility	600	No nighttime construction	

TABLE 5.7-20

Exceedance of Noise Thresholds – Nighttime Construction

Site	Nearest Receptor	Approximate Distance from the Well[(a)]	Construction Noise Level at Receptor dBA (L_{eq})[(a)]	Sleep Interference Threshold Exceeded? (LSM/SUM 50 dBA L_{eq}
Site 9	Trailer Court	30	78	Yes (SUM)
Site 10	Single-family Residential	250	No nighttime construction	
Site 11	Single-family Residential	390	64	Yes (LSM)
Site 12	Funeral Home	50	Not a noise sensitive receptor at night	
	Single-family Residential	130	73	Yes (SUM)
Site 13	Single-family Residential and Hotel	260 and >1,000	No nighttime construction	
Site 14	Single-family Residential	80	76	Yes (SUM)
Site 15	Multi-family Residential	715	58	Yes (LSM)
Site 16	Multi-family Residential	115	75	Yes (SUM)
Site 17 (Alternate)	Senior Care Facility	500	62	Yes (LSM)
Site 18 (Alternate)	Single-family Residential	25	85	Yes (SUM)
Site 19 (Alternate)	Church and Preschool	80	Not a noise sensitive receptor at night	
	Single-family Residential	120	75	Yes (SUM)

Note:

(a) Approximate distance from well drilling/pumping tests to nearby noise sensitive structure, based on aerial photo information from Google Earth ™ and using ArcGIS™, see Table 5.7-7 (Summary of Nearby Sensitive Receptors). L_{eq} evaluated at the nearest structure.

LSM = Less than significant with mitigation

SUM = Significant and unavoidable with mitigation

The evaluation of impacts that follows discusses sites with less-than-significant impacts, followed by sites with significant impacts.

Sites 2, 6, 7, 8, and Westlake Pump Station

Site 2

Site 2 would be located at the southern end of the Lake Merced Golf Club in Daly City, shielded from the fairways by vegetation and topography (see Figure 3-12). Site 2 includes an existing test well, and no new well drilling is proposed. Additionally, the Site 2 well facility would be a fenced enclosure, and no building construction is proposed. Sensitive noise receptors that could be affected by construction at Site 2 include multi-family residences and Garden Village Elementary School, which are located approximately 140 feet to the north and 275 feet to the east, respectively, from the nearest proposed pipeline. For the analysis of potential noise impacts on the adjacent golf club, see Section 5.11, Recreation.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), pipeline and fenced enclosure construction would result in noise levels of up to 73 dBA L_{eq} at the nearest multi-family residences and 67 dBA L_{eq} at the Garden Village Elementary School, occurring over approximately one month. Therefore, the noise levels at Garden Village Elementary School and Ben Franklin Intermediate School (which is located further from construction than Garden Village) would not exceed the daytime speech interference threshold of 70 dBA L_{eq}, while the noise levels at the multi-family residences located closest to the proposed pipeline would occasionally exceed the daytime speech interference threshold.

Pipeline installation located away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed, and therefore any individual noise-sensitive receptor near Site 2 would not be exposed to substantial construction-related noise level increases for more than two weeks. In addition, fenced enclosure construction would occur over a one-month period. Construction at Site 2 would create temporary noise levels of up to 65 dBA L_{eq} at the multi-family residences and 64 dBA L_{eq} at the Garden Village Elementary School. Therefore, noise impacts from pipeline installation and construction of the fenced enclosure at Site 2 would be *less than significant*.

No nighttime construction is proposed at Site 2, so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 2.

Westlake Pump Station

Westlake Pump Station upgrades would occur within the fenced and paved Daly City Corporation Yard, which is bordered by a multi-family residence and the playing fields of the Benjamin Franklin Intermediate School (see Figure 3-13). Additionally, the proposed improvements would be made inside the existing building. Although the size of the improvements at the Westlake Pump Station has not yet been determined, construction noise levels inside the existing building would not be likely to exceed 85 dBA L_{eq}, given the type of equipment anticipated to be used. Typically, concrete industrial buildings similar to the existing building on the site attenuate noise levels by approximately 25 dBA L_{eq} (U.S. EPA 1974). The resulting noise at the nearest sensitive receptor would therefore be 50 dBA L_{eq} or less, which is below the speech interference threshold of 70 dBA L_{eq}. Therefore, this potential noise impact would be *less than significant*.

No nighttime construction is proposed at the Westlake Pump Station, so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at the Westlake Pump Station.

Site 6

Site 6 would be located in Daly City and across D Street from, and west of, the Colma BART station and BART's railtrack extension and storage yard. To the west of Site 6 is a SamTrans park-and-ride lot; a multi-family residential complex lies to the east; and Woodlawn Memorial Park is located to the south (see Figures 3-14 and 3-16 for Consolidated Treatment at Site 6 and Figures 3-18 and 3-20 for On-Site Treatment). Site 6 includes an existing test well, and no new well drilling is proposed. Construction of a well facility building is proposed under both the Consolidated at Site 6 Treatment and On-Site Treatment options. Sensitive noise receptors that could be affected by construction at Site 6 include visitors to gravesites at Woodlawn Memorial Park, the closest of which are located approximately 325 feet south of the construction activity center, and the multi-family residences, which are located approximately 600 feet to the east of the construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well facility and pipeline construction would result in noise levels of up to 65 dBA L_{eq} at the multi-family residence, occurring over approximately 14 months. The noise levels at the multi-family residence would not exceed the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, this impact would be *less than significant*.

The cemetery in the vicinity of Site 6 would not be substantially affected by noise from construction because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries In addition, noise level at the closest portion of the cemetery would be 70 dBA L_{eq}, and because this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*.

In addition, Site 6 would require the installation of up to 765 feet of pipeline. The nearest noise-sensitive receptors are multi-family residences located approximately 500 feet from the proposed pipeline. Since pipeline installation is proposed to progress at a rate of 300 to 600 feet per week, any one sensitive receptor along the pipeline installation route would not be exposed to substantial construction-related noise level increases for more than two weeks. Therefore, noise impacts on the closest sensitive receptors during pipeline installation at Site 6 would be *less than significant*.

No nighttime construction is proposed under either option at Site 6 so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 6.

Site 7 (Consolidated Treatment at Site 6)

Site 7 (Consolidated Treatment at Site 6) would be located on vacant land adjacent to Woodlawn Memorial Park in Colma (see Figures 3-14 and 3-17). The site is located next to a cemetery maintenance shed, a mausoleum (currently unused) and across Colma Boulevard from Greenlawn Cemetery. Site 7 (Consolidated Treatment at Site 6) would have a well with a fenced enclosure, but no building construction is proposed. Sensitive receptors that could be affected by the construction of Site 7 include visitors to gravesites at Woodlawn Memorial Park and Greenlawn Cemetery, the closest of which would be located in the Greenlawn Cemetery, approximately 60 feet from the proposed construction activity center.

Construction at Site 7 (Consolidated Treatment at Site 6) would include the construction of pipelines for the conveyance of water from Site 7 to Site 6 across the Woodlawn Memorial Park for treatment. The proposed pipeline route through the cemetery is approximately 1,780 feet long and based on a construction rate of 300 to 600 feet per week (see Project Description Section 3.5.1.1 [Construction Methods for Production Wells]) would take approximately three to six weeks to construct. Pipeline trenching would extend across the memorial park and would be audible to all visitors. However, the cemetery in the vicinity of Site 7 would not be substantially affected by noise from construction because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries (as described in Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), and because this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*.

Other sensitive receptors (single-family residences) would be located 1,300 feet north of the well at Site 7. In addition, fenced enclosure construction would occur over a three-month period. Construction at Site 7 (Consolidated Treatment at Site 6) is 1,300 feet away from sensitive receptors and noise levels caused by construction would not be audible. Therefore, noise impacts from construction of the fenced enclosure would be *less than significant*.

Accounting for distance and ground attenuation, nighttime well drilling activities would result in noise levels at the nearest residences of up to 47 dBA L_{eq} occurring over approximately seven consecutive nights, which would not exceed the nighttime sleep interference threshold of 50 dBA L_{eq}.

Nighttime well drilling activities and pumping tests would also result in increased noise levels at nearby gravesites. However, since cemeteries are not open to visitors at night, the nighttime noise would not affect cemetery visitors.

Site 7 (On-site Treatment)

Site 7 would be located on vacant land adjacent to Woodlawn Memorial Park in Colma (see Figures 3-18 and 3-21). Site 7 (On-site Treatment) would include construction of a well facility building instead of consolidating treatment at Site 6. Sensitive receptors that could be affected by construction at Site 7 include visitors to gravesites at Woodlawn Memorial Park and Greenlawn Cemetery, the closest of which are located at the Greenlawn Cemetery, approximately 60 feet from the proposed construction activity center.

The cemetery in the vicinity of Site 7 would not be substantially affected by noise from construction (including well drilling and pump testing, as well as well facility and pipeline construction) because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries (as described in Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), and because this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*.

Other sensitive receptors (single-family residences) would be located 1,300 feet north of the well. Accounting for distance and ground attenuation, nighttime well drilling activities would result in noise levels at the nearest residences of up to 47 dBA L_{eq} occurring over approximately seven consecutive nights, which would not exceed the nighttime sleep interference threshold of 50 dBA L_{eq}.

Nighttime well drilling and pumping tests would also result in increased noise levels at nearby gravesites. However, since cemeteries are not open to visitors at night, the drilling noise would not affect cemetery visitors.

Site 8

Site 8 is situated in the Town of Colma south of Serramonte Boulevard between the Kohl's Department Store rear parking area and a tall retaining wall east of a car dealership (see Figure 3-22). Site 8 includes an existing test well, and no new well drilling is proposed. Construction of a well facility building is proposed. The nearest sensitive receptors to Site 8 would be visitors at gravesites at Greenlawn Cemetery, the closest of which would be about 500 feet northwest of the construction activity center, and a senior care facility located approximately 600 feet to the southeast, on the other side of large intervening buildings.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well facility and pipeline construction would result in intermittent noise levels of up to 65 dBA L_{eq} at the senior care facility, occurring over approximately 14 months, which therefore would not exceed the daytime speech interference threshold of 70 dBA L_{eq}. As a result, this noise impact would be *less than significant*.

The cemetery in the vicinity of Site 8 would not be substantially affected by noise from construction because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries (as described in Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). In addition, noise level at the closest portion of the cemetery would be 67 dBA L_{eq} and this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*.

In addition, Site 8 would require the installation of approximately 450 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors would be the senior care facility, located approximately 450 feet from the proposed pipeline, on the other side of large intervening buildings. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed, and therefore, the senior care facility would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no mitigation measures would be required.

No nighttime construction is proposed at Site 8, so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 8.

Impact Conclusion: Less than Significant

<u>Sites 5 (Consolidated Treatment at Site 6), 10, 11, 13, 15, and 17 (Alternate)</u>

Site 5 (Consolidated Treatment at Site 6)

Site 5 would be located adjacent to the parking lot of the former Serra Bowl bowling alley and a single-family residence fronting onto B Street in Daly City (see Figure 3-15). Proposed construction at Site 5 (Consolidated Treatment at Site 6) includes the installation of a new pipeline that would connect the well at Site 5 to treatment facilities for Sites 5, 6, and 7 that would be constructed (i.e., consolidated) at Site 6 (see Figure 3-14). The pipeline would be installed under the Serra Bowl parking lot and through the SFPUC right-of-way west of the Colma BART Station. Pipeline installation would occur approximately 25 feet from the adjacent single-family residence. Installation of the 1,120 feet of pipeline to Site 6 would occur during daytime construction. Site 5 includes an existing test well, and no new well drilling is proposed. Additionally, with consolidated treatment at Site 6, the Site 5 well facility would be in a fenced enclosure, and no building construction is proposed. Sensitive noise receptors that could be affected by construction of Site 5 (Consolidated Treatment at Site 6) include the single-family residence located approximately 25 feet from the nearest proposed pipeline.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), pipeline construction would result in noise levels of up to 88 dBA L_{eq}, which would occasionally exceed the daytime speech interference threshold of 70 dBA L_{eq} at the adjacent residence. Fenced enclosure construction would occur over a three-month period and would generate temporary noise levels of up to 81 dBA L_{eq} at a distance of 50 feet. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce daytime construction-related noise levels to 70 dBA L_{eq} by requiring the SFPUC to meet a 70 dBA L_{eq} performance standard using feasible measures such as installing a temporary noise barrier (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]). This mitigated noise level would be below the daytime speech interference threshold of 70 dBA L_{eq} at the closest residence. Therefore, with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), this noise impact would be reduced to *less-than-significant* levels.

Pipeline installation extending away from the well facility at Site 5 would progress at a rate of 300 to 600 feet per week, as proposed, and therefore the noise-sensitive receptor adjacent to Site 5 would not be exposed to substantial construction-related noise level increases for more than two weeks. Therefore, this portion of the noise impact would be *less than significant*.

No nighttime construction is proposed at Site 5 (Consolidated Treatment at Site 6), so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 5 (Consolidated Treatment at Site 6).

Site 10

Site 10 would be located within the SFPUC right-of-way south of Hickey Boulevard, near commercial land uses and single-family residences. Site 10 includes an existing test well, and no new well drilling is proposed. Construction of a well facility building is proposed. The nearest noise-sensitive receptors to Site 10 are the single-family residences located approximately 250 feet west of the proposed construction activity center (see Figure 3-25).

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well facility and pipeline construction would result in noise levels at nearby residences of up to 75 dBA L_{eq}, occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plans) would reduce daytime construction-related noise levels to 70 dBA L_{eq} by requiring the SFPUC to meet a 70 dBA L_{eq} performance standard using feasible measures such as installing a temporary noise barrier (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]). This mitigated noise level would be below the daytime speech interference threshold of 70 dBA L_{eq} at the closest residences. Therefore, with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), this noise impact would be reduced to *less-than-significant* levels.

In addition, Site 10 would require the installation of approximately 455 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors are single-family residences, located approximately 180 feet from the proposed pipeline. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

No nighttime construction is proposed at Site 10, so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 10.

Site 11

Site 11 would be located on vacant land adjacent to a BART ventilation structure in South San Francisco (see Figures 3-27 and 3-28). The construction zone for the well facility would be near the Centennial Way Trail, a Kaiser Medical Center garage and parking lot, and single-family residences. Site 11 would include construction of both a new production well and a well facility building. The nearest sensitive receptors to

Site 11 are the single-family residences located approximately 400 feet southwest of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels of up to 64 dBA L_{eq} at the single family residences during a four to six week period, and well facility and pipeline construction would result in noise levels of up to 71 dBA L_{eq} at nearby residences, occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce daytime construction-related noise levels to 66 dBA $L_{eq,}$ by requiring the SFPUC to prepare a noise control plan and implement measures such as installing a temporary noise barrier to meet a 70 dBA L_{eq} performance standard for Impact NO-3.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night would result in noise levels at the closest residences of up to 64 dBA L_{eq} occurring over approximately seven consecutive nights, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well pumping tests would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would produce noise levels similar to the well drilling activity). Therefore, this impact would be *significant*. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce nighttime noise levels to 49 dBA L_{eq} by requiring the SFPUC to meet a 50 dBA L_{eq} performance standard using feasible measures such as the installation of truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), which would be below the nighttime sleep interference threshold. Therefore, with the implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), this noise impact would be reduced to *less-than-significant* levels.

In addition, Site 11 would require the installation of approximately 1,315 feet of pipeline along a restricted-access driveway off Antoinette Lane, which would occur during the daytime. The nearest sensitive receptors are multi-family residences, located approximately 315 feet from the proposed pipeline. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

Site 13

Site 13 would be located adjacent to the Centennial Way Trail on SFPUC-owned land across South Spruce Avenue from Francisco Terrace Playlot and single-family residences (see Figures 3-31 and 3-32). Site 13 includes an existing test well, and no new well drilling is proposed. Construction of a well facility building is proposed. Sensitive receptors that could be affected by construction of Site 13 include single-family residences located approximately 290 feet west of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), residences would experience well facility and pipeline construction noise levels of up to 72 dBA L_{eq} occurring over approximately 14 months, which would occasionally exceed the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce daytime construction-related noise levels to 67 dBA L_{eq} by requiring the SFPUC to meet a 70 dBA L_{eq} performance standard using feasible measures such as installing a temporary noise barrier (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]). This mitigated noise level would be below the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), this impact would be reduced to *less-than-significant* levels.

In addition, Site 13 would require the installation of approximately 2,475 feet of pipeline along Spruce Avenue and Huntington Avenue, which would occur during the daytime. The nearest sensitive receptor is Stay Bridge Suites, an extended stay hotel, located approximately 80 feet southeast of the proposed pipeline. The Stay Bridge Suites are located over 1,000 feet south of the construction activity center and there would be no combined effect of pipeline installation during other daytime construction activities. Additionally, the single-family residence located approximately 105 feet from pipeline installation could temporarily be exposed to noise levels of up to 77 dBA L_{eq}. However, pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual noise-sensitive receptor would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

No nighttime construction is proposed at Site 13, so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 13.

Site 15

Site 15 would be located in San Bruno in the Golden Gate National Cemetery, immediately adjacent to a cemetery maintenance facility building along Sneath Lane (see Figures 3-34 and 3-36). Site 15 would include both the drilling of a new production well and construction of a new well facility building. Sensitive noise receptors that could be affected by construction of Site 15 include visitors to gravesites at the Golden Gate National Cemetery, located as close as approximately 100 feet from the construction activity center, and a multi-family residence, located approximately 750 feet southwest of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing would result in noise levels of up to 58 dBA L_{eq} over a four to six week period at the nearest residence, and well facility and pipeline construction would result in noise levels of up to 69 dBA L_{eq} at the multi-family residence, occurring over approximately 14 months. The daytime speech interference threshold of 70 dBA L_{eq} would not be exceeded at the multi-family residence, and the noise impact there would be *less than significant*.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well-drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 58 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (the well pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 (Construction Impacts and Mitigation Measures), would produce noise levels similar to the production well installation). Therefore, the impact of nighttime construction-related noise at Site 15 on sensitive noise receptors would be *significant*. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce nighttime construction-related levels to 43 dBA L_{eq} at the multi-family residence (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]) by requiring the SFPUC to meet a 50 dBA L_{eq} performance standard using feasible measures such as the installation of truck-mounted noise control blankets. Therefore, with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), the impact of nighttime construction-related noise levels on the multi-family residence would be reduced to *less-than–significant* levels.

The cemetery in the vicinity of Site 15 would not be substantially affected by noise from construction because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries (as described in Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), and because this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*.

In addition, to connect to the distribution system, approximately 935 feet of pipeline would be installed, which would occur during the daytime. The nearest sensitive receptor is the multi-family residence located approximately 250 feet from the proposed pipeline installation route. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

Nighttime well drilling activities at Site 15 would also result in increased noise levels at nearby gravesites. However, since cemeteries are not open to visitors at night, the drilling noise would not affect cemetery visitors. As a result, at night, there would be *no impact* related to noise at Site 15.

Site 17 (Alternate)

Site 17 (Alternate) would be located adjacent to Standard Plumbing Supply and Cypress Lawn Cemetery (see Figure 3-38). A portion of the construction area would be located within the SFPUC right-of-way across Collins Avenue. Site 17 (Alternate) would include construction of both a production well and a well facility building. Sensitive receptors that could be affected by construction of Site 17 (Alternate) include a senior care facility located approximately 500 feet northeast of the proposed construction activity center and visitors to gravesites at Cypress Lawn Cemetery, the closest of which would be located approximately 200 feet south of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing would result in noise levels of up to 67 dBA at the senior care facility during a four to six week period, and well facility and pipeline construction would result in noise levels at the senior care facility of up to 67 dBA L_{eq} occurring over approximately 14 months, which would not exceed the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, this noise impact would be *less than significant*.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well-drilling activities at night would result in noise levels at the senior care facility of up to 62 dBA L_{eq} occurring over approximately seven consecutive nights, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well-pumping tests would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would produce noise levels similar to the production well). Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce nighttime noise levels to 47 dBA L_{eq} by requiring the SFPUC to meet a 50 dBA L_{eq} performance standard using feasible measures such as the installation of truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), which would be below the nighttime sleep interference threshold. Therefore, with the implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), this noise impact would be reduced to *less-than–significant* levels.

In addition, Site 17 (Alternate) would require the installation of approximately 250 feet of pipeline, which would occur during the daytime. The nearest sensitive receptor is the senior care facility, located approximately 425 feet from the proposed pipeline. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, the senior care facility would not be exposed to substantial additional construction-related noise level increases at any one location for more than two weeks, and no additional mitigation measures would be required.

The cemetery in the vicinity of Site 17 (Alternate) would not be substantially affected by noise from construction because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries (as described in Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), and because this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*.

Nighttime well drilling activities and pumping tests would also result in increased noise levels at nearby gravesites. However, since cemeteries are not open to visitors at night, the drilling noise would not affect cemetery visitors. As a result, this impact would be *less than significant*.

Impact Conclusion: Less than Significant with Mitigation

Sites 1, 3, 4, 5 (On-site Treatment), 9, 12, 14, 16, 18 (Alternate), and 19 (Alternate)

Site 1

Site 1 would be located on the northeast corner of Lake Merced Golf Club property west of I-280 and south of the Westlake Village apartment complex in Daly City (see Figure 3-11). A restroom building for the golf club is situated in the southern portion of the proposed construction area and would be demolished as part of the proposed Project. Site 1 would include construction of both a new production well and a well facility building. Sensitive noise receptors that could be affected by construction of Site 1 include the Westlake Apartment residences, the closest of which would be located approximately 90 feet north of the construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels up to 77 dBA L_{eq} during a four to six week period at the nearest residences, and well facility and pipeline construction (including demolition) would result in intermittent noise levels at the nearest residences of up to 86 dBA L_{eq} occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq}.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well-drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 77 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well-pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 (Construction Impacts and Mitigation Measures), would produce noise levels similar to the new production well installation). As a result, the impact of both daytime and nighttime construction-related noise would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 1 to speech interference and sleep interference thresholds respectively, where feasible, by use of feasible measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 76 dBA L_{eq} and nighttime construction-related noise levels to 57 dBA L_{eq}. However, even with the implementation of all feasible mitigation these noise levels would still exceed both the daytime speech interference threshold of 70 dBA L_{eq} for residences within 180 feet of the construction activity center and the nighttime sleep interference threshold of 50 dBA L_{eq} for residences within 200 feet of the well. As a result, this impact would be *significant and unavoidable with mitigation*, given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 1 would require the installation of up to approximately 295 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors would be the residences located approximately 40 feet from the proposed pipeline. Pipeline installation away from well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

Site 3

Site 3 would be located near single-family residences and within the southwest portion of a playing field at Ben Franklin Intermediate School in unincorporated Broadmoor. The Lake Merced Golf Club is northeast of the site. Site 3 would include a well facility with fenced enclosure, and no building construction is proposed. Sensitive noise receptors that could be affected by construction of Site 3 include single-family residences, located approximately 90 feet south of the construction activity center and the Benjamin Franklin Intermediate School, located approximately 250 feet northwest of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels of up to 77 dBA L_{eq} at the nearest single-family residences and 68 dBA L_{eq} at Benjamin Franklin Intermediate School during a four to six week period, and fenced enclosure construction and pipeline construction would occur over approximately six months divided over two summers when school is not in session (for three months each summer; includes well drilling and pump testing). Because construction would be limited to two summer seasons (see Chapter 3, Section 3.5.1 [Construction Sequencing and Schedule]), noise impacts at the school would be *less than significant*, as students would not be present. However, noise levels at the single-family residences would exceed the daytime speech interference threshold of 70 dBA L_{eq}. In addition, fenced enclosure construction would occur over the two three-month summer seasons and create temporary noise levels of up to 67 dBA L_{eq} at the single-family residences which would also exceed the daytime speech interference threshold of 70 dBA L_{eq}.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels the nearest residences of up to 77 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well-pumping tests would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 (Construction Impacts and Mitigation Measures), would produce noise levels similar to the new well installation). As a result, the impact of both daytime and nighttime construction-related noise at Site 3 on sensitive receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 3 to speech interference and sleep interference thresholds respectively, where feasible, by use of feasible measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 57 dBA L_{eq} and nighttime construction-related noise levels to 57 dBA L_{eq}, at the nearest single-family residences. These mitigated noise levels would be below the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), the daytime construction noise impact would be reduced to *less-than–significant* levels. However, the mitigated nighttime noise levels at the residences within approximately 190 feet of the well would still exceed the nighttime sleep interference threshold of 50 dBA L_{eq} by up to 7 dBA L_{eq}. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 3 would require the installation of approximately 845 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors would be residences, located approximately 110 feet from the proposed pipeline. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required. Therefore, noise impacts from pipeline installation would be *less than significant*.

Site 4

Site 4 would be located at the Garden Village Elementary School playing field and adjacent to the backyards of residences that front onto 87th Street in unincorporated Broadmoor (see Figure 3-12). The Site 4 well facility would have a fenced enclosure, and no building construction is proposed. Noise-sensitive receptors that could be affected by construction of Site 4 include the adjacent single-family residences, located approximately 75 feet south of the proposed construction activity center, and the Garden Village Elementary School, located approximately 425 feet northeast of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels of up to 78 dBA L_{eq} at the nearest single-family residences and 63 dBA L_{eq} at Garden Village Elementary School, occurring over a four to six week period, and fenced enclosure construction and pipeline construction would occur over approximately three months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq} at the single-family residences. However, the daytime speech interference threshold would not be exceeded at Garden Village Elementary School, given that the school is 425 feet from the site of well installation.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), nighttime well drilling activities would result in noise levels at the nearest residences of up to 78 dBA L_{eq} occurring over approximately seven consecutive nights, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well pumping tests would be performed sequentially to the final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 (Construction Impacts and Mitigation Measures), would generate noise levels similar to the new well installation). As a result, the impact of both daytime and nighttime construction-related noise at Site 4 on sensitive receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 4 to speech interference and sleep interference thresholds respectively, where feasible, by use of feasible measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 58 dBA L_{eq} and nighttime construction-related noise levels to 58 dBA L_{eq}. at the single-family residences. This mitigated noise level would be below the daytime speech interference threshold of 70 dBA L_{eq}. Therefore, with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), the daytime construction noise impact at the affected single-family residences would be reduced to *less-than-significant* levels.

However, the nighttime noise levels at the residences within approximately 190 feet of the well would still exceed the nighttime sleep interference threshold of 50 dBA L_{eq} by up to 8 dBA L_{eq}. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 4 would require the installation of approximately 1,000 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors are residences, located less than 25 feet from the proposed pipeline. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required. Therefore, noise impacts from pipeline installation would be *less than significant*.

Nighttime well drilling activities and well pumping tests would also result in increased noise levels at Garden Village Elementary School. However, since the school is not open at night, the drilling noise would not affect the learning environment of the school. As a result, this impact would be *less than significant*.

Site 5 (On-site Treatment)

Site 5 would be located adjacent to the parking lot of the former Serra Bowl bowling alley and a single-family residence fronting onto B Street in Colma (see Figure 3-19). Site 5 (On-site Treatment) would include construction of a well facility building. Site 5 has an existing test well, and no new well drilling is proposed. Sensitive receptors that could be affected by construction of Site 5 (On-site Treatment) include the single-family residence located approximately 50 feet from the proposed construction activity center. As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), construction activities for well facility and pipeline construction would result in noise levels of up to 91 dBA L_{eq} at the single-family residence, occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq} at this single-family residence. Therefore, the impact of daytime construction-related noise at Site 5 (On-site Treatment) on sensitive receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce daytime construction-related noise levels to 81 dBA L_{eq} (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]) at the single-family residence. However, this noise level would still exceed the daytime speech interference threshold of 70 dBA L_{eq}. As a result, this impact would remain s*ignificant and unavoidable with mitigation*.

The proposed Project includes an option for Site 5 to be constructed with consolidated treatment at Site 6, which is the SFPUC's preferred option, and if implemented, this option would avoid the significant noise impacts that would result from the 14-month construction of a well facility building at Site 5. Construction of Site 5 (Consolidated Treatment at Site 6) instead of Site 5 (On-site Treatment) would result in a *less-than-significant* noise impact, because consolidated treatment would require only a four-month construction duration for a fenced enclosure at Site 5, which would have a *less-than-significant* noise impact relative to speech interference, instead of a 14-month construction duration if a well facility building were constructed (see evaluation of Site 5 [Consolidated Treatment at Site 6], above). However, given that the SFPUC is currently uncertain of the feasibility of installing a pipeline between Sites 5 and 6 (due to the potential for unforeseen constraints that may render this option infeasible), as preferred (See Chapter 3, Project Description, Section 3.4.3 [Facility Sites]), the SFPUC maintains as part of its project proposal the option of constructing on-site treatment at Site 5, which would only be built if consolidating treatment at Site 6 is infeasible. Therefore, if this option were implemented, it would result in *significant and unavoidable* impacts even with all feasible mitigation applied at the site.

No nighttime construction is proposed at Site 5 (On-site Treatment), so there would be no exceedance of the nighttime sleep interference threshold of 50 dBA L_{eq}. Therefore, at night, there would be *no impact* related to noise at Site 5.

Construction at Site 5 (On-site Treatment) includes pipeline construction of up to approximately 645 feet of pipeline, which would occur during the daytime. The nearest sensitive receptor is a nearby residence, located approximately 25 feet from the proposed pipeline. Pipeline installation at the well facility would proceed in combination with construction of the well facility. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, the residence on B Street would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

Site 9

Site 9 would be on SFPUC-owned land east of El Camino in South San Francisco and located southeast of the Treasure Island Trailer Court, outside of the existing improved area of the trailer court (see Figures 3-23 and 3-24). Other nearby land uses include single-family residences to the east and commercial uses to the south. Site 9 would include both the drilling of a new production well and the construction of a new well facility building. Sensitive noise receptors that could be affected by construction of Site 9 include trailers at the Treasure Island Trailer Court, the closest of which would be located approximately 75 feet from the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in up to 78 dBA L_{eq} at nearby residences during a four to six week period, and well facility and pipeline construction would result in noise levels measured at the exterior of the nearest residences of up to 83 dBA L_{eq} occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq}.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 78 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} at this location (well pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would generate noise levels similar to the new production well installation). Therefore, the impact of both daytime and nighttime construction-related noise would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 9 to speech interference and sleep interference thresholds respectively, where feasible, by use of measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 73 dBA L_{eq} and nighttime construction-related noise levels to 58 dBA L_{eq} at the nearest single family residence.

However, these noise levels would still exceed both the daytime speech interference threshold of 70 dBA L_{eq} and the nighttime sleep interference threshold of 50 dBA L_{eq}. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 9 would require the installation of approximately 600 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors are mobile-home residences, located approximately 25 feet from the proposed pipeline. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any one residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

In addition, construction traffic would use the San Mateo County Flood Control District's access road from Mission Road to the site. This access road is adjacent to a row of trailers at the Treasure Island Trailer Court. The evaluation of the noise from construction traffic along this road is discussed below in Impact NO-4, regarding construction-hauling routes.

Site 12

Site 12 would be located adjacent to the Garden Chapel Funeral Home on Southwood Drive in South San Francisco (see Figures 3-29 and 3-30). The site is partially located on the parking lot for the funeral home. Surrounding land uses include commercial and single-family residential. Site 12 would include both the drilling of a new production well and construction of a new well facility building. Sensitive receptors that could be affected by construction of Site 12 include the Garden Chapel Funeral Home, located approximately 80 feet from the construction activity center, and single-family residences, the closest of which would be located approximately 140 feet from the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels up to 73 dBA L_{eq} at the nearest residences and 82 dBA L_{eq} at the funeral home within a four to six week period, and well facility and pipeline construction would result in noise levels of up to 83 dBA L_{eq} at the funeral home and 78 dBA L_{eq} at the nearest residences, occurring over approximately 14 months, which would both exceed the daytime speech interference threshold of 70 dBA L_{eq}.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 73 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well pumping tests would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would generate noise levels similar to the new production well installation). Therefore, the impact of both daytime and nighttime construction-related noise at Site 12 on sensitive receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 12 to speech interference and sleep interference thresholds respectively, where feasible, by use of measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 68 dBA L_{eq} and nighttime construction-related noise levels to 53 dBA L_{eq} at the nearest single-family residences; whereas implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) would reduce daytime construction-related noise levels at the funeral home to 73 dBA L_{eq} (see Table 5.7-21). However, these noise levels would still exceed both the daytime speech interference threshold of 70 dBA L_{eq} at the funeral home and the nighttime sleep interference threshold of 50 dBA L_{eq} within approximately 190 feet of the construction activity center at the single-family residences. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 12 would require the installation of approximately 1,635 feet of pipeline along El Camino Real, which would occur during the daytime and would take approximately three to six weeks to complete. The nearest sensitive receptor would be the funeral home, located less than 25 feet from proposed pipeline installation; and single-family residences are located as close as approximately 80 feet from the proposed pipeline installation route. Pipeline installation is proposed to progress at a rate of 300 to 600 feet per week, as proposed. Therefore, the funeral home and any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

Nighttime well drilling activities and pumping tests would also result in increased noise levels at the funeral home. However, since the funeral home is not generally open to visitors at night and impacts would only occur for approximately seven days for well drilling and up to 48 hours subsequently for pump testing, the drilling noise would not substantially affect this noise receptor. As a result, this nighttime noise impact would be *less than significant* at the funeral home.

Site 14

Site 14 would be located in San Bruno on an existing SFPUC right-of-way at the northern boundary of the Golden Gate National Cemetery, in proximity to gravesites and homes that face onto Greenwood Drive (see Figures 3-34 and 3-35). Site 14 would include both the drilling of a new production well and the construction of a new well facility building. Demolition of the existing pump station, tank, and well near Site 14 may also occur. Sensitive receptors that could be affected by construction of Site 14 include visitors to gravesites at the Golden Gate National Cemetery, located as close as approximately 25 feet from the construction activity center, and single-family residences to the west and north that face onto Greenwood Drive, located approximately 100 feet from the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels of up to 76 dBA L_{eq} at the nearest residences during a four to six week period, and well facility and pipeline construction (including demolition) would result in noise levels of up to 81 dBA L_{eq} at the single-family residences, occurring over approximately 14 months or less. These noise levels at the single-family residences would exceed the daytime speech interference threshold of 70 dBA L_{eq}, which would be a *significant* noise impact.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well-drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 76 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well-pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would generate noise levels similar to the production well drilling). Therefore, the impact of both daytime and nighttime construction-related noise at Site 14 on sensitive noise receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 14 to speech interference and sleep interference thresholds respectively, where feasible, by use of measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 71 dBA L_{eq} and nighttime construction-related levels to 56 dBA L_{eq} at single-family residences. However, these noise levels would still exceed both the daytime speech interference threshold of 70 dBA L_{eq} within approximately 110 feet of the construction activity center and the nighttime sleep interference threshold of 50 dBA L_{eq} within approximately 190 feet of the well at the single-family residences. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

The proposed Project also includes the installation of approximately 2,895 feet of pipeline associated with Site 14, which would occur less than 25 feet away from the nearest gravesites. Pipeline installation would take five to 10 weeks to complete. The cemetery surrounding Site 14 would not be substantially affected by noise from construction because the SFPUC would stop construction for outdoor graveside services upon request from the cemeteries (as described in Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]), and because this analysis assumes that cemetery visitors tend to come infrequently and therefore would be unlikely to be exposed to construction noise more than once or twice during the construction period. As a result, the impact of construction noise on the cemetery would be *less than significant*. In addition, the nearest noise-sensitive receptor is the multi-family residence located approximately 250 feet southwest of the proposed pipeline installation route. Pipeline installation away from the well facility would progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual sensitive noise receptor would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

Nighttime well drilling activities and pumping tests at Site 14 would also result in increased noise levels at nearby gravesites. However, since cemeteries are not open to visitors at night, the drilling noise would not affect cemetery visitors. As a result, this portion of the noise impact would be *less than significant*.

Site 16

Site 16 would be located in Millbrae on SFPUC-owned land that is currently occupied by an Orchard Supply Hardware store for parking and storage (see Figure 3-37). The site is located between El Camino Real and the Caltrain right-of-way. Site 16 would include both the drilling of a new production well and the construction of a new well facility building. Sensitive receptors that could be affected by construction of Site 16 include a multi-family residence located approximately 115 feet south of the proposed construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels of up to 75 dBA at the nearest multi-family residence over a four to six week period, and well facility and pipeline construction would result in noise levels of up to 80 dBA L_{eq} at the nearest residences, occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq}.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 75 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would produce noise levels similar to the new production well installation). Therefore, the impact of both daytime and nighttime construction-related noise at Site 16 on noise-sensitive receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 16 to speech interference and sleep interference thresholds respectively, where feasible, by use of measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 70 dBA L_{eq} and nighttime construction-related noise levels to 55 dBA L_{eq} at the multi-family residence. Therefore, with implementation of Mitigation

Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), the impact of daytime construction-related noise levels on the multi-family residence would be reduced to *less-than-significant* levels. However, nighttime construction-related noise levels would still exceed the nighttime sleep interference threshold of 50 dBA L_{eq} up to a distance of approximately 190 feet from the well. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 16 would require the installation of up to approximately 1,095 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors would be at a multi-family residence, located approximately 35 feet from the proposed pipeline installation route. Additionally, the multi-family residence located approximately 35 feet from pipeline installation could temporarily be exposed to substantial noise levels. However, pipeline installation is proposed to progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, resulting in a *less-than-significant* noise impact for this portion of the Project, and no additional mitigation measures would be required.

Site 18 (Alternate)

Site 18 (Alternate) would be in South San Francisco on land located south of Alta Loma Drive in a single-family residential neighborhood. Site 18 (Alternate) would include both the drilling of a new production well and construction of a new well facility building. Sensitive receptors that could be affected by construction of Site 18 (Alternate) include single-family residences, one of which is located approximately 35 feet from the proposed construction activity center (see Figure 3-39).

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and testing, would result in noise levels of up to 85 dBA L_{eq} at the nearest residences over a four to six week period, and well facility and pipeline construction would result in noise levels measured at the exterior of the nearest residences of up to 92 dBA L_{eq} occurring over approximately 14 months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq}.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 85 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} at this location (well pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures] would generate noise levels similar to the new production well drilling). Therefore, the impact of both daytime and nighttime construction-related noise at Site 18 (Alternate) on sensitive receptors would be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 18 (Alternate) to speech interference and sleep interference thresholds respectively, where feasible, by use of measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 82 dBA L_{eq} and nighttime construction-related noise levels to 65 dBA L_{eq}. However, these noise levels would still exceed both the daytime speech interference threshold of 70 dBA L_{eq} and the nighttime sleep interference threshold of 50 dBA L_{eq}. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 18 (Alternate) would require the installation of approximately 425 feet of pipeline, which would occur during the daytime. The nearest sensitive receptors are the residences, located less than 25 feet from the proposed pipeline installation route. Pipeline installation is proposed to progress at a rate of 300 to 600 feet per week, as proposed. Therefore, any individual residence would not be exposed to substantial additional construction-related noise level increases for more than two weeks, and no additional mitigation measures would be required.

Site 19 (Alternate)

Site 19 (Alternate) would be located in South San Francisco behind the Our Redeemer's Lutheran Church (which also operates a preschool at this location), and behind nearby single-family and multi-family residences (see Figure 3-40). This area is across Southwood Drive from the Garden Chapel Funeral Home where Site 12 would also have to be developed if Site 19 (Alternate) is selected. Site 19 (Alternate) would involve construction of a new production well with a fenced enclosure, but no building construction is proposed. Sensitive receptors that could be affected by construction at Site 19 (Alternate) include the Our Redeemer's Lutheran Church and its preschool, located approximately 50 feet from the construction activity center, single-family residences located approximately 115 feet from the proposed construction activity center, and multi-family residences located approximately 150 feet from the construction activity center.

As presented in Table 5.7-19 (Exceedance of Noise Thresholds – Daytime Construction), well installation, which includes site development, well drilling and pump testing, would result in noise levels of up to 82 dBA L_{eq} at the church and preschool and 75 dBA L_{eq} at the nearest residence over a four to six week period, and fenced enclosure construction and pipeline construction would occur over approximately four months, which would exceed the daytime speech interference threshold of 70 dBA L_{eq} at both receptors.

As presented in Table 5.7-20 (Exceedance of Noise Thresholds – Nighttime Construction), well drilling activities at night, occurring over approximately seven consecutive nights, would result in noise levels at the nearest residences of up to 75 dBA L_{eq}, which would exceed the nighttime sleep interference threshold of 50 dBA L_{eq} (well pumping tests discussed above would be performed sequentially to final well development for a continuous period of 12 to 48 hours and, as noted in Section 5.7.3.4 [Construction Impacts and Mitigation Measures], would generate noise levels similar to those associated with the new production well drilling). Therefore, the impact of both daytime and nighttime construction-related noise at Site 19 (Alternate) on sensitive receptors would be *significant*. Implementation of Mitigation Measures

M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), which limit daytime and nighttime noise levels at Site 19 (Alternate) to speech interference and sleep interference thresholds respectively, where feasible, by use of measures such as installing temporary noise barriers and truck-mounted noise control blankets (see Table 5.7-21 [Exceedance of Noise Thresholds during Construction – Mitigated Noise Level]), would reduce daytime construction-related noise levels to 55 dBA L_{eq} and nighttime construction-related noise levels to 55 dBA L_{eq} at the nearest single-family residences and to 62 dBA L_{eq} at the church and preschool. Therefore, with implementation Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan), the impact of daytime construction-related noise levels would be reduced to *less-than-significant* levels. However, nighttime construction-related noise levels would still exceed the nighttime sleep interference threshold of 50 dBA L_{eq} at single-family residences within approximately 190 feet from the well. As a result, this impact would be *significant and unavoidable with mitigation* given that even with all feasible mitigation, as discussed above, the Project would still result in a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.

In addition, Site 19 (Alternate) would use the same pipeline route along El Camino Real for connecting to the distribution system as would need to be installed for Site 12, discussed above. The only difference would be the 225 feet of pipelines extending from Site 19 (Alternate) to the middle of Southwood Drive. As a result, the noise impacts of pipeline installation associated with Site 19 (Alternate) would not result in any additional impacts that would be substantially different than those discussed under Site 12, which would be *less than significant*. Therefore, noise impacts from pipeline installation of the fenced enclosure would be *less than significant*.

Nighttime well-drilling activities and pumping tests would also result in increased noise levels at the church. However, since the church and preschool are assumed not to be generally open to visitors at night and nighttime construction activities would be limited to approximately one week for the well drilling and up to 48 hours for the pump testing, the drilling noise would not substantially affect this receptor. As a result, this portion of the noise impact would be *less than significant*.

Impact Conclusion: Significant and Unavoidable with Mitigation

> ***Mitigation Measure 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])***
> (See Impact NO-1 for a description)
>
> ***Mitigation Measure 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])***
> In addition to the requirements of Mitigation Measure M-NO-1 (Noise Control Plan) under Impact NO-1, the SFPUC will require that its construction contractor prepare and implement an Expanded Noise Control Plan to further reduce construction noise levels at nearby noise-sensitive land uses. Construction noise shall not exceed the following performance standards as measured at the exterior of the closest sensitive receptor: If noise measurements are not permitted at the exterior of the sensitive receptor's location, the SFPUC shall take noise measurements and then estimate the noise level at the sensitive receptor by adjusting for the attenuation across the

additional distance. If there is any conflict between Mitigation Measure M-NO-1 (Noise Control Plan) and Mitigation Measure M-NO-3 (Expanded Noise Control Plan), the most stringent requirement would be applicable.

- 70 dBA L_{eq} between the hours of 7:00 a.m. and 10:00 p.m., Monday through Friday at residences, senior care and religious facilities, and schools.

- 50 dBA L_{eq} at residential type buildings during normal sleeping hours, which are considered to be 10:00 p.m. to 7:00 a.m.

The contractor will determine the specific methods to meet the performance standards given above. Specific measures that can be feasibly implemented to comply with these performance standards include, but are not limited to, those listed in Mitigation Measure M-NO-1 (Noise Control Plan) under Impact NO-1.

For Sites 1, 3, 4, 9, 12, 14, 16, 18 (Alternate), and 19 (Alternate), the SFPUC shall offer hotel vouchers to residents who are subject to noise levels from well drilling and testing that exceed the performance standard of 50 dBA L_{eq} at the exterior of the residence for the period of the well drilling and pump testing that will occur during the nighttime hours.

TABLE 5.7-21

Exceedance of Noise Thresholds during Construction – Mitigated Noise Level

Site	Nearest Receptor	Daytime Construction			Nighttime Construction		
		Mitigation Measure No.	Predicted Noise Level at Receptor Building with Mitigation	Speech Interference Threshold Exceeded with Mitigation? 70 dBA L_{eq}	Mitigation Measure No.	Predicted Noise Level at Receptor Building with Mitigation	Sleep Interference Threshold Exceeded with Mitigation? 50 dBA L_{eq}
Site 1	Multi-family Residential	1 and 3	76	Yes	1 and 3	57	Yes
Site 3	Single-family Residential	1 and 3	57	No	1 and 3	57	Yes
Site 4	Single-family Residential	1 and 3	58	No	1 and 3	58	Yes
Site 5 (Consolidated Treatment)	Single-family Residential	1 and 3	70	No	No nighttime construction		
Site 5 (On-site Treatment)	Single-family Residential	1 and 3	81	Yes	No nighttime construction		
Site 9	Trailer Court	1 and 3	73	Yes	1 and 3	58	Yes
Site 10	Single-family Residential	1 and 3	70	No	No nighttime construction		
Site 11	Single-family Residential	1 and 3	66	No	1 and 3	49	No

TABLE 5.7-21

Exceedance of Noise Thresholds during Construction – Mitigated Noise Level

Site	Nearest Receptor	Daytime Construction			Nighttime Construction		
		Mitigation Measure No.	Predicted Noise Level at Receptor Building with Mitigation	Speech Interference Threshold Exceeded with Mitigation? 70 dBA L_{eq}	Mitigation Measure No.	Predicted Noise Level at Receptor Building with Mitigation	Sleep Interference Threshold Exceeded with Mitigation? 50 dBA L_{eq}
Site 12	Funeral Home	1 and 3	73	Yes	Not a noise sensitive receptor at night.		
	Single-family Residential	1 and 3	68	No	1 and 3	53	Yes
Site 13	Single-family Residential	1 and 3	67	No	No nighttime construction		
Site 14	Single-family Residential	1 and 3	71	Yes	1 and 3	56	Yes
Site 15	Multi-family Residential	None required	N/A	N/A	1 and 3	43	No
Site 16	Multi-family Residential	1 and 3	70	No	1 and 3	55	Yes
Site 17 (Alternate)	Senior Care Facility	None required	N/A	N/A	1 and 3	47	No
Site 18 (Alternate)	Single-family Residential	1 and 3	82	Yes	1 and 3	65	Yes
Site 19 (Alternate)	Church and preschool	1 and 3	62	No	Not a noise sensitive receptor at night.		
	Single-family Residential	1 and 3	55	No	1 and 3	55	Yes

Impact NO-4: Project construction would not result in a substantial temporary increase in ambient noise levels along construction haul routes. (Less than Significant)

All Sites

Haul truck, and material and equipment delivery truck volumes associated with the Project would vary from day to day, with the highest volumes generally occurring during the removal of well cuttings or during the overlap of facility construction and pipeline installation (see Table 5.5-6 [Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase] in Section 5.6, Transportation and Circulation for the maximum truck trips per day). Calculations made for the worst-case hour assume that all workers would arrive at or leave each site in separate autos or light-duty trucks during a typical hour containing truck trips. It should be noted that autos and light-duty truck traffic noise did not make a measurable contribution to the Project-related traffic noise as calculated for this report (calculations on file with the San Francisco Planning Department). The sites are proposed to be constructed in various clusters, as explained in Chapter 3, Project Description, Section 3.5.1 (Construction Sequencing and Schedule). The truck traffic for each site was added together for when they are to be in the same general location. Estimated Project-related traffic noise levels along haul routes associated with construction at each facility site are listed in Table 5.7-22 (Summary of Noise Effects from Construction Truck Traffic). The haul truck noise impact is considered on an hourly basis. Hourly average noise levels generated by haul truck traffic are estimated to range between 52 and 59 dBA L_{eq} at 50 feet from the roadway centerline, depending on truck volumes generated.

Typical daytime noise levels measured in the baseline survey (see Table 5.7-8 [Summary of Measured Noise Levels at Representative Sites - April and October 2009]) ranged from 55 – 70 dBA L_{eq}. Estimated noise levels resulting from haul trucks are typical of these baseline noise levels from traffic along area roadways. In addition, all estimated noise levels would fall below the daytime speech interference thresholds. Therefore, because estimated noise levels from truck trips would fall below the daytime speech interference thresholds, and haul truck noise would fall within the range of existing baseline noise levels along roadways serving the sites, noise impacts from temporary disturbance from noise along construction haul routes at all sites would be *less than significant*.

Impact Conclusion: Less than Significant

TABLE 5.7-22
Summary of Noise Effects from Construction Truck Traffic

Site	General Location	Maximum Daily Trips[a]	Maximum Noise Level at 50 feet from Roadway Centerline dBA L_{eq}[b]
Site 1	Poncetta Drive	26	55
Site 2	Park Plaza Drive	10	52
Site 3 and 4	Park Plaza Drive	40	59
Westlake Pump Station	Coronado Avenue	9	52
Site 5	B Street Hill Street	9	52
Site 6	Hill Street D Street	27	55
Site 7	Colma Blvd	15	56
Site 8	Serramonte Blvd	27	55
Site 9	Mission Road	24	55 [b]
Site 10	Camaritas Avenue	28	55
Site 11	Antoinette Lane	24	52
Site 12	Southwood Drive	26	55
Site 13	South Spruce Avenue Huntington Avenue	24	52
Site 14	Sneath Lane	26	59
Site 15	Sneath Lane	24	59
Site 16	El Camino Real (State Hwy 82) Hemlock Avenue	24	52
Site 17 (Alt)	Collins Avenue	26	55
Site 18 (Alt)	Alta Loma Drive	26	55
Site 19(Alt)	Southwood Drive	15	55

Note:

(a) Maximum Daily Trips were taken from maximum daily trips as shown in Table 5.6-6 (Maximum Daily Construction Vehicle Round Trip Generation during the Highest Volume Construction Phase) in Section 5.6, Transportation and Circulation.

(b) Access Road centerline assumed to be 25 feet from trailers.

5.7.3.5 Operational Impacts and Mitigation Measures

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. (Less than Significant with Mitigation)

Operational noise from the well facilities would result primarily from running the well pump. Associated piping and smaller ancillary valves, gauges, pumps, and compressors would also contribute minimally to overall noise generation. Minor traffic noise would result from maintenance trips to each site at a maximum of two trips per day.

As described in Chapter 3, Section 3.4 (Proposed Project), four well station types are included in the Project: 1) well with fenced enclosure; 2) well with a building; 3) well with a treatment building; and 3) well with a treatment and filtration building. Each proposed well with fenced enclosure site has been designed to have a submersible pump to minimize noise (see Section 3.4.2.3 [Well Pumps]). At locations with submersible pumps, the pumps would be installed below grade and submersed in water (see schematic drawing in Figure 3-10 [Typical Well Profile for Submersible Motor Driven Pump]), and would therefore not have perceptible noise generated aboveground[6].

For sites with building enclosures, the buildings would be constructed of board-formed concrete and metal panels. Where the building's air system is connected to the outside air for intake and exhaust, acoustical louvers would be installed to help reduce noise produced inside the building from reaching the exterior of the building. The building would also include noise reducing features such as standard weatherproofed steel doors and roofing materials with sound-reducing qualities. A limited amount of sound absorbing material would be included inside the well buildings to minimize an interior increase in noise levels due to sound reflections off hard room surfaces (see Section 3.4.2.2 [Well Facility Types]).

Electrical pump noise is a function of the size and speed of the motor. The electrical demand of the pumps in kilovolt amperes (kVA) is provided in Table 3-6 (Electrical Energy Demand for Facility Sites during Dry Years) in Chapter 3, Project Description. The pumps would range in size from 84 kVA to 168 kVA. Noise level generation from these pumps is calculated to be 92 to 93 dBA measured at a distance of three feet (Hoover & Keith 1981).

Given the assumptions stated in Section 5.7.3.2 (Approach to Analysis), noise levels were calculated at each noise-sensitive receiver location and compared to the threshold levels established in local standards and for potential speech or sleep interference. Where the standard is in terms of the hourly average noise level during the daytime or the nighttime, the lower of the two thresholds is used. Where the local standard is in terms of CNEL or L_{dn} the equivalent hourly L_{eq} for 24-hour continuous noise is used. The results of the analysis are shown in Table 5.7-23 (Conflicts with Local Noise Standards – Operation); and in Table 5.7-24 (Exceedance of Noise Thresholds – Operation).

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[6] The sound of the submersible pumps is inaudible above ground, because sound from the pump would be attenuated due to the distance below the ground surface, as well as the dampening effect of the water. The impedance of water is thousands of times greater than air, so noise does not travel through water to any great extent (Au and Hastings 2008).

TABLE 5.7-23
Conflicts with Local Noise Standards - Operation

Site	Jurisdiction	Nearest Receptor	Approximate Distance to the Receptor Property Line (feet)[(a)]	Most Restrictive Threshold Applicable to the Receptor	Predicted Noise Level at Receptor L_{eq}	Conflict with Ordinance? (LSM/SUM)[(b)]
Site 1	Daly City	Multi-family Residential	30	58	60	Yes (LSM)
Site 2	Daly City	Multi-family Residential and School	320 and 150	Submersible pump would not increase ambient noise levels		
Site 3	Unincorporated San Mateo County	Single-family Residential and School	85 and Within	Submersible pump would not increase ambient noise levels		
Site 4	Unincorporated San Mateo County	Single-family Residential and School	25 and 100	Submersible pump would not increase ambient noise levels		
WLPS	Daly City	Multi-family Residential	< 25	53	(c)	Yes (LSM)
Site 5 (Consolidated Treatment at Site 6)	Daly City	Single-family Residential	40	Submersible pump would not increase ambient noise levels		
Site 6 (Consolidated Treatment at Site 6)	Colma	Cemetery	200	58	48	No
		Multi-family Residential	455	53	37	No
Site 7 (Consolidated Treatment at Site 6)	Colma	Cemetery	30	Submersible pump would not increase ambient noise levels		
Site 5 (On-site Treatment)	Daly City	Single-family Residential	25	53	62	Yes (LSM)

TABLE 5.7-23
Conflicts with Local Noise Standards - Operation

Site	Jurisdiction	Nearest Receptor	Approximate Distance to the Receptor Property Line (feet)[a]	Most Restrictive Threshold Applicable to the Receptor	Predicted Noise Level at Receptor L_{eq}	Conflict with Ordinance? (LSM/SUM)[b]
Site 6 (On-site Treatment)	Colma	Cemetery	200	58	48	No
		Multi-family Residential	455	53	37	No
Site 7 (On-site Treatment)	Colma	Cemetery	< 25	58	64	Yes (LSM)
Site 8	Colma	Cemetery	445	58	37	No
Site 9	South San Francisco	Trailer Court	25	50	62	Yes (LSM)
Site 10	South San Francisco	Single-family Residential	220	50	43	No
Site 11	South San Francisco	Single-family Residential[d]	375	50	38	No
Site 12	South San Francisco	Funeral Home	20	65	64	No
		Single-family Residential	90	50	51	Yes (LSM)
Site 13	South San Francisco	Single-family Residential	210	50	44	No
		Extended Stay Hotel	>1,000	50	< 30	No
Site 14	San Bruno	Single-family Residential	25	Submersible pump would not increase ambient noise levels		

TABLE 5.7-23
Conflicts with Local Noise Standards - Operation

Site	Jurisdiction	Nearest Receptor	Approximate Distance to the Receptor Property Line (feet)[(a)]	Most Restrictive Threshold Applicable to the Receptor	Predicted Noise Level at Receptor L_{eq}	Conflict with Ordinance? (LSM/SUM)[(b)]
Site 15	San Bruno	Multi-family Residential	665	Submersible pump would not increase ambient noise levels		
Site 16	Millbrae	Multi-family Residential	85	54	51	No
Site 17 (Alternate)	Colma	Cemetery	130	58	48	No
Site 18 (Alternate)	South San Francisco	Single-family Residential	< 25	50	64	Yes (LSM)
Site 19 (Alternate)	South San Francisco	Church/preschool and Single-family Residential	45 and 65	Submersible pump would not increase ambient noise levels		

Notes:

(a) Approximate distance from well or well facility to nearby noise sensitive property line, based on aerial photo information from Google Earth ™, see Table 5.7-7 (Summary of Nearby Sensitive Receptors). L_{eq} evaluated at the property line of the closest sensitive receptor per ordinance requirements of respective local jurisdiction.

(b) LSM = less than significant with mitigation
SUM = significant and unavoidable with mitigation

(c) The size and exact location of proposed new equipment is not known at this time. Therefore, the impact of operational noise from the Westlake Pump Station would be potentially significant.

TABLE 5.7-24

Exceedance of Noise Thresholds – Operation

Site	Nearest Receptor	Approximate Distance from the Well or Well Facility (feet)[a]	Predicted Noise Level at Receptor Building	Speech Interference Threshold Exceeded? (LSM/SUM)[b] 70 dBA L_{eq}	Sleep Interference Threshold Exceeded? (LSM/SUM)[b] 50 dBA L_{eq}
Site 1	Multi-family Residential	50	56	No	Yes (LSM)
Site 2	Multi-family Residential and school	325 and 350	Submersible pump would not increase ambient noise levels		
Site 3	Single-family Residential and school	90 and 250	Submersible pump would not increase ambient noise levels		
Site 4	Single-family Residential and school	75 and 425	Submersible pump would not increase ambient noise levels		
WLPS	Multi-family Residential	<25	[c]	Yes (LSM)	Yes (LSM)
Site 5 (Consolidated Treatment at Site 6)	Single-family Residential	50	Submersible pump would not increase ambient noise levels		
Site 6 (Consolidated Treatment at Site 6)	Multi-family Residential	555	35	No	No
Site 7 (Consolidated Treatment at Site 6)	No nearby sensitive receptors[d]				
Site 5 (On-site Treatment)	Single-family Residential	35	59	No	Yes (LSM)
Site 6 (On-site Treatment)	Multi-family Residential	555	35	No	No

TABLE 5.7-24

Exceedance of Noise Thresholds – Operation

Site	Nearest Receptor	Approximate Distance from the Well or Well Facility (feet)[a]	Predicted Noise Level at Receptor Building	Speech Interference Threshold Exceeded? (LSM/SUM)[b] 70 dBA L_{eq}	Sleep Interference Threshold Exceeded? (LSM/SUM)[b] 50 dBA L_{eq}
Site 7 (On-site Treatment)	No nearby sensitive receptors[d]				
Site 8	Senior Care Facility	600	34	No	No
Site 9	Trailer Court	30	60	No	Yes (LSM)
Site 10	Single-family Residential	250	42	No	No
Site 11	Single-family Residential	390	38	No	No
Site 12	Funeral Home	50	56	No	Not a noise sensitive receptor at night
	Single-family Residential	130	48	No	No
Site 13	Single-family Residential	260	42	No	No
	Extended Stay Hotel	>1,000	<30	No	No
Site 14	Single-family Residential	<25	Submersible pump would not increase ambient noise levels		
Site 15	Multi-family Residential	715	Submersible pump would not increase ambient noise levels		

TABLE 5.7-24

Exceedance of Noise Thresholds – Operation

Site	Nearest Receptor	Approximate Distance from the Well or Well Facility (feet)[a]	Predicted Noise Level at Receptor Building	Speech Interference Threshold Exceeded? (LSM/SUM)[b] 70 dBA L_{eq}	Sleep Interference Threshold Exceeded? (LSM/SUM)[b] 50 dBA L_{eq}
Site 16	Multi-family Residential	115	49	No	No
Site 17 (Alternate)	Senior Care Facility	500	36	No	No
Site 18 (Alternate)	Single-family Residential	25	62	No	Yes (LSM)
Site 19 (Alternate)	Church/preschool and Single-family Residential	80 and 120	Submersible pump would not increase ambient noise levels		

Notes:

(a) Approximate distance from the well or well facility to the nearby noise sensitive structure based on aerial photo information from Google Earth™ and Arc GIS™; see Table 5.7-7 (Summary of Nearby Sensitive Receptors). L_{eq} evaluated at the nearest structure.

(b) LSM = less than significant with mitigation, SUM = significant and unavoidable with mitigation

(c) The size and exact location of proposed new equipment is not known at this time. Therefore, the impact of operational noise from the Westlake Pump Station would be potentially significant.

(d) For purposes of determining conflicts with local noise standards, cemeteries are considered a sensitive receptor, but this analysis does not otherwise apply analytical noise thresholds to cemeteries.

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

Sites 2, 3, 4, 5 (Consolidated Treatment at Site 6), 7 (Consolidated Treatment at Site 6), 14, 15, and 19 (Alternate)

Well facilities at these sites would have a submersible pump. Submersible pumps are underground and would not result in measurable noise above ground due to the attenuation provided by the water column. The above ground equipment would consist of a weatherproof control panel that would not be a source of noise given that control panels do not generate noise. Therefore, *no impact* would occur at these well facilities relative to conflicts with local noise ordinances or relative to the speech and sleep interference thresholds.

Impact Conclusion: No Impact

Sites 6, 8, 10, 11, 13, 16, and 17 (Alternate)

As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation) and Table 5.7-24 (Exceedance of Noise Thresholds – Operation), noise levels during well operation at these sites would result in noise levels below the thresholds based on the applicable local noise ordinance for the jurisdiction in which the site is located and below the speech and sleep interference thresholds. As a result, the impact would be *less than significant*.

Impact Conclusion: Less than Significant

Sites 1, 5 (On-site Treatment), 7 (On-site Treatment), 9, 12, 18 (Alternate), and the Westlake Pump Station

Site 1

Site 1 would be located in Daly City in the northeast corner of the Lake Merced Golf Club (see Figure 3-11) adjacent to multi-family residences. As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation), noise levels during well operation would result in 60 dBA L_{eq} at the property line of the multi-family residences for which the Daly City General Plan recommends a threshold of 58 dBA L_{eq}. As identified in Table 5.7-24 (Exceedance of Noise Thresholds – Operation), noise levels during well operation at Site 1 would result in 56 dBA L_{eq} at the exterior of the multi-family residences, which would exceed the sleep interference threshold of 50 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the well facility meet the performance standard of 50 dBA L_{eq}, by incorporating such measures as additional sound insulation and weatherstripping.

Site 5 (On-site Treatment)

Site 5 would be located in Daly City on B Street (see Figures 3-18 and 3-19) adjacent to a single-family residence. As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation), noise levels during well operation would result in 62 dBA L_{eq} at the property line of the multi-family residences for which the Daly City General Plan recommends a threshold of 53 dBA L_{eq}. As identified in Table 5.7-24 (Exceedance of Noise Thresholds – Operation), noise levels during well operation at Site 5 (On-site Treatment) would result in 59 dBA L_{eq} at the exterior of the single-family residence, which would exceed the sleep interference threshold of 50 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the well facility meet the performance standard of 50 dBA L_{eq}, by incorporating such measures as additional sound insulation and weatherstripping.

Site 7 (On-site Treatment)

Site 7 (On-site Treatment) would be located in Colma adjacent to the Woodlawn Memorial Park (see Figures 3-18 and 3-21). As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation), noise levels during well operation would result in 64 dBA L_{eq} at the property line of the cemetery for which the Colma General Plan recommends a threshold of 58 dBA L_{eq}. Therefore, this noise impact would be *significant*. Operational noise levels would not exceed speech or sleep interference thresholds, as there are no residences nearby, and this analysis does not apply these thresholds to cemeteries since noise sensitive receptors are not constantly present at cemeteries (unlike at residences). However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the well facility meet the performance standard of 58 dBA L_{eq}, by incorporating such measures as additional sound insulation and weatherstripping.

Site 9

Site 9 would be located in South San Francisco east of El Camino Real (see Figures 3-23 and 3-24) adjacent to a BART ventilation structure. As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation), noise levels during well operation would result in 62 dBA L_{eq} at the property line of the multi-family residences for which the South San Francisco Municipal Code identifies a threshold of 50 dBA L_{eq}. As identified in Table 5.7-24 (Exceedance of Noise Thresholds – Operation), noise levels during well operation at Site 9 would result in 60 dBA L_{eq} at the exterior of nearby single-family residences, which would exceed the sleep interference threshold of 50 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the well facility meet the performance standard of 50 dBA L_{eq}, by incorporating such measures as additional sound insulation and weatherstripping.

Site 12

Site 12 would be located in South San Francisco on Southwood Drive (see Figures 3-29 and 3-30) adjacent to a funeral home and single-family residences. As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation), noise levels during well operation would result in 51 dBA L_{eq} at the property line of the single-family residences for which the South San Francisco Municipal Code identifies a threshold of 50 dBA L_{eq}, and noise levels would result in 64 dBA L_{eq} at the property line of the funeral home for which the South San Francisco Municipal Code identified a threshold of 65 dBA L_{eq}. Therefore, this noise impact would be *significant* (operational noise levels would not exceed the speech and sleep interference thresholds; see Table 5.7-23). However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the well facility meet the performance standard of 50 dBA L_{eq}, by incorporating such measures as additional sound insulation and weatherstripping.

Site 18 (Alternate)

Site 18 (Alternate) would be located in South San Francisco on Alta Loma Drive (see Figure 3-39) adjacent to single-family residences. As identified in Table 5.7-23 (Conflicts with Local Noise Standards – Operation), noise levels during well operation would result in 64 dBA L_{eq} at the property line of the closest single-family residence for which the South San Francisco municipal Code identifies a threshold of 50 dBA L_{eq}. As identified in Table 5.7-24 (Exceedance of Noise Thresholds – Operation), noise levels during well operation at Site 18 (Alternate) would result in 62 dBA L_{eq} at the exterior of the multi-family residences, which would exceed the sleep interference threshold of 50 dBA L_{eq}. Therefore, this noise impact would be *significant*. However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the well facility meet the performance standard of 50 dBA L_{eq}, by incorporating such measures as additional sound insulation and weatherstripping.

Westlake Pump Station

The Westlake Pump Station would be located in Daly City (see Figure 3-13) adjacent to multi-family residences. Upgrades to the Westlake Pump Station would be necessary to serve the well facilities at Sites 2, 3, and 4. As described in Section 3.4 (Proposed Project), the proposed upgrades to this pump station 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. The size and exact location of proposed new equipment is not known at this time. Therefore, the impact of operational noise from the Westlake Pump Station relative to the Daly City noise ordinance, as well as the speech and sleep interference thresholds would be potentially *significant*. However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would reduce this impact to *less than significant* by requiring that the final design of the improvements at the pump station meet the performance standard of 50 dBA L_{eq}, the sleep interference threshold, by incorporating such measures as additional sound insulation and weatherstripping.

Measure 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)
The SFPUC shall incorporate noise controls that reduce noise levels from operation of the Project to meet the following performance standards:

- For Sites 1, 5 (On-site Treatment), 9, 12, 18 (Alternate), and the Westlake Pump Station, operational noise levels shall be reduced to 50 dBA L_{eq} or less.

- For Site 7 (On-site Treatment), operational noise levels shall be reduced to 58 dBA L_{eq} or less.

To meet these performance standards, noise control measures, which could include the following or other equally effective measures, will be implemented, as needed. The designs for the enclosure buildings will be reviewed by a qualified acoustical expert[7] to confirm that the following measures have been appropriately incorporated into the final design documents and that they are sufficient to achieve the stipulated performance standard for each site:

- Install sound-absorbing material on the interior ceiling and/or wall surfaces, as necessary, to control reverberant buildup within the enclosure building.
- Utilize standard construction methods to eliminate cracks and gaps at the wall-roof junction and at penetrations through the walls and roof.
- Install a gypsum board ceiling, or equivalent, to provide a sound insulating roof construction.
- Orient louvers away from sensitive receptors, where possible. Where it is not possible to orient louvers away from sensitive receivers, utilize sound attenuators or additional baffles that provide up to 20 dBA of transmission loss from inside to outside the building as needed to meet the performance standard.
- Use doors that are filled steel and fully weather-stripped.
- Do not allow unprotected ventilation openings through the building walls or roof. Control all ventilation sound transmission paths, as appropriate for the fan types and ventilation systems used.

Impact Conclusion: Less than Significant with Mitigation

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[7] Qualifications shall include the following: A) Bachelor of Science or higher degree from a qualified program in engineering, physics, or architecture offered by an accredited university or college, and five years' experience in noise control engineering and construction noise analysis. B) Demonstrated substantial and responsible experience in preparing and implementing construction and operational noise control treatments and monitoring plans, calculating construction and operational noise levels, and overseeing the implementation of construction and operational noise abatement measures.

5.7.3.6 *Cumulative Impacts and Mitigation Measures*

Impact C-NO-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise. (Significant and Unavoidable with Mitigation)

For cumulative construction-related noise and vibration impacts, the geographic scope for the analysis of cumulative impacts relative to noise (and vibration) consists of each proposed GSR facility site (including the construction area for the well, the well facility, and the pipelines), and the immediate vicinity around each of these sites.

Construction

Expose persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies

As discussed above under Impact NO-1, during certain phases of construction, the GSR Project would include construction within jurisdictions with daytime standards (South San Francisco and San Bruno) and nighttime standards (County of San Mateo, City of South San Francisco, Town of Colma, and City of San Bruno). In some instances, proposed GSR construction would include work outside of the local jurisdictions' noise ordinance time limits within which construction is allowed. In other instances, the GSR Project's predicted daytime noise levels at certain locations would exceed the maximum daytime $L_{eq,}$ identified in local ordinances. The predicted nighttime noise levels at certain locations would also exceed the maximum nighttime L_{eq} levels identified in local ordinances. In addition, construction of the GSR Project would, in some instances, also result in a substantial temporary increase in ambient noise levels in the GSR Project vicinity above levels existing without the GSR Project.

It is assumed that several of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), particularly those projects located in the immediate vicinity, could adversely affect some of the same receptors as the GSR Project. Many of the cumulative projects listed in Table 5.1-3 would result in construction-related noise levels that may exceed local noise standards and/or may also result in a substantial temporary increase in ambient noise levels in the GSR Project vicinity above levels existing without a given cumulative project. These cumulative projects would be located in three jurisdictions:

- **Daly City.** "A" Street Well Replacement Project (cumulative project C). The continuous drilling for this well may conflict with the Daly City Municipal Code which limits noise disturbance between the hours of 10:00 p.m. and 6:00 a.m.

- **Colma.** Peninsula Pipelines Seismic Upgrade Project (PPSU) at the Colma Site (cumulative project D-1) and Holy Cross Cemetery Expansion Project (cumulative project E). Construction at cumulative project D-1 may conflict with the Colma Municipal Code, but construction at cumulative project E would be located far enough away from residences that it likely would not conflict with the Town's Municipal Code.

- **South San Francisco.** Mission & McLellan Project (cumulative project F), PPSU Project at the South San Francisco Site (cumulative project D-2), the California Water Service Company (Cal Water) Well Replacement SSF1-25 Project (cumulative project G), the PG&E Transmission Pipeline Replacement Project (cumulative project H), and the Centennial Village Project (cumulative project I). Continuous drilling and testing for the Cal Water Well Replacement SSF1-25 Project and construction noise for the other projects may conflict with the South San Francisco Municipal Code, which regulates the maximum noise level for individual pieces of equipment.

The cumulative projects listed above are in proximity to Sites 5, 8, 9, 11, 12, 13, 17 (Alternate), and 19 (Alternate), all of which except for Site 5 have potentially significant noise impacts during construction. Therefore, cumulative impacts related to exposure of people to noise levels in excess of standards established by local general plan or noise ordinance, or applicable standards of other agencies would be *significant*, and the GSR Project's contribution could be cumulatively considerable, given that GSR Sites 8, 9, 11, 12, 13, 17 (Alternate), and 19 (Alternate) would have *significant* construction noise impacts.

As described in Impact NO-1, in Daly City, GSR Project construction for Site 5 would have no impact. Therefore, even though cumulative projects may conflict with local noise ordinances resulting in a significant cumulative noise impact, the contribution of the GSR Project at Site 5 would not be cumulatively considerable (*less than significant)*.

In Colma, of the GSR sites that would be in close proximity to cumulative projects, GSR Project construction for Sites 8 and 17 (Alternate) would result in *significant* impacts related to conflicts with the Colma noise ordinance. Cumulative impacts could be *significant,* and the GSR Project's contribution to this impact could be considerable. However, as discussed in Impact NO-1, the GSR Project's construction impacts related to conflict with the Colma noise ordinance would be reduced to a *less-than-significant* level with implementation of Mitigation Measure M-NO-1 (Noise Control Plan) (see Impact NO-1, above, for description). Implementation of this mitigation measure would ensure that construction activities (other than well drilling and testing) would occur during allowable hours and that noise levels from construction would be reduced below the noise ordinance threshold during construction of the GSR Project. With implementation of this mitigation measure, the GSR Project's contribution to cumulative impacts related to conflict with the Colma noise ordinance would not be cumulatively considerable (*less than significant*).

In South San Francisco, of the GSR sites that would be in close proximity to cumulative projects, GSR Project construction for Sites 9, 11, 12, 13, and 19 (Alternate) would result in *significant* impacts related to conflicts with the South San Francisco Municipal Code. The South San Francisco Municipal Code regulates the noise for single pieces of construction equipment, rather than noise levels at a sensitive receptor. Given the type of construction that would be used for other projects, it is expected that all of the projects constructed in South San Francisco would be able to meet the applicable noise limit of 90 dBA for an individual piece of equipment, resulting in a less-than-significant cumulative impact. The Cal Water replacement well would be drilled within about 630 feet of GSR Site 11, and both projects are expected to require nighttime construction to enable continuous drilling and testing. Because there are multi-family residences located on Antoinette Lane between GSR Site 11 and the Cal Water well site, this would be a significant cumulative impact, and the GSR Project's contribution would be cumulatively considerable, given that nighttime noise impacts of construction at GSR Site 11 would be significant. However, with implementation of Mitigation Measure M-NO-1 (Noise Control Plan), noise levels from nighttime construction for the GSR Project would be reduced sufficiently that construction at GSR Site 11 would not exceed local noise standards. As a result, with implementation of this mitigation measure, the GSR Project's contribution to a significant cumulative noise impact in South San Francisco would not be cumulatively considerable, and the cumulative impact would be *less than significant*.

Excessive groundborne vibration

As discussed above under Impact NO-2, damage from vibration could occur if construction occurs within 27 feet of a building. There is a potential for nighttime vibration annoyance when construction is within 155 feet of a receptor. Cumulative impacts associated with daytime construction would only be expected if both the GSR Project and a cumulative project are within 27 feet a building. Cumulative effects from nighttime construction would only occur if both projects are within 155 feet of a receptor. Of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) only the PPSU Project at the Colma Site (cumulative project D-1) which overlaps with GSR Sites 8 and 17 (Alternate), has the potential for cumulative vibration impacts. However nighttime construction is not proposed at the PPSU Colma Site, and the closest receptors are 450 feet away from Site 8 and 435 feet from Site 17 (Alternate). Therefore, no cumulative impacts related to excessive groundborne vibration are anticipated (*less than significant*).

Temporary increase in ambient noise levels

Of the GSR sites in close proximity to cumulative projects, GSR Project-related daytime and nighttime construction (as discussed under Impact NO-3) would cause *less-than-significant* temporary noise impacts at Site 8 and *significant* impacts at Sites 5, 9, 11, 12, 13, 17 (Alternate), and 19 (Alternate). It is assumed that construction of some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would also result in a substantial temporary increase in ambient noise levels in the Project vicinity above levels existing without these cumulative projects. The Daly City and Cal Water well replacement projects (cumulative projects C and G) would generate nighttime construction noise, but would not be close to the proposed GSR facility sites, where nighttime drilling would occur. Two cumulative projects in particular would generate noise close to proposed GSR facility sites. Noise levels associated with construction of these projects were estimated based on typical pipeline improvement projects. Assuming that both of these cumulative pipeline projects would generate temporary noise levels similar to GSR Project pipeline installation, the PPSU Project at the Colma Site (cumulative project D-1) could generate up to 82 dBA L_{eq} at 50 feet from the construction area during the daytime. The PG&E Transmission Pipeline Replacement Project (cumulative project H) at El Camino Real and Southwood Drive could generate up to 82 dBA L_{eq} at 50 feet from the construction area during the daytime. The PPSU Project would be located on the same site as GSR Site 8 and GSR Site 17 (Alternate). The PG&E Transmission Pipeline Replacement Project would be located near GSR Sites 12 and 19 (Alternate). Given that both of these cumulative projects would be constructed during the daytime, there would be no nighttime cumulative noise impact. However, cumulative impacts related to the temporary increase in ambient noise levels would be *significant*, and the GSR Project's contribution to this cumulative impact could be cumulatively considerable, given the proximities of some of its sites to some of the cumulative projects noted, as well as the estimated dBA levels involved in the construction of all of the projects identified in this analysis. However, as discussed in Impact NO-3, the GSR Project's noise level at the senior care facility during construction of Sites 8 and/or 17 (Alternate) would be reduced by Mitigation Measure M-NO-3 (Expanded Noise Control Measures) to 65 dBA L_{eq}, which would be less than the speech interference threshold of 70 dBA L_{eq}. Therefore, with implementation of Mitigation Measure M-NO-3, the GSR Project's contribution to cumulative impacts related to noise at nearby sensitive receptors would not be cumulatively considerable (*less than significant*).

Construction of the proposed GSR facilities at Site 12 would cause *significant* temporary noise impacts by raising noise levels during the daytime up to 83 dBA L_{eq} at the funeral home on Southwood Drive. Daytime construction at Site 19 (Alternate) would increase noise levels up to 82 dBA L_{eq} at the church and preschool at El Camino Real and Southwood Drive. However, as discussed in Impact NO-3, the GSR Project's impacts on noise levels at the funeral home during construction at Site 12 would be reduced to 73 dBA L_{eq} with implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan) (see Impact NO-1 and NO-3 for the full text of the mitigation measure). Nevertheless, noise impacts from construction at Site 12, including mitigation, would result in a *significant and unavoidable* noise impact; while the GSR Project's impacts on noise levels at the church and preschool during construction at Site 19 (Alternate) would be reduced to 62 dBA L_{eq} resulting in a *less-than-significant* impact at the church and preschool, through implementation of Mitigation Measures M-NO-1 (Noise Control Plan), and M-NO-3 (Expanded Noise Control Plan). The PG&E transmission pipeline would be constructed in the El Camino Real right-of-way approximately 200 feet from the church and preschool and 90 feet from the funeral home. In the event that the PG&E Transmission Pipeline Replacement Project and GSR Sites 12 and 19 (Alternate) were constructed at the same time (which may be the case if both Sites 12 and 19 [Alternate] are selected), temporary daytime noise levels at the church and preschool would intermittently reach 78 dBA L_{eq}, a *significant* cumulative noise impact. With implementation of Mitigation Measures M-NO-1 (Noise Control Plan) and M-NO-3 (Expanded Noise Control Plan, cumulative noise levels could still result in a cumulatively *significant* temporary increase in ambient noise levels in the GSR Project vicinity above levels existing without the GSR Project, given that even with all feasible mitigation, the GSR Project would still result in a substantial temporary increase in ambient noise levels in the GSR Project vicinity above levels existing without the GSR Project. The cumulative noise impact relative to temporary noise levels would, therefore, be *significant and unavoidable*, given that no feasible mitigation is available to reduce noise levels further to reach an acceptable level, and the GSR Project's contribution to cumulative impacts related to temporary noise levels during construction would therefore be cumulatively considerable (*significant and unavoidable with mitigation*).

Operation

Expose persons to, or cause the generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies

Of the GSR sites in close proximity to cumulative projects, operation of the proposed GSR facilities at Sites 5 (On-site Treatment), 9, and 12 as proposed (i.e., without mitigation), would result in the exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. Some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), particularly those cumulative projects that would generate operational noise and are located in close proximity to GSR sites, could generate noise levels in excess of standards established in the local general plan or noise ordinance. The cumulative projects that are in the immediate vicinity of some of the proposed GSR sites and that may also generate incremental additions to the noise environment from operations are: The San Francisco Groundwater Supply Project wells (cumulative project A1 – A6), the Daly City "A" Street Well Replacement Project (cumulative project C), the Mission & McLellan Project (cumulative project F), the Cal Water Well Replacement SSF1-25 Project (cumulative project G), and the Centennial Village Project (cumulative project I). Therefore, cumulative impacts related to noise in excess of local standards would be *significant*, and the GSR Project's contribution to this cumulative impact at Sites 5 (On-site Treatment), 9, and 12 could be cumulatively considerable, given the analysis presented above in Impact NO-5 for these locations.

However, as described in Impact NO-5, the GSR Project's operational noise impacts would be reduced to *less-than-significant* levels with implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) for GSR Sites 5 (On-site Treatment), 9, and 12. Therefore, with implementation of the mitigation measure, the GSR Project's contribution to cumulative impacts related to operational noise would not be cumulatively considerable (*less than significant*).

Substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project

Operation of the proposed GSR facilities at certain sites, as proposed (i.e., without mitigation), would generate a substantial permanent increase in ambient noise levels in the GSR Project vicinity above levels existing without the GSR Project. Some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) particularly those cumulative projects located in the immediate vicinity, could generate noise levels above existing conditions. The cumulative projects that are in the immediate vicinity of some of the proposed GSR sites and that may also generate incremental additions to the noise environment from operations are: the Daly City "A" Street Well Replacement Project (cumulative project C), the Mission & McLellan Project (cumulative project F), the Cal Water Well Replacement SSF1-25 Project (cumulative project G), and the Centennial Village Project (cumulative project I). Therefore, cumulative impacts related to increased ambient noise levels would be *significant*, and the GSR Project's contribution to this cumulative impact could be cumulatively considerable at Sites 5 (On-site Treatment), 9, and 12 given the analysis presented above in Impact NO-5 for these locations.

However, as described in Impact NO-5, the GSR Project's operational noise impacts would be reduced to *less-than-significant* levels with implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) for GSR Sites 5 (On-site Treatment), 9, and 12. Therefore, with implementation of the mitigation measure, the GSR Project's contribution to cumulative impacts related to operational noise would not be cumulatively considerable (*less than significant*).

5.7.4 References

Au and Hastings. 2008. *Principles of Marine Bioacoustics*.

California Department of Transportation (Caltrans). 1998. *Technical noise supplement to the Caltrans traffic noise analysis protocol.* Sacramento, CA.

Caltrans. 2004. *Transportation- and Construction-Induced Vibration Guidance Manual.* Sacramento, CA.

Caltrans. 2012. *2011 All Traffic Volumes on CSHS*. Website accessed March 22, 2013 at: http://traffic-counts.dot.ca.gov/2011all/Route82-86.html

City/County Association of Governments of San Mateo County (C/CAG). 1996. *San Mateo County Comprehensive Airport Land Use Plan*. December.

Colma, Town of. 1999. *Town of Colma General Plan*.

Colma, Town of. n.d. *Municipal Code Section 5.04.110 et seq*.

Daly City, City of. 1989. *City of Daly City General Plan, Noise Element.*

Daly City, City of. n.d. *Municipal Code Section 9.22.010 and 9.22.030*.

Federal Highway Administration (FHWA). 2006. *FHWA roadway construction noise model user's guide*. Washington, D.C.

Federal Transit Administration (FTA). 2006. *Transit noise and vibration impact assessment*. Washington, D.C.

Harris, C.M. 1991. *Handbook of Acoustical Measurements and Noise Control.*

Hoover & Keith. 1981. *Noise control for buildings, manufacturing plants*. Houston, TX.

Millbrae, City of. 1998. *City of Millbrae General Plan 1998-2015*.

Millbrae, City of. n.d. *Community Preservation Ordinance Chapter 6.25, Community Preservation, Section 6.25.050(F)(9).*

San Bruno, City of. 2009. *San Bruno General Plan.* March.

San Bruno, City of. n.d. *Municipal Code Chapter 6.16*.

San Francisco International Airport (SFO). n.d. Website accessed January 14, 2013 at: http://tx-sfo.airportnetwork.com/#

San Mateo County. 1986a. *General Plan Overview Background & Issues Chapters 1-16)*. November.

San Mateo County. 1986b. *General Plan Policies*. November.

San Mateo, County of. n.d. *Chapter 4.88 Noise Control*, San Mateo County Ordinance Code.

South San Francisco, City of. 1999. *City of South San Francisco General Plan*.

South San Francisco, City of. n.d. *Municipal Code, Chapter 8.32 Noise Regulations*.

United States Environmental Protection Agency (U.S. EPA), Office of Noise Abatement and Control. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. March.

Wilson, Ihrig & Associates (WIA). 2009. *Test Wells Noise Study Technical Memorandum*. October 6.

5.8 AIR QUALITY

This section evaluates impacts on air quality resulting from temporary construction activities and the operation of well facility sites. The analysis was conducted using methodologies and assumptions recommended by the Bay Area Air Quality Management District (BAAQMD) and determined by the San Francisco Planning Department to be adequate for use in this analysis. Procedures and methods recommended by the California Air Resources Board (CARB) are also used in this study. In keeping with guidelines for CEQA air quality studies, this report describes existing air quality, potential short-term construction-related impacts, potential direct and indirect long-term emissions associated with the Project, and the impacts of these emissions on both the local and regional scale.

5.8.1 Setting

The Project area is located in San Mateo County, which is within the San Francisco Bay Area Air Basin (Air Basin). The Project area is located in a sub-region of the Air Basin referred to as the Peninsula. Ambient concentrations of air pollutants in the Project area are a product of the quantity of pollutants emitted by local sources and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect air quality and pollutant transport and dilution include terrain, wind, atmospheric stability, and the presence of sunlight.

Motor vehicles are the primary source of ambient air pollution in the proposed Project study area. Other local sources of air pollution include industry, residential heating by burning wood and natural gas, and agricultural practices. Small miscellaneous sources such as lawn mowers, coffee roasters, char broilers, bakeries, dry cleaners, gasoline stations, and many other small business operations also contribute air pollutants. Air pollutant concentrations are affected by both emissions and meteorology. While meteorology tends to create short-term variations in pollutant concentrations, changes in emissions create long-term variations. Topographical and meteorological conditions are important factors in affecting local air pollutant concentrations. Meteorological effects such as wind speed, wind direction, and air temperature gradients interact with topographical features to direct the movement and dispersal of air pollutants.

5.8.1.1 Meteorology

The climate of the San Francisco Bay Area (Bay Area) is determined largely by a high-pressure system that is almost always present over the eastern Pacific Ocean. High-pressure systems are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, resulting in subsidence inversions. In the winter, the Pacific high pressure system weakens and shifts southward, allowing storms to pass through the area. Between storm cycles, inversions often develop, and local pollution levels can build up to unhealthful concentrations.

The Pacific Ocean is a dominating influence on the climate of the Peninsula. Local wind patterns are strongly influenced by terrain gaps, such as the one in San Bruno. Marine air traveling through these gaps is typically characterized by gusty winds and low clouds. Climate information from San Francisco International Airport shows that prevailing winds flow generally from the west-northwest over 50 percent of the time (CARB 1984). On average, winds are strongest in late spring and summer, with wind speeds exceeding 20 miles per hour in the afternoons. East-southeast winds are predominant in winter, but only about 25 percent of the time. Calm conditions occur less than two percent of the time annually. Typical winter temperatures in the northern portion of the Peninsula range from the 40s in the mornings to the mid-50s to about 60 degrees during the afternoons. Typically, summer temperatures range from the 50s in morning to the 60s and 70s in the afternoon. The coldest weather is typically in December and January, while the warmest temperatures generally occur June through October. Rainfall in the area averages about 20 inches per year and is confined primarily to the wet season from late October to early May. Except for occasional light drizzles from thick marine stratus clouds, summers are almost completely dry.

Strong sunlight during late spring through summer into early fall provides a catalyst for ozone precursor pollutants to react in the atmosphere and form elevated levels of ground level ozone. Thus, the highest annual ambient ozone-smog levels typically occur from May to October. In winter, periods of stagnant air (calm or very low wind speeds) can occur, especially between Pacific storm systems. This stagnation can allow respirable and fine particulate matter levels to build up to unhealthful levels, especially when fireplaces are being heavily used (e.g., year-end holidays).

5.8.1.2 Ambient Air Quality

Air pollutant levels are typically described in terms of "concentrations," which refers to the amount of pollutant material per volumetric unit of air. Concentrations are measured in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The federal and California Clean Air Acts have established ambient air quality standards for different pollutants. National Ambient Air Quality Standards (NAAQS) were established by the federal Clean Air Act for six criteria pollutants including carbon monoxide (CO), ozone, nitrogen dioxide (NO_2), small particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide and lead. Pollutants regulated under the California Clean Air Act are similar to those regulated under the federal Clean Air Act. In many cases, the California Ambient Air Quality Standards (CAAQS) are more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Both the U.S. Environmental Protection Agency (U.S. EPA) and the CARB review ambient air quality standards on a regular basis and make necessary adjustments in response to updated scientific information. Ambient air quality standards are shown in Table 5.8-1 (Relevant California and National Ambient Air Quality Standards). In addition, the U.S. EPA has identified over 100 other contaminants as hazardous air pollutants. The CARB has identified contaminants that can cause cancer or other health effects as toxic air contaminants.

TABLE 5.8-1
Relevant California and National Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	California Attainment Status	National Standards	National Attainment Status
Ozone	8-hour	0.070 ppm (137 μg/m^3)	Nonattainment	0.075 ppm (147μg/m^3)	Nonattainment
	1-hour	0.09 ppm (180 μg/m^3)	Nonattainment	None	—
Carbon Monoxide	1-hour	20 ppm (23 mg/m^3)	Attainment	35 ppm (40 mg/m^3)	Attainment
	8-hour	9.0 ppm (10 mg/m^3)	Attainment	9 ppm (10 mg/m^3)	Attainment
Nitrogen Dioxide	1-hour	0.18 ppm (339 μg/m^3)	Attainment	0.100 ppm (188 μg/m^3)	Unclassified
	Annual	0.030 ppm (57 μg/m^3)	Status not reported	0.053 ppm (100 μg/m^3)	Attainment
Sulfur Dioxide	1-hour	0.25 ppm (655 μg/m^3)	Attainment	0.075 ppm (196 μg/m^3)	Attainment
	24-hour	0.04 ppm (105 μg/m^3)	Attainment	0.14 ppm (365 μg/m^3)	Attainment
	Annual	None	—	0.03 ppm (56 μg/m^3)	Attainment
Respirable Particulate Matter (PM_{10})	24-hour	50 μg/m^3	Nonattainment	150 μg/m^3	Unclassified
	Annual	20 μg/m^3	Nonattainment	None	—
Fine Particulate Matter ($PM_{2.5}$)	24-hour	None	—	35 μg/m^3	Nonattainment
	Annual	12 μg/m^3	Nonattainment	15 μg/m^3	Attainment

Source: BAAQMD 2012

Notes:
ppm = parts per million
mg/m3 = milligrams per cubic meter
μg/m3 = micrograms per cubic meter

Ozone

Ground-level ozone is the principal component of smog. Ozone is not directly emitted into the atmosphere, but instead forms through a photochemical reaction of reactive organic gases (ROG) and nitrogen oxides, which are known as ozone precursors. Ozone levels are highest from late spring through autumn when precursor emissions are high and meteorological conditions are warm and stagnant. Motor vehicles create the majority of ROG and NO_X emissions in the Peninsula sub-region. Exposure to levels of ozone above current ambient air quality standards can lead to human health effects such as lung inflammation and tissue damage and impaired lung functioning. Ozone exposure is also associated with symptoms such as coughing, chest tightness, shortness of breath, and the worsening of asthma symptoms (BAAQMD 2011a). The greatest risk for harmful health effects belongs to outdoor workers, athletes, children, and others who spend greater amounts of time outdoors during periods of high ozone or $PM_{2.5}$ levels (e.g., "Spare the Air" days). Elevated ozone levels can reduce crop and timber yields, as well as damage native plants. Ozone can also damage materials such as rubber, fabrics, and plastics. In April 2005, the CARB approved a new 8-hour standard of 0.07 ppm and retained the 1-hour ozone standard of 0.09 ppm after an extensive review of the scientific literature. Evidence from the reviewed studies indicates that significant harmful health effects could occur among both adults and children if exposed to levels above these standards.

Suspended and Inhalable Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter (PM) is a complex mixture of tiny particles that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These particles vary greatly in shape, size, and chemical composition, and can be made up of many different materials such as metals, soot, soil, and dust. Particles 10 microns or less in diameter are defined as "respirable particulate matter" or "PM_{10}." Fine particles are 2.5 microns or less in diameter ($PM_{2.5}$) and, while also respirable, can contribute significantly to regional haze and reduction of visibility. Inhalable particulates come from smoke, dust, aerosols, and metallic oxides. Although particulates are found naturally in the air, most particulate matter found in the study area is emitted either directly or indirectly by motor vehicles, industry, construction, agricultural activities, and wind erosion of disturbed areas. Most $PM_{2.5}$ is comprised of combustion products such as smoke. Extended exposure to PM can increase the risk of chronic respiratory disease (BAAQMD 2011a). PM exposure is also associated with increased risk of premature deaths, especially in the elderly and people with pre-existing cardiopulmonary disease. In children, studies have shown associations between PM exposure and reduced lung function and increased respiratory symptoms and illnesses. Besides reducing visibility, the acidic portion of PM (e.g., nitrates or sulfates) can harm crops, forests, and aquatic and other ecosystems. In June 2002, the CARB adopted new ambient air quality standards for PM_{10} and $PM_{2.5}$, resulting from an extensive review of the health-based scientific literature. The U.S. EPA adopted a more stringent 24-hour $PM_{2.5}$ standard of 35 $\mu g/m^3$ in September 2006, replacing the older standard of 65 $\mu g/m^3$ (BAAQMD 2012).

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is an essential ingredient in the formation of ground-level ozone pollution. NO_2 is one of the nitrogen oxides (NO_X) emitted from high-temperature combustion processes, such as those occurring in trucks, cars, and power plants. Home heaters and gas stoves also produce NO_2 in indoor settings. Besides causing adverse health effects, NO_2 is responsible for the visibility reducing reddish-brown tinge seen in smoggy air in California. NO_2 is a reactive, oxidizing gas capable of damaging cells lining the respiratory tract. Studies suggest that NO_2 exposure can increase the risk of acute and chronic respiratory disease (BAAQMD 2011a). Due to potential health effects at or near the current air quality standard, the CARB recently revised the State ambient air quality standard for NO_2 (BAAQMD 2012). The U.S. EPA recently adopted a new 1-hour NO_2 standard of 0.10 ppm. As shown in Table 5.8-2 (Highest

Measured Air Pollutant Concentrations), levels measured in the Project vicinity are below the most up-to-date standards.

Carbon Monoxide (CO)

Carbon monoxide is a non-reactive pollutant that is toxic, invisible, and odorless. It is formed by the incomplete combustion of fuels. The largest sources of CO emissions are motor vehicles, wood stoves, and fireplaces. Unlike ozone, CO is directly emitted to the atmosphere. The highest CO concentrations occur during the nighttime and early mornings in late fall and winter. CO levels are strongly influenced by meteorological factors such as wind speed and atmospheric stability. The health threat from elevated ambient levels of CO is most serious for those who suffer from heart disease, like angina, clogged arteries, or congestive heart failure. For a person with heart disease, a single exposure to CO at relatively low levels may cause chest pain and reduce that person's ability to exercise; repeated exposures may contribute to other cardiovascular effects. High levels of CO can affect even healthy people. People who breathe high levels of CO can develop vision problems, reduced ability to work or learn, reduced manual dexterity and difficulty performing complex tasks. At extremely high levels, CO is poisonous and can cause death. As shown in Table 5.8-2 (Highest Measured Air Pollutant Concentrations), CO levels measured in the Bay Area are well below the health-based standards.

Sulfur Dioxide (SO_2)

Sulfur dioxide is a colorless gas with a strong odor. It can damage materials through acid deposition. It is produced by the combustion of sulfur-containing fuels, such as oil and coal. Refineries, chemical plants, and pulp mills are the primary industrial sources of sulfur dioxide emissions. Sulfur dioxide concentrations in the Bay Area are well below the ambient standards. Adverse health effects associated with exposure to high levels of sulfur dioxide include irritation of lung tissue, as well as increased risk of acute and chronic respiratory illness (BAAQMD 2011a).

Lead

Lead occurs in the atmosphere as particulate matter. It was primarily emitted by gasoline-powered motor vehicles, although the use of lead in fuel has been virtually eliminated. As a result, levels in the Bay Area have dropped dramatically. Lead concentrations in the Bay Area are well below the ambient standards.

5.8.1.3 Toxic Air Contaminants

Toxic Air Contaminants (TACs) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer or serious illness) and include, but are not limited to, the criteria air pollutants listed above. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, State and federal level. The identification, regulation, and monitoring of TACs is relatively new compared to that for criteria air pollutants that have established ambient air quality standards. TACs are regulated or evaluated on the basis of risk to human health rather than comparison to an ambient air quality standard or emission-based threshold.

Diesel Exhaust

Diesel exhaust is the predominant TAC in urban air with the potential to cause cancer. It is estimated to represent about two-thirds of the cancer risk from TACs (based on the statewide average). According to the CARB, diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the State's Proposition 65 or under the federal Hazardous Air Pollutants programs. California has adopted a comprehensive diesel risk reduction program. The U.S. EPA and the CARB have adopted low-sulfur diesel fuel standards in 2006 that reduce diesel particulate matter substantially. The CARB recently adopted new regulations requiring the retrofit and/or replacement of construction equipment, on-highway diesel trucks, and diesel buses in order to lower $PM_{2.5}$ emissions and reduce statewide cancer risk from diesel exhaust.

Wood Smoke

In cooler weather, smoke from residential wood combustion can be a primary source of PM_{10} and $PM_{2.5}$. Highly localized particulate matter concentrations can result when cold stagnant air traps smoke near the ground, and with no wind, the pollution can persist for many hours. Wood smoke also contains TACs, (often referred to generally as polycyclic aromatic hydrocarbons). Wood smoke particulate matter can carry these TACs on their surface, and transport them deep into the lungs. Wood smoke is also an irritant and is implicated in worsening asthma and other chronic lung problems. The BAAQMD recently adopted rules to regulate wood smoke emissions from residential fireplaces. Essentially, new open fire places that burn wood are prohibited, and burning of wood in non-compliance fireplaces is prohibited on days (and nights) that BAAQMD declares as “Spare the Air” days.

5.8.1.4 Existing Pollution Levels

Ambient air quality is affected by the rate and concentration of pollutant emissions and meteorological conditions. Factors such as wind speed, atmospheric stability, and mixing height all affect the atmosphere's ability to mix and disperse pollutants. Long-term variations in air quality typically result from changes in emissions, while short-term variations result from changes in atmospheric conditions. Measured air pollutant data indicate that PM_{10} and $PM_{2.5}$ are the air pollutants of greatest concern. In recent years, ground-level ozone concentrations exceeded State and federal standards during 2010.

5.8.1.5 Measured Pollutant Concentrations

The air quality monitoring stations in San Francisco (10 Arkansas Street) and San Mateo County (in Redwood City at 897 Barron Avenue) are considered generally representative of air quality in the Project area, because they are the closest monitoring stations to the Project area. The San Francisco station is closest to the Project. Ambient air pollution data typically receives great scrutiny and quality assurance testing, so final data lags about one year behind the current calendar year. The highest local air pollutant levels measured over the past five years (2007 to 2011) are reported in Table 5.8-2 (Highest Measured Air Pollutant Concentrations). State and federal air quality standards are presented in Table 5.8-1 (Relevant California and National Ambient Air Quality Standards).

TABLE 5.8-2
Highest Measured Air Pollutant Concentrations

Pollutant	Average Time	Measured Air Pollutant Levels				
		2007	**2008**	**2009**	**2010**	**2011**
San Francisco						
Ozone	8-Hour	0.049 ppm	0.066 ppm	0.056 ppm	0.051 ppm	0.054 ppm
	1-Hour	0.06 ppm	0.082 ppm	0.072 ppm	0.079 ppm	0.07 ppm
Carbon Monoxide (CO)	8-Hour	1.6 ppm	2.29 ppm	2.86 ppm	1.37 ppm	1.2 ppm
Nitrogen Dioxide (NO_2)	1-Hour	0.069 ppm	0.062 ppm	0.059 ppm	0.093 ppm	0.093 ppm
	Annual	0.016 ppm	0.016 ppm	0.015 ppm	0.013 ppm	0.014 ppm
Respirable Particulate Matter (PM_{10})	24-Hour	**70 µg/m³**	41 µg/m³	36 µg/m³	40 µg/m³	46 µg/m³
	Annual	**22 µg/m³**	**22 µg/m³**	19 µg/m³	19 µg/m³	20 µg/m³
Fine Particulate Matter ($PM_{2.5}$)	24-Hour	**45 µg/m³**	29µg/m³	**36 µg/m³**	**45 µg/m³**	**48 µg/m³**
	Annual	9 µg/m³	12 µg/m³	NA	11 µg/m³	10 µg/m³
Redwood City						
Ozone	8-Hour	0.07 ppm	0.07 ppm	0.063 ppm	**0.077 ppm**	0.061 ppm
	1-Hour	0.077 ppm	0.082 ppm	0.087 ppm	**0.113 ppm**	0.076 ppm
Carbon Monoxide (CO)	8-Hour	2.33 ppm	1.86 ppm	1.76 ppm	1.72 ppm	1.67 ppm
Nitrogen Dioxide (NO_2)	1-Hour	0.057 ppm	0.069 ppm	0.056 ppm	0.053 ppm	0.056 ppm
	Annual	0.013 ppm	0.014 ppm	0.012 ppm	0.012 ppm	0.012 ppm
Respirable Particulate Matter (PM_{10})	24-Hour	**56 µg/m³**	41 µg/m³	INA	INA	INA
	Annual	20 µg/m³	**21 µg/m³**	INA	INA	INA
Fine Particulate Matter ($PM_{2.5}$)	24-Hour	**45 µg/m³**	28 µg/m³	32 µg/m³	**37 µg/m³**	**40 µg/m³**
	Annual	8 µg/m³	11 µg/m³	9 µg/m³	8 µg/m³	9 µg/m³

Source: BAAQMD 2013

Notes:

ppm = parts per million and µg/m³ = micrograms per cubic meter
Values reported in **bold** exceed ambient air quality standard
INA = information not available.

In general, air quality in and around San Francisco is good due to the fairly good ventilation provided by the nearly persistent sea breeze regime. The State and national ambient air quality standards for ozone were exceeded during 2010 at the Redwood City monitoring station, but not in San Francisco. The national PM_{10} standards were not exceeded during that period at either station, but exceedances of the 24-hour State standard were measured on two sampling days in San Francisco and on one sampling day in Redwood City. Exceedances of the national $PM_{2.5}$ 24-hour standard were measured on 11 sampling days in San Francisco and three sampling days in Redwood City during the five-year period. Note that PM_{10} and $PM_{2.5}$ are sampled once every six days. All other criteria pollutants are not measured because the area has a long history of compliance with those air quality standards or there is a lack of emission sources. The highest carbon monoxide concentrations measured in San Francisco and Redwood City have been well below the national and State ambient standards. However, since automobile emissions are the primary source of carbon monoxide, the highest concentrations would typically be found away from monitoring stations, near congested roadways that carry large volumes of traffic. These are referred to as "hot spots." Other criteria pollutants, such as nitrogen dioxide, sulfur dioxide, and lead, are typically found at low levels at the two monitoring stations. These pollutants should not pose a major air pollution concern in the Project area.

5.8.1.6 Attainment Status

Areas that do not violate ambient air quality standards are considered to have attained the standard. Violations of ambient air quality standards are based on air pollutant monitoring data and are judged for each air pollutant, using the most recent three years of monitoring data. The Bay Area as a whole does not meet State or national ambient air quality standards for ground level ozone and $PM_{2.5}$, nor does it meet the State standard for PM_{10} (see Table 5.8-1 [Relevant California and National Ambient Air Quality Standards]).

Under the federal Clean Air Act, the U.S. EPA has classified the region as a marginal nonattainment area for the 8-hour ozone standard. The U.S. EPA required the region to attain the standard by 2007. While the U.S. EPA has since determined that the Bay Area has met this standard, it also required BAAQMD to submit a formal redesignation request and maintenance plan before removing the marginal nonattainment designation. However, BAAQMD did not request a redesignation under the older standard, because in May 2008, the U.S. EPA lowered the 8-hour ozone standard from 0.08 to 0.075 ppm, which was finalized in September 2011. The U.S. EPA finalized area designations for the 2008 8-hour ozone standard in April and designated the Bay Area as Marginal nonattainment. The State will have to submit plans (i.e., State Implementation Plan [SIP]) to attain the new standards for areas designated as in nonattainment, including the Bay Area.

The U.S. EPA formally designated the entire Bay Area as nonattainment for the $PM_{2.5}$ standard in December 2009 based on $PM_{2.5}$ monitoring data for the three-year period 2006-2008. However, Bay Area $PM_{2.5}$ levels have declined in the past several years. Monitoring data for the 2008-2010 period and for the 2009-2011 period show that the Bay Area met the 24-hour national $PM_{2.5}$ standard during these periods. Based on the Bay Area $PM_{2.5}$ monitoring data for years 2008-2010, on December 8, 2011 CARB submitted a "clean data finding" request to the U.S. EPA on behalf of the Bay Area. If the clean data finding request is approved, then U.S. EPA guidelines provide that the region can fulfill federal $PM_{2.5}$ SIP requirements either by preparing a "clean data" SIP submittal or a "Redesignation request and $PM_{2.5}$ maintenance plan." Because peak $PM_{2.5}$ levels can vary from year to year based on natural short-term changes in weather conditions, BAAQMD believes that it would be premature to submit a redesignation request and $PM_{2.5}$ maintenance plan at this time. Therefore, BAAQMD is currently preparing a "clean data" SIP to address the required elements that include an emission inventory for primary $PM_{2.5}$, as well as precursors to secondary PM formation; and amendments to BAAQMD's New Source Review (NSR) regulation to address $PM_{2.5}$.

The Bay Area has met the CO standards for over a decade and is classified as an attainment maintenance area by the U.S. EPA. The U.S. EPA grades the region as unclassified for all other air pollutants, which include PM_{10}.

California's ambient air quality standards are more stringent than the national ambient air quality standards. At the State level, the region is considered a serious nonattainment area for ground level ozone and a nonattainment area for PM_{10} and $PM_{2.5}$. The region is required to adopt plans on a triennial basis that show progress towards meeting the State ozone standard. The area is considered an attainment area or unclassified for all other pollutants.

5.8.1.7 Sensitive Receptors

Sensitive receptors are people who are particularly susceptible to the adverse effects of air pollution. The CARB has identified the following people who are most likely to be affected by air pollution: children, the elderly, the acutely ill, and the chronically ill, especially those with cardio-respiratory diseases. Residential areas are also considered sensitive receptors to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to any pollutants present. Other sensitive receptors include retirement facilities, day care facilities, hospitals, and schools. There are multiple sensitive receptors within the Project vicinity (see Appendix 2 of the GSR Air Quality Technical Report [Illingworth & Rodkin 2012], included as Appendix E of this EIR).

5.8.2 Regulatory Framework

5.8.2.1 Federal and State Regulations

The federal Clean Air Act of 1977 (CAA) governs air quality in the United States. In addition to being subject to federal requirements, air quality in California is also governed by more stringent regulations under the California Clean Air Act. At the federal level, the U.S. EPA administers the Clean Air Act. The California Clean Air Act is administered by the CARB and by the Air Quality Management Districts at the regional and local levels. The BAAQMD regulates air quality at the regional level, which includes San Francisco and San Mateo County.

Federal Clean Air Act

The U.S. EPA is responsible for enforcing the federal CAA. The U.S. EPA is also responsible for establishing the NAAQS. The NAAQS are required under the CAA and subsequent amendments. The

U.S. EPA regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain types of locomotives. The U.S. EPA has jurisdiction over emission sources outside State waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including those for vehicles sold in states other than California. Automobiles sold in California must meet the stricter emission standards established by the CARB.

California Clean Air Act and California Air Resources Board

In California, the CARB, which is part of the California Environmental Protection Agency, is responsible for meeting the State requirements of the federal Clean Air Act, administering the California Clean Air Act, and establishing the CAAQS. The California Clean Air Act, as amended in 1992, requires all air districts in the State to endeavor to achieve and maintain the CAAQS. The CARB regulates mobile air pollution sources, such as motor vehicles. It is responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. The CARB established passenger vehicle fuel specifications, which became effective in March 1996. It oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality activities at the regional and county level.

5.8.2.2 Regional and Local Regulations

Bay Area Air Quality Management District

The BAAQMD is the regional agency responsible for air quality regulation within the San Francisco Bay Area Air Basin (Air Basin), regulating air quality through planning and review activities (i.e., permitting activities). The BAAQMD has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits, impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD regulates new or expanding stationary sources of toxic air contaminants.

The BAAQMD's responsibilities include operating an air quality monitoring network as well as awarding grants to reduce motor vehicle emissions, conducting public education campaigns, and many other activities. The BAAQMD has jurisdiction over most of the nine-county Bay Area, including the proposed well facility sites.

To protect public health, BAAQMD has adopted plans to achieve ambient air quality standards. BAAQMD must continuously monitor its progress in implementing attainment plans and must periodically report to the CARB and the U.S. EPA. It must also periodically revise its attainment plans to reflect new conditions and requirements.

In 1991, the BAAQMD, Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) prepared the *Bay Area 1991 Clean Air Plan*. This air quality plan addresses the California Clean Air Act. Updates are developed approximately every three years. The plans are meant to demonstrate progress toward meeting the more stringent 1-hour ozone CAAQS. In 2010, BAAQMD adopted the *Bay Area 2010 Clean Air Plan* (2010 Clean Air Plan) (BAAQMD 2010b). This Clean Air Plan updates the most recent ozone plan, the 2005 Ozone Strategy. Unlike previous Bay Area Clean Air Plans, the 2010 Clean Air Plan is a multi-pollutant air quality plan addressing four categories of air pollutants:

- Ground-level ozone and the key ozone precursor pollutants (reactive organic gases and NO_X), as required by State law.
- Particulate matter, primarily $PM_{2.5}$, as well as the precursors to secondary $PM_{2.5}$.[1]
- Toxic air contaminants.
- Greenhouse gases.

While the 2010 Clean Air Plan addresses State requirements, it will also provide the basis for developing future control plans to meet federal requirements (i.e., NAAQS) for ozone and $PM_{2.5}$. The region is required to prepare a federally enforceable plan to meet the NAAQS for $PM_{2.5}$. In addition, U.S. EPA is likely to adopt a more stringent NAAQS for ozone. These new standards will likely trigger new planning requirements for the Bay Area and more stringent federally enforceable control measures. As of January 2013, this planning process is ongoing.

While previous Clean Air Plans have relied upon a combination of stationary and transportation control measures, the 2010 Clean Air Plan adds two new types of control measures: (1) Land Use and Local Impact Measures, and (2) Energy and Climate Measures. These types of measures would indirectly reduce air pollutant and greenhouse gas emissions through reductions in vehicle use and energy usage. In addition, the plan includes Further Study Measures, which will be evaluated as potential control measures.

The 2010 Clean Air Plan proposes expanded implementation of transportation control measures (TCMs) and includes public outreach programs designed to educate the public about air pollution in the Bay Area and promote individual behavior changes that improve air quality. New measures in the 2010 Clean Air Plan are aimed at helping guide land use policies that would indirectly reduce air pollutant emissions. Some of these measures or programs rely on local governments for implementation. The clean air planning efforts for ozone also will reduce PM_{10} and $PM_{2.5}$, as a substantial amount of particulate matter comes from combustion emissions such as vehicle exhaust. Conversely, strategies to reduce ozone precursor emissions will reduce secondary formation of $PM_{2.5}$ and PM_{10}.

In addition, California's Senate Bill 656 (SB 656, Sher, 2003) that amended Section 39614 of the Health and Safety Code, required further action by the CARB and air districts to reduce public exposure to PM_{10} and $PM_{2.5}$. Efforts identified by BAAQMD in response to SB 656 are primarily targeting reductions in wood smoke emissions, adoption of new rules to further reduce NO_X and particulate matter from internal combustion engines, and reductions in particulate matter from commercial charbroiling activities.

[1] PM is both directly emitted (referred to as direct PM or primary PM) and also formed in the atmosphere through reactions among different pollutants (this is referred to as indirect or secondary PM).

5.8.3 Impacts and Mitigation Measures

5.8.3.1 *Significance Criteria*

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on air quality if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal, State, or regional ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

5.8.3.2 *Approach to Analysis*

The air quality impact analysis considers construction and operational impacts associated with the proposed Project. The analysis evaluates construction of 19 potential well facility sites; however, a maximum of 16 well facilities would ultimately be operated as part of the Project. Construction equipment, trucks, worker vehicles, and ground-disturbing activities associated with the Project would generate emissions of criteria pollutants and precursors.

The GSR Air Quality Technical Report was prepared to evaluate air quality impacts associated with construction and operation of the Project (Illingworth & Rodkin 2012) (see Appendix E [GSR Final Air Quality Technical Report]). This technical report is consistent with the San Francisco Planning Department, Environmental Planning Division's requirements for air quality assessments and the BAAQMD Guidelines for assessing and mitigating air quality impacts. Based on a writ of mandate issued by the Alameda County Superior Court, the significance thresholds adopted by the BAAQMD have been set aside and are no longer in effect. 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 (BAAQMD 1999). 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 this CEQA analysis (BAAQMD 2009).

The BAAQMD guidelines indicate that the significance of a project's impact should be evaluated based on the effectiveness of proposed measures to reduce construction-related emissions (e.g., whether control measures are implemented as part of construction). If appropriate, mitigation measures are implemented for each project to control PM_{10} and $PM_{2.5}$ emissions. Table 5.8-3 (Air Quality Significance Thresholds), summarizes the air quality thresholds of significance, followed by a discussion of each threshold.

TABLE 5.8-3
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 µg/m³	0.3 µg/m³	
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/m³		

Sources: BAAQMD 2011a; BAAQMD 2009

Ozone Precursors

As discussed previously, the Bay Area is currently designated as in non-attainment for ozone and particulate matter (PM_{10} and $PM_{2.5}$). Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving ROG and NO_x. The BAAQMD is the primary regulatory agency in the Bay Area charged with ensuring that the region attains applicable federal and State ambient air quality standards. The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, is based on the State and federal Clean Air Acts emissions limits for stationary sources.

The federal NSR program was created by the federal CAA to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of federal health based ambient air quality standards. Similarly, to ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors, ROG and NO_x, the offset emissions level is an annual average of 10 tons per year (or 54 pounds per day) (BAAQMD 2009). These represent emissions levels under which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Although this regulation applies to new or modified stationary sources, construction projects result in ROG and NO_x emissions as a result of increases in vehicle trips, architectural coatings, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of land use projects, and those projects that result in emissions below these thresholds would not be considered as contributing to an existing or projected air quality violation or resulting in a considerable net increase in ROG and NO_x emissions. Because construction activities are temporary in nature, only the average daily thresholds are applicable to construction phase emissions.

Particulate Matter (PM_{10} and $PM_{2.5}$)

The BAAQMD has not established an offset limit for $PM_{2.5}$ and the current federal Prevention of Significant Deterioration (PSD) offset limit of 100 tons per year for PM_{10} is too high and would not be an appropriate significance threshold for the Air Basin considering the nonattainment status for PM_{10}. However, the emissions limits provided for in the federal NSR that apply to stationary sources that emit criteria air pollutants in areas that are currently designated as in nonattainment is an appropriate significance threshold. For PM_{10} and $PM_{2.5}$, the emissions limits under NSR are 15 tons per year (82 lbs. per day) and 10 tons per year (54 lbs. per day), respectively. These emissions limits represent levels at which a source is not expected to have an impact on air quality (BAAQMD 2009). Similar to ozone precursor thresholds identified above, land use development projects typically result in particulate matter emissions as a result of increases in vehicle trips, space heating and natural gas combustion, landscape maintenance, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of a land use project. Those projects that result in emissions below the NSR emissions limits would not be considered as contributing to an existing or projected air quality violation or resulting in a considerable net increase in PM_{10} and $PM_{2.5}$ emissions. Because construction activities are temporary in nature, only the average daily thresholds are applicable to construction-phase emissions.

Other Criteria Pollutants

Regional concentrations of CO in the Bay Area have not exceeded the CAAQS in the past 11 years and SO_2 concentrations have never exceeded the standards. The primary source of CO impacts from land use projects is vehicle traffic. Construction-related SO_2 emissions represent a negligible portion of the total basin-wide emissions and construction-related CO emissions represent less than five percent of the Bay Area total basin-wide CO emissions (BAAQMD 2009). As discussed previously, the Bay Area is designated as in attainment for both CO and SO_2. Furthermore, the BAAQMD has demonstrated that in order to exceed the California ambient air quality standard of 9.0 ppm (8-hour average) or 20.0 ppm (1-hour average) for CO, project traffic in addition to existing traffic would need to exceed 44,000 vehicles per hour at affected intersections (or 24,000 vehicles per hour where vertical and/or horizontal mixing is limited) (BAAQMD 2011a). Operation of the Project is estimated to add one vehicle per day during a Take Year. Therefore, given the Bay Area's attainment status and the limited CO and SO_2 emissions that could result, construction of projects such as the proposed Project would not result in a cumulatively considerable net increase in CO or SO_2, and quantitative analysis is therefore not required.

Fugitive Dust

Fugitive dust emissions are typically generated during construction phases. Studies have shown that the application of best management practices (BMPs) at construction sites significantly controls fugitive dust (Western Regional Air Partnership 2006). Individual measures have been shown to reduce fugitive dust by anywhere from 30 percent to 90 percent (BAAQMD 2009). The BAAQMD has identified a number of BMPs to control fugitive dust emissions from construction activities (BAAQMD 2011a). Such measures include site watering, treatment or covering of exposed surfaces, prevention of dirt track out on to public roadways, maintenance of equipment, and public noticing.

Health Risks and Hazards from New or Modified Sources

Construction activities typically require the use of heavy-duty diesel vehicles and equipment, which emit diesel particulate matter (DPM). CARB identified DPM as a TAC in 1998, based on evidence demonstrating cancer effects in humans (CARB 1998). The exhaust from diesel engines includes hundreds of different gaseous and particulate components, many of which are toxic. Mobile sources such as trucks and buses are among the primary sources of diesel emissions, and concentrations of DPM are higher near heavily traveled highways. Other sources of health risks and hazards include: gas stations, stationary diesel engines (i.e., backup generators), dry cleaners, crematories, spray booths, diesel-fueled locomotives, major ports, rail yards, airports, oil refineries, power plants, and cement plants (BAAQMD 2011b). Land use projects that require a substantial amount of heavy-duty diesel vehicles and equipment, as well as projects that require stationary sources, such as a diesel backup generator, would result in emissions of DPM and possibly other TACs that may affect nearby sensitive receptors. Construction-phase TACs, however, would be temporary, and current health risk modeling methodologies are associated with longer-term exposure periods of 9, 40, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities, resulting in difficulties with producing accurate modeling results (BAAQMD 2009). Nevertheless, DPM is a known TAC and therefore, appropriate thresholds are identified to ensure that a project does not expose sensitive receptors to substantial pollutant concentrations.

Similar to the criteria pollutant thresholds identified above, the BAAQMD Regulation 2, Rule 5, sets cancer risk limits for new and modified sources of TACs at the maximally exposed individual (MEI). 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 (BAAQMD 2011a). In accordance with Regulation 2, Rule 5, the BAAQMD Air Pollution Control Officer shall deny any permit to operate a source that results in an increased cancer risk of 10 per million or an increase chronic or acute Hazard Index of 1.0 at the MEI. This threshold is designed to ensure that the source does not contribute to a cumulatively significant health risk impact (BAAQMD 2011a).

In addition, particulate matter, primarily associated with mobile sources (vehicular emissions) is strongly associated with mortality, respiratory diseases, and impairment of lung development in children, and can contribute to hospitalization for cardiopulmonary disease. Based on toxicological and epidemiological research, smaller particles and those associated with traffic appear more closely related to health effects (San Francisco Department of Public Health 2008). Therefore, estimates of $PM_{2.5}$ emissions from a new source can be used to approximate broader potential adverse health effects. The U.S. EPA has proposed a Significant Impact Level (SIL) for $PM_{2.5}$. For developed urban areas, including much of San Francisco, the U.S. 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 (BAAQMD 2011a). The BAAQMD has determined that on balance the annual average $PM_{2.5}$ threshold of 0.3 $\mu g/m^3$ will afford the same health protections as required by San Francisco's Health Code Article 38 (BAAQMD 2011a). Therefore, the lower range of the U.S. 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.

In determining the potential distance that emissions from a new source (construction sources or operational sources) may affect nearby sensitive receptors, a summary of research findings in the CARB's *Land Use Compatibility Handbook* suggests that air pollutants from high volume roadways are substantially reduced or can even be indistinguishable from upwind background concentrations at a distance of 1,000 feet downwind from sources such as freeways and large distribution centers (BAAQMD 2011a). Given the scientific data on dispersion of TACs from a source, the BAAQMD recommends assessing impacts of sources of TACs on nearby receptors within a 1,000-foot radius (BAAQMD 2011a). This radius is also consistent with the CARB's *Land Use Compatibility Handbook* and Health and Safety Code Section 42301.6 (Notice for Possible Source Near School) (BAAQMD 2011a).

In summary, potential health risks and hazards from new sources on existing or proposed sensitive receptors are assessed within a 1,000-foot zone of influence and risks and hazards from new sources that exceed any of the following thresholds at the MEI are determined to be significant: excess cancer risk of 10 per one million, chronic or acute Hazard Index of 1.0, and annual average $PM_{2.5}$ increase of 0.3 $\mu g/m^3$.

Cumulative Air Quality Impacts

Regional air quality impacts are, by their very nature, cumulative impacts. Emissions from past, present, and future projects contribute to adverse regional air quality impacts on a cumulative basis. No single project by itself would be sufficient in size to result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulative adverse air quality impacts (BAAQMD 2011a). As described above, the project-level thresholds for criteria air pollutants are based on levels by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants. Therefore, if a project's emissions are below the project-level thresholds, the project would not be considered to result in a considerable contribution to cumulative regional air quality impacts.

With respect to localized health risks and hazards, as described above, the significance thresholds for sensitive receptors represent a cumulative impact analysis, as this analysis considers all potential sources that may result in adverse health impacts within a receptor's zone of influence. Similarly, new sources that contribute to health risks and hazards at nearby sensitive receptors that exceed these cumulative thresholds would result in a significant health risk and hazards impact to existing sensitive receptors (BAAQMD 2010a).

Consistency with Applicable Air Quality Plan

As discussed previously, the BAAQMD has published the 2010 Clean Air Plan, representing the most current applicable air quality plan for the Air Basin. Consistency with this plan is the basis for determining whether the proposed Project would conflict with or obstruct implementation of an applicable air quality plan.

Construction Impacts

Air quality impacts from construction are assessed with respect to whether or not the Project would result in a cumulatively considerable net increase of nonattainment pollutants or their precursors as measured against thresholds which were established by the BAAQMD and which the Planning Department has determined are adequate for use in this analysis, as discussed above in Section 5.8.3.2 (Approach to Analysis).

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 CARB. The on-site construction modeling was based on the construction equipment inventories and schedule provided by the SFPUC. A new 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 (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]). Either a well station building or a fenced enclosure would be constructed at each site. In addition, pipelines would be installed to connect the well stations 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. As discussed in Chapter 3, Project Description, Section 3.5.1 (Construction Sequencing and Schedule), total construction time for a production well and building is estimated to last 16 months; emissions were calculated based on the duration of specific types of activities within that overall construction period. Emissions associated with each component of the construction activities were computed as follows:

- Well drilling/well construction anticipated to last 30 days,
- Construction of well facility building anticipated to last 240 days,
- Construction of fenced enclosure (for well facility sites that would not have buildings) anticipated to last 60 days of which 40 would have equipment operation, and
- Pipelines anticipated to be constructed at a rate of 120 feet per day.

For sites with well facility buildings, the largest 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 model 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 emissions 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 four 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 (four 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.

Construction equipment assumptions in the CalEEMod model were adjusted to account for the CARB overestimation of emissions. The model is based on older load factor assumptions. The CARB adjusted construction fleet emissions by reducing the load factors used in their OFFROAD2007 model by 33 percent. Since CalEEMod is also based on the same OFFROAD2007 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-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 truck trips. Emissions for 10 minutes of idling were applied to each truck roundtrip, which would include five minutes for each trip.

Operation and Maintenance Impacts

Operation of the Project would involve the operation and maintenance of pumps. These pumps would be operated by electricity. The Project would also include provisions for portable drive-up emergency generators to power the pumps, during a Take Year, in the event of a power outage. Operation of the Project was analyzed qualitatively based on these intermittent and infrequent proposed operational activities which would only occur during a Take Year and a power outage. The intermittent operation of the emergency generators would result in very low emissions, with no potential to cause significant air quality impacts.

Areas of No Project Impact

Operation of the Project would not result in impacts related to conflicts with an applicable air quality plan. The following criterion is, therefore, not discussed further in this section relative to Project operation.

Conflict with or obstruct implementation of applicable air quality plans. Project operation and maintenance activities would result in emissions well below the BAAQMD thresholds for criteria air pollutants and would not expose sensitive receptors to substantial levels of air pollutants (see Impacts AQ-5, AQ-6 and C-AQ-1). As a result, Project operation would not conflict with the *Bay Area 2010 Clean Air Plan*, nor would it obstruct implementation of the 2010 Clean Air Plan.

5.8.3.3 Summary of Impact Analysis

Table 5.8-4 (Summary of Impacts – Air Quality), provides a summary of potential air quality impacts from the Project.

TABLE 5.8-4
Summary of Impacts – Air Quality

Facility Sites	Construction				Operations			Cumulative
	Impact AQ-1: Construction of the Project would not conflict with or obstruct implementation of applicable air quality plans.	Impact AQ-2: Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation.	Impact AQ-3: Project construction would expose sensitive receptors to substantial pollutant concentrations.	Impact AQ-4: Project construction activities would not create objectionable odors affecting a substantial number of people.	Impact AQ-5: Project operations would not violate air quality standards or contribute substantially to an existing air quality violation.	Impact AQ-6: Project operations would not expose sensitive receptors to substantial pollutant concentrations.	Impact AQ-7: Project operations would not create objectionable odors affecting a substantial number of people.	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.
Site 1	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 2	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 3	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 4	LS	LSM	LS	LS	LS	LS	LS	LSM
Westlake Pump Station	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 5 (Consolidated Treatment at Site 6)	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 5 (On-Site Treatment)	LS	LSM	LSM	LS	LS	LS	LS	LSM
Site 6	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 7 (Consolidated Treatment and On-site options)	LS	LSM	LS	LS	LS	LS	LS	LSM

TABLE 5.8-4
Summary of Impacts – Air Quality

Facility Sites	Construction				Operations			Cumulative
	Impact AQ-1: Construction of the Project would not conflict with or obstruct implementation of applicable air quality plans.	Impact AQ-2: Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation.	Impact AQ-3: Project construction would expose sensitive receptors to substantial pollutant concentrations.	Impact AQ-4: Project construction activities would not create objectionable odors affecting a substantial number of people.	Impact AQ-5: Project operations would not violate air quality standards or contribute substantially to an existing air quality violation.	Impact AQ-6: Project operations would not expose sensitive receptors to substantial pollutant concentrations.	Impact AQ-7: Project operations would not create objectionable odors affecting a substantial number of people.	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.
Site 8	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 9	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 10	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 11	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 12	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 13	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 14	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 15	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 16	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 17 (Alternate)	LS	LSM	LS	LS	LS	LS	LS	LSM

TABLE 5.8-4
Summary of Impacts – Air Quality

Facility Sites	Construction				Operations			Cumulative
	Impact AQ-1: Construction of the Project would not conflict with or obstruct implementation of applicable air quality plans.	**Impact AQ-2: Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation.**	**Impact AQ-3: Project construction would expose sensitive receptors to substantial pollutant concentrations.**	**Impact AQ-4: Project construction activities would not create objectionable odors affecting a substantial number of people.**	**Impact AQ-5: Project operations would not violate air quality standards or contribute substantially to an existing air quality violation.**	**Impact AQ-6: Project operations would not expose sensitive receptors to substantial pollutant concentrations.**	**Impact AQ-7: Project operations would not create objectionable odors affecting a substantial number of people.**	**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.**
Site 18 (Alternate)	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 19 (Alternate)	LS	LSM	LS	LS	LS	LS	LS	LSM

Notes:

LS = Less than Significant

LSM = Less than Significant with Mitigation

5.8.3.4 Construction Impacts and Mitigation Measures

Impact AQ-1: Construction of the Project would not conflict with or obstruct implementation of applicable air quality plans. (Less than Significant)

All Sites

The Project would not conflict with or obstruct the BAAQMD's *Bay Area 2010 Clean Air Plan*, the most recently adopted regional air quality plan that pertains to the Project (BAAQMD 2010b). The 2010 Clean Air Plan provides a comprehensive plan to improve Bay Area air quality and protecting public health.

The Clean Air Plan contains 55 control measures under the following categories: stationary-source measures, mobile-source measures, transportation control measures, land use, and local impact measures and energy and climate measures. Many of these control measures require action on the part of the BAAQMD, CARB, or local communities, and are not directly related to the actions undertaken by an individual infrastructure project. For example, the first mobile source control measure listed in the Plan is MSM A-1 Promote Clean, Fuel-Efficient Light and Medium-Duty Vehicles. Under this control measure the BAAQMD would provide incentives for the purchase of low emission vehicles, target high-mileage vehicles for fleet turnover, initiate demonstration projects for renewable fuels and projects for GHG efficient vehicle and PM emissions, encourage federal participation, and continue public outreach and education of efficient driving habitats and vehicle maintenance. While the Project could benefit from these actions, in no way would it prevent the BAAQMD from implementing these actions as none directly apply to the Project. The comparison provided between MSM A-1 and the Project would be similar for the remaining 54 control measures.

The activities associated with Project construction and operation would not conflict with or obstruct implementation of the long-term air quality planning goals of the 2010 Clean Air Plan due to the short-term nature of the construction emissions. Because construction of the proposed Project would not conflict with or obstruct implementation of the 2010 Clean Air Plan, the impact would be *less than significant*.

Impact Conclusion: Less than Significant

Impact AQ-2: Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation. (Less than Significant with Mitigation)

All Sites

Construction of all well facility sites would generate fugitive dust (including PM_{10} and $PM_{2.5}$) and other criteria pollutants, primarily as a result of a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle exhaust. With respect to construction-related emissions, PM_{10} is the pollutant of greatest concern to BAAQMD. Construction-related emissions could cause substantial increases in localized concentrations of PM_{10} and could affect compliance with PM_{10} ambient air quality standards on a regional basis. Particulate emissions from construction activities could also lead to adverse health effects and nuisance concerns (e.g., reduced visibility and soiling of exposed surfaces).

In addition, combustion emissions from construction equipment and vehicles (i.e., heavy equipment and delivery/haul trucks, worker commute vehicles, air compressors, and generators) would be generated during Project construction. Emissions from construction worker commute trips would be minor compared to the emissions generated by construction equipment (e.g., diesel-powered drilling equipment). Nevertheless, total criteria pollutant emissions of ROG and NO_x from these emission sources would incrementally add to regional atmospheric loading of ozone precursors during Project construction.

Table 5.8-5 (Estimated Total Criteria Air Pollutant Construction Emissions), shows criteria air pollutant emissions associated with construction of each facility site and the total for the construction of 19 wells and the Westlake Pump Station.

TABLE 5.8-5
Estimated Total 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)[(a)]	176	1,291	77	66
Site 6 (On-Site Treatment) [(a)]	172	1,266	76	65
Site 7 (On-Site Treatment) [(a)]	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

TABLE 5.8-5
Estimated Total Criteria Air Pollutant Construction Emissions (in pounds)

Facility Site	ROG	NO_x	PM_{10}	$PM_{2.5}$
Total (pounds)	3,174	23,211	1,301	1,150
Average Daily Emissions (pounds per day)	7.6	55.3	3.1	2.7
Threshold (pounds per day)	54	54	82	54
Exceed Threshold?	No	Yes	No	No

Source: Illingworth & Rodkin 2012

Notes:

(a) Worst-case scenario for Sites 5, 6 and 7 assumes on-site treatment, longest proposed pipeline to water connection, and highest potential trip generation. For this reason, the consolidated treatment Scenario F at Site 6 is not presented.

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. Detailed emissions computations and assumptions along with CalEEMod modeling output are contained in Appendix 3 of the GSR Air Quality Technical Report (Illingworth & Rodkin 2012), provided as Appendix E.

Average daily emissions are compared against the daily criteria air pollutant emission significance thresholds. As indicated in Table 5.8-5 (Estimated Total Criteria Air Pollutant Construction Emissions), construction emissions of ROG, PM_{10} and $PM_{2.5}$ would be below the significance thresholds. NO_x emissions would be below the significance threshold if 16 well facilities, plus the Westlake Pump Station modification, were constructed, but would exceed the significance threshold if it were necessary to construct more than 16 well facility sites, plus the Westlake Pump Station modification. However, Mitigation Measure M-AQ-2b (NO_x Reduction during Construction of Alternate Sites) would reduce this air quality impact to *less than significant* by reducing construction-period NO_x emissions at the alternate sites by 20 percent. If only 16 well facilities, plus the Westlake Pump Station modification, were constructed, the NO_x emissions would not exceed the significance threshold and no mitigation measures would be required. Construction-period NO_x emissions at the alternate sites were recomputed assuming that all on-site off-road construction equipment 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 wells 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 significance threshold and would, therefore, be *less than significant with mitigation*.

Table 5.8-5 (Estimated Total Criteria Air Pollutant Construction Emissions) does not include emissions for 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. Since the Project does not include the BAAQMD Best Management Practices for minimizing dust emissions due to Project construction, this impact would be significant. However, implementation of Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures) would reduce this impact on air quality to a less-than-significant level.

Mitigation Measure M-AQ-2a: BAAQMD Basic Construction Measures (All Sites)
The SFPUC shall post one or more publicly visible signs with the telephone number and person to contact at the SFPUC with complaints related to excessive dust or vehicle idling. This person shall respond to complaints and, if necessary, take corrective action within 48 hours. The telephone number and person to contact at the BAAQMD's Compliance and Enforcement Division shall also be provided on the sign(s) in the event that the complainant also wished to contact the applicable air district.

In addition, to limit dust, criteria pollutants, and precursor emissions associated with Project construction, the following BAAQMD-recommended Basic Construction Measures shall be included in all construction contract specifications for the proposed Project:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas and unpaved access roads) shall be watered two times per day;
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered;
- All visible mud or dirt tracked-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping shall be prohibited;
- All vehicle speeds on unpaved areas shall be limited to 15 miles per hour;
- All paving shall be completed as soon as possible after pipeline replacement work is finished;
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations). Clear signage shall be provided for construction workers at all access points; and
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

Mitigation Measure M-AQ-2b: NO_x Reduction during Construction of Alternate Sites
If one to three wells at Sites 1 through 16 are drilled but found to be unusable for any reason, and one to three well facilities are therefore constructed at alternate sites, the SFPUC shall reduce NO_x emissions by 20 percent during construction at the alternate site or 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 of 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 as such become available.

Impact Conclusion: Less than Significant with Mitigation

Impact AQ-3: Project construction would expose sensitive receptors to substantial pollutant concentrations. (Less than Significant with Mitigation)

Construction activities associated with the Project would require the use of heavy-duty diesel vehicles and equipment that emit diesel particulate matter (DPM) as $PM_{2.5}$, which is a TAC identified by the CARB as causing cancer. In addition, the organic gas components of DPM can pose non-cancer hazards. To address such potential health risk impacts, estimated emissions data from the proposed construction activities were input to a dispersion model that computes DPM/$PM_{2.5}$ and organic compound concentrations at receptors. Refer to Section 5.8.3.3 (Summary of Impact Analysis), above and the GSR Air Quality Technical Report for information regarding the methodology for computing both cancer and non-cancer health risks (Illingworth & Rodkin 2012) (Appendix E, [GSR Final Air Quality Technical Report]).

The health risk associated with 19 well facility sites was estimated by calculating risk at groups of well facility sites in close proximity. Some proposed well facility sites are separated sufficiently from other proposed sites such that they would not have additive effects together; whereas the opposite is also true (i.e., the potential effects from some well facility sites would overlap with the effects from other sites). Therefore, those well facility sites that would have 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)
Group 7: Facility Site 13
Group 8: Facility Sites 14 and 15
Group 9: Facility Site 16

MEIs were identified for each geographic group of sites. The MEI for the group with the highest risk is the MEI for the Project as a whole. The MEI with the highest risk and the only one that exceeds a threshold is a single family residence at Group 3, which includes Sites 5, 6, and 7 with the On-site Treatment option.

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 5.8-6 (Project Cancer Risks, Non-cancer Hazard Indices, and $PM_{2.5}$ Concentrations). The results shown in Table 5.8-6 apply to the MEI for each group. Results that exceed the applicable thresholds are highlighted in Table 5.8-6.

TABLE 5.8-6
Project Cancer Risks, Non-cancer Hazard Indices, and $PM_{2.5}$ Concentrations

Site Modeling Group	Lifetime Excess Cancer Risk (per million)	Non-cancer Acute or Chronic Hazard Index[(a)]	$PM_{2.5}$ Concentration ($\mu g/m^3$)
Project Thresholds	10	1.00	0.3
Group 1: Site 1	2.41	0.48	0.02
Group 2: Sites 2, 3, and 4	1.51	0.72	0.02
Group 3: Sites 5, 6, and 7 (Consolidated Treatment at Site 6)	1.31	0.11	0.01
Group 3: Sites 5, 6, and 7 (On-site Treatment)	**10.74**	0.22	0.08
Group 4: Facility Site 8 and Site 17 (Alternate)	1.05	0.18	0.01
Group 5: Facility Sites 9 and 10	5.87	0.33	0.05
Group 5: Sites 9 and 10, and Site 18 (Alternate)	9.55	0.53	0.08
Group 6: Sites 11 and 12, and Site 19 (Alternate)	7.88	0.46	0.07
Group 7: Site 13	1.34	0.14	0.01
Group 8: Sites 14 and 15	3.37	0.54	0.03
Group 9: Site 16	7.60	0.37	0.06

Source: Illingworth & Rodkin 2012

Notes:

(a) Highest of acute or chronic Hazard Index shown

As indicated in Table 5.8-6 (Project Cancer Risks, Non-cancer Hazard Indices, and $PM_{2.5}$ Concentrations) the excess cancer risk at the MEI for each geographic group caused by construction of the Project is estimated to range from 1.05 to 10.74. The highest value is estimated to be 10.74, which would exceed the BAAQMD threshold of 10 in a million, at Group 3 for Sites 5, 6, and 7 for the On-site Treatment option. No other groups would exceed the threshold. Because construction of Group 3 (Sites 5, 6, 7 with On-site Treatment) would have the highest risk, the MEI for Group 3 (Sites 5, 6, 7 with On-site Treatment) would also be the MEI for the Project as a whole. Because the construction of Group 3 (Sites 5, 6, 7 with On-site Treatment) could exceed the BAAQMD threshold, this air quality impact would be *significant*. However, implementation of Mitigation Measure M-AQ-3 (Construction Health Risk Mitigation) would reduce this impact to *less than significant* by requiring the use of equipment that generate fewer emissions of TACs. Construction emissions for Group 3 (with On-site Treatment) were recomputed assuming that all on-site off-road construction equipment that is larger than 50 horsepower for construction of the well facility building at Site 5 would have diesel engines that meet the minimum mitigation requirements. This would reduce $PM_{2.5}$ emissions identified in Table 5.8-6 by greater than 50 percent. As a result, excess cancer risk was recomputed to be less than 5.39 per million for Group 3 (Sites 5, 6, 7 with On-site Treatment) (Illingworth & Rodkin 2012). The resulting cancer risks with mitigation would be below the significance thresholds and would, therefore, be *less than significant*.

As also indicated in Table 5.8-6 (Project Cancer Risks, Non-cancer Hazard Indices, and $PM_{2.5}$ Concentrations), the Hazard Index, which evaluates non-cancer health risks, is estimated to range from

0.11 to 0.72, which would be less than the significance threshold of 1.00. The annual $PM_{2.5}$ concentrations are estimated to range from 0.01 to 0.07 μg/m^3, which would be less than the significance threshold of 0.3 μg/m^3.

> ***Mitigation Measure M-AQ-3: Construction Health Risk Mitigation (Site 5 On-site Treatment)***
> The SFPUC shall require the construction contractor to utilize, during the construction of Site 5 (On-site Treatment), 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.

Impact Conclusion: Less than Significant with Mitigation

Impact AQ-4: Project construction activities would not create objectionable odors affecting a substantial number of people. (Less than Significant)

<u>All Sites</u>

While construction activities may cause localized odors (e.g., diesel operation) on a temporary basis, these are not anticipated to be objectionable beyond the construction boundaries such that they would result in formal odor complaints, given that the activities are intermittent and temporary. Therefore, given that construction of the project would not generate objectionable odors that could affect a substantial number of people this impact would be *less than significant*.

Impact Conclusion: Less than Significant

5.8.3.5 Operational Impacts and Mitigation Measures

Impact AQ-5: Project operations would not violate air quality standards or contribute substantially to an existing air quality violation. (Less than Significant)

<u>All Sites</u>

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 and Hold Periods, 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 Project 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.

In addition, the Project 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. The SFPUC or the Partner Agencies would utilize existing generators and would not acquire new generators for this Project.

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. This level of activity would result in emissions well below the BAAQMD thresholds. The portable generators would only operate during periods of power outages when facility operations are vital. This would be rare and, therefore, the generators would not result in significant air quality impacts. Portable diesel engines are required to meet CARB standards (California Code of Regulations, Section 93116 of Title 17). As a result, Project operation would result in a *less-than-significant* air quality impact because it would not violate air quality standards nor contribute substantially to an existing air quality violation.

Impact Conclusion: Less than Significant

Impact AQ-6: Project operations would not expose sensitive receptors to substantial pollutant concentrations. (Less than Significant)

<u>All Sites</u>

As described under Impact AQ-5, operational pollutant emissions would be quite small, and are therefore not anticipated to cause localized emissions that would lead to significant excess cancer risk, significant acute or chronic hazards or annual $PM_{2.5}$ concentrations. Therefore, such potential air quality impacts attributable to the Project would be *less than significant*.

Impact Conclusion: Less than Significant

Impact AQ-7: Project operations would not create objectionable odors affecting a substantial number of people. (Less than Significant)

<u>All Sites</u>

Operation of the Project would not cause objectionable odors that could affect a substantial number of people, because the Project wells would run on electrical power (no direct emissions) and chemicals used for water treatment would be stored in the well facility buildings. In addition, water treatment facilities are not typically a source of odor complaints and are not listed by BAAQMD as a potential odor source (BAAQMD 2011a). Therefore, since there is no odor potential during operation of the Project, this air quality impact would be *less than significant*.

Impact Conclusion: Less than Significant

5.8.3.6 *Cumulative Air Quality Impacts*

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. (Less than Significant with Mitigation)

The geographic scope for the analysis of potential cumulative air quality impacts is the overall region in which the facilities are being constructed within the San Francisco Bay Area Air Basin. Projects throughout this region could have adverse effects on the same sensitive receptors. Refer to Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis) in Section 5.1, Overview, for the location of the cumulative projects.

Construction-related Criteria Pollutant Emissions

The significance thresholds used to address pollutant emissions associated with project construction represent the levels at which a project's individual emissions of criteria pollutants and precursors would result in a cumulatively considerable contribution to the San Francisco Bay Area Air Basin's existing air quality violations. As indicated in Table 5.8-5 (Estimated Total Criteria Air Pollutant Construction Emissions) above, construction-related criteria pollutant and precursor emissions associated with the Project would exceed the BAAQMD significance threshold for NO_x if all sites, including alternate sites, were constructed. The Project would also generate fugitive dust emissions during construction. Since the Project does not include the BAAQMD Best Management Practices for minimizing dust emissions due to Project construction, this impact would be *significant*. As a result, the Project's contribution to this cumulative impact would be cumulatively considerable (*significant*). However, implementation of Mitigation Measures M-AQ-2a: BAAQMD Basic Construction Measures and M-AQ-2b (NO_x Reduction during Construction of Alternate Sites) would reduce fugitive dust emissions and NO_x emissions to less-than-cumulatively considerable (*less than significant*) levels by requiring measures to minimize dust emissions, and by requiring the construction contractors to use newer equipment or retrofitted equipment that would create fewer emissions of NO_x. Construction emissions of other criteria air pollutants (i.e., ROG, PM_{10} and $PM_{2.5}$) would be below the significance thresholds (see Table 5.8-5). As a result, cumulative air quality impacts would be *less than significant with mitigation*.

Construction-related Health Risks

To address cumulative impacts on sensitive receptors due to TAC emissions during Project construction, potential health risks and hazards were assessed from TAC sources, including the Project, that are located within 1,000 feet of the Project MEI. Cumulative sources were identified using the BAAQMD database and include busy roadways and stationary sources. In addition, Daly City plans to replace or upgrade the existing "A" Street Well (cumulative project C). Construction of the Daly City well project is assumed for the purposes of this analysis to have TAC emissions similar to construction of a GSR production well[2].

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[2] Although included in the analysis in this EIR, the cumulative project C, the Daly City "A" Street Well Replacement Project, was not included in the analysis in the Air Quality Technical Report as the information was made available after completion of the Air Quality Technical Report.

Table 5.8-7 (Cumulative Cancer Risks, Non-cancer Hazard Indices, and $PM_{2.5}$ Concentrations Calculated at the Project MEI), shows the cumulative risk, hazard indices, and annual $PM_{2.5}$ concentrations for construction at the MEI. As discussed above, 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 30.24 in one million, which is below the cumulative significance threshold of 100 in one million. The cumulative Hazard Index for the Project MEI at Group 3 (Sites 5, 6, 7 with On-site Treatment) is predicted to be 0.40, which is below the cumulative significance threshold of 10.0. The cumulative annual $PM_{2.5}$ concentration for the Project MEI at Group 3 (Sites 5, 6, 7 with On-site Treatment) is predicted to be 0.34 μg/m^3, which is below the cumulative significance threshold of 0.8 μg/m^3. The cumulative impacts relative to health risk from construction would, therefore, be *less than significant*.

TABLE 5.8-7
Cumulative Cancer Risks, Non-cancer Hazard Indices, and PM2.5 Concentrations Calculated at Project MEI

Site Modeling Group	Cumulative TAC Source Analyzed	Lifetime Excess Cancer Risk (per million)	Non-cancer Acute or Chronic Hazard Index[(a)]	$PM_{2.5}$ Concentration (μg/m^3)
Cumulative Thresholds		100	10.00	0.8
Project MEI (located at Group 3: Sites 5, 6, and 7 with On-site Treatment)				
Project risk		10.74	0.22	0.08
Cumulative source - roadway	I-280	7.74	0.01	0.13
Cumulative source - roadway	Junipero Serra Blvd.	1.84	0.02	0.05
Cumulative source - roadway	San Pedro Rd.	1.04	0.02	0.05
Cumulative source - roadway	Washington St	0.96	0.02	0.02
Cumulative stationary source[(b)]	Plant G9309	0.29	0.00	0.00
Cumulative stationary source[(b)]	Plant 14102	6.32	0.00	0.00
Cumulative project C (Daly City "A" Street Well Replacement)	Construction	1.31	0.11	0.01
Cumulative risk		30.24	0.40	0.34

Source: Illingworth & Rodkin 2012

Notes:
(a) The acute or chronic hazard index is reported, whichever is higher.
(b) Stationary sources are identified by their BAAQMD Plant ID.

Operations-related Emissions

The significance thresholds applicable to operational emissions represent the levels at which a project's individual emissions of criteria pollutants and precursors would result in a cumulatively considerable contribution to the San Francisco Bay Area Air Basin's existing air quality violations. The proposed Project is anticipated to have very small emissions, because on average, it would generate about one vehicle trip per day and not cause any other routine emissions. As a result, operational emissions would not exceed the significance thresholds, and, therefore, cumulative impacts relative to operational emissions would be *less than significant*.

5.8.4 References

Bay Area Air Quality Management District (BAAQMD). 1999. *BAAQMD CEQA Air Quality Guidelines*.

BAAQMD. 2009. *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*. October.

BAAQMD. 2010a. *Air Toxics NSR Program Health Risk Screening Analysis (HSRA) Guidelines*. January.

BAAQMD. 2010b. *Bay Area 2010 Clean Air Plan*. September.

BAAQMD. 2011a. *California Environmental Quality Act Air Quality Guidelines*. May.

BAAQMD. 2011b. *Recommended Methods for Screening and Modeling Local Risks and Hazards*. May.

BAAQMD. 2012. *Air Quality Standards and Attainment Status*. Website accessed August 1, 2012 at: http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm.

BAAQMD. 2013. *Annual Bay Area Air Quality Summaries (2007-2013)*. Website accessed February 14, 2013 at: http://www.baaqmd.gov/Divisions/Communications-and-Outreach/Air-Quality-in-the-Bay-Area/Air-Quality-Summaries.aspx.

California Air Resources Board (CARB). 1984. *California Surface Wind Climatology*.

CARB. 1998. *Fact Sheet, The Toxic Air Contaminant Identification Process: Toxic Air Contaminant Emissions from Diesel-fueled Engines*. October. Website accessed July 26, 2012 at: http://www.arb.ca.gov/toxics/dieseltac/factsht1.pdf.

California Code of Regulations, Section 2485 of Title 13. *Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling.*

California Code of Regulations, Section 93116 of Title 17. *Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Rated At 50 Horsepower And Greater*.

Illingworth & Rodkin, Inc. (Illingworth & Rodkin). 2012. *GSR Air Quality Technical Report*. August.

San Francisco Department of Public Health. 2008. *Assessment and Mitigation of Air Pollutant Health Effects for Intra Urban Roadways: Guidance for Land Use Planning and Environmental Review*. May.

Western Regional Air Partnership. 2006. *WRAP Fugitive Dust Handbook*. Website accessed July 26, 2012 at: http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf. September.

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5.9 GREENHOUSE GAS EMISSIONS

This section addresses greenhouse gas (GHG) emissions that could result from implementation of the proposed Project. Construction-related and operational GHG emissions are evaluated quantitatively and then compared to the 2011 *CEQA Air Quality Guidelines* of the Bay Area Air Quality Management District (BAAQMD) (BAAQMD 2011). GHGs and their contribution to climate change are a global issue, and this analysis qualitatively assesses the Project's consistency with local and statewide GHG reduction policies.

5.9.1 Setting

5.9.1.1 GHGs and Climate Change

Gases that trap heat in the atmosphere are referred to as GHGs because they capture heat radiated from the sun as it is reflected back into the atmosphere, much like a greenhouse. The accumulation of GHGs has been implicated as the driving force for global climate change. The primary GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and water vapor (H_2O).[1]

While GHGs in the atmosphere are naturally occurring, the emission rate of CO_2, CH_4, and N_2O has been accelerated by human activities. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices and landfills. Other GHGs include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, which are generated during certain industrial processes. GHGs are typically reported in "carbon-dioxide-equivalent" measures (CO_2e).

There is international scientific consensus that human-caused increases in GHGs have and will continue to contribute to climate change. Potential climate change impacts in California may include, but are not limited to: a decrease in snowpack; sea level rise; and a greater number of extreme heat days per year, high ozone days, large forest fires, and drought years. Secondary effects are likely to include impacts on agriculture, changes in disease vectors, and changes in habitat and biodiversity (California Environmental Protection Agency 2006).

5.9.1.2 GHG Emissions Summary

The California Air Resources Board (CARB) estimated that in 2009 California produced about 457 million metric tons of CO_2e (MMT CO_2e). The transportation sector was the highest source at 38 percent of the State's total GHG emissions, followed by electricity generation (both in-state and out-of-state) at 23 percent and industrial sources at 18 percent. Commercial and residential fuel use (primarily for heating) accounted for nine percent of the State's total GHG emissions (CARB 2011).

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[1] Ozone that is not directly emitted, but formed from other gases in the troposphere (the lowest level of the earth's atmosphere), also contributes to the retention of heat.

In the San Francisco Bay Area (Bay Area), fossil fuel consumption in the transportation sector (e.g., on-road motor vehicles, off-highway mobile sources, and aircraft), and the industrial and commercial sectors are the two largest sources of GHG emissions, each accounting for approximately 36 percent of the Bay Area's 95.8 MMT CO_2e emitted in 2007. Electricity generation accounted for approximately 16 percent of the Bay Area's GHG emissions, followed by residential fuel usage at seven percent, off-road equipment at three percent, and agriculture at one percent (BAAQMD 2010a).

5.9.2 Regulatory Framework

5.9.2.1 Federal Regulations

There are no federal regulations or requirements pertaining to GHG emissions that apply to the Project.

5.9.2.2 State Regulations

Global Warming Solutions Act (Assembly Bill 32)

In 2006, the California legislature passed the Global Warming Solutions Act, or Assembly Bill 32 (AB 32) (California Health and Safety Code Division 25.5, Sections 38500 et seq.). AB 32 requires the CARB to design and implement emission limits, regulations, and other feasible and cost effective measures to ensure that statewide GHG emissions will be reduced to 1990 levels by 2020.

California Climate Change Scoping Plan

In December 2008, pursuant to AB 32, the CARB adopted the California Climate Change Scoping Plan, which outlines measures to attain the 2020 GHG reduction limits. To meet these goals, California must reduce its GHG emissions by 30 percent below projected 2020 business-as-usual emissions levels, or about 15 percent from current levels (CARB 2010). The Scoping Plan estimates a reduction of 174 MMT CO_2e (about 191 million U.S. tons) from the transportation, energy, agriculture, forestry, and high global warming potential gas sectors. The CARB has identified an implementation timeline for the GHG reduction strategies in the Scoping Plan (CARB 2011). Some of these measures may require new legislation to implement, some will require subsidies, some already have been developed, and some will require additional effort to evaluate and quantify. Additionally, some emission reduction strategies may require environmental review under CEQA or the National Environmental Policy Act (NEPA).

AB 32 also anticipates that local government actions will result in reduced GHG emissions. The CARB has identified a GHG reduction target of 15 percent from current levels for local governments, noting that successful plan implementation relies on the authority of local governments to plan, zone, approve, and permit land development to accommodate population growth and the changing needs of their jurisdictions.

5.9.2.3 *Local Regulations*

Bay Area Air Quality Management District CEQA Guidelines

The BAAQMD is the primary agency responsible for air quality regulation in the nine-county San Francisco Bay Area Air Basin. As part of its role in air quality regulation, BAAQMD prepared CEQA Air Quality Guidelines to assist lead agencies in evaluating air quality impacts. In May 2011, BAAQMD adopted revised CEQA air quality thresholds of significance and issued revised guidelines superseding the 1999 air quality guidelines. The 2011 *CEQA Air Quality Guidelines* provided CEQA thresholds of significance for operational GHG emissions for the first time. GHG operational thresholds for land use projects are: compliance with a Qualified GHG Reduction Strategy; or 1,100 metric tons (MT) of CO_2 equivalent (CO_2e) per year; or 4.6 MT CO_2e per service population (residents plus employees) per year. No construction thresholds for GHG emissions are provided. The BAAQMD recommends the significance of GHG construction-related emission impacts be determined in relation to meeting AB 32 GHG reduction targets. The BAAQMD further recommends and encourages lead agencies to incorporate best management practices (BMPs) to reduce GHG emissions during construction, as feasible and applicable (BAAQMD 2011).

Based on a decision by the Alameda County Superior Court, these thresholds have been set aside and are no longer in effect. In a ruling dated February 14, 2012, Alameda County Superior Court Judge Frank Roesch found that in adopting updated significance thresholds for air quality impacts, the BAAQMD violated CEQA by not first studying the potential environmental impacts of its new rules, and then required they be rescinded pending compliance with CEQA (California Building Industry Association v. BAAQMD 2012). However, the San Francisco Planning Department has determined that Appendix D of the BAAQMD *CEQA Air Quality Guidelines*, in combination with BAAQMD's Revised Draft Options and Justification Report (BAAQMD 2009), provide substantial evidence to support the BAAQMD recommended thresholds and, therefore, has determined that they are appropriate for use in this CEQA analysis. Therefore, the analysis in this section applies the numeric thresholds of significance from the 2011 *CEQA Air Quality Guidelines* discussed above.

The San Francisco Planning Department submitted to BAAQMD a draft of the City and County of San Francisco's (CCSF) *Strategies to Address Greenhouse Gas Emissions in San Francisco*, which presents a comprehensive assessment of policies, programs, and ordinances that collectively represent San Francisco's Qualified GHG Reduction Strategy (San Francisco Planning Department 2010). The BAAQMD responded stating the strategy met the criteria for a qualified greenhouse gas reduction strategy as described in the District's *CEQA Air Quality Guidelines* (BAAQMD 2010b). However, because the Project is located outside the CCSF's geographic boundaries, the Qualified GHG Reduction Strategy has not been applied to assess the Project's impact on GHG emissions.

San Francisco Greenhouse Gas Reduction Ordinance

In May 2008, the CCSF adopted an ordinance amending the San Francisco Environment Code to: establish GHG emissions targets and departmental action plans; authorize the San Francisco Department of the Environment to coordinate efforts to meet these targets; and make environmental findings. The

Greenhouse Gas Reduction Ordinance establishes the following GHG emissions reduction limits and the target dates by which to achieve them:

- Reduce GHG emissions by 25 percent below 1990 levels by 2017.
- Reduce GHG emissions by 40 percent below 1990 levels by 2025.
- Reduce GHG emissions by 80 percent below 1990 levels by 2050.

The ordinance also directs CCSF departments to prepare climate action plans that assess GHG emissions associated with their activities and with the activities they regulate, as well as to report the results of those assessments to the San Francisco Department of the Environment.

SFPUC Climate Action Plan

In 2009, pursuant to San Francisco's Greenhouse Gas Reduction Ordinance, the San Francisco Public Utilities Commission (SFPUC) presented a departmental climate action plan focused on energy efficiency and renewable energy programs that help to reduce GHG emissions. The total energy savings potential for all SFPUC facilities is estimated to be 11.8 million kilowatt-hours (kWh) of electricity. A number of SFPUC energy efficiency and renewable energy generation projects have already been implemented, with many more in the planning, design, or construction phases (San Francisco Planning Department 2010).

The SFPUC manages and implements energy-efficiency projects in municipal buildings and facilities and provides energy-efficiency services, such as energy audits, and design and construction management. Energy-efficiency technologies are commonly applied to: lighting; heating, ventilation, and air conditioning (HVAC); facility pumps and motors; and electrical controls. As of 2007, the SFPUC estimated that the energy-efficiency improvement projects had resulted in a reduction in CO_2 emissions of approximately 11,000 MT per year (San Francisco Planning Department 2010).

The SFPUC currently operates over two megawatts (MW) of solar electric photovoltaic projects throughout San Francisco that collectively generate over two million kWh of clean renewable electricity annually. A large-scale solar electric photovoltaic project planned for Sunset Reservoir is expected to produce an additional five MW of solar energy. Other potential opportunities for large scale solar projects are being considered for the SFPUC Tesla Portal facility in San Joaquin County, as well as for SFPUC water supply facilities in the Sunol Valley. In addition, the SFPUC has installed wind-monitoring equipment at sites in and around the Bay Area and the Sierra Nevada to evaluate the potential for wind power development (San Francisco Planning Department 2010). SFPUC projects that reduce electrical energy consumption and/or generate renewable energy help to reduce GHG emissions associated with SFPUC facility operations.

San Francisco's Electricity Resource Plan

San Francisco's 2011 Updated Electricity Resource Plan presents the City-wide plan to help San Francisco achieve its goal of generating all of its energy needs from renewable and zero-GHG electric energy sources by 2030 (SFPUC 2011a). The updated plan proposes three broad strategies to reduce GHG emissions from electricity:

- Empower San Francisco citizens and businesses to cost-effectively reduce GHG emissions associated with their own electric energy usage;
- Increase the amount of zero-GHG electricity supplied to the City's customers from the wholesale energy market; and
- Continue and expand the SFPUC electric service to guarantee reliable, reasonably-priced, and environmentally sensitive service to its customers.

San Francisco's 2011 Updated Electricity Resource Plan includes recommendations for implementation of each of these strategies.

5.9.3 Impacts and Mitigation Measures

5.9.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on greenhouse gases if it were to:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

5.9.3.2 Approach to Analysis

The analysis of GHG emissions considers construction-related and operational impacts associated with the Project. Construction is conservatively assumed to occur at all 19 sites, while operation is assumed to occur at 16 sites. Pursuant to Section 15064.4 of the CEQA Guidelines, the significance of the Project's GHG emissions has been determined based on the thresholds of significance as discussed in Section 5.9.2.3 (Local Regulations) above, and on whether the Project's emissions would exceed levels outlined in any applicable GHG reduction plans, policies, or regulations.

The thresholds of significance include a threshold for operational GHG emissions, but none for construction-related GHG emissions (BAAQMD 2011). Therefore, the impact analysis for construction compares the total GHG emissions that would be generated during Project construction to BAAQMD operational significance thresholds. This comparison is shown in two ways: first, comparing the annual construction emissions to the threshold and; second, by averaging construction emissions over the lifespan of the Project. The life of the Project is estimated at 45 years.[2] The operational GHG threshold of significance that applies to the Project is 1,100 MT of CO_2e per year.

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[2] The SFPUC provided an estimate of Project life of 50 years (SFPUC 2012b); a slightly shorter lifetime of 45 years has been used in this analysis to provide a conservative estimate of Project life.

There are two types of GHG emissions that would occur due to construction activities: direct and indirect. Direct GHG emissions are those emissions that occur from implementation of the Project and are directly associated with construction activities. These include the combustion of fossil fuels in mobile equipment, such as off-road construction equipment, on-road haul trucks, and on-road worker vehicles. Indirect GHG emissions are releases from sources that are not directly associated with the Project, such as from the purchase of electricity to operate any electrical equipment for Project construction. The methodology used to evaluate construction-related GHG emissions is summarized below.

Construction-related GHG Emissions Sources

Off-road Construction Equipment

On-site construction period emissions were modeled using the latest version of the California Emissions Estimator Model, or CalEEMod (Version 2011.1.1, July 2012). Construction equipment assumptions in CalEEMod were adjusted to account for the CARB overestimation of emissions, in that the model is based on older load factor assumptions. CARB adjusted construction fleet emissions by reducing the load factors used in their OFFROAD2007 model by 33 percent. Because CalEEMod is also based on the same OFFROAD model, the load factors in the model for this Project were also reduced by 33 percent.

Regarding indirect GHG emissions, although construction sites are expected to be connected to the local electric grid system, construction of the Project would not rely on electricity-powered equipment. Therefore, construction-related GHG emissions are not estimated.

On-road Haul Trucks, Vendors, and Worker Trips

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 CARB. A total of 210 haul truck trips was assumed in the calculations using soil import/export amounts (in cubic yards) and assuming a 20-cubic yard capacity haul truck as indicated in Chapter 3, Project Description, Section 3.5.2 (Construction Area, Site Preparation, Excavation, and Spoil Handling). The emissions from haul truck trips were assumed to be all heavy-duty trucks as classified by CARB EMFAC 2007. 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. Trucks were assumed to idle on-site for 10 minutes. 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 heavy-duty truck trips. Emissions for five minutes of idling were applied to each one-way haul truck for a total of 10 minutes per roundtrip.

Areas of No Project Impact

The Project would not result in impacts related to conflicts with applicable plans and policies related to emissions of greenhouse gases. The following criterion is not discussed further in this section.

Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. The Project would not be in conflict with any adopted GHG reduction plan, policy or regulation. For the purposes of this discussion, the applicable adopted plans are the State Scoping Plan, the San Francisco Greenhouse Gas Reduction Ordinance and the San Francisco Electricity Resource Plan. As noted above, the CCSF's Strategies to Address Greenhouse Gas Emissions are not being applied to assess the Project's GHG emissions impacts because the Project is located outside of the geographical boundaries of the CCSF.

The Project would not conflict with the State strategies or the local government operation reduction goals identified in the Scoping Plan, nor the San Francisco Greenhouse Gas Reduction Ordinance. The SFPUC actively contributes to and facilitates the City's strategy to reduce GHG emissions 10 percent below its 1990 levels by the end of 2012 (SFPUC 2012a). The Greenhouse Gas Reduction Ordinance establishes a reduction target of 25 percent below 1990 levels by 2017. Both these reduction goals are more aggressive than the Scoping Plan recommended reduction goal for local by governments of 15 percent below 2008 levels by 2020. Further, as indicated in Chapter 3, Project Description, Section 3.7 (Greenhouse Gas Reduction Actions), the SFPUC has established GHG reduction actions that would be included in the construction specifications for the Project. The GHG reduction actions would be implemented as part of the Project and include requiring construction contractors to maintain tire pressure in construction vehicles and the SFPUC to consult with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all applicable energy efficiency measures in the project design. This is consistent with the both the tire inflation and green building measures identified in the Scoping Plan and the SFPUC strategies to reduce GHG emissions under the San Francisco Greenhouse Gas Reduction Ordinance.

The Project would not conflict with the San Francisco Electricity Resource Plan. As noted in Section 5.9.1 (Setting), the Plan has three broad strategies for dealing with reducing GHG emissions of residents and businesses: empowering residents and businesses to cost-effectively reduce their own GHG emissions; increasing the zero-GHG electricity supply; and guaranteeing reliable, reasonably priced, and environmentally sensitive service to its customers. The Project would develop groundwater wells and associated facilities, and would not interfere with the SFPUC's ability to implement GHG strategies in the community, purchase or construct zero-GHG electricity supply, or service its customers.

For these reasons, the Project would not conflict with an applicable plan, policy, or regulation adopted to reduce emissions of greenhouse gases.

5.9.3.3 *Summary of Impacts*

Table 5.9-1 (Summary of Impacts – Greenhouse Gas Emissions), provides a summary of potential greenhouse gas impacts from the Project.

TABLE 5.9-1
Summary of Impacts – Greenhouse Gas Emissions

Construction	Operation	Cumulative
Impact GG-1: Project construction would generate GHG emissions, but not at levels that would have a significant impact on the environment.	**Impact GG-2: Project operations would generate GHG emissions, but not at levels that would result in a significant impact on the environment.**	**Impact C-GG: The proposed Project would not result in a cumulatively considerable contribution to GHG emissions.**
LS All Sites	LS All Sites	LS All Sites

Note:
LS = Less than Significant Impact

5.9.3.4 *Construction Impacts and Mitigation Measures*

Impact GG-1: Project construction would generate GHG emissions, but not at levels that would have a significant impact on the environment. (Less than Significant)

All Sites

Project construction activities are estimated to occur for approximately 21 months (June 2014 to February 2016). As shown in Table 5.9-2 (Project Construction GHG Emissions), construction of the Project would emit from 817 to 1,084 MT of CO_2 annually and a total of 1,901 MT of CO_2. Because the BAAQMD CEQA Guidelines do not contain significance thresholds for GHG emissions for construction, this analysis apportions GHG emissions from construction over the lifetime of the Project. The life of the Project is estimated at 45 years. Apportioning the construction emissions over the lifetime of the Project would result in emissions of 42 MT of CO_2 per year.

TABLE 5.9-2
Project Construction GHG Emissions (Sites 1-19 [Alternate] and Westlake Pump Station)

Construction Emission Source	Year 1 CO_2 (Metric Tons)	Year 2 CO_2 (Metric Tons)
Construction equipment	936	706
Haul trucks	71	53
Worker commute	77	58
Total annual construction emissions	**1,084**	**817**
Total construction emissions	**1,901 MT**	
Total construction emissions apportioned over the 45 years of the Project lifetime	**42 MT per year**	

Annual construction emissions, as well as emissions apportioned over the 45 years of the Project life, would result in emissions of approximately 42 MT per year, which is far less than the 1,100-MT per year operational threshold of significance.

In addition, the SFPUC would require construction contractors to implement GHG reduction actions, as noted in Chapter 3, Project Description, Section 3.7 (Greenhouse Gas Reduction Actions). This includes maintaining tire inflation to manufacturers' inflation specifications and implementing a construction worker education program.

Because construction emissions would be far below the operational threshold of 1,100 MT per year (both for each year of construction and apportioned over the life of the Project) and the Project incorporates greenhouse gas reduction strategies, construction-period greenhouse gas emissions would be *less than significant*.

Although no mitigation is necessary to reduce GHG emissions from Project construction, implementation of Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures), as described under Impact AQ-2a in Section 5.8, Air Quality, would also serve to reduce construction-related GHG emissions. Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures) includes idling restrictions specified in Title 13 of the California Code of Regulations, Section 2485.

Impact Conclusion: Less than Significant

5.9.3.5 Operational Impacts and Mitigation Measures

Impact GG-2: Project operations would generate GHG emissions, but not at levels that would result in a significant impact on the environment. (Less than Significant)

All Sites

The Project would use a small amount of fuel for worker trips to perform routine equipment checks at each well facility site. Worker trips are anticipated to be once per week during normal and wet years and daily during dry years when wells are operating (i.e., Take Years). However, these maintenance trips would be made by existing employees in existing SFPUC fleet vehicles, and any increase in GHG emissions would be small.

Indirect operation-related GHG emissions include the use of electricity for operation of the Project well facilities and pump station upgrade, operation of the Partner Agency wells to the extent they operate differently under the Project from their existing operation, and operation of the regional water system to the extent it provides additional surface water to the Partner Agencies during normal and wet years to facilitate the increase in storage of groundwater. As indicated in Appendix I (Calculations for GSR Energy Use Impacts), the collective energy demand of the Project would consist of operation of new well facilities and the Westlake Pump Station (increase of four million kWh), operation of the Partner Agencies' wells (decrease of four million kWh), and operation of the regional water system (no change). Therefore, overall, the change in electricity use as a result of the Project would be negligible. Furthermore, the electricity required to supply the new well facilities would be supplied by the SFPUC Power Enterprise from facilities at Hetch Hetchy. Generation of this electricity does not cause GHG emissions because the power is generated from hydroelectric facilities (SFPUC 2011b).

As explained in Section 5.9.3.2 (Approach to Analysis), and in Impact GG-1 above, construction-period GHG emissions are apportioned over the life of the Project and then compared to the operational threshold of 1,100 MT per year to determine significance. Construction emissions from the Project would be 42 MT per year. Even with the addition of construction-period GHG emissions to the operational GHG emissions, annual GHG emissions would still be less than the operational threshold of 1,100 MT of CO_2e per year (see Table 5.9-2 [Project Construction GHG Emissions]).

In addition, as noted in Chapter 3, Project Description, Section 3.7 (Greenhouse Gas Reduction Actions), WSIP projects that include construction of new buildings would be coordinated with the SFPUC Power Enterprise's Energy Efficiency Group to 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. Projects with building components will attempt to meet or exceed LEED Silver certification as required by the City's Green Building Ordinance.

Therefore, the Project's operational GHG emissions would be *less than significant*.

Impact Conclusion: Less than Significant

5.9.3.6 Cumulative Impacts and Mitigation Measures

Impact C-GG: The proposed Project would not result in a cumulatively considerable contribution to GHG emissions. (Less than Significant)

Because GHG emissions affect global climate change, the evaluation of GHG emissions is inherently a cumulative impact issue. Because it is not feasible to evaluate GHG emissions impacts based on all of the cumulative projects that may affect global climate change, the geographic scope for the analysis of cumulative GHG emission impacts includes the San Francisco Bay Area Air Basin, as well as the State as a whole.

GHG Emissions during Project Construction

As discussed above under Impact GG-1, the BAAQMD has not established a threshold of significance for construction-related GHG emissions. It is estimated that construction activities associated with the GSR Project would generate up to 1,084 MT of CO_2e in the peak 12-month construction period in 2014 and 2015. Total GHG emissions from construction activity of 1,901 MT of CO_2e apportioned over a minimum 45-year lifespan of the Project would be approximately 42 MT of CO_2e per year. Peak-year construction emissions of 1,084 MT of CO_2e would represent approximately 0.0002 percent of total annual GHG emissions for the State and approximately 0.001 percent of total annual GHG emissions for the Bay Area. Thus, while the cumulative impact of regional and statewide GHG emissions is *significant*, the contribution of GHG emission from the Project would be extremely small in terms of both the statewide and Bay Area annual GHG emissions. In addition, construction-related GHG emissions would be temporary in nature and limited to the 21-month construction period. Therefore, the GSR Project's contribution to GHG emissions during construction would not be cumulatively considerable (*less than significant*).

Although no mitigation would be necessary to reduce GHG emissions from Project construction, the SFPUC would implement GHG reduction actions and would divert the majority of construction-related wastes from landfills. Further, implementation of Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures), would also serve to reduce GHG emissions during construction.

GHG Emissions during Project Operations

Given the global nature of climate change, cumulative GHG emissions are considered a significant impact. At the project level, the BAAQMD CEQA Guidelines established 1,100 MT of CO_2e per year as the individual project operational threshold. Because the BAAQMD's threshold of significance for operational GHG emissions represents the level that would not substantially conflict with the goal of reducing statewide GHG emissions – which in turn are aimed at stabilizing global climate change (BAAQMD 2011) – GHG emissions below this threshold are not considered cumulatively considerable.

Operation of the GSR Project would not cause an increase in GHG emissions, because the Partner Agency wells would use less electricity from Pacific Gas and Electric Company (PG&E) over the long-term, and the new GSR wells would use clean electricity from the SFPUC Power Enterprise. Even with the construction emissions apportioned to the first 45 years of Project operation, GHG emissions would not exceed the 1,100 MT per year threshold of significance. Because the GSR Project's operational GHG emissions would be less than the threshold of 1,100 MT of CO_2e, the GSR Project's contribution to cumulative GHG emissions and associated climate change impacts would not be cumulatively considerable (*less than significant*).

5.9.4 References

Bay Area Air Quality Management District (BAAQMD). 2009. *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance.*

BAAQMD. 2010a. *Source Inventory of Bay Area Greenhouse Gas Emissions*. February.

BAAQMD. 2010b. Personal Communication, Jean Roggenkamp, October 28, 2010.

BAAQMD. 2011. *California Environmental Quality Act Air Quality Guidelines*. May.

California Air Resources Board (CARB). 2010. *California's Climate Plan: Fact Sheet*. September 25.

CARB. 2011. *California Greenhouse Gas Inventory for 2000–2009 by Category as Defined in the Scoping Plan*. October 25.

California Building Industry Association v. Bay Area Air Quality Management District. 2012. *Proposed Statement of Decision. Case No. RG10-548693. Superior Court of the State of California in and for the County of Alameda*.

California Environmental Protection Agency. 2006. *Climate Action Team Report*. March.

San Francisco Planning Department. 2010. *Strategies to Address Greenhouse Gas Emissions in San Francisco*. November.

San Francisco Public Utilities Commission (SFPUC). 2011a. *San Francisco's 2011 Updated Electricity Resource Plan, Achieving San Francisco's Vision for Greenhouse Gas Free Electricity*. March.

SFPUC. 2011b. Personal communication, Greg Bartow, December 21, 2011.

SFPUC. 2012a. *Climate Action Plan Annual Report to Mayor's Climate Team*. April.

SFPUC. 2012b. Personal communication, Robin Cort, July 6, 2012.

5.10 WIND AND SHADOW

This section analyzes potential impacts related to wind and shadow that could occur during construction and operation of the Project, as well as the potential for Project implementation to adversely affect existing wind and shadow patterns.

5.10.1 Setting

The Project would be located in northern San Mateo County as shown on Figure 2-1 (Project Vicinity Map), in Chapter 2, Introduction and Background. The study area for potential impacts related to wind and shadow is the individual well facility site and the areas nearby. The Project would be located within the cities of Daly City, South San Francisco, San Bruno, and Millbrae, the Town of Colma, and unincorporated San Mateo County (Broadmoor). These jurisdictions are within the Peninsula climatological subregion, as identified by the Bay Area Air Quality Management District (BAAQMD). Winds on the Peninsula are generally influenced by the Pacific Ocean and the Santa Cruz Mountains. Two physical gaps in the Santa Cruz Mountains are found on the Peninsula; the Project would be located in proximity to the San Bruno Gap. Because this gap is oriented in the same northwest to southeast direction as the prevailing winds, and because the elevations along the gap are less than 200 feet above mean sea level, marine air easily penetrates through to San Francisco Bay. Annual average wind speeds range from five to 10 miles per hour (mph) throughout the Peninsula, with higher wind speeds usually found along the Pacific Coast. Winds on the eastern side of the Peninsula are often higher in certain areas, such as near the San Bruno Gap (BAAQMD 2011). Due to the limited presence of tall buildings (generally higher than 40 feet as defined by the San Francisco Planning Code [San Francisco 1985]) in the study area, natural wind and shadow patterns are largely unaffected by man-made structures.

5.10.2 Regulatory Framework

No federal, State or local regulations governing wind or shadow would apply to the Project. Although City and County of San Francisco (CCSF) regulations govern wind and shadow effects within the boundaries of San Francisco, these local regulations do not apply to the Project because it would be outside the city limits. Nevertheless, an overview of CCSF wind and shadow regulations is provided for informational purposes.

5.10.2.1 Wind

The San Francisco Planning Code establishes wind comfort and wind hazard criteria for use in evaluating new development in four areas of San Francisco: the C-3 Downtown Commercial Districts; the Van Ness Avenue Special Use District; the Folsom–Main Residential/Commercial Special Use District; and the

Downtown Residential District.[1] As the Project would not be located in any of these areas, the wind comfort and wind hazard criteria established in the Planning Code do not apply to the Project.

5.10.2.2 Shadow

San Francisco General Plan

The *Recreation and Open Space Element* of the *San Francisco General Plan* (San Francisco 2009) includes the following policy related to potential solar access or shading impacts:

> *Policy 1.6*: Preserve sunlight in public open spaces

The policy promotes solar access and states that shadows created by new development can critically diminish the utility of public open spaces. It states that properties under the jurisdiction of the Recreation and Park Department or designated for acquisition are protected by the Planning Code, which restricts the issuance of building permits authorizing construction of any structure exceeding 40 feet in height that would shade these properties from between one hour after sunrise to one hour before sunset, unless it is determined that the impact on the use of the space would be insignificant. Policy 1.6 further states that:

> A number of other open spaces designated in this Element or elsewhere in the General Plan are under the jurisdiction of other public agencies, or are privately owned and therefore not protected by the Planning Code amendments. Planning Code protections that limit the shading should be extended to other public open spaces, such as the San Francisco Redevelopment Agency parks and some Bay Area Rapid Transit (BART) plazas, such as the New Montgomery station. The CCSF should conduct a thorough study to assess the extent of these spaces and the feasibility of protecting them during the hours of their most intensive use.

The Project would not be located on San Francisco Recreation and Park Department property or located next to other open spaces in the CCSF. Therefore, this policy does not apply to the Project.

San Francisco Planning Code

Planning Code Section 295, adopted in 1985 pursuant to voter approval of Proposition K (also known as the Sunlight Ordinance), prohibits the issuance of building permits for structures over 40 feet in height that would cast shade or shadow on property under the jurisdiction of, or designated to be acquired by, the Recreation and Park Commission. The statute applies to the time of day beginning one hour after sunrise and ending one hour before sunset at any time of year, unless the Planning Commission

[1]The San Francisco Planning Code provides that any new building or addition located in these areas of the City that would cause wind speeds to exceed the hazard level of 26-mph equivalent for more than one hour of any year must be modified to meet this criterion. (The 26-mph standard, as defined in the Planning Code, accounts for short-term three-minute-averaged wind observations at 36 mph as equivalent to the frequency of an hourly-averaged wind speed of 26 mph. Winds over 34 mph make it difficult for a person to maintain balance and gusts can blow a person over). For CEQA purposes, the San Francisco Planning Department generally refers to the wind hazard criterion to determine the significance of wind effects related to new development in the City.

determines that the shade or shadow would have an insignificant adverse impact on the use of such property (San Francisco 1985).

The Project would be located on the Peninsula, outside of the San Francisco city limits. No parks or open spaces are within the Project or vicinity that are under the jurisdiction of the San Francisco Recreation and Park Department (refer to Section 5.11, Recreation). Therefore, the Project would not be subject to review under Planning Code Section 295.

5.10.3 Impacts and Mitigation Measures

5.10.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on wind and shadow if it were to:

- Alter wind in a manner that substantially affects public areas.
- Create new shadow in a manner that substantially affects outdoor recreation facilities or other public areas.

5.10.3.2 Approach to Analysis

Due to the nature of the Project, no impacts would occur related to the impact criteria listed above for the reasons described below:

Alter Wind in a Manner that Substantially Affects Public Areas. While the Project would include construction of new structures to house well facilities (up to 15.5 feet above finished grade and up to 103 feet long), the size and height of the structures would be similar to, or less than, other buildings in the study area. Due to their smaller height and size, new well facility structures would not alter wind patterns to the degree that they would adversely affect surrounding public areas. Therefore, the criterion related to altering wind in a manner that would substantially affect public areas is not applicable to the Project and is not discussed further.

Create New Shadow in a Manner that Substantially Affects Outdoor Recreation Facilities or Other Public Areas. The proposed Project does not include any features that would substantially affect shadow patterns. Although numerous public areas exist near well facility sites, the low elevation of the proposed new well facility buildings (approximately 15.5 feet above finished grade) at the various well facility sites would not be high enough to result in substantial shadowing that would affect off-site outdoor recreational facilities or the enjoyment or use of other public areas. Therefore, the criterion related to creating new shadow that would substantially affect outdoor recreational facilities or other public areas is not applicable to the proposed Project and is not discussed further.

5.10.3.3 *Construction and Operational Impacts and Mitigation Measures*

As discussed above, implementation of the proposed Project would not result in impacts related to wind and shadow. Therefore, no mitigation measures related to this resource topic are required.

5.10.3.4 *Cumulative Impacts and Mitigation Measures*

Because the GSR Project would not result in Project-specific impacts related to wind or shadow, implementation of the Project would not contribute to any such cumulative impacts.

5.10.4 References

Bay Area Air Quality Management District (BAAQMD). 2011. *California Environmental Quality Act Air Quality Guidelines.* May.

San Francisco, City and County of. 1985. *San Francisco Planning Code Article 2.5: Height and Bulk Districts, Section 295 Height Restrictions on Structures Shadowing Property Under the Jurisdiction of the Recreation and Park Commission.* January.

San Francisco, City and County of. 2009. *San Francisco General Plan, Recreation and Open Space Element.*

5.11 RECREATION

This section provides an overview of the recreational resources in the vicinity of the Project and evaluates the potential impacts of construction and operation on these recreational resources. Recreational resources addressed in this section include parks, trails (i.e., pedestrian and bicycle paths), a golf club, and school athletic fields. This section also evaluates potential effects of GSR Project pumping on the recreational facilities and activities at Lake Merced. Potential impacts on bicycle paths are also addressed in Section 5.6, Transportation and Circulation, from the perspective of bicycle and pedestrian network performance. Impacts on irrigated golf clubs due to changes in the availability of groundwater are evaluated in Section 5.16, Hydrology and Water Quality.

5.11.1 Setting

The proposed Project would be located in northern San Mateo County as shown on Figure 2-1 (Project Vicinity Map) in Chapter 2, Introduction and Background. The study area for potential impacts related to recreation includes the individual facility sites and areas nearby. The study area also includes Lake Merced and the facilities used for lake-based activities, as well as upland recreational areas such as trails and picnic tables surrounding the lake. Lake Merced is included in the study area because GSR pumping could alter lake levels and result in changes to recreational resources at and surrounding the lake. Well facilities would be constructed and operated as part of the Project at locations in the cities of Daly City, South San Francisco, San Bruno, and Millbrae, the Town of Colma, and unincorporated San Mateo County. Table 5.11-1 (Recreational Resources near GSR Facility Sites) lists the recreational resources located at or near the well facility sites.

TABLE 5.11-1
Recreational Resources near GSR Facility Sites

Jurisdiction	Recreational Resource	Proximity to Project Facility Sites[a]
City of San Francisco	Lake Merced (see Figure 5.11-1)	Site 1 would be located approximately one mile southeast of Lake Merced.
Daly City	Lake Merced Golf Club (see Figures 3-11, 3-12, and 5.11-1)	Site 1 would be located in the northeast portion of the golf club property approximately 50 feet northeast of playing surfaces.
		Site 2 would be approximately 60 feet west of playing surfaces.
		Site 3 would be approximately 525 feet west of playing surfaces. Pipelines would be installed within 275 feet of playing surfaces.
		Site 4 would be approximately 450 feet south of playing surfaces. Pipelines would be installed within 65 feet of playing surfaces.

TABLE 5.11-1
Recreational Resources near GSR Facility Sites

Jurisdiction	Recreational Resource	Proximity to Project Facility Sites[a]
Broadmoor, in unincorporated San Mateo County	Ben Franklin Intermediate School (see Figures 3-12, 3-13, and 5-11.1)	Site 2 would be located approximately 60 feet away from the athletic field, across Park Plaza Drive.
		Site 3 would be located at the southeast corner of the school's athletic field. Pipelines would be located underneath the field and running track.
		Site 4 would be located approximately 100 feet southeast of the school's athletic field, across Park Plaza Drive; the well facility would be approximately 220 feet from the field. A pipeline would be located approximately 60 feet from the field across Park Plaza Drive.
		Westlake Pump Station is adjacent to the school's secondary athletic field.
	Garden Village Elementary School (see Figures 3-12, 3-13, and Figure 5.11-1)	Site 2 would be approximately 30 feet north of the school's athletic field; the well facility would be 125 feet away from the field.
		Site 3 would be approximately 330 feet west of the school's athletic field, across Park Plaza Drive.
		Site 4 well facility would be adjacent to the school's athletic field, and pipelines would run along the western edge of the field.
South San Francisco	South San Francisco Centennial Way Trail (See Figures 3-27, 3-28, 3-31, 3-32, and 5.11-2)	Site 11 would be approximately 75 feet west of the trail. The well facility would be approximately 230 feet west of the trail.
		Site 13 would be approximately 50 feet west of the trail. The well facility would be approximately 70 feet west of the trail.
	Francisco Terrace Playlot (See Figures 3-31, 3-32, and 5.11-2)	Site 13 would be approximately 50 feet southeast of the park, across South Spruce Avenue. The well facility would be approximately 160 feet west of the park.

Notes:

(a) Distances were measured in GIS from the edge of the construction area boundary to the boundary of the recreational resource (e.g., athletic field, trail, etc.).

5.11.1.1 Description of Recreational Resources

Recreational resources are illustrated on Figures 5.11-1 (Recreational Resources (North]) and 5.11-2 (Recreational Resources [South]).

City of San Francisco

Lake Merced is a 300-acre freshwater lake within a larger 614-acre Lake Merced area tract in southwest San Francisco. The lake and surrounding open space area are under the jurisdiction of the SFPUC, but managed by the San Francisco Recreation and Parks Department (SFRPD). Lake Merced is composed of four individual, but connected, water bodies (North Lake, South Lake, East Lake, and Impound Lake) and is located approximately one mile northwest of GSR Site 1, as shown on Figure 5.11-1 (Recreational Resources [North]). Lake Merced discharges to the Vista Grande Drainage Canal at a spillway located near the midpoint of the southwest bank of South Lake; this spillway limits the level of the lake to no more than 13 feet City Datum[1].

Lake Merced supports numerous recreational activities, including boating, fishing, bird and nature watching, picnicking, trail activities, and bicycling. Several special events are hosted at the lake annually, including competitive boating races (e.g., dragon boating), and walks around the perimeter of the lake. Competitive and public leisure boating occurs at North Lake and South Lake (SFPUC 2011).

Fishing primarily occurs from the lake shorelines and fishing piers, and occasionally from boats; Lake Merced has four fishing piers – two on North Lake and two on South Lake (SFPUC 2011). The Lake Merced trail system consists of the paved perimeter trail and a series of unpaved nature trails that extend from the perimeter trail down to, or along, the shoreline of all four individual lakes. Lake Merced is not widely used for picnicking; however, limited picnic facilities are available near North Lake, South Lake, and Impound Lakes (SFPUC 2011). Beach access points are located adjacent to the picnicking areas on the North Lake, South Lake, and Impound Lake.

City of Daly City

The Lake Merced Golf Club is an 18-hole, private golf club located in northwest Daly City. Site 1 would be located within the northeast corner of this golf club. Sites 2, 3, and 4 would be located between 60 feet and 525 feet from the southwest corner of the golf club property, as shown on Figure 3-12 in Chapter 3, Project Description.

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[1] City Datum is a measurement system that has been used at Lake Merced since at least 1926 and is used throughout this document for Lake Merced water levels. The City Datum does not represent the depth of the lake. An elevation of 0 feet City Datum is equal to 11.37 feet above mean sea level (NAVD 88) and 8.57 NGVD 29. Since mean sea level is equivalent to 0 feet NGVD 29, a lake level of -8.57 City Datum is equal to mean sea level, and negative lake elevations above this level are not below mean sea level.

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Legend

- Proposed Well
- Existing Test Well
- Westlake Pump Station
- Recreational Resources in the Project Area

0 500 1,000 2,000

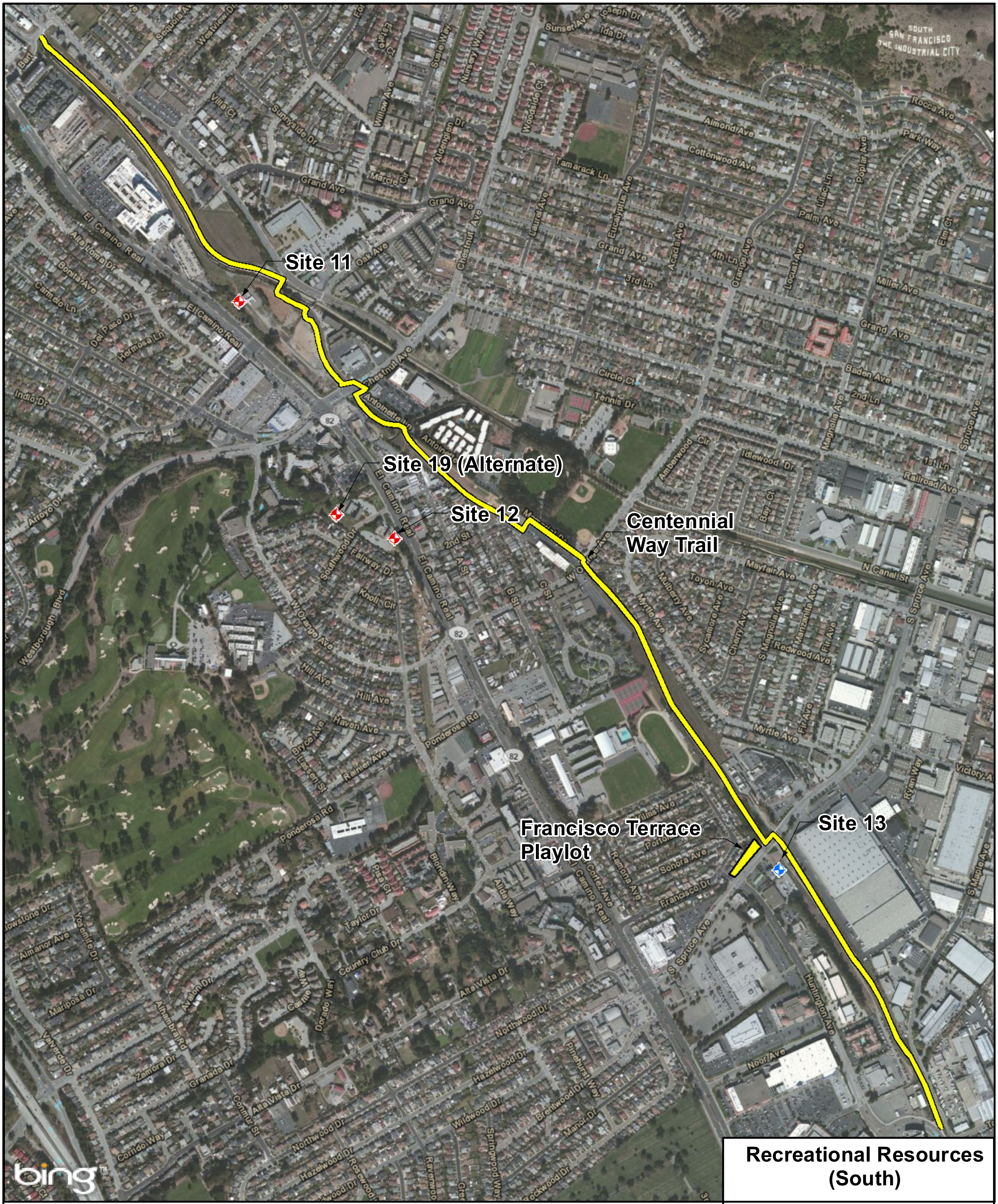
Scale Feet

1 " = 2,000 '

Recreational Resources (North)

Regional Groundwater Storage and Recovery Project

Figure 5.11-1



Recreational Resources (South)

Legend

- Proposed Well
- Existing Test Well
- Recreational Resources in the Project Area

0 500 1,000
Scale Feet
1" = 1,000'

N

Regional Groundwater Storage and Recovery Project

Figure 5.11-2

Broadmoor (Unincorporated San Mateo County)

Garden Village Elementary School and Ben Franklin Intermediate School are located in the northern section of Broadmoor, south of the Lake Merced Golf Club. Both schools have athletic fields that are used both for school and non-school recreational activities.

Garden Village Elementary School athletic field is about three acres in area and is located along the east side of Park Plaza Drive. The construction area for Sites 2 and 4 would be located adjacent to the school's athletic field, with a pipeline route traversing the southern edge of the field. The construction area of Site 3 would be located across Park Plaza Drive from the field.

The Ben Franklin Intermediate School athletic field is also about three acres in area and is located along the west side of Park Plaza Drive. The school's athletic fields can host a variety of recreational activities including softball, baseball, soccer, and track and field. The construction area of Site 3 would be within the school's athletic field. The construction area of Sites 2 and 4 would be across Park Plaza Drive from the field.

City of South San Francisco

The City of South San Francisco's Centennial Way Trail connects the South San Francisco Bay Area Rapid Transit (BART) station to the San Bruno BART station mostly along the BART right-of-way. The trail is a linear park that is also classified as a Class I bicycle and pedestrian path[2], together with several plazas, interpretive panels, benches, and a dog run. The construction area for Site 11 would be located approximately 75 to 230 feet west of the trail, as it passes the site. The construction area for Site 13 would be located about one mile south of Site 11 and approximately 50 feet west of the trail and a small plaza with interpretive panels.

Francisco Terrace Playlot is located on the western side of South Spruce Avenue, between Terrace Drive and Centennial Way Trail. The playlot has a basketball court and a play area with a play structure and other play equipment. The construction area for Site 13 would be located approximately 50 feet southeast of the playlot, across South Spruce Avenue.

5.11.2 Regulatory Framework

5.11.2.1 Federal

No federal regulations regarding recreation are applicable to the Project.

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[2] Class I bicycle facilities are exclusive rights-of-way that are physically separated from motorists (South San Francisco 1999).

5.11.2.2 State

The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan), prepared by the San Francisco Bay Regional Water Quality Control Board (RWQCB), identifies the beneficial uses of surface waters and groundwater within its region (RWQCB 2011). The RWQCB is responsible for protecting the beneficial uses of San Francisco Bay Area water resources, including Lake Merced. The Basin Plan was last revised on December 31, 2011 (RWQCB 2011). Existing beneficial uses of Lake Merced relevant to recreation identified in the Basin Plan include commercial sport and fishing, body contact recreation (e.g., swimming, wading, and fishing), and non-contact recreation (e.g., rowing). However, due to the Lake's function as an emergency water source for San Francisco (see Section 5.17, Hazards and Hazardous Materials), swimming is not permitted in Lake Merced (SFPUC 2011).

5.11.2.3 Local

Daly City General Plan

The Daly City General Plan Noise Element (Daly City 1989) specifies policies related to operational-related noise levels that are specifically applicable to golf clubs. Policy 1.2 requires use of the State Office of Noise Control Guidelines to assess development. The acceptable noise levels near golf clubs are a Community Noise Equivalent Level (CNEL) of 75 dBA (equivalent to approximately 68 dBA L_{eq}) (Daly City 1989) (see Section 5.7, Noise and Vibration for a definition of terms and further analysis of noise impacts).

Western Shoreline Area Plan

The Western Shoreline Area Plan, which is part of the San Francisco General Plan, is the City and County of San Francisco's (CCSF's) plan for the Local Coastal Zone established by the California Coastal Commission (San Francisco 1988). Policies related to Lake Merced include preserving recreational facilities, passive activities, playgrounds, and vistas of the Lake Merced area; maintaining a recreational pathway around the lake for multiple use; and only allowing activities that will not adversely affect the lake's water quality as a standby reservoir for emergency use.

Significant Natural Resource Areas Management Plan

The SFRPD is currently completing a Significant Natural Resource Areas Management Plan (SNRAMP) for designated significant natural areas in the CCSF. The purpose of the management plan is to establish a maintenance and preservation program related to the protection and enhancement of natural resource values. The SNRAMP itself has not been finalized and adopted; however, the process of developing the SNRAMP began in 1995, with the preparation of a staff report on the SNRAMP. The staff report set forth general objectives, policies, and management actions to guide development of the SNRAMP and the protection and enhancement of natural areas under CCSF's jurisdiction. General policies and management actions presented in the staff report relevant to recreational resources at Lake Merced include: developing nature programs to promote educational and recreational value of resources; and developing guidelines for pathways and interpretive trails/signs (SFRPD 1995).

5.11.3 Impacts and Mitigation Measures

5.11.3.1 Significance Criteria

For purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant impact on recreation if it were to:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated.
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.
- Physically degrade existing recreational resources.

5.11.3.2 Approach to Analysis

This analysis assesses recreation impacts associated with the implementation of the proposed Project. Local planning documents, site visits, and maps were reviewed to identify the recreational resources in the Project area that, because of their proximity, could be affected by the proposed Project. Additionally, groundwater modeling was used to model Lake Merced water levels and surface area both under existing conditions and with the GSR Project and, under cumulative conditions, to determine potential impacts to recreational resources resulting from changing water levels. The approach to analysis for impacts to recreation at Lake Merced is described in detail below, under "Potential Effects at Lake Merced".

The significance criteria listed above were then used to assess potential impacts on each recreational resource in the study area, including direct impacts on recreational facilities during Project construction, including pipelines. With regard to the last criterion, the analysis considers that physical degradation of existing resources could occur if the Project were to:

- Remove or damage existing recreational resources directly;
- Disrupt access to existing recreation facilities; or
- Cause environmental impacts that would result in deterioration of the quality of the recreational experience.

To determine the potential for construction activities to cause an effect on recreation, the proposed construction areas were compared to locations of identified recreational resources and facilities. In addition, impact findings in other relevant sections of the EIR were reviewed for relevance to recreational resources. The impact findings of Section 5.2, Land Use; 5.3, Aesthetics; 5.6, Transportation and Circulation; 5.7, Noise and Vibration; and 5.8, Air Quality were reviewed to determine potential air quality effects from construction-related dust and construction equipment exhaust; noise effects from the operation of construction equipment and permanent well facilities; visual effects from the presence of construction equipment and staging and permanent operation of well facilities; and traffic effects from construction-related roadway detours and/or closures. To determine the potential effect of operation and maintenance of the proposed Project on Lake Merced, impact findings from Section 5.16, Hydrology and Water Quality were reviewed, as described below.

Potential Effects at Lake Merced

Impacts on recreation would be significant if groundwater pumping were to result in physical deterioration of recreational facilities or resources at Lake Merced, which is hydraulically connected to the underlying groundwater basin. As described in Section 5.1, Overview, Section 5.1.6 (Groundwater Modeling Overview), groundwater level changes were modeled to project groundwater levels and other parameters for three scenarios: modeled existing conditions, conditions with the proposed GSR Project, and the cumulative conditions. For each scenario, groundwater conditions were modeled for a 47-year hydrologic sequence based upon historical hydrologic years (1958 to 2005) using the pumping assumptions listed in Table 5.1-2 (Model Input – Pumping Assumptions for Modeling Scenarios). As also discussed in Section 5.1.6 (Groundwater Modeling Overview), the groundwater modeling was supplemented by lake level modeling for Lake Merced for the same period.

To determine the potential for impacts on recreation at Lake Merced, the fluctuation of lake water levels, estimated over the 47-year modeling period, was incorporated into a geographic information system (GIS), along with lake topography, bathymetry, and slope. A GIS-based analysis was then conducted to estimate lake depth and surface area for: 1) the monthly minimum water levels for the modeled existing conditions, Project conditions, and cumulative conditions, and 2) the monthly maximum water levels for the modeled existing conditions, Project conditions, and cumulative conditions. The minimum and maximum water levels were evaluated to show the range of impacts that could occur from the Project. These conditions represent the extremes and are meant to illustrate the range of potential impacts. Therefore, mean monthly water levels are also provided in Table 5.11-4 (Lake Merced Acreage and Depth under Modeled Existing Conditions and Project Conditions) to provide context. The GIS-based analysis estimated lake depth and surface area for monthly minimum and maximum water levels to determine whether the lake itself, which is a recreational resource, would be physically degraded; or, whether nearby recreational resources and facilities, such as docks, trails and picnic areas, would be physically degraded as a result of Project operations.

As discussed in Section 5.1.6 (Groundwater Modeling Overview), under pumping conditions with the Project, hydrologic parameters such as temperature and rainfall would not occur exactly as modeled, and the response to pumping would depend on actual hydrological conditions taking place at that time and in the not-too-distant past. In addition, at water levels of approximately 5 feet City Datum and above, all of the individual lakes are hydraulically connected. At water levels of approximately 5 feet City Datum and below, the individual lakes are hydrologically independent, in which case lake levels tend to decrease progressively from north to south; i.e., North and East lakes would have higher levels than South Lake, and South Lake would be higher than Impound Lake (Kennedy/Jenks 2012a). The GIS-based analysis cannot determine this level of detail because sufficient information about the comparative rate of decline between the lakes is not available. Hence, the GIS-based analysis applies one constant rate of decline across all of the lakes, and the modeled lake levels should be considered representative of relative changes in lake levels in response to groundwater pumping.

Areas of No Project Impact

Due to the nature of the proposed Project (potable water infrastructure), there would be no impacts related to increased use of recreational facilities or the construction or expansion of recreational facilities, as this type of project does not create additional demand for or cause additional use of such facilities. These criteria are not discussed further in this section for the following reasons:

Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated. The Project would not increase the use of existing recreational facilities. The Project is a groundwater storage and recovery system that would not, independently and separately from its contribution as part of the overall Water System Improvement Program (WSIP), deliver any additional amounts of water or generate new residential or employee population (discussed further in Chapter 6, Other CEQA Issues, Section 6.1 [Growth Inducement]) beyond that analyzed for the WSIP in the WSIP Program Environmental Impact Report (PEIR). Because the Project would not increase the existing population or housing supply of the Project area over and above its contribution to the WSIP, no increased use of parks and other recreational resources would occur at a Project-specific level that would result in physical deterioration or accelerated deterioration of existing recreational resources.

Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment. The Project does not propose any recreational facilities and would not require construction or expansion of recreational resources that might have an adverse physical effect on the environment.

Impair access to recreational resources near the facility sites during operation of the Project. Operation of the facility sites would not cause long-term access conflicts with established recreational facilities, because the Project would not permanently close roadways or otherwise change access to recreational resources. Lake Merced impacts are discussed separately under Impact RE-6.

Remove or damage recreational resources, or deteriorate the quality of the recreational experience at Lake Merced during construction. The GSR Project does not include any construction activities at or near Lake Merced. Therefore there would be no impact to Lake Merced from Project construction.

5.11.3.3 Summary of Impacts

Tables 5.11-2 and 5.11-3 provide summaries of potential recreational impacts from the Project. Table 5.11-2 (Summary of Impacts on Recreational Resources) provides a summary of construction and operational impacts on recreational resources near the facility sites. Table 5.11-3 (Summary of Impacts on Recreational Resources at Lake Merced) provides a summary of Project operational impacts on Lake Merced. Lake Merced impacts are presented in a separate table since these impacts are related to the proposed Project as a whole and not associated with an individual proposed well facility site or group of sites.

TABLE 5.11-2
Summary of Impacts on Recreational Resources

	Construction			Operations		Cumulative
Sites	**Impact RE-1: The Project would not remove or damage existing recreational resources during construction.**	**Impact RE-2: The Project would deteriorate the quality of the recreational experience during construction.**	**Impact RE-3: The Project would not impair access to recreational resources during construction.**	**Impact RE-4: The Project would not damage recreational resources during operation.**	**Impact RE-5: The Project would not deteriorate the quality of the recreational experience during operation.**	**Impact C-RE-1: Construction and operation of the proposed Project would not result in significant cumulative impacts on recreational resources.**
Site 1	LS	LSM	NI	NI	LS	NI
Site 2	NI	LSM	LS	NI	NI	NI
Site 3	LS	LS	LS	LS	LS	NI
Site 4	LS	LSM	LS	NI	NI	NI
Westlake Pump Station	NI	NI	NI	NI	NI	NI
Site 5 (Consolidated Treatment and On-site options)	NI	NI	NI	NI	NI	NI
Site 6	NI	NI	NI	NI	NI	NI
Site 7 (Consolidated Treatment and On-site options)	NI	NI	NI	NI	NI	NI
Site 8	NI	NI	NI	NI	NI	NI
Site 9	NI	NI	NI	NI	NI	NI
Site 10	NI	NI	NI	NI	NI	NI
Site 11	NI	LS	LS	NI	LS	LS

TABLE 5.11-2
Summary of Impacts on Recreational Resources

	Construction			Operations		Cumulative
Sites	**Impact RE-1: The Project would not remove or damage existing recreational resources during construction.**	**Impact RE-2: The Project would deteriorate the quality of the recreational experience during construction.**	**Impact RE-3: The Project would not impair access to recreational resources during construction.**	**Impact RE-4: The Project would not damage recreational resources during operation.**	**Impact RE-5: The Project would not deteriorate the quality of the recreational experience during operation.**	**Impact C-RE-1: Construction and operation of the proposed Project would not result in significant cumulative impacts on recreational resources.**
Site 12	NI	NI	NI	NI	NI	NI
Site 13	NI	LS	LS	NI	LS	LS
Site 14	NI	NI	NI	NI	NI	NI
Site 15	NI	NI	NI	NI	NI	NI
Site 16	NI	NI	NI	NI	NI	NI
Site 17 (Alternate)	NI	NI	NI	NI	NI	NI
Site 18 (Alternate)	NI	NI	NI	NI	NI	NI
Site 19 (Alternate)	NI	NI	NI	NI	NI	NI

Notes:

NI = No Impact

LS = Less than Significant Impact

LSM = Less than Significant with Mitigation

TABLE 5.11-3
Summary of Impacts on Recreational Resources at Lake Merced

Impact	Significance Level
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
Impact C-RE-2: Operation of the Project would not result in significant cumulative impacts on recreational resources at Lake Merced.	LS

Notes:

LS = Less than Significant Impact

5.11.3.4 Construction Impacts and Mitigation Measures

Impact RE-1: The Project would not remove or damage existing recreational resources during construction. (Less than Significant)

Temporary impacts on established recreational facilities and resources could result if construction activities were to overlap geographically with existing recreational resources. The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 2, 5 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

Project construction activities at these sites would not remove or damage recreational resources, because none of the construction areas for these facility sites contain recreational resources. Therefore, *no impact* on recreational resources in terms of their damage or removal during construction would occur.

Impact Conclusion: No Impact

<u>Sites 1, 3, and 4</u>

Site 1

Site 1 would be located within the Lake Merced Golf Club (see Figure 3-11 in Chapter 3, Project Description and Figure 5.11-1). The construction area would be located within the northeast portion of the golf club property, approximately 50 feet away from playing surfaces (i.e., fairway and green) at Hole #4. The site would be located on land that is not within the area of play and that does not provide access to other playing areas at the course. An existing restroom within the construction area is proposed to be demolished during construction activities. The SFPUC would financially compensate the golf club for the loss of the restroom (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]). Additionally, demolition of the restroom and construction of the well facility would not substantially damage this recreational resource, and the impact on the environment would therefore be *less than significant*, given that the remainder of this facility would remain unaffected.

Site 3

Site 3 would be located within the Ben Franklin Intermediate School athletic field on the eastern portion of the campus as shown on Figure 3-12 in Chapter 3, Project Description and on Figure 5.11-1. The well facility would be located behind a baseball backstop and the pipelines would be located within the athletic field and along the running track. Construction access to the well facility site would be along a path on the north edge of the field and along the track on the west edge of the field. Construction at Site 3, which would include well drilling, construction of a fenced enclosure, and pipeline installation, would occur during two three-month summer construction seasons. Therefore, when the neighboring schools are not in session, the entire athletic field would be closed and inaccessible to recreationists. As described in Chapter 3, Project Description, Section 3.4.3 (Facility Sites), the SFPUC would notify the Jefferson Elementary School District (School District) of construction activities in advance to enable the School District to relocate recreational activities to nearby recreational resources during construction (Jefferson Elementary School District 2013). Several similar athletic fields exist less than one mile from Site 3 (e.g., Westlake Park, Westmoor High School, and Marjorie Tobias, Pauline Brown, and Westlake elementary schools). Therefore, because the SFPUC would notify the School District of construction activities, and because this analysis presumes that recreation activities could be temporarily relocated to other nearby athletic fields, impacts on the environment due to the temporary closure of the athletic field would be *less than significant*. However, if the five locations within one mile of Site 3 cannot fully accommodate the temporary displacement of recreational activities from the Ben Franklin Intermediate School athletic field over two summers when there would be construction at Site 3, the resulting impact on this recreational resource would still be *less than significant*, given the number of other similar recreational resources in the vicinity beyond one mile from Site 3 to which such recreational activities could be temporarily relocated until the area around Site 3 is restored and the field becomes useable .

As described in Chapter 3, Project Description, Section 3.4.3 (Facility Sites), at the end of the first construction season, the SFPUC would restore the site to at least its general pre-existing conditions for school use during the intervening school year (approximately nine months). Restoration would involve replacing turf immediately following completion of the pipeline installation in the center of the field, and replacing the backstop and repaving and restriping the track and generally restoring the construction area to a clean and safe condition. Therefore, because the athletic field would be restored to a clean and safe condition in between construction seasons and after construction is complete, the temporary construction-related impact on the environment would be *less than significant.*

Site 4

Site 4 would be located on and adjacent to the athletic field at Garden Village Elementary School (see Figure 3-12 in Chapter 3, Project Description and Figure 5.11-1). The fenced enclosure for the well facility would be located at the top of a small slope about 20 feet in elevation overlooking the school's athletic field; well drilling and construction would occur at this location over a period of six months (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). The construction area includes both the top of the slope and a small portion of the athletic field (about 2,500 square feet out of approximately 132,000 square feet [three acres]) including a backstop; this portion of the athletic field, including the backstop, would be closed to recreational use for approximately six months. The water connection pipeline installation would occur within the edge of the athletic field along Park Plaza Drive. The width of the pipeline construction area within the athletic field would range from 12 to 18 feet; this portion of the athletic field would be closed to recreational use for a period of approximately six to eight weeks. As proposed, Project pipelines would be installed at a rate of 300 to 600 feet of pipeline per week; therefore, construction of this pipeline across the athletic field would take approximately one to two weeks to complete (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). The turf would be restored to its general pre-construction condition following construction (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]), and recreational use could resume in the restored area approximately three weeks after restoration activities occur. The existing baseball backstop would be temporarily relocated during construction and returned to its original location after construction is complete (see Chapter 3, Project Description, Section [3.4.3 Facility Sites]). Although construction would occur during the school year, the athletic field is large enough so that recreational use could continue in the portion of the field unaffected by construction, and therefore, the temporary construction-related impact on the environment would be *less than significant.*

Impact Conclusion: Less than Significant

Impact RE-2: The Project would deteriorate the quality of the recreational experience during construction. (Less than Significant with Mitigation)

Temporary impacts on established recreational facilities and resources could result if construction activities were to deteriorate the quality of the recreational experience through visual disruption, construction-related noise, or dust/exhaust emissions at or in proximity to recreational resources during times when they are being utilized. The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

<u>Sites 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

These sites would not be located near an existing recreational resource, except for the Westlake Pump Station. The Westlake Pump Station upgrade would be located on a parcel that is adjacent to an athletic field at the Ben Franklin Intermediate School, but facility upgrades at the Westlake Pump Station would be within the existing buildings at this site, and no ground-disturbing construction would occur. Therefore, because these facility sites are not located near an existing recreational resource, and construction at the Westlake Pump Station would occur inside existing buildings, Project construction activities would not affect the quality of the recreational experience at these sites. As a result, *no impact* on recreational resources, in terms of a potential deterioration of the quality of recreational experience, would occur.

Impact Conclusion: No Impact

<u>Sites 3, 11, and 13</u>

Site 3

Site 3 would be located approximately 600 feet from the Lake Merced Golf Club playing surfaces, across Park Plaza Drive (see Figure 3-12 in Chapter 3, Project Description). However, Site 3 pipeline installation would occur approximately 275 feet west of the Lake Merced Golf Club playing surface. Construction activities would occur during two three-month summer periods and would cause a minor increase in noise levels and dust/exhaust emissions in the vicinity of the playing surfaces (see Impact NO-3 in Section 5.7, Noise and Impact AQ-3 in Section 5.8, Air Quality). The golf course playing surface is about 20 feet in elevation higher than the proposed well facility site, and the area between the well facility site and the golf course includes a roadway, and a large number of trees and shrubs that provide substantial screening between the well facility site and the golf course playing surface. The vegetation and difference in elevation would limit recreationists' exposure to temporary dust/exhaust emissions, and noise from construction activities at the site. The site is not visible to recreationists at the golf club (see Section 5.3.1.3 [Individual Project Well Facility Sites]). Therefore, construction at Site 3 would not substantially deteriorate the quality of recreational experience at the golf club and the impact would be *less than significant*.

Site 3 would be located on the Ben Franklin Intermediate School athletic field. Project construction at Site 3 would not impact the quality of recreational experience at the athletic field, because no construction activities would occur during the school year; therefore, recreationists would not be exposed to construction-related visual, noise, or dust impacts and *no impact* would occur. During the athletic field closure, recreational activities could be relocated to other similar athletic fields in the area. However, this would not substantially deteriorate the quality of the recreational experience at other athletic fields, because there are a number of other similar recreational resources in the vicinity of Site 3 that could accommodate the relocated recreational activities. The School District develops the schedule for District school recreational facilities in August of each year (Jefferson Elementary School District 2013). As stated in Chapter 3, Project Description, Section 3.4.3 (Facility Sites) the School District would be notified a minimum of nine months prior to construction at Site 3, which would allow for the School District to plan for field closure. As a result, impacts to recreationists related to the Ben Franklin Intermediate School athletic field closure would be *less than significant*.

Site 3 would be located approximately 330 feet west of the Garden Village Elementary School athletic field. The well facility fenced enclosure at Site 3 would be separated from the athletic field by Park Plaza Drive and, partially, by a vegetated hillside topped by a single-family residence. Site 3 construction activities would be visible from some portions of the Garden Village athletic field and would also cause a minor increase in noise and dust/exhaust emissions at the athletic field (see Impact NO-3 in Section 5.7, Noise and Vibration and Impact AQ-3 in Section 5.8, Air Quality). In general, the recreational uses of the athletic field are sports-related and active and, therefore presumed by this analysis to not be overly sensitive to noise or visual disruption. Additionally, the intervening distance, trees, and hillside would prevent the exposure of recreationists to substantial temporary construction-related dust, exhaust, and noise generated at Site 3. As a result, impacts from Site 3 construction on the quality of recreational experience at the Garden Village Elementary School athletic field would be *less than significant*.

Also, noise and air quality mitigation measures would be implemented during construction of Site 3 to mitigate construction-related noise, dust, and exhaust impacts on nearby sensitive receptors such as single-family residences and school buildings. Implementation of these mitigation measures would also reduce noise levels and dust/exhaust emissions at the school athletic fields and golf club that are adjacent to this site (see mitigation measures in Impact NO-1 in Section 5.7, Noise and Vibration and Impact AQ-2 in Section 5.8, Air Quality).

Site 11

Site 11 would be located from 75 to 230 feet west of the South San Francisco Centennial Way Trail as it passes by the site (see Figures 3-27 and 3-28 in Chapter 3, Project Description and Figure 5.11-2). Pedestrians and bicyclists use the trail, which – by its nature – is primarily intended for non-stationary activities. Well drilling and construction of the well facility building would be located behind the BART ventilation structure and last for approximately 16 months (see Chapter 3, Project Description Section 3.5.1 [Construction Sequencing and Schedule]). Pipeline construction would approach within 75 feet of the trail and occur over approximately three to five weeks (including both pipeline installation and restoration of the surface). Construction-related impacts on the quality of the recreational experience for those who use the portion of the trail nearest to Site 11 would be limited to an approximately 800-foot stretch. Visual effects of construction on trail users would be minor, because the area already contains infrastructure associated with the BART system (which would presumably lower expectations for the quality of the recreational experience at this location) and most of the construction would be visually blocked from the trail by the existing BART ventilation structure. Project construction would sporadically increase noise levels at the trail. Also, construction activities would emit dust and engine exhaust in the area of the trail (see Sections 5.7, Noise and Vibration and 5.8, Air Quality). However, due to the temporary nature of the construction activities near this short segment of trail and the continuous movement of recreationists along the trail, these impacts on the quality of the recreational experience would be *less than significant.*

Additionally, noise and air quality mitigation measures would be implemented during construction of Site 11 to mitigate construction-related noise, dust and exhaust impacts to nearby sensitive receptors such as single-family residences. Implementation of these mitigation measures would also reduce noise levels and dust/exhaust emissions at the trail (see mitigation measures in Impact NO-1 in Section 5.7, Noise and Vibration and Impact AQ-2 in Section 5.8, Air Quality for more detail).

Site 13

Site 13 would be located approximately 50 feet west of the South San Francisco Centennial Way Trail and approximately 35 feet from the interpretive panels beside the trail (see Figures 3-31 and 3-32 in Chapter 3, Project Description and Figure 5.11-2). Construction-related impacts on the quality of recreational experience of those who use the portion of the trail nearest Site 13 would be limited to an approximate 250-foot stretch. Construction near the trail (i.e., well facility building and paved areas) is expected to last for 14 months (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). Project construction would cause sporadic increases in noise levels and dust/exhaust emissions at the trail and would be visible to trail users.

The recreational experience of a trail visitor using the bench would be affected by construction activities; however, such recreationalists could temporarily relocate to another portion of the trail if construction activities adversely impact their recreational experience. Similarly, other trail users may decide to utilize other trail segments in the area to avoid any of the Project's temporary impacts on recreational experience near Site 13. Therefore, given the linear nature of the trail and the temporary nature of construction, recreationalists would not have to experience a substantial deterioration of the quality of recreational experience (due to construction-related noise, dust, and exhaust emissions, or views of the construction site) for more than a few minutes as they pass the construction area.

Site 13 is also located across South Spruce Avenue from Francisco Terrace Playlot; the site's construction area is approximately 50 feet east of the park. The park contains basketball courts, a play structure, and other play equipment and is partially screened from the street with trees. Construction at Site 13 is expected to last for 14 months (see Chapter 3, Project Description Section 3.5.1 [Construction Sequencing and Schedule]). The Site 13 construction area would be partially visible by those who use the park, even though the existing trees block some views of the site; however, park users are not considered sensitive to views of construction activities, equipment and materials because the viewshed does not play a primary role in the quality of these recreational experiences. Project construction would cause sporadic increases in noise levels at the park. Dust and exhaust emissions from construction would not be substantial, because most ground disturbing activities would be located about 150 to 200 feet away across South Spruce Avenue. The quality of recreational experience at the park would deteriorate only slightly during Site 13 construction, because any exposure to dust, exhaust emissions, or increased noise levels would be limited (due to the distance from construction activities) and temporary in duration. Moreover, park users could relocate to other park resources in the area to avoid the Project's impacts. Similar recreational resources are available within a mile or less (e.g., Bayshore Circle Park, Herman Park, Orange Park, Orange Memorial Park, and South San Francisco High School). As a result, potential impacts related to the degradation of recreational resources, in terms of the quality of recreational experience, near these two sites would be *less than significant*.

Additionally, noise and air quality mitigation measures would be implemented during construction of Site 13 to mitigate construction-related noise, dust, and exhaust impacts to nearby sensitive receptors such as single-family residences. Implementation of these mitigation measures would also reduce noise levels and dust/exhaust emissions at the trail and playlot (see mitigation measures in Impact NO-1 in Section 5.7, Noise and Vibration and Impact AQ-2 in Section 5.8, Air Quality for more detail).

Impact Conclusion: Less than Significant

<u>Sites 1, 2, and 4</u>

Site 1

Site 1 would be located within the Lake Merced Golf Club (see Figure 3-11 in Chapter 3, Project Description). The construction area would be located within the northeast portion of the golf club property, approximately 50 feet away from Hole #4 and within 1,000 feet of six other playing holes used by golfers. The duration of construction is expected to be 16 months (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). The site is located on previously disturbed land that is at a higher elevation than the adjacent fairway and is not used for golfing. Site 1 would be partially separated from the fairway by existing trees and vegetation.

Substantial noise levels would occur sporadically during the 16-month construction duration. However, significant construction-related noise impacts would be limited to Hole #4 and the six other playing holes within 1,000 feet of the construction site; noise levels would decrease as golfers move away from the construction area. Therefore, because the increased noise level would be temporary and limited to one geographic area of the golf club, construction-related noise levels would have a *less-than-significant* impact on the quality of the recreational experience at the Lake Merced Golf Club.

Additionally, Mitigation Measure NO-1 (Noise Control Plan) would be implemented during construction of Site 1 to mitigate construction-related noise to nearby sensitive receptors such as single-family residences. (See mitigation measures in Impact NO-1 in Section 5.7, Noise and Vibration).

Construction would temporarily increase dust and engine exhaust emissions, and result in temporary but significant air quality impacts near Site 1 (see Section 5.8, Air Quality for detailed analysis), which would also be a temporary yet *significant* impact on the recreational experience at this location. However, Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures) is required to reduce this air quality impact to less-than-significant levels and would also serve to mitigate the temporary yet significant impact on the recreational experience at this location to *less-than-significant* levels by requiring dust control measures and equipment and vehicle best management practices per BAAQMD Guidelines. This mitigation measure would reduce dust and emission during construction and the impact on the quality of the recreational experience at the golf club would be reduced to *less-than-significant.*

Mitigation Measure M-AQ-2a: BAAQMD Basic Construction Measures (All Sites)
(See Impact AQ-2 in Section 5.8, Air Quality for a description)

Impacts on the visual quality of the golf club as it relates to the quality of the recreational experience would not be substantial. Golfers would have a partially obstructed view of the construction site during the 16-month construction period, since the well facility would be located on a vegetated hillside above the golf links. The apartment complex located north of the golf links provides a developed backdrop when the site is viewed from the fairway. Therefore, construction at Site 1 would not detract from the visual quality of the golfing experience, and the temporary impact on recreational experience at this location would be *less than significant.*

The Project also proposes the demolition of the existing golf club restroom, which is located within the proposed construction area for Site 1. The Lake Merced Golf Club operates and maintains the restroom for golfers. An additional restroom facility for the golfers is located at the club house which is approximately a third of a mile south of the existing restroom. The SFPUC would financially compensate the golf club for the loss of the restroom (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]). Because the impacts from construction on recreation at this site would be temporary, and because there would be another restroom available to golfers at the Lake Merced Golf Club, the impact of the restroom demolition at Site 1 on the quality of the recreational experience at this location would be *less than significant*.

Site 2

Site 2 would be located adjacent to the Lake Merced Golf Club (see Figure 3-12 in Chapter 3, Project Description and Figure 5.11-1) and construction activities would occur about 60 feet away from the golf course playing surface. Construction at the site would include conversion of a test well, construction of a fenced enclosure, and installation of pipelines, and would take approximately one month to complete (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). Construction activities would temporarily increase noise levels and would generate dust and exhaust emissions in the vicinity of the playing surfaces. The golf course playing surface is about 20 feet higher in elevation than the proposed well facility site, and the area between the well facility site and the golf course includes a large number of trees and shrubs, which provide substantial screening between the well facility site and the golf course. In addition to the short construction duration of one month, the vegetation and difference in elevation would substantially limit recreationists' exposure to views of construction activities, and would also limit golfers' exposure to the temporary dust/exhaust emissions and noise from construction activities at the site. Therefore, the impact on the quality of recreational experience at the golf club would be *less than significant*.

Site 2 would also be located adjacent to the athletic field at Garden Village Elementary School and across Park Plaza Drive from the athletic field at Ben Franklin Intermediate School (see Figure 3-12 in Chapter 3, Project Description). Construction at Site 2 would occur during a one-month construction time period when schools may be in session. Construction at Site 2 is proposed to occur between 7:00 a.m. and 7:00 p.m. during weekdays and occasionally on Saturdays between 7:00 a.m. and 5:00 p.m., depending on construction needs (see Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]). Construction activities would be visible from and would increase noise and dust/exhaust emissions levels at the Garden Village Elementary School athletic field, and, to a lesser degree, at the Ben Franklin Intermediate School athletic field. The fields at both schools are used during the school day for school recreational activities and after school hours for non-school recreational activities, such as youth sports. In general, the recreational uses of the fields are sports related and active and, therefore, are presumed by this analysis to not be overly sensitive to visual or noise disruption from construction activities. Golfers would pass near the construction area as they golf on the links closest Site 2 and they would not linger near the construction area. For these reasons, and because impacts would be temporary, the impact on the quality of recreational experience at both the Garden Village Elementary School athletic field, the Ben Franklin Intermediate School athletic field, and the Lake Merced Golf Club due to one month of increased noise levels and view of construction activities would be *less than significant*.

In addition, construction of Site 2 would generate dust and exhaust emissions during the one-month construction duration. Site 2 construction activities would occur across the street, and approximately 60 feet away from the edge of the Ben Franklin Intermediate School athletic field. Because of the physical separation and distance, temporary air quality impacts on the recreational experience at Ben Franklin Intermediate School would be *less than significant.* However, because construction would occur immediately adjacent to the Garden Village Elementary School athletic field and because there are no natural buffers to reduce the effects of dust and exhaust emissions at the field, impacts to air quality at Garden Village Elementary School would be *significant* (see Section 5.8, Air Quality for detailed analysis), which would also be a temporary yet *significant* impact on recreational experience at this location. Implementation of Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures) is required to reduce this air quality impact *less-than-significant* levels and would also serve to mitigate the temporary yet *significant* impact on the recreational experience at this location. With implementation of dust control measures and equipment and vehicle best management practices, the impact on the quality of the recreational experience would be reduced to *less than significant.*

> ***Mitigation Measure M-AQ-2a: BAAQMD Basic Construction Measures (All Sites)***
> (See Section Impact AQ-2 in 5.8, Air Quality for a description)

Site 4

Site 4 would be located approximately 560 feet south of the Lake Merced Golf Club playing surfaces (see Figure 3-12 in Chapter 3, Project Description). However, the Site 4 water connection pipeline would be installed within 65 feet of the golf course playing surface. Based on an installation rate of 300 to 600 feet per week, as proposed, the water connection pipeline would take approximately one to two weeks to complete (see discussion of pipeline construction schedule under Impact RE-1 for Site 4), while well facility construction would occur over approximately six months. Construction activities at Site 4 would not be visible from the golf course playing surface, but may temporarily increase noise and dust/emission exhaust levels near the golf club during construction of the pipeline. Nevertheless, the existing trees and shrubs at the edge of the golf course playing surface and the higher elevation of the golf course would limit recreationists' exposure to temporary construction-related dust, exhaust, and noise from Site 4 construction activities. Therefore, due to the temporary nature of construction and the natural vegetative screening, construction at Site 4 would not substantially deteriorate the quality of recreational experience at the golf club.

Site 4 would be located approximately 220 feet from the athletic field at Ben Franklin Intermediate School. However, pipeline construction for Site 4 would occur along the eastern side of Park Plaza Drive approximately 60 feet from the athletic field. Construction at Site 4 would occur during a six-month period when school would be in session, although storm drain and water connection pipeline installation along Park Plaza Drive would be only two to four weeks, based on a pipeline installation rate of 300 to 600 feet per week (see discussion under Impact RE-1 regarding Site 4). Only the Site 4 pipeline construction along Park Plaza Drive would be visible from this athletic field, because the well facility fenced enclosure at Site 4 would be separated from the athletic field by Park Plaza Drive and a vegetated hillside topped with a single-family residence. This physical separation would also substantially reduce recreationists' exposure to dust and exhaust emissions generated during construction. In general, the recreational uses of the athletic field are sports-related and active and, therefore, are presumed by this analysis to not be overly sensitive to noise or visual disruption. While construction activities would temporarily increase noise levels and dust/exhaust emissions at the athletic field due to the temporary nature of construction, the intervening road, and the vegetative screening, construction at Site 4 would not substantially deteriorate the quality of recreational experience at the Ben Franklin Intermediate School athletic field and such impacts at this location would therefore be *less than significant*.

Site 4 would be located on and adjacent to the athletic field at the Garden Village Elementary School. The fenced enclosure for the well facility would be located at the top of a slope about 20 feet in elevation overlooking the school's athletic field; well drilling and construction would occur here over a period of six months. The construction area includes both the hilltop of the slope (i.e., at street level) and a small portion of the athletic field (about 2,500 square feet). Pipeline installation would occur within the edge of the athletic field along Park Plaza Drive during a period of approximately one to two weeks, based on a pipeline installation rate of 300 to 600 feet per week, as proposed (see discussion under Impact RE-1 for Site 4).

Construction at this site would be scheduled to occur during the school year between 7:00 a.m. and 7:00 p.m. during weekdays and occasionally on Saturdays between 7:00 a.m. and 5:00 p.m., depending on construction needs (see Chapter 3, Project Description, Section 3.5.3.1 [Construction Hours]). Construction activities would be visible and cause increased noise levels as well as and dust and engine exhaust emissions at the Garden Village Elementary School athletic field.

As stated previously, the recreational uses of the field are sports-related and active and, therefore, not overly sensitive to visual and noise disruption from construction activities. For this reason, the visibility of construction activities and the temporary increase in noise levels during construction activities would have *less-than-significant* impacts on the quality of the recreational experience at the Garden Village Elementary School athletic field.

However, because pipeline construction would occur immediately adjacent to the Garden Village Elementary School athletic field, and because there are no natural buffers to reduce the effects of dust and exhaust emissions at the field, this air quality impact would be *significant* (see Section 5.8, Air Quality for detailed analysis), which would also be a temporary yet *significant* impact on recreational experience at this location. Nevertheless, implementation of Mitigation Measure M-AQ-2a (BAAQMD Basic Construction Measures) is required to reduce this air quality impact to *less-than-significant* levels and would also serve to mitigate the temporary yet *significant* impact on the recreational experience at this location. With implementation of the dust control measures and equipment and vehicle best management practices, the impact on the quality of the recreational experience would be reduced to *less than significant*.

> ***Mitigation Measure M-AQ-2a: BAAQMD Basic Construction Measures (All Sites)***
> (See Impact AQ-2 in Section 5.8, Air Quality, for a description)

Impact Conclusion: Less than Significant with Mitigation

Impact RE-3: The Project would not impair access to recreational resources during construction. (Less than Significant)

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

Sites 1, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station

Project construction at Sites 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17 (Alternate), 18 (Alternate), and 19 (Alternate) would not be located near an existing recreational resource. Construction at Site 1 would not alter access to the Lake Merced Golf Club, because golfers access the Golf Club from Junipero Serra Boulevard, whereas access to Site 1 would be from Poncetta Drive. Poncetta Drive would remain open during construction (see Section 5.6, Transportation and Circulation). Although the Westlake Pump Station is on a parcel that is located adjacent to an athletic field at the Ben Franklin Intermediate School, construction activities at the Pump Station would not block roads or paths providing access to school athletic fields. Therefore, construction at these sites would have *no impact* on access to recreational resources.

Impact Conclusion: No Impact

Sites 2, 3, 4, 11, and 13

Site 2

Construction at Site 2 would not alter access to the Ben Franklin Intermediate School or Garden Village Elementary School athletic fields during construction. The Lake Merced Golf Club maintenance road could be temporarily blocked by construction of the Site 2 well facility and the installation of the water connection pipelines for Sites 2 and 4, as shown on Figure 3-12 in Chapter 3, Project Description. Golf club maintenance vehicles on the maintenance road may be subject to some delays while construction equipment enters and exits the site, and while pipeline is being installed across the road. Construction across the maintenance road could be completed within one day, assuming installation of pipelines at a rate of approximately 300 to 600 feet per week (see Section 3.5.1 [Construction Sequencing and Schedule]). However, the impact on recreation would be *less than significant* because construction at Site 2 would not interfere with access by golfers, and the delays to maintenance vehicles would be temporary, occurring occasionally during the one-month construction duration.

Site 3

Site 3 would not affect access to the Garden Village Elementary School athletic field and *no impact* would occur.

The Ben Franklin Intermediate School athletic field would be closed during construction of Site 3, for two three-month construction periods during summer months. Site 3 would not alter access to Garden Village Elementary School athletic field during construction. During the athletic field closure, recreationists could be relocated to other similar athletic fields in the area. Additionally, as stated in Chapter 3, Project

Description, Section 3.4.3 (Facility Sites) the School District would be notified a minimum of nine months prior to construction at Site 3, which would allow for the School District to plan for field closure. Therefore, because there are a number of other nearby recreational facilities that could accommodate recreationists during field closure, and because the School District would be notified at least nine months in advance of construction such that the District could plan for field closure, impacts as they relate to access to recreational resources would be *less than significant*.

Site 4

Site 4 would be located on and adjacent to the Garden Village Elementary School athletic field, and the water connection pipeline would be located along the western edge of the field. During the two to four weeks estimated by this analysis for pipeline construction, the western portion of the field would be closed to recreationists, including the entryway from Park Plaza Drive to the playground at the interior of the school grounds. However, the field and playground would still be available to recreationists via Village Lane.

As discussed in Section 5.6, Transportation and Circulation, construction of pipelines would require temporary closure of an approximately 350-foot stretch of the parking and northbound travel lane of Park Plaza Drive from the northern end of 87th Street. The temporary closure along Park Plaza Drive would last up to one week, assuming installation of pipelines at a rate of approximately 300 to 600 feet per week, as proposed. Partial closure would allow for controlled traffic through the intersection during construction. However, despite these partial roadway and parking closures, recreationists would still be able to park in the remaining parking spaces along Park Plaza Drive, and travel to the athletic field via Park Plaza Drive and other roadways.

Thus, due to the short duration of construction, the availability of other parking spaces, and because the field and playground would still be accessible via alternate points, the impact on access to this recreation facility would be *less than significant*.

Site 11

Site 11 would be located in South San Francisco east of El Camino Real, north of its intersection with Arroyo Drive. Site 11 would also be adjacent to an existing BART ventilation structure property, from which access to the site would be provided. An existing access road from Antoinette Lane off of Chestnut Avenue to the south would be used during construction. The existing access road intersects with the Centennial Way Trail. During construction, traffic would increase along the access road, thus increasing traffic intersecting with the trail. However, construction activities would not require closure of any portion of the Centennial Way Trail at Site 11. Thus, the impact on access to this recreational resource from Site 11 construction activities would be *less than significant*.

Site 13

Site 13 would be located approximately 50 feet west of Centennial Way Trail. The trail would remain open during construction at the site. A signaled crosswalk across South Spruce Avenue provides access to the trail at this location. Site 13 would also be located approximately 50 feet east of Francisco Terrace

Playlot, located across South Spruce Avenue. The playlot is accessible from a signaled crosswalk at the intersection of Terrace Drive and South Spruce Avenue and the public sidewalk near the access to the Centennial Way Trail. Construction traffic may increase the overall traffic along South Spruce Avenue, adjacent to the trail and playlot. Additionally, construction activities would result in temporary lane closures along South Spruce Avenue and Huntington Avenue (see Section 5.6, Transportation and Circulation); however, construction activities would not alter access to either the trail or park. Thus, the impact on access to these recreation facilities would be *less than significant*.

Impact Conclusion: Less than Significant

5.11.3.5 Operational Impacts and Mitigation Measures

Impact RE-4: The Project would not damage recreational resources during operation. (Less than Significant)

Impacts on irrigated recreational land uses (i.e., golf clubs) due to changes in the availability of groundwater are evaluated in Impact HY-6 in Section 5.16, Hydrology and Water Quality. Impacts on recreational uses of Lake Merced due to effects of Project pumping on lake levels are discussed in Impact HY-9 in Section 5.16, Hydrology and Water Quality. The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 1, 2, 4 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

Operational activities at these facilities would not directly degrade or damage recreational resources because these well facilities would not be located on a recreational resource (see Figures 3-11 to 3-40 in Chapter 3, Project Description). While Site 1 would be located on golf club property, it is not located on the golf links. Although some of these sites would be located near recreational resources, none of the resources would be affected. As a result, *no impact* on recreational resources through operation of these sites would occur.

Impact Conclusion: No Impact

<u>Site 3</u>

The well facility at Site 3 would be located at the southwest corner of the Ben Franklin Intermediate School athletic field behind a baseball backstop with access provided by the same asphalt road and running track used for site access during construction. Although the driveway would occasionally be used by maintenance vehicles, it would also be possible for maintenance staff to park on the street and walk to the well site. The Project proposes restoration of the athletic field to its general pre-construction condition after construction is completed. Restoration would involve replacing turf immediately following completion of the pipeline installation in the center of the field; replacing turf at the staging area behind the backstop at the end of the construction; and replacing and relocating the backstop, and repaving and restriping the track after each construction season, and restoring the site to a clean and safe condition for full school use (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]). Recreational use of the turf could resume about three weeks after replacement. Use of the running track could occur immediately following restoration. Relocation of the backstop and footpath would provide for the continued use of the area for recreational purposes.

Therefore, because the athletic field would be restored to a clean and safe condition after construction is completed, and between construction seasons, and because the school's backstop and footpath would be relocated as part of the Project, the full use of the recreational resources would be restored following construction at Site 3. The impact on this recreational resource during operation would therefore be *less than significant*.

Impact Conclusion: Less than Significant

Impact RE-5: The Project would not deteriorate the quality of the recreational experience during operation. (Less than Significant)

Operational impacts on established recreational facilities and resources could result if Project operations were to physically degrade an existing recreational resource by causing a deterioration of the quality of the recreational experience (e.g., a permanent visual disruption or ongoing operational noise). The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 2, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

Sites 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17 (Alternate), 18 (Alternate), and 19 (Alternate) would not be located near existing recreational resources. Therefore, the quality of recreational experience at existing recreational resources would not be affected by operation of these sites. As a result, *no impact* on recreation would occur through operation of these sites.

Sites 2, 4, and the Westlake Pump Station would be located near Ben Franklin Intermediate School and Garden Village Elementary School athletic fields. Although Sites 2 and 4 would be located near these recreational resources, operational noise from the well facilities would be indiscernible to recreationists at recreational resources nearby because these sites would be equipped with submersible well pumps and would not have perceptible noise generated aboveground (see Section 5.7, Noise and Vibration). Recreationists at these fields are not considered sensitive to views of the well facilities because the viewshed is presumed by this analysis to not play a primary role in the quality of the recreational experience at this location.

Operation and maintenance of Project well facilities would require access for well exercising either weekly or monthly (i.e., one hour per week, or a single four-hour period each month). Each well station would also be visited daily at times when wells are operating (i.e., dry years) for routine equipment checks, lasting approximately 30 minutes. Permanent access to Site 2 would be facilitated by an existing golf club maintenance road. This road is not used by golfers or other recreationists, and therefore operation and maintenance would not interfere with the recreational experience at the golf club or recreationists at the school athletic fields and *no impact* would occur. Permanent access to Site 4 would be from Park Plaza Drive. Operation and maintenance of Site 4 would not deteriorate the quality of the recreational experience at the school athletic fields because it would not disrupt or impair recreational activities at these recreational resources, and *no impact* would occur.

Equipment upgrades at the Westlake Pump Station would occur inside the existing building, and the Westlake Pump Station would continue to be accessed via the existing access road off of Coronado Avenue (see Figure 3-13), and would not significantly alter the operations of the facility such that it would result in the deterioration of the recreational experience of those using the Ben Franklin Intermediate school secondary athletic field. As a result, *no impact* on recreational resources near these sites, in terms of a potential deterioration of the quality of recreational experience, would occur.

Impact Conclusion: No Impact

<u>Sites 1, 3, 11, and 13</u>

Site 1

Site 1 would be located in the northeastern corner of the Lake Merced Golf Club, a privately owned golf club. The proposed well facility building would replace an existing restroom on the site. The well facility would be located above the golf links and golfers would have a relatively unobstructed view of the well facility. However, intervening vegetation would likely grow to sufficient height to provide visual screening. The existing apartment complex adjacent to the golf club provides a developed backdrop when the proposed well facility site is viewed from the links, and therefore the visual impact from operation of Site 1 would be less than significant (see Impact AES-3 in Section 5.3, Aesthetics). Maintenance and operation would occur either weekly or monthly, and the site would be accessed via Poncetta Drive (see Figure 3-11). Each well station would also be visited daily at times when wells are operating (i.e., dry years) for routine equipment checks, lasting approximately 30 minutes. Maintenance and operation of the well facility would not disrupt recreational activities at the golf club, and therefore there would be *no impact* from operation and maintenance activities.

As discussed in Impact NO-5 in Section 5.7, Noise and Vibration, operation of the well facility at Site 1 would generate perceptible operational noise. However, as discussed in Impact RE-2, noise levels experienced by golfers would be limited geographically to the portion of the golf links nearest to the well facility; perceptible noise levels would decrease as golfers continue down the links away from the well facility. Therefore, given the non-stationary nature of this recreational activity, and that the noise would be limited to one geographic area of the golf links, impacts on the recreational experience at the Lake Merced Golf Club as it relates to operational noise would be *less than significant*.

Site 3

Sites 3 would be located in the southwest corner of the Ben Franklin Intermediate School athletic field. Operational noise from the well facility would be indiscernible to recreationists at recreational resources nearby because the site would be equipped with a submersible well pump and would not have perceptible noise generated aboveground (see Impact NO-5 in Section 5.7, Noise and Vibration). Recreationists at this field are not considered sensitive to views of the well facility because the viewshed is presumed by this analysis to not play a primary role in the quality of the recreational experience at this location. Permanent access to Site 3 would follow the route shown on Figure 3-12 from Park Plaza Drive along the path at the northern edge of the athletic field and along the running track at Ben Franklin School, and would occur either one hour per week, or for four hours once a month. As described in Chapter 3, Project Description, Section 3.4.3 (Facility Sites), the SFPUC would coordinate site access for operation and maintenance with the Jefferson Elementary School District to minimize potential disruptions to recreationists. Therefore, impacts on the recreational experience at this location would be *less than significant*.

Site 11

The well facility at Site 11 would be located about 230 feet west of the South San Francisco Centennial Way Trail. Operation and maintenance of Project well facilities would require access for well exercising either weekly or monthly (i.e., one hour per week, or a single four-hour period each month). Each well station would also be visited daily at times when wells are operating (i.e., dry years) for routine equipment checks, lasting approximately 30 minutes. Access would occur via an existing access road, as shown on Figure 3-27. Ongoing site access would not interfere with trail users, and therefore would not disrupt or otherwise affect the quality of the recreational experience at the Centennial Way Trail. The well facility building would be located behind the existing BART ventilation structure, would be visible from only short sections of the trail, and would also be separated by existing trees. Because of this, visual impacts on the Centennial Way Trail would be *less than significant* (see Impact AES-3 in Section 5.3, Aesthetics). Also because of the distance and the intervening BART structure and trees, any increased noise levels in the vicinity of the trail from operation of the well facility would not be substantial (see Impact NO-5 in Section 5.7, Noise and Vibration). Additionally, as discussed in Impact RE-3, the trail is primarily used for non-stationary activities. Because of the distance of the well facility to the trail, intervening structure and vegetation, and the nature of the recreational experience at the trail, operation of the Site 11 well facility would not substantially affect the quality of the recreational experience from Centennial Way Trail. As a result, the impact on recreation at this site would be *less than significant*.

Site 13

The well facility at Site 13 would be located approximately 70 feet from the Centennial Way Trail and approximately 160 feet from the Francisco Terrace Playlot located on the opposite side of South Spruce Avenue. Operation and maintenance of Project well facilities would require access for well exercising either weekly or monthly (i.e., one hour per week, or a single four-hour period each month). Each well station would also be visited daily at times when wells are operating (i.e., dry years) for routine equipment checks, lasting approximately 30 minutes. Access would occur from a driveway off of South Spruce Avenue for ongoing maintenance and operation (see Figure 3-32). The access driveway is located away from the Centennial Way Trail, and would not interfere with trail users. The well facility building would be visible from both the trail and Francisco Terrace Playlot. However, the site would include landscape planting, and the building would be consistent with other industrial and commercial uses that dominate the viewsheds in this area, therefore visual impacts would be less than significant (see Impact AES-3 in Section 5.3, Aesthetics), and the impact on the quality of the recreational experience would be *less-than-significant*.

Operation of the well facility at Site 13 would generate noise (see Impact NO-5 in Section 5.7, Noise and Vibration). However, as discussed in Section 5.7, Noise and Vibration, 5.7.1.1 (Characteristics of Noise), active parks and playgrounds are not considered sensitive receptors because the levels of background noise are elevated due to active recreational uses. Open space or outdoor recreation areas that are used for passive recreational activities, such as picnicking, would be noise-sensitive uses if the noise environment is considered to contribute to the recreational experience. The Francisco Terrace Playlot is separated from the well facility by South Spruce Avenue, a four-lane road, and existing trees. Because of this distance, and because active playgrounds are not considered by this analysis to be sensitive to noise, such impacts on the recreational experience at the Francisco Terrace Playlot would be *less than significant.* The primary function of Centennial Way Trail is for non-stationary recreation. Existing benches are located across from the well facility; however, they are located across South Spruce Avenue and do not represent the primary function of the trail. Therefore, noise impacts on the recreational experience at Centennial Way Trail would be *less than significant*. As a result, the impact on quality of recreational experience at this site would be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant)

Lake Merced Water Levels under Modeled Existing Conditions and Project Conditions

The analysis presented below comes from information generated in the groundwater modeling. The groundwater modeling is discussed in detail in Section 5.1, Overview, Section 5.1.6 (Groundwater Modeling Overview).

Figure 5.16-12 (Simulated Lake Merced Levels Relative to Modeled Existing Conditions) shows the estimated Lake Merced water levels) over the 47-year simulation period under modeled existing conditions. The modeled existing conditions respond directly to the assumed hydrologic sequence and existing groundwater practices described in Section 5.1.6 (Groundwater Modeling Overview). Lake levels are predicted to increase during years one to four in response to simulated above-average precipitation periods, followed by a predicted decline in lake levels in years 4 through 16 to a low of 1.5 feet City Datum during a simulated dry period. From years 16 to 36, lake levels are predicted to fluctuate with climatic conditions, but are also predicted to show an overall increasing trend and rise to over 11 feet City Datum. During the design drought[3] in years 36 to 44, the estimated lake levels decline sharply to -0.8 feet City Datum, then recover to about 5 feet City Datum. Over the simulation period, the estimated mean monthly lake level is predicted to be 6.3 feet City Datum. The estimated lake levels are predicted to be below 5 feet City Datum for 33 percent of the simulation period.

[3] See Section 5.1.6.1 (Westside Basin Groundwater Model) in Section 5.1, Overview, for discussion of the Westside Basin Groundwater Model, including a definition of the design drought.

Figure 5.16-12 in Section 5.16, Hydrology and Water Quality also shows the estimated Lake Merced water levels over the 47-year simulation period under Project conditions. For the first two years of the simulation, the estimated Lake Merced water levels are expected to be similar to the modeled existing conditions, but then rise rapidly from approximately 9 feet City Datum to approximately 11 feet City Datum by year 10 as a result of predicted higher groundwater levels in the Shallow Aquifer. During years 44 to the end of the simulation, after the design drought, the Project-affected lake levels are predicted to be about 4 feet below what they would be under the modeled existing conditions at the end of the simulation. The lowest estimated lake level, expected at the end of the design drought, is approximately -2 feet City Datum (compared to approximately -1.5 feet City Datum under modeled existing conditions; i.e., without the Project), which would leave approximately 4 feet of water in Impound Lake and about 9 feet of water in East Lake. The estimated mean monthly lake level is predicted to be 9.1 feet City Datum. The estimated lake levels would be below 5 feet City Datum for 14 percent of the simulation period, whereas the estimated lake levels would be below 5 feet City Datum for 33 percent of the simulation period under the modeled existing conditions.

The estimated size and depth of the four individual lakes are provided in Table 5.11-4 (Lake Merced Acreage and Depth under Modeled Existing Conditions and Project Conditions) for monthly minimum, mean, and maximum lake levels under modeled existing conditions and Project conditions.

TABLE 5.11-4
Lake Merced Acreage and Depth under Modeled Existing Conditions and Project Conditions

	Acreage and Depth under Modeled Existing Conditions			Acreage and Depth under Project Conditions		
	At Monthly Minimum Water Level of -0.8 ft. City Datum	At Monthly Mean Water Level of 6.3 ft. City Datum	At Monthly Maximum Water Level of 12.4 ft. City Datum	At Monthly Minimum Water Level of -2.5 ft. City Datum	At Monthly Mean Water Level of 9.1 ft. City Datum	At Monthly Maximum Water Level of 13 ft. City Datum
North Lake						
Acreage (acres)	51.9	56.4	66.4	51.2	63.5	66.8
Water Depth (feet)	14.2	21.3	27.4	12.5	24.1	28
South Lake						
Acreage (acres)	159.8	171.9	202.5	157.5	196.2	203.4
Water Depth (feet)	16.2	23.3	29.4	14.5	26.1	30
East Lake						
Acreage (acres)	20.1	24.6	32.6	19.37	30.1	32.9
Water Depth (feet)	10.2	17.3	23.4	8.5	20.1	24
Impound Lake						
Acreage (acres)	9.3	16.6	22.4	8.4	20.1	22.7
Water Depth (feet)	5.2	12.3	18.4	3.5	15.1	19

Source: Kennedy/Jenks 2012b

The lake itself is a recreational resource used for boating and fishing. Boating occurs at North and South Lakes. Fishing occurs from the shoreline, fishing piers located at the North and South Lakes, and occasionally from boats (SFPUC 2011). East Lake's recreational resources include trails and pathways; it does not have fishing piers, boat docks or beach access points. Therefore, it is assumed that this lake does not support recreational fishing. In addition to in-water recreational activities, the lake also supports recreational activities at its shoreline beach access points, and upland trail, picnic, and sitting areas. The scenic quality of the lake is also a contributor to the quality of the recreational experience for all recreationists. Recreational activities that could be affected by increased water depth include boating and fishing, because increased water levels could inundate stationary docks and piers. Increased lake acreage could affect shoreline fishing, beach access, trail access, and other low-lying recreational facilities such as picnic areas, because the increased lake surface area could encroach into these shoreline and/or upland recreational resources.

The monthly maximum and minimum water levels represent the range of conditions that are predicted to occur at Lake Merced under both the modeled existing conditions and Project conditions. As shown on Table 5.11-4 (Lake Merced Acreage and Depth under Modeled Existing Conditions and Project Conditions), the estimated monthly maximum lake water level under modeled existing conditions is predicted to be 12.4 feet City Datum. Under the Project, the estimated monthly maximum lake elevation is predicted to increase slightly to 13 feet City Datum. The change would be an approximately 7-inch increase in water depth and a 0.3- to 1.1-acre increase in size at each individual lake.

However, the minor increase in water depth and surface area acreage under Project conditions would not result in a discernible difference in the availability and quality of recreational resources at Lake Merced because the change in water level would not alter access to recreational facilities nor would it render facilities unusable. The Project would not encroach upon any additional trail, beach access areas, or piers/docks that are not already affected by the fluctuations in water levels under existing conditions. The minor increase in lake depth and surface area would also have a negligible effect on the scenic quality of the lake, because it would not substantially change its appearance. Therefore, impacts on recreational resources at Lake Merced due to increased lake levels under monthly maximum Project conditions would be *less than significant*.

As shown in Table 5.11-4 (Lake Merced Acreage and Depth under Modeled Existing Conditions and Project Conditions), the monthly minimum lake elevation under modeled existing conditions is -0.8 feet City Datum. Under the Project, the estimated monthly minimum lake elevation is predicted to decrease to -2.5 feet City Datum. This translates to an approximately 1.7-foot decrease in water depth, and a 0.7- to 2.3-acre decrease in acreage at each individual lake. Decreased lake levels have the potential to affect boating and fishing because these recreational activities require sufficient water depth. As discussed in Section 5.11.2.2 (State), boating and fishing are also identified in the RWQCB's Basin Plan as beneficial uses of Lake Merced. If decreased lake surface area were to strand floating docks/piers, this would also impact fishing and boating. Decreased lake acreage also would have the potential to affect the quality of the recreational experience if decreased water levels were to affect the scenic quality of the lake.

However, the decrease in water depth and lake acreages under modeled project conditions would not substantially affect recreational resources at Lake Merced, and there would be no discernible change from modeled existing conditions. As shown on Table 5.11-4 (Lake Merced Acreage and Depth under Modeled

Existing Conditions and Project Conditions), there would be sufficient water depth during operation of the Project to support fishing and boating at North and South Lakes, with a depth of 12.5 feet and 14.5 feet, respectively. Generally, a water depth greater than 4 feet supports small craft boating, and a water depth of 6 feet supports dragon boating (DBAW 1991; International Canoe Federation 2011). There would also be sufficient acreage to support the floating and stationary docks/piers at North and South Lakes, as well as boating and rowing activities. Additionally, while the lake would experience a decrease in acreage during dry periods, the difference would not substantially change the visual appearance of the individual lakes when compared to the monthly minimum water levels under modeled existing conditions. Because existing recreational resources would be preserved, the Project would be consistent with *Western Shoreline Area Plan* policies that call for the preservation of recreational facilities in a usable condition, including passive activities, vistas, and trails/paths. Additionally, the Project would not preclude SNRAMP staff report policies to promote recreational uses and develop guidelines for pathways and interpretive trails/signs.

Therefore, impacts on recreational resources at Lake Merced due to decreased lake levels predicted under monthly minimum Project conditions would be *less than significant*.

Impact Conclusion: Less than Significant

5.11.3.6 Cumulative Impacts and Mitigation Measures

Impact C-RE-1: Construction and operation of the proposed Project would not result in significant cumulative impacts on recreational resources. (Less than Significant)

Construction

The geographic scope for the analysis of cumulative construction impacts on recreational resources consists of each proposed GSR facility site (including the construction area for the well, the well facility, and the pipelines) and the immediate vicinity around each of these sites, including the roadways that provide access to the recreational resources in and near each of the proposed GSR facility sites. Table 5.11-5 (Recreational Resources Near Proposed GSR Facility Sites and Other Cumulative Projects) identifies the recreational resources that are within the geographic scope of analysis for cumulative recreation impacts. Refer to Figures 5.11-1 (Recreational Resources [North]) and 5.11-2 (Recreational Resources [South]) for the location of recreational resources relative to the proposed GSR facility sites, and refer to Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis) in Section 5.1, Overview for the location of the cumulative projects.

TABLE 5.11-5
Recreational Resources Near Proposed GSR Facility Sites and Other Cumulative Projects

Recreational Resource	Proximity to Proposed GSR Facility Sites	Other Cumulative Projects (with Cumulative Project ID)
South San Francisco Centennial Way Trail (Class I bicycle and pedestrian path)	• GSR Site 11 construction area would be approximately 75 to 230 feet west of the trail. • GSR Site 13 construction area would be approximately 50 feet west of the trail. • GSR Sites 11 and 13 are approximately one mile from each other and would be constructed at the same time.	• Cumulative Project H: PG&E Transmission Pipeline Replacement Project would roughly parallel the Centennial Way Trail for a mile, approximately 100 to 700 feet away; the PG&E pipeline route would be approximately 250 to 650 feet from GSR Site 11.
Francisco Terrace Playlot	GSR Site 13 pipeline construction area would be approximately 50 feet south of the park, across South Spruce Avenue.	• Cumulative Project I: Centennial Village Project would be a mixed use development approximately 270 feet to the southwest across South Spruce Avenue from Francisco Terrace Playlot and approximately 160 feet from the closest pipeline construction area for GSR Site 13.

Of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), the PG&E Transmission Pipeline Replacement Project (cumulative project H) and the Centennial Village Project (cumulative project I) could generate construction-related impacts that could also affect recreational resources, as detailed below. Activities associated with these projects could occur at the same time as the construction activities proposed at GSR Sites 11 and 13 (including installation of pipelines). No other cumulative projects were identified that would be located both near GSR facility sites and recreational resources affected by the GSR Project.

Impacts on Recreational Experience

Centennial Way Trail

Construction of the PG&E Transmission Pipeline Replacement Project would generate noise, dust, and vehicle exhaust emissions near the Centennial Way Trail, which could impact the recreational experience of bicyclists and pedestrians using the trail. The PG&E transmission pipeline replacement roughly parallels the Centennial Way Trail for a mile and is approximately 250 to 650 feet from Site 11. Project construction at GSR Sites 11 and 13 would result in a *less-than-significant*, temporary increase in noise levels at Centennial Way Trail due to the use of construction equipment, lasting approximately 16 months and 14 months, respectively. Typical daily construction hours for the GSR Project would be between 7:00 a.m. and 7:00 p.m. Monday through Friday. If necessary, construction work may occasionally occur on Saturdays between the hours of 7:00 a.m. and 5:00 p.m., when the trail may have more users. Daytime construction at proposed GSR Sites 11 and 13 would also result in release of fugitive dust, resulting from soil disturbance and diesel engine exhaust emissions, which would be a *less-than-significant* Project impact on air quality (see Impact RE-2). Depending on whether and the extent to which there may be overlapping construction schedules among these projects, implementation of these projects together could result in a cumulative impact on recreational resources. However, these impacts would be temporary (only during construction) and transitory (lasting only as long as it would take for a recreationist to pass by the area of construction), and potentially-affected recreationists could avoid this area completely by heading north or south to other sections of the trail, or they could utilize alternate recreational facilities in the region (e.g., Bayshore Circle Park, Orange Memorial Park, and the South San Francisco High School athletic fields) until construction is completed. For these reasons, the potential cumulative impact on Centennial Way Trail would be *less than significant*.

Francisco Terrace Playlot

Construction of the Centennial Village Project (cumulative project I) identified in Table 5.1-3 (Projects Considered for Cumulative Impacts) would generate noise, dust, and vehicle exhaust emissions near the Francisco Terrace Playlot located at Terrace Drive and South Spruce Avenue, which could impact the recreational experience for park users.

The Centennial Village Project includes mixed use development approximately 160 feet southwest of the GSR Site 13 pipeline construction area and 270 feet southwest of the Francisco Terrace Playlot.

Project construction at GSR Site 13 would result in a *less-than-significant*, temporary increase in noise levels at Francisco Terrace Playlot due to the use of construction equipment, for approximately 14 months. Typical daily construction hours for the GSR Project would be between 7:00 a.m. and 7:00 p.m. Monday through Friday. If necessary, construction work may occasionally occur on Saturdays between the hours of 7:00 a.m. and 5:00 p.m., when the park may have more users. Daytime construction at proposed GSR Site 13 would also result in release of fugitive dust, resulting from soil disturbance and diesel engine exhaust emissions, which would be a *less-than-significant* project impact on air quality (See Impact RE-2). Depending on the extent of overlap between the construction schedules for the two projects, implementation of these projects together could result in a cumulative impact on recreational resources. However, any exposure to dust, exhaust emissions, or increased noise levels would be limited (due to the playlot's distance from the GSR Project and Centennial Village project construction activities) and temporary in duration. Moreover, potentially affected park users could avoid this area completely by utilizing alternate recreational facilities in the region (e.g., Bayshore Circle Park, Herman Park, Orange Park, Orange Memorial Park, and the South San Francisco High School athletic fields) until construction is completed. For these reasons, the potential cumulative impact on Francisco Terrace Playlot would be *less than significant*.

Disruption of Access to a Recreational Resource

Construction of the PG&E Transmission Pipeline Replacement Project (cumulative project H) may require a temporary closure of the portion of Centennial Way Trail where the pipeline crosses from Antoinette Lane to El Camino Real. However, construction of proposed GSR Site 11 near the PG&E Transmission Pipeline project would not affect access to the Centennial Way Trail. Therefore, there would be *no impact* related to cumulative construction-related impacts on access to the Centennial Way Trail.

Operations

The geographic scope for the analysis of cumulative operational impacts on recreational resources consists of the GSR study area, including the proposed GSR facility sites and the immediate vicinity around each of these sites, including the roadways that provide access to the recreational resources in and near each of the proposed GSR facility sites. Refer to Figures 5.11-1 (Recreational Resources [North]) and 5.11-2 (Recreational Resources [South]) for the location of recreational resources relative to the proposed GSR facility sites, and refer to Figure 5.1-3 (Location of Projects Considered in Cumulative Analysis) in Section 5.1, Overview for the location of the cumulative projects. Of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), the Mission & McLellan Project (cumulative project F) and the Centennial Village Project (cumulative project I) could generate operation-related impacts that could also affect recreational resources, as detailed below. No other cumulative projects were identified that would affect recreational resources in the GSR Project study area. Cumulative impacts on irrigated recreational land uses (i.e., golf clubs) due to changes in the availability of groundwater are evaluated in Impact C-HY-2 in Section 5.16, Hydrology and Water Quality.

The Mission & McLellan and Centennial Village projects are not located on or adjacent to a recreational resource in the GSR study area; therefore, they would not have permanent impacts on the recreational experience or access to recreational resources during their operation. However, these projects combined would include the development of 152 new residential units. Residents of these units could utilize recreational resources in the GSR study area, which could increase use of these resources such that physical deterioration or accelerated deterioration of these recreational resources could occur, or require construction or expansion of recreational resources. Therefore, cumulative impacts related to the potential need for expanded recreational resources could be *significant*.

However, the GSR Project would not increase the use of, or require construction or expansion of recreational resources that might have an adverse physical effect on the environment. The Project is a groundwater storage and recovery system that would not, independently and separately from its contribution as part of the overall WSIP, deliver any additional amounts of water or generate new residential or employee population (discussed further in Chapter 6, Other CEQA Issues, Section 6.1 [Growth Inducement]) beyond that analyzed for the WSIP in the WSIP PEIR. Because the Project would not increase the existing population or housing supply of the Project area over and above its contribution to the WSIP, no increased use of parks and other recreational resources would occur at a Project-specific level that would result in increased use resulting in physical deterioration or accelerated deterioration of existing recreational resources. As discussed above under Impact RE-5, operation of the Project at most sites would have no impact on the quality of existing recreational experiences, and would have a less-than-significant impact during operation of Sites 11 and 13 on Centennial Way Trail and Francisco Terrace Playlot, respectively, and under Impact RE-4, a less-than-significant impact on the athletic field at Site 3. Therefore, the GSR Project's contribution to a potentially *significant* cumulative impact on recreational resources during operation would not be cumulatively considerable (*less than significant*).

Impact C-RE-2: Operation of the Project would not result in significant cumulative impacts on recreational resources at Lake Merced. (Less than Significant)

The geographic scope for cumulative operational impacts on Lake Merced recreational resources includes the four individual lakes and the upland areas surrounding the lakes. Refer to Figures 5.11-1 (Recreational Resources [North]) and 5.11-2 (Recreational Resources [South]) for the location of recreational resources relative to the proposed GSR facility sites, and refer to Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis) in Section 5.1, Overview for the location of the cumulative projects.

As noted in greater detail in the cumulative analysis presented in Section 5.16, Hydrology and Water Quality, these include the SFPUC's proposed San Francisco Groundwater Supply (SFGW) Project (cumulative project A) and Daly City's proposed Vista Grande Drainage Basin Improvement Project (cumulative project B). The former would affect Lake Merced water surface elevations most directly through groundwater pumping and the latter through direct hydrologic input of stormwater to the Lake (Vista Grande), as well as projected pumping by Partner Agencies in the South Westside Groundwater Basin and potentially increased pumping at the Holy Cross cemetery (i.e., other existing projects). See Section 5.1, Overview, Section 5.1.6 (Groundwater Modeling Overview) for an explanation of cumulative operational scenarios considered in the modeling conducted for the proposed Project.

With operation of the GSR Project and the identified cumulative projects, the average Lake Merced water levels, according to the Westside Basin Groundwater Model, are predicted to decrease 0.3 feet over the 47-year simulation period (calculated as a monthly average). Due to stormwater inputs from the Vista Grande Drainage Basin Improvement Project (as well as in-lieu recharge from the GSR Project), water levels are predicted to be slightly higher than under the modeled existing conditions for much of the 47-year simulation period (see Figures 5.16-11 (Simulated Lake Merced Level Changes) and 5.16-12 (Simulated Lake Merced Levels Relative to Modeled Existing Conditions) in Section 5.16, Hydrology and Water Quality). However, initial pumping by the San Francisco Groundwater Project and pumping by the GSR Project during dry years are predicted to decrease Lake Merced lake levels (Kennedy/Jenks 2012a).

To examine the potential effects of recreational resources at Lake Merced, including possible inundation of trails and fishing piers, as well as water-dependent activities such as boating, rowing, and fishing, Table 5.11-6 (Lake Merced Acreage and Depth under Modeled Existing Conditions and Cumulative Conditions) presents the minimum, mean, and maximum water depths and acreages at Lake Merced for the modeled existing conditions and the cumulative conditions.

TABLE 5.11-6
Lake Merced Acreage and Depth under Modeled Existing Conditions and Cumulative Conditions

	Acreage and Depth under Modeled Existing Conditions			Acreage and Depth under Cumulative Conditions		
	At Monthly Minimum Water Level of -0.8 ft. City Datum	At Monthly Mean Water Level of 6.3 ft. City Datum	At Monthly Maximum Water Level of 12.4 ft. City Datum	At Monthly Minimum Water Level of -4.9 ft. City Datum	At Monthly Mean Water Level of 6.1 ft. City Datum	At Monthly Maximum Water Level of 9.5 ft. City Datum
North Lake						
Acreage (acres)	51.9	56.4	66.4	50.4	55.8	64
Water Depth (feet)	14.2	21.3	27.4	10.1	21.1	24.5
South Lake						
Acreage (acres)	159.8	171.9	202.5	154.3	170.6	197.4
Water Depth (feet)	16.2	23.3	29.4	12.1	23.1	26.5
East Lake						
Acreage (acres)	20.1	24.6	32.6	18.3	24.2	30.6
Water Depth (feet)	10.2	17.3	23.4	6.1	17.1	20.5
Impound Lake						
Acreage (acres)	9.3	16.6	22.4	7.2	16.4	21.2
Water Depth (feet)	5.2	12.3	18.4	1.1	12.1	15.5

Source: Kennedy/Jenks 2012b

Under cumulative conditions , the available surface area of North, South, and East Lakes is not predicted to decrease substantially as compared to modeled existing conditions, and the water depth under cumulative conditions is predicted to be sufficient to support existing boating uses in all years at North and South Lakes. Generally, a water depth greater than 4 feet supports small craft boating, and a water depth of 6 feet supports dragon boating (DBAW 1991; International Canoe Federation 2011). Further, floating and stationary docks would not be disconnected from the lake water surface.

However, under cumulative conditions, Impound Lake water levels are predicted to be substantially reduced during an extended drought compared to modeled existing conditions. While the depth and size of Impound Lake would be reduced naturally under modeled existing conditions during an extended drought, the combination of the groundwater pumping associated with the proposed Project and the San Francisco Groundwater Project, along with other ongoing groundwater pumping activities, would exacerbate the effects on Impound Lake during the years of an extended drought. This would reduce the visual quality and, therefore, the quality of the recreational experience near Impound Lake as seen from the paved trail around the lake perimeter, and from the picnic areas on John Muir Drive and Lake Merced Boulevard.

However, all four lakes, including Impound Lake, would remain accessible for recreational purposes during extended drought periods. Impound Lake supports recreational activities such as picnicking, beach access, and potentially shoreline fishing, in addition to scenic vistas. Boating does not occur at Impound Lake. Even under extended drought periods, picnic facilities and shoreline access would still be in useable condition. The existing availability of trails and beach access points at all lakes is also not predicted to change substantially under cumulative conditions.

While the visual quality at Impound Lake would be reduced during an extended drought, Lake Merced would continue to offer scenic vistas. The reduced visual quality of Impound Lake alone would not result in a significant cumulative impact on the overall physical degradation of the recreational resources because all other currently supported recreational activities would still be available to recreationists. The effects under cumulative conditions would not have permanent or ongoing impacts on recreational resources at Lake Merced, given that water levels are predicted to decline for only a temporary period of time during an extended drought under cumulative conditions, and the water level fluctuations and surface area changes would not prevent use of the lake by recreationists. Additionally, because recreation facilities would be preserved, cumulative conditions would not conflict with the Western Shoreline Plan policies to preserve passive recreational activities, pathways, and vistas in a useable condition, or preclude SNRAMP policies to promote recreational uses and develop guidelines for pathways and interpretive trails/signs. Therefore, cumulative operational impacts on recreational resources at Lake Merced would be *less than significant*.

5.11.4 References

Daly City, City of. 1989. *General Plan Noise Element*.

Department of Boating and Waterways, State of California (DBAW). 1991. *Layout, Design, and Construction Handbook for Small Craft Boat Launching Facilities.*

International Canoe Federation. 2011. *Dragon Boat Racing Competition Rules 2011*.

Jefferson Elementary School District. 2013. Personal Communication, Rick Young, Director of Maintenance and Operations, January 24, 2013.

Kennedy/Jenks Consultants (Kennedy/Jenks). 2012a. *Task 10.1 Technical Memorandum, Groundwater Modeling Analysis for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. April.

Kennedy/Jenks. 2012b. *Task 10.2 Technical Memorandum, San Francisco Public Utilities Commission, Assessment of Groundwater Surface Water Interactions for the Regional Storage and Recovery Project and San Francisco Groundwater Supply Project.* May.

Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2011. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*. December.

San Francisco, City and County of. 1988 (as amended through 1996). *City and County of San Francisco General Plan, Western Shoreline Area Plan.* September.

San Francisco Public Utilities Commission (SFPUC). 2011. *Lake Merced Watershed Report*. January.

San Francisco Recreation and Park Department (SFRPD). 1995. *Staff Report on the Significant Natural Resource Areas Management Plan*. Adopted January 19, 1995 [S.F. Recreation and Park Commission Resolution No. 9501-008].

South San Francisco, City of. 1999. *City of South San Francisco General Plan*.

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5.12 UTILITIES AND SERVICE SYSTEMS

This section addresses potential impacts on utilities and service systems that could occur as a result of Project implementation. Utilities and service systems discussed in this section include natural gas, telecommunications, potable water, wastewater, stormwater, and solid waste facilities. Water quality is addressed in Section 5.16, Hydrology and Water Quality, safety hazards related to underground utilities are addressed in Section 5.17, Hazards and Hazardous Materials, and potential impacts on energy resources are addressed in Section 5.18, Mineral and Energy Resources.

5.12.1 Setting

Project facilities would be constructed and operated at locations in the Town of Colma, cities of Daly City, South San Francisco, San Bruno, and Millbrae, and the community of Broadmoor in unincorporated San Mateo County. The study area for potential impacts related to public services includes individual facility sites and the service systems (i.e., infrastructure and capacity of the system) for the electricity, natural gas, telecommunications, potable water, wastewater, stormwater, and solid waste facilities that serve the facility sites. Table 5.12-1 (Utilities and Major Service Providers in the Project Area) shows utilities and major service providers in the study area.

5.12.1.1 Utilities

Electricity and Natural Gas

The San Francisco Public Utilities Commission (SFPUC) Power Enterprise provides electricity to all City and County of San Francisco (CCSF) facilities. Pacific Gas and Electric Company (PG&E) provides electricity and natural gas to most of Northern California, including the study area. It provides the SFPUC Power Enterprise with transmission and distribution services from Newark (California) to points west, pursuant to an Interconnection Agreement regulated by the Federal Energy Regulatory Commission (FERC). Under this agreement, PG&E transmits and distributes electricity to the SFPUC Power Enterprise customers and would provide power distribution services for the proposed Project.

PG&E provides natural gas to customers in the study area through a network of regional gas transmission pipelines. Transmission pipelines are generally larger and operate at a higher pressure than distribution pipelines (PG&E 2012a). PG&E transmission pipelines operate at or above 60 pounds per square inch gauge (psig). A natural gas transmission pipeline is located near GSR Site 1 immediately west of Interstate 280 (I-280) and along Hickey Boulevard immediately north of Site 10. A transmission pipeline is located along El Camino Real south of Site 11 and west of Site 12. These pipelines are considered high-priority utility lines (PG&E 2012b[1]).

[1] High priority utilities pipelines include natural gas in pipelines greater than six-inches diameter with normal operating pressures greater than 60 pounds per square inch gauge (Caltrans 1999).

TABLE 5.12-1
Utilities and Major Service Providers in the Project Area

City/County	Electricity/ Natural Gas	Telecom	Potable Water	Wastewater	Stormwater	Solid Waste
City of Daly City	PG&E	Comcast, Astound	City of Daly City	North San Mateo County Sanitation District (NSMCSD)	Daly City	Allied Waste Daly City
San Mateo County (Broadmoor)	PG&E	Comcast, Astound	California Water Service Company (Cal Water)	NSMCSD	Daly City	Allied Waste Daly City
Town of Colma	PG&E	Comcast, Astound	Cal Water	NSMCSD, South San Francisco-San Bruno Water Quality Control Plant (SSF/SB WQCP)	Town of Colma	Allied Waste Daly City
City of South San Francisco	PG&E	Astound, Comcast, AT&T	Cal Water, Westborough County Water District	SSF/SB WQCP	City of South San Francisco	South San Francisco Scavenger Company
City of San Bruno	PG&E	San Bruno Cable	City of San Bruno	SSF/SB WQCP	City of San Bruno	Recology San Bruno
City of Millbrae	PG&E	AT&T, Comcast	City of Millbrae	City of Millbrae	City of Millbrae	South San Francisco Scavenger Company

Sources: San Francisco Planning Department 2009; San Mateo County 2009; San Mateo County 2011; San Mateo County n.d.

Notes:

PG&E = Pacific Gas and Electric Company

AT&T = American Telephone and Telegraph

Telecommunications

Telecommunication services in this analysis include telephone land line, cellular telephone, cable and satellite television, and internet access. Multiple telecommunication providers serve customers in the study area including Astound, American Telephone and Telegraph (AT&T), Comcast, and San Bruno Cable.

Water Service

The cities of Daly City, San Bruno, and Millbrae provide water service to their customers. The Town of Colma and San Mateo County (Broadmoor) receive their potable water from the California Water Service Company (Cal Water). The City of South San Francisco receives its potable water from Cal Water and the Westborough County Water District (South San Francisco 1999; Colma 1999; San Mateo County 2009).

Wastewater Service

Three wastewater treatment providers exist in the study area: North San Mateo County Sanitation District (NSMCSD), the cities of South San Francisco-San Bruno, and the City of Millbrae. The NSMCSD collects, treats, and disposes of wastewater for the majority of the residents of City of Daly City (including the proposed facility sites), unincorporated community of Broadmoor, a portion of the Town of Colma (including the proposed facility sites), the Westborough County Water District in South San Francisco, and the San Francisco County Jail in San Bruno. According to the NSMCSD's National Pollutant Discharge Elimination System (NPDES) permit (CA0037737), the treatment plant has an average dry weather flow design of eight million gallons of effluent per day (mgd) and can treat up to 25 mgd during wet weather flow periods. As of 2006, the plant discharges an annual average flow of 6.85 mgd (RWQCB 2006).

The City of South San Francisco and the City of San Bruno jointly own the South San Francisco-San Bruno Water Quality Control Plant. According to the two cities' joint NPDES permit (CA0038130), the facility has a dry-weather capacity of 13 mgd and a wet-weather capacity of approximately 62 mgd (RWQCB 2003). The average dry weather flow through the plant is 9 mgd (South San Francisco 2012).

The City of Millbrae owns and operates a sewer collection system and wastewater treatment plant. In 1998, the Millbrae General Plan identified that the capacity at the treatment plant was very limited and appeared to be insufficient to handle projected flows. In 2011, the City applied for and received approval from the California State Revolving Fund for financing to upgrade the plant. According to the City's NPDES permit (CA0037532), the plant has an average dry weather flow design capacity of 3 mgd and a peak wet weather capacity of 9 mgd. As stated in the NPDES permit, the plant discharged an average dry weather flow of 2.2 mgd and an annual average flow of 2.41 mgd (five-year averages, 1995 through 1999) (RWQCB 2001).

Stormwater

Each jurisdiction within the study area manages its own stormwater system, which includes maintenance of creeks and storm drains located underneath streets. San Bruno also oversees two San Mateo County Flood Control District pump stations (San Bruno 2011).

5.12.1.2 Solid Waste

Allied Waste Daly City provides solid waste and recycling collection services in the City of Daly City, the unincorporated community of Broadmoor, and the Town of Colma. The South San Francisco Scavenger Company provides solid waste and recycling collection services in the cities of South San Francisco and Millbrae. Recology San Bruno provides solid waste and recycling collection services in the City of San Bruno (San Mateo County 2011). Solid waste that is collected in San Mateo County is directed to the Ox Mountain Sanitary Landfill in Half Moon Bay, the only operating landfill in the County. The Ox Mountain landfill has a permitted capacity of 37,900,000 cubic yards and a maximum disposal capacity of 3,598 tons per day. The remaining capacity is approximately 24,600,000 cubic yards, with approximately 28 years of site life remaining. The landfill solid waste permit lists an estimated closure date of 2018; however the permit is reviewed every five years (Republic Services 2012). The landfill accepts a variety of materials including construction and demolition materials (CalRecycle 2011).

5.12.2 Regulatory Framework

5.12.2.1 Federal

No federal regulations relative to utilities and service systems would be applicable to the Project.

5.12.2.2 State

California Public Utilities Commission

The California Constitution vests the California Public Utilities Commission (CPUC) with exclusive power and sole authority to regulate privately-owned and investor-owned public utilities. The CPUC regulates Cal Water as an investor-owned utility, but does not have jurisdiction over municipal utilities operated by the SFPUC, Daly City, and San Bruno. The CPUC has provisions that require regulated utilities to work closely with local governments and to give due consideration to their concerns.

California Integrated Waste Management Act of 1989

The *California Integrated Waste Management Act of 1989* (Public Resources Code [PRC], Division 30), enacted through Assembly Bill (AB) 939 and modified by subsequent legislation, required all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 (PRC Section 41780). The Department of Resources, Recycling, and Recovery (CalRecycle), formerly known as the California Integrated Waste Management Board (CIWMB), determines compliance with this mandate to divert generated waste (which includes both disposed and diverted waste). Prior to 2007, diversion for cities and counties was calculated by establishing a "base year" waste generation rate against which future diversion was measured. In 2007, SB 1016 changed how the diversion rate is computed. SB 1016 builds on AB 939 compliance requirements by implementing a simplified measure of jurisdictions' performance by changing to a per capita disposal rate which uses only two factors: a jurisdiction's population (or in some cases employment) and its disposal as reported by disposal facilities. The per capita disposal rate approach is not determinative of jurisdiction compliance. Instead, CalRecycle uses per capita disposal as an indicator in evaluating program implementation and local jurisdiction performance (CalRecycle 2012). Jurisdictional diversion/disposal progress data for the per capital disposal rate approach is available from 2007 through 2011 from CalRecycle (CalRecycle 2013). Jurisdictional compliance status is "Awaiting Review" for the cities of San Bruno, South San Francisco, and Millbrae, the Town of Colma, and unincorporated San Mateo County for 2007 through 2011. Daly City compliance was listed as "Issued," "Active," and "Fulfilled" in 2007, 2008, and 2009, respectively; for 2010 and 2011, Daly City's compliance status is "Awaiting Review" (CalRecycle 2013).

Utility Notification Requirements

Title 8, Section 1541 of the California Code of Regulations requires excavators to determine the approximate locations of subsurface installations such as sewer, telephone, fuel, electric, and waterlines (or any other subsurface installations that may reasonably be encountered during excavation work) prior to opening an excavation. The California Government Code (Sections 4216 et seq.) requires owners and operators of underground utilities to become members of and participate in a regional notification center. According to Section 4216.1, operators of subsurface installations who are members of, participate in, and share, in the costs of a regional notification center are in compliance with this section of the code. Underground Service Alert North (USA North) receives planned excavation reports from public and private excavators and transmits those reports to all participating members of USA North that may have underground facilities at the location of excavation. At this point, members of the regional notification center will mark or stake their facilities, provide information, or give clearance to dig (USA North 2013).

5.12.2.3 Local

City of Daly City

The Daly City Municipal Code, Chapter 15.64, *Recycling and Diversion of Construction and Demolition Debris*, requires all new construction and alteration projects within Daly City with a construction value of greater than $25,000 and $15,000, respectively, to comply with the diversion requirements set forth in this code (Daly City n.d.). The code requires that at least 60 percent of waste tonnage from construction, demolition, and alteration projects be diverted from disposal through reuse or recycling. The maximum feasible amount of designated recyclable and reusable materials must be salvaged prior to demolition. Construction and demolition debris is defined as discarded materials generally considered to be not water soluble and nonhazardous in nature, including, but not limited to: steel, copper, aluminum, glass, brick, concrete, asphalt material, pipe, gypsum, wallboard, and lumber; rocks, soils, tree remains, trees, and other vegetative matter that normally results from land clearing, landscaping and development operations for a construction project; and remnants of new materials, including, but not limited to: cardboard, paper, plastic, wood, and metal scraps.

Town of Colma Ordinance No. 569

Colma adopted Ordinance No. 569 to comply with AB 939, the Integrated Waste Management Act. The ordinance requires that at least 50 percent of the waste tonnage from any demolition project where the waste includes concrete and asphalt, (or 15 percent where there is no concrete and/or asphalt) be recycled and/or reused to meet the terms and conditions of the ordinance. In addition to demolition, new construction, remodeling, and re-roofing of homes requires 50 percent recycling of waste tonnage (Colma n.d.).

City of South San Francisco General Plan

The South San Francisco General Plan (1999) includes a goal to reduce the generation of solid waste to slow the filling of local and regional landfills, in accordance with AB 939, the California Integrated Waste Management Act. Additionally, the City of South San Francisco Municipal Code, Chapter 15.60 requires the diversion of 100 percent of inert solids from landfills, and a minimum of 50 percent of the remaining construction and demolition debris (South San Francisco n.d.).

City of San Bruno Municipal Code

The San Bruno Municipal Code, Chapter 10.23, *Recycling and Diversion of Debris from Construction and Demolition*, identifies salvage, diversion, and reporting requirements for waste disposal (San Bruno n.d.). The code contains salvage requirements to recover the maximum feasible amount of salvageable designated recyclable and reusable materials prior to demolition. The code also requires a 50 percent diversion rate for construction and demolition debris from commercial and residential buildings.

City of Millbrae Recycling and Waste Prevention Program

Millbrae operates a Recycling and Waste Prevention Program. The program was formed in 1994 to comply with AB 939, and to help meet the State-mandated goal to reduce the amount of garbage placed in landfills by 50 percent by the end of the 2000. Since 1999, Millbrae has achieved the 50 percent requirement (Millbrae 2013). Millbrae requires 50 percent recycling of all waste generated for a project by weight, with at least 25 percent achieved through reuse and recycling of materials other than source-separated dirt, concrete, and asphalt (San Mateo County 2012).

San Mateo County Integrated Waste Management Ordinance

In compliance with AB 939, San Mateo County adopted an Integrated Waste Management Ordinance in 2002 to reduce construction and demolition debris (County of San Mateo Chapter 4.105 Recycling and Diversion of Debris from Construction and Demolition) (San Mateo County 2002). This ordinance requires that: (a) 100 percent of inert solids (i.e., asphalt, concrete, rock, stone, brick, sand, soil, and fines), and at least 50 percent of the remaining construction and demolition debris be diverted from local landfills, and (b) the project proponent develop and submit a Waste Management Plan that includes at least the following:

- Salvaging all or part of structures where practicable;
- Having 100 percent of inert solids be reused or recycled at approved facilities; and
- Source separating non-inert materials, such as cardboard and paper, wood, metals, green waste, new gypsum wallboard, tile, porcelain fixtures, and other easily recycled materials, and directing them to recycling facilities approved by the County and taking the remainder (but no more than 50 percent by weight or yardage) to a facility for disposal or taking all mixed construction and demolition debris to an approved facility.

5.12.3 Impacts and Mitigation Measures

5.12.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on utilities and service systems if it were to:

- Disrupt operation of, or require relocation of, regional, or local utilities.
- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (RWQCB).
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Have insufficient water supply available to serve the Project from existing entitlements and resources, or require new or expanded water supply resources or entitlements.
- Result in a determination by the wastewater treatment provider that would serve the Project that it has inadequate capacity to serve the Project's projected demand in addition to the provider's existing commitments.
- Be served by a landfill with insufficient permitted capacity to accommodate the Project's solid waste disposal needs.
- Result in non-compliance with federal, State, and local statutes and regulations related to solid waste.

5.12.3.2 Approach to Analysis

The primary focus of this analysis is on temporary utility disruption during construction, as well as analysis of adequate utility capacity to accommodate Project operations. Local utilities were contacted and planning documents reviewed to identify the utility companies serving the facility sites, to identify the utilities that could be affected by the proposed Project, and to determine whether the existing utilities have capacity to serve the Project.

During construction, short-term temporary disruption of utility service could occur if existing utilities were accidentally damaged during Project-related construction activities. Additionally, electricity connections would be needed to supply temporary power for construction and permanent power to operate the well facilities at all well facility sites. Construction- and operation-related fuel and energy use are addressed in Section 5.18, Mineral and Energy Resources. This analysis also addresses the potential temporary construction-related and permanent operational-related impacts on wastewater and stormwater facilities since components of the Project require discharge water to be sent to these facilities. The impact on utilities and service systems would be significant if new or expanded facilities would be required beyond those included in the Project, the construction of which could result in an environmental impact.

This analysis also identifies potential impacts related to landfill capacity resulting from the disposal of construction waste, as well as the ability of local jurisdictions to comply with federal, State, and local landfill statutes. The analysis evaluates the potential effects of landfill disposal with respect to the available capacity of local landfills and local jurisdictions' ability to comply with solid waste diversion rates.

Areas of No Project Impact

The analysis of impacts on utilities and service systems typically evaluates whether existing utilities and services systems are adequate to serve a proposed project, or whether they require expansion or new construction to accommodate the proposed project and, if so, whether construction of the new or expanded utilities and/or service systems could have an adverse impact on the environment. The GSR Project differs from typical development projects, because the Project is a utility (water supply and treatment) project designed to increase water supply during dry years.

Due to the nature of the proposed Project, there would be no construction or operational impacts related to one of the above-listed significance criteria; therefore, the criterion is not discussed further in this section for the following reasons:

Have insufficient water supply available to serve the Project from existing entitlements and resources, or require new or expanded water supply resources or entitlements. During construction of each well facility, groundwater pumped at the site would be used to flush the treatment facilities and new pipelines to meet disinfection requirements and water quality regulations. During operation, 14 of the facility sites (well sites that include buildings) would have a sink for use when maintenance personnel visit the site – weekly during normal and wet years or daily during dry years. Water for use at the sink would be supplied from a small potable water supply line (similar to a residential connection); the demand would be less than 100 gallons per year for each site on average (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]). No other water use is needed or proposed. Use of the groundwater during construction and operations is so small that it would have a negligible effect on the ability of the Project to supply water and would not have any effect on existing water supply sources. Therefore, the significance criterion related to sufficient water supply is not applicable to construction or operation of the Project and is not discussed further.

In addition, no construction or operational impacts on natural gas or telecommunications systems would occur. Neither construction nor operation of the Project would use natural gas. Construction of the Project may require one telephone line at each facility site. Operation of the Project would also require one telephone line at each facility site for the Supervisory Control and Data Acquisition (SCADA) system (see Chapter 3, Project Description, Section 3.4.2.6 [Site SCADA Systems]). Provision of 17 telephone lines from Comcast, Astound, AT&T, and/or San Bruno Cable would not exceed the capacity of these systems, because each system operates in an urban area with the capacity for additional lines.

As described below, there would be no operational impacts related to three additional significance criteria. Therefore, the following significance criteria are not addressed further in this impact analysis in the context of Project operation; they are, however, addressed in the context of Project construction:

Disrupt operation of or require relocation of regional or local utilities during Project operations. Once operational, the Project would not disturb existing utilities or require additional relocation of utilities. Maintenance activities would occur on-site and would not require additional subsurface construction that could disrupt existing utilities systems. Therefore, the significance criterion related to disruption or relocation of regional or local utilities is not applicable to operation of the Project and is not discussed further.

Be served by a landfill with insufficient permitted capacity to accommodate the Project's solid waste disposal needs during Project operation. Upon completion of construction, the Project would not generate solid waste requiring disposal. Therefore, the significance criterion related to landfill capacity is not applicable to operation of the Project and is not discussed further.

Result in non-compliance with federal, State, and local statutes and regulations related to solid waste during Project operation. As mentioned above, upon completion of construction, the Project would not generate solid waste requiring disposal. Therefore, the significance criterion related to compliance with solid waste regulations is not applicable to operation of the Project and is not discussed further.

5.12.3.3 Summary of Impacts

Table 5.12-2 (Summary of Impacts – Utilities and Service Systems) summarizes impacts on utilities and service systems from the Project.

TABLE 5.12-2
Summary of Impacts – Utilities and Service Systems

Construction				Operations	Cumulative
Impact UT-1: Project construction could result in potential damage to or temporary disruption of existing utilities during construction.	**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.**	**Impact UT-3: Project construction would not result in adverse effects on solid waste landfill capacity.**	**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.**	**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.**	**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 All Sites	LS All Sites	LS All Sites	LSM All Sites	LS All Sites	LSM All Sites

Notes:

LS = Less than Significant Impact

LSM = Less than Significant Impact with Mitigation

5.12.3.4 Construction Impacts and Mitigation Measures

Impact UT-1: Project construction could result in potential damage to or temporary disruption of existing utilities during construction. (Less than Significant with Mitigation)

All Sites

Construction activities for the proposed Project could result in unintentional damage or interference with existing water, sewer, storm drain, natural gas, electricity, and/or telecommunication lines and, in some cases, could require that existing lines be permanently relocated, potentially causing a temporary disruption in service. Numerous utility lines of varying sizes are located at or near the facility sites and the proposed pipeline routes would cross existing utilities at several locations. While the Project does not propose to relocate utilities owned and operated by other utility companies, it is possible that relocation would be necessary once the locations and characteristics of existing utilities are confirmed. Table 5.12-3 (Preliminary List of Known Utilities within Construction Area at Facility Sites) presents a preliminary list of known utilities within the construction area of each facility site. Additional utilities may be identified during the construction planning and notification process.

TABLE 5.12-3
Preliminary List of Known Utilities Within Construction Area at Facility Sites

Site	Potentially Affected Utilities
Site 1	PG&E overhead electric lines, PG&E natural gas transmission line
Site 2	Daly City sanitary sewer, storm drain, and water line; overhead PG&E electric lines; SFPUC water transmission pipeline
Site 3	Daly City sanitary sewer, storm drain, and water line; overhead PG&E electric line
Site 4	Daly City sanitary sewer, storm drain, and water line; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Westlake Pump Station	Daly City storm drain and water line; overhead PG&E electric line
Site 5	Daly City sanitary sewer, storm drain, and water line; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 6	Daly City sanitary sewer and storm drain; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 7	Daly City sanitary sewer; Colma storm drain; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 8	Daly City sanitary sewer; Colma storm drain; underground PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 9	Daly City sanitary sewer; South San Francisco storm drain; overhead PG&E electric line; SFPUC water transmission pipeline
Site 10	South San Francisco sanitary sewer and storm drain; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 11	South San Francisco sanitary sewer; South San Francisco storm drain; underground PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 12	South San Francisco sanitary sewer and storm drain; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 13	South San Francisco sanitary sewer and storm drain; overhead PG&E electric line; Cal Water waterline
Site 14	San Bruno sanitary sewer and storm drain; overhead PG&E electric line; SFPUC water transmission pipeline
Site 15	San Bruno sanitary sewer and storm drain; underground PG&E Gas Electric; SFPUC water transmission pipeline
Site 16	Millbrae sanitary sewer and storm drain; PG&E overhead electric line; SFPUC water transmission pipeline; PG&E gas line
Site 17 (Alternate)	Daly City sanitary sewer; Colma storm drain; underground PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 18 (Alternate)	South San Francisco sanitary sewer and storm drain; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline
Site 19 (Alternate)	South San Francisco sanitary sewer and storm drain; overhead PG&E electric line; SFPUC water transmission pipeline; Cal Water waterline, PG&E gas line

Note: Potentially affected utilities are those utilities within the construction area shown in Figures 3-11 to 3-40.

It is expected that construction at each facility site would occur over a 16-month period for facility sites that include a well facility building and during a three-month period for wells that have only a fenced facility (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). Project pipeline construction would generally progress at a rate of 300 to 600 feet per week, including excavation, disconnection of affected utilities, pipeline replacement, utility reconnection and backfill of construction trenches (see Chapter 3, Project Description, Section 3.5.1 [Construction Sequencing and Schedule]). However, utility connections that extend perpendicularly from a site across a roadway may take more time to install, given the potential to encounter additional utilities and the need to maintain roadway circulation; in such cases, these connections may take up to one week for installation of a single connection, and up to two weeks for connections of two or more utilities within the same area.

Impacts on existing utilities within the construction area of the well facility site could occur during construction. Site preparation, foundation construction, and utility connections would have the potential for disrupting existing utilities based on the excavation needed for construction. The open-cut construction method for pipeline installation would also have the potential for disrupting existing utilities from excavation activities near utilities. Accidental rupture of, or damage to, such utility lines during Project construction could temporarily disrupt utility services and may pose a safety risk for construction workers. Due to the potential for encountering unanticipated utilities in the vicinity of the facility sites, potential damage to, relocation of and service disruption of these utilities could occur, which could result in *significant* impacts. However, these impacts would be reduced to *less-than-significant* levels with implementation of Mitigation Measures M-UT-1a through M-UT-1i as discussed below.

Mitigation Measure M-UT-1a: Confirm Utility Line Information (All Sites)

Prior to excavation and/or other ground-disturbing construction activities, the SFPUC or its contractor(s) shall locate overhead and underground utility lines, such as natural gas, electricity, sewer, telephone, and waterlines, that may be encountered during excavation work. Pursuant to State law, the SFPUC or its contractor(s) shall notify USA North. Information regarding the size and location of existing utilities shall be confirmed before excavation and other ground-disturbing activities commence. These utilities shall be highlighted on all construction drawings. Utilities may be located by customary techniques such as geophysical methods and hand excavation.

Mitigation Measure M-UT-1b: Safeguard Employees from Potential Accidents Related to Underground Utilities (All Sites)

While any excavation is open, the SFPUC or its contractor(s) shall protect, support, or remove underground utilities as necessary to safeguard employees. As part of contractor specifications, the contractor(s) shall be required to provide updates on planned excavations for the upcoming week and to specify when construction will occur near any high-priority utility lines that are identified. At the beginning of each week when this work will take place, the SFPUC construction managers shall conduct meetings with contractor staff, as required by the California Occupational Safety and Health Administration (CalOSHA), to record all protective and avoidance measures regarding such excavations.

Mitigation Measure M-UT-1c: Notify Local Fire Departments (All Sites)

In the event that construction activities result in damage to high-priority utility lines, including leaks or suspected leaks, the SFPUC or its contractor(s) shall immediately notify local fire departments to protect worker and public safety.

Mitigation Measure M-UT-1d: Emergency Response Plan (All Sites)

Prior to commencing construction activities, the SFPUC shall develop an emergency response plan that outlines procedures to follow in the event of a leak or explosion resulting from a utility rupture. The emergency response plan shall identify the names and phone numbers of PG&E staff who would be available 24 hours per day in the event of damage or rupture of the high-pressure PG&E natural gas pipelines. The plan shall also detail emergency response protocols including notification, inspection, and evacuation procedures; any equipment and vendors necessary to respond to an emergency, such as an alarm system; and routine inspection guidelines.

Mitigation Measure M-UT-1e: Advance Notification (All Sites)

The SFPUC or its contractor(s) shall notify all affected utility service providers in advance of Project excavation and/or other ground-disturbing activities. The SFPUC or its contractor(s) shall make arrangements with these entities regarding the protection, relocation, or temporary disconnection of services prior to the start of excavation and other ground-disturbing activities. The SFPUC or its contractor(s) shall coordinate with the appropriate utility service providers to ensure advance notification to residents, owners, and businesses in the Project area of a potential utility service disruption two to four days in advance of construction. The notification shall provide information about the timing and duration of the potential service disruption.

Mitigation Measure M-UT-1f: Protection of Other Utilities during Construction (All Sites)

Detailed specifications shall be prepared as part of the design plans to include procedures for the excavation, support and fill of areas around subsurface utilities, cables, and pipes. If it is not feasible to avoid an overhead utility line during construction, the SFPUC or its contractor(s) shall coordinate with the affected utility owner to either temporarily or permanently support the line, to de-energize the line while temporarily supporting the overhead line, or to temporarily re-route the line.

Mitigation Measure M-UT-1g: Ensure Prompt Reconnection of Utilities (All Sites)

The SFPUC or its contractor(s) shall promptly notify utility providers to reconnect any disconnected utility lines as soon as it is safe to do so.

Mitigation Measure M-UT-1h: Avoidance of Utilities Constructed or Modified by Other SFPUC Projects (All Sites)

The final construction drawings for the Project shall reflect any changes in utility locations, as well as the locations of any new utilities installed during construction of other SFPUC projects in San Mateo County whose disturbance areas overlap with the Project area.

Mitigation Measure M-UT-1i: Coordinate Final Construction Plans with Affected Utilities (All Sites)

The SFPUC or its contractor(s) shall coordinate final construction plans and specifications with affected utility providers.

Implementation of Mitigation Measure M-UT-1a (Confirm Utility Line Information), Mitigation Measure M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities), Mitigation Measure M-UT-1c (Notify Local Fire Departments), Mitigation Measure M-UT-1d (Emergency Response Plan), Mitigation Measure M-UT-1e (Advance Notification), Mitigation Measure M-UT-1f (Protection of Other Utilities during Construction), Mitigation Measure M-UT-1g (Ensure Prompt Reconnection of Utilities), Mitigation Measure M-UT-1h (Avoidance of Utilities Constructed or Modified by Other SFPUC Projects), and Mitigation Measure M-UT-1i (Coordinate Final Construction Plans with Affected Utilities) would adequately mitigate potential impacts related to the potential disruption and relocation of utility operations or accidental damage to existing utilities by requiring that the SFPUC and/or its contractor(s) identify the potentially affected lines in advance, coordinate with utility service providers to minimize the risk of damage to existing utility lines, protect lines in place to the extent possible or temporarily re-route lines if necessary, and take special precautions when working near high-priority utility lines (e.g., gas transmission lines). Therefore, this impact would be *less than significant with mitigation.*

Impact Conclusion: Less than Significant with Mitigation

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. (Less than Significant)

<u>All Sites</u>

The data used in this analysis of Impact UT-2 are presented in Chapter 3, Project Description, Sections 3.5.1.1 (Construction Methods for Production Wells) and 3.5.1.4 (Dewatering and Other Potential Discharges).

After well drilling is complete, each new well would undergo well development and pumping tests which produce up to approximately three million gallons of water that must be disposed. Well development and pump testing would occur over the course of approximately 150 hours (about six days) for each well, resulting in an average disposal need of 0.5 mgd. Water from the well development and testing would be discharged to a storm drain and/or sanitary sewer. Clean groundwater discharges to storm drains would be acceptable, as they would be exempt under The San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (NPDES Permit CAS612008, Section C.15.a.[i][7]) (RWQCB 2011). Due to the anticipated quality of the groundwater that would be discharged from the pump tests, permits from the San Francisco Bay RWQCB are not anticipated (SFPUC 2011).

Before being placed into service, the new pipelines at all sites, including either the proposed pipeline or the alternate pipeline, would be flushed using groundwater and disinfected to meet water quality regulations. The new treatment facilities would be flushed and disinfected similarly at those sites with treatment facilities. All water used for flushing would come from the new wells and would be either dechlorinated and sent to the storm drain or, if not dechlorinated, sent via the nearest sanitary sewer to local wastewater treatment plants for processing. This process would be a one-time event at each facility site and only occur just prior to starting up operation of the proposed facilities. Construction impacts on the sanitary sewer and storm drain systems are discussed below.

Sanitary Sewer Collection System and Wastewater Treatment Plant Capacity

If discharge water from well development, pumping tests and flushing[2] were sent to a sanitary sewer, water from Sites 1, 2, 3, 4, 5, 6, 7, 8, and 17 (Alternate) would be sent to the North San Mateo County Sanitation District (NSMCSD). Water from Sites 9, 10, 11, 12, 13, 14, 15, 18 (Alternate), and 19 (Alternate) would be sent to the South San Francisco–San Bruno Water Quality Control Plant (SSF-SB WQCP). Water from Site 16 would be sent to the Millbrae Wastewater Treatment Plant.

Well installation would be phased, resulting in a maximum of four wells to be constructed simultaneously within either the NSMCSD or SSF-SB WQCP collection area.[3] Development and testing of four wells simultaneously would result in the discharge of a maximum of 2.0 mgd[4] of groundwater for approximately six days to any of the treatment facilities. The Millbrae Wastewater Treatment Plant or storm drain system would receive a maximum of 0.5 mgd with construction of the well at Site 16. Temporary flows of this size would be within the capacity of the wastewater treatment plants, which have substantial excess capacity designed for wet weather flow periods.

Water volumes used for flushing the six-inch and eight-inch diameter pipe sizes would be sent to sanitary sewer pipelines of equal or greater diameter. The available capacity of the sanitary sewer systems is variable, but if necessary, the groundwater discharge would be pumped to portable storage tanks and then released to the sanitary sewer such that the discharge rate would not exceed the capacity of any individual sanitary sewer conveyance line (see Chapter 3, Project Description, Section 3.5.1.1 [Construction Methods for Production Wells]).

Therefore, the temporary discharge of groundwater from well development, pump testing, and flushing would be accommodated by the existing sanitary sewer collection system and the wastewater treatment plant, and the Project would not exceed the capacity of these systems.

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[2] No discharges from well development, pumping tests, and flushing are expected from Sites 2, 5, 6, 8, 10, and 13 because at these sites, existing test wells would be converted to production wells and no pumping or flushing would be required.

[3] Sites 1, 3, 4, and 7 in the NSMCSD collection area would be constructed in Construction Cluster A. Sites 12, 14, 15, and 19 (Alternate) in the SSF-SB WQCP collection area could be constructed together in Construction Cluster B. Site 18 (Alternate) in the NSMCSD collection area, and Sites 9 and 11 in the SSF-SB WQCP collection area would be constructed together in Construction Cluster C. Site 16 is the only site within the Millbrae Wastewater Treatment Plant collection area, and would be constructed as part of Cluster B. The remaining well facility sites have existing wells and would not require well installation as part of the Project.

[4] Development and pump testing would occur over the course of approximately 150 hours for each well resulting in an average of approximately 0.5 mgd per well. Four wells producing approximately 0.5 mgd would result in a total of approximately 2.0 mgd.

Storm Drain Capacity

If discharge water from flushing and well development and pumping test were sent to a storm drain, the water would be sent to the closest storm drain system, each of which is owned and maintained by the local jurisdiction: the cities of Daly City, South San Francisco, San Bruno, and Millbrae; the Town of Colma; and San Mateo County.

The peak discharge rate during well development (lasting for a few hours) would be approximately 800 gallons per minute (gpm) and the typical discharge rate would be closer to 500 gpm. The capacity of most storm drain systems is over 1,000 gpm. In addition, the SFPUC would notify the above wastewater and stormwater agencies in advance of the discharge, regardless of season, so that discharge methods (i.e., direct discharge or holding in portable storage tanks) appropriate to the available capacity can be applied (see Chapter 3, Project Description, Section 3.5.1.1 [Construction Methods for Production Wells]). At any given time, the capacity of storm drain systems is variable and the existing capacity used by other dischargers is unknown. However, given the Project's construction discharge rate, and because the SFPUC would control the rate of discharge (if needed), and notify the appropriate agencies before discharge occurs, the temporary discharge of groundwater from well development, pump testing, and flushing would be accommodated by the existing storm drain system, and the Project would not exceed the capacity of these systems.

Impact Conclusion

Therefore, because the storm drain systems could accommodate the groundwater discharge, because the SFPUC would control the rate of discharge to the sanitary sewer system and notify appropriate agencies before discharge occurs, and because the local wastewater treatment plants would have adequate capacity to treat these flows, potential impacts related to exceeding the capacity of wastewater or stormwater systems such that new facilities would be required would be *less than significant*.

Impact Conclusion: Less than Significant

Impact UT-3: Project construction would not result in adverse effects on solid waste landfill capacity. (Less than Significant)

<u>All Sites</u>

Construction of the Project would result in the generation of waste materials, primarily soils excavated from pipeline trenches and from the foundations for building construction, with some quantities of waste material generated from well excavation. Materials excavated during well facility construction and pipeline installation could be used as backfill around the facilities. Remaining soil would be hauled off site for recycling or disposal at appropriate facilities. Other waste generated on the sites would primarily consist of vegetation, including trees, which would be hauled off site for recycling or disposal. Other waste sources would be construction debris and possibly demolition debris from Sites 1 and 14. The Project would require off-site disposal of solid waste at the nearby Ox Mountain Sanitary Landfill.

The quantities of solid waste that would be disposed of at landfills cannot be specifically calculated at this time. However, the largest potential source of solid waste would be the excavated soil. As indicated in

Chapter 3, Project Description, Table 3-10 (Construction Soil Material Haul Amounts and Anticipated Haul Truck Trips), the estimated amount of excavated soils would be approximately 3,365 cubic yards (calculated assuming some excavated soil would be used on-site as backfill for pipeline trenches and at foundations; see Table 3-10). The Ox Mountain Sanitary Landfill has a remaining capacity of approximately 24,600,000 cubic yards. Assuming all 3,365 cubic yards (which is conservative given the 50 percent diversion rate requirements of AB 939) were disposed of at the Ox Mountain Sanitary Landfill, the remaining landfill capacity would not be substantially affected (Republic Services 2012). Because the Project would be served by a landfill with more than sufficient permitted capacity to accommodate the Project's solid waste disposal needs during construction, potential impacts on the environment related to the need for additional landfill capacity would, therefore, be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant with Mitigation)

<u>All Sites</u>

Project construction would result in the generation of waste materials, including construction debris from all sites, demolition materials from Sites 1 and 14 (potentially), and excavated spoil from all sites. Construction waste materials would be hauled off site for recycling or disposal. As described in Section 5.12.2 (Regulatory Framework), the jurisdictions in the Project area have local regulations pertaining to the disposal of solid waste. AB 939 (as modified by subsequent legislation) requires California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of waste.

Construction waste materials generated by the Project could make it difficult for the jurisdictions to achieve diversion goals in compliance with AB 939 and other local regulations. Because specific quantification of waste volumes and identification of the sources have not been possible at this time, it is unknown whether the Project's diversion rate from local landfills would be consistent with local jurisdictional diversion and solid waste disposal requirements. Therefore, this impact is considered *significant.* However, implementation of Mitigation Measure M-UT-4 (Waste Management Plan) would mitigate this impact to *less-than-significant* levels by requiring the construction contractor to prepare and implement a waste management plan, as detailed below.

Mitigation Measure M-UT-4: Waste Management Plan (All Sites)

The SFPUC shall require the construction contractor(s) to prepare a Waste Management Plan identifying the types of debris that would be generated by the Project and how all waste streams would be handled within each jurisdiction. In accordance with the priorities of AB 939, the plan shall emphasize source reduction measures followed by recycling and composting methods to reduce the amount of waste being disposed of in landfills. The plan shall include actions to divert waste with disposal in a landfill in accordance with local ordinance requirements as follows:

Daly City (Sites 1, 2, 5, 6, and the Westlake Pump Station)

For sites within Daly City, at least 60 percent of waste tonnage from construction and demolition shall be diverted from disposal through reuse or recycling. The maximum feasible amount of designated recyclable and reusable materials shall be salvaged prior to demolition. Construction and demolition debris is defined as discarded materials generally considered to be not water soluble and nonhazardous in nature, including, but not limited to: steel, copper, aluminum, glass, brick, concrete, asphalt material, pipe, gypsum, wallboard, and lumber; rocks, soils, tree remains, trees, and other vegetative matter that normally results from land clearing, landscaping, and development operations for a construction project; and remnants of new materials, including, but not limited to: cardboard, paper, plastic, wood, and metal scraps.

Unincorporated San Mateo County (Sites 3, 4)

For sites within unincorporated San Mateo County, salvage all or parts of a structure where practicable; recycle or reuse 100 percent of inert solids at approved facilities; direct source separating non-inert materials (e.g., cardboard and paper, wood, metals, green waste, new gypsum wallboard, tile, porcelain fixtures, and other easily recycled materials) to recycling facilities approved by the County, the remainder (but no more than 50 percent by weight or yardage) of which shall be taken to a facility for disposal.

Colma (Sites 7, 8, and Site 17 [Alternate])

For sites within Colma, recycle 50 percent of the waste tonnage from any demolition project where the waste includes concrete and asphalt (or 15 percent where there is no concrete and/or asphalt); and recycle 50 percent of waste tonnage for new construction.

South San Francisco (Sites 9, 10, 11, 12, 13, 18 [Alternate], and 19 [Alternate])

For sites within South San Francisco, recycle 100 percent of inert solids (i.e., asphalt, concrete, rock, stone, brick, sand, soil and fines), and recycle at least 50 percent of the remaining construction and demolition debris.

San Bruno (Sites 14 and 15)

For sites within San Bruno, recover the maximum feasible amount of salvageable designated recyclable and reusable materials prior to demolition; divert 50 percent of construction and demolition debris from residential and commercial buildings.

Millbrae (Site 16)

For sites within Millbrae, recycle 50 percent of all waste generated for the Project by weight, with at least 25 percent achieved through reuse and recycling of materials other than source separated dirt, concrete, and asphalt.

The plan shall be reviewed by the SFPUC, and upon Project completion, the contractor shall submit receipts to the SFPUC documenting achievement of the stated waste reuse, recycling, and disposal goals.

Impact Conclusion: Less than Significant with Mitigation

5.12.3.5 Operational Impacts and Mitigation Measures

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. (Less than Significant)

<u>All Sites</u>

Sanitary Sewer Collection System and Wastewater Treatment Plant Capacity

As discussed in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types), Sites 5, 6, 7, 8, 9, 10, 11, 13, and 15[5] may include filtration systems to treat the extracted groundwater, in addition to other treatment systems which may be necessary at these sites. The filtration system would consist of a series of vertical pressure vessels. The backwash water from the system would connect with a pipeline to a nearby sanitary sewer. It is anticipated that filters would be backwashed, on average, once a day for five minutes at approximately 350 gpm per filter. Depending on the quantity of water being treated, the treatment facilities would have six to 16 filters, which would result in a discharge of approximately 0.01 to 0.03 mgd per well (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]). Wastewater from the backwash process would be discharged to the sanitary sewer and be treated at the NSMCSD (for Sites 5, 6, 7 and 8 totaling 0.08 mgd) and the SSF-SB WQCP (for Sites 9, 10, 11, 13, 14, and 15 totaling 0.06 mgd). The Project would also generate small sanitary sewer flows from sinks at up to 14 of the well facilities.

As discussed in Section 5.12.1.1 (Utilities), the NSMCSD has an average dry weather flow design of eight million gallons of effluent per day and can treat up to 25 mgd during the wet weather flow period. The SSF-SB WQCP has a dry-weather capacity of 13 mgd and a wet-weather capacity of approximately 62 mgd. Both treatment facilities are currently functioning at below their permitted capacity. The 0.06 to 0.08 mgd of wastewater generated from backwashing the filters, and the small addition of wastewater flow from operation of 14 sinks, would be minor compared to the existing flows of the wastewater treatment plants receiving the flows, and would not cause the treatment facilities to exceed their permitted capacity. Therefore, Project operation would not exceed the capacity of these wastewater treatment facilities or require the construction or expansion of facilities, and the impact would be *less than significant*.

Storm Drain Capacity

The SFPUC's past experience with intermittent well operations indicates that monthly exercising for four-hour periods during normal and wet years should be adequate to prevent well screen fouling (MWH et al. 2008). The well exercising would occur at a rate of approximately 300 to 600 gpm for four hours per month during normal and wet years. It is assumed that water pumped during well exercising would be the same as the well pump capacity; see Table 3-3 (Site-specific Facility Characteristics) in Chapter 3, Project Description, Section 3.8.3 (Maintenance). Groundwater pumped during exercising

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[5] The Site 6 filtration system would treat water from Sites 5, 6 and 7 in the consolidated treatment at Site 6 scenario. The Site 15 filtration system would treat water from both Sites 14 and 15.

would be discharged to a local storm drain. As discussed in Impact UT-2, the capacity of most storm drain systems is over 1,000 gpm and could accommodate discharge at the rate of 300 to 600 gpm for a four-hour period. At any given time, the capacity of storm drain systems is variable, and the existing capacity used by other dischargers is unknown. However, given the scope of discharges (four hours per month during normal and wet years at a rate of 300 to 600 gpm), there would still be significant capacity left in the system to accommodate other discharges.

Impact Conclusion

Therefore, because the quantity of discharge water associated with monthly well exercising would not exceed the capacity of local storm drains or require or result in the construction of, or expansion of stormwater drainage facilities, potential impacts related to wastewater treatment facilities or stormwater drainage facilities would be *less than significant.*

Impact Conclusion: Less than Significant

5.12.3.6 Cumulative Impacts and Mitigation Measures

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. (Less than Significant with Mitigation)

The geographic scope for the analysis of cumulative impacts on utilities and service systems consists of each proposed GSR facility site (including the construction area for the well, the well facility and the pipelines), the immediate vicinity around each of these sites and the service areas of regional service/utility providers. For landfill capacity, the geographic scope includes San Mateo County, within which construction-related waste could be sent to the Ox Mountain Landfill. For compliance with solid waste statutes and regulations, the geographic area encompasses San Mateo County.

Construction

Damage to or Disruption of Existing Utilities and Relocation of Utilities

As described in Impact UT-1, the GSR Project could result in unintentional damage or interference with existing water, sewer, storm drain, natural gas, electricity, and/or telecommunication lines and, in some cases, could require that existing lines be permanently relocated, potentially causing a temporary disruption in service. Most of the projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), could also result in potential damage to existing utilities, disruption of utility services, or relocation of utilities when the new construction ties into existing utilities. In particular, the SFPUC's Peninsula Pipelines Seismic Upgrade (PPSU) Project, Colma Site (cumulative project D-1), would replace an existing water pipeline that traverses proposed GSR Site 8 with the proposed replacement pipeline to be constructed underneath the existing storm drain culvert on the site. This could result in a temporary interruption in service of the storm drain. Additional projects could contribute to the cumulative impacts related to the disruption of existing utilities; these projects include Vista Grande Basin Drainage Improvement Project (cumulative project B) near GSR Sites 1, 2, 3, and 4; Cal Water's Well Replacement

SSF1-25 Project (cumulative project G) near GSR Sites 11, 12, and 19 (Alternate); PG&E's Transmission Pipeline Replacement Project (cumulative project H) near GSR Sites 9, 11, 13, 18 (Alternate), and 19 (Alternate); and the Centennial Village Project (cumulative project I) near Site 13.

Disruption of existing utilities could occur during construction of the GSR Project and several of the cumulative projects listed above. Specifically, the GSR Project at Site 8 and the SFPUC's PPSU Project, Colma Site (cumulative project D-1) could temporarily affect the existing storm drain culvert if construction of both projects occurred at the site time. Other temporary utility disruptions could occur with construction of the other cumulative projects. Therefore, cumulative impacts related to disruption of utility operations or accidental damage to existing utilities and relocation of regional or local utilities or services system from other lapping construction of the cumulative projects would be *significant*, and the GSR Project's contribution to this cumulative impact could be cumulatively considerable, given that the GSR Project, as proposed, also has the potential to result in *significant* impacts on utilities and service systems.

However, as discussed in Impact UT-1, the GSR Project's impacts related to damage to an existing utility, disruption of service, or relocation of utilities would be reduced to a *less-than-significant* level with implementation of Mitigation Measure M-UT-1a (Confirm Utility Line Information), Mitigation Measure M-UT-1b (Safeguard Employees from Potential Accidents Related to Underground Utilities), Mitigation Measure M-UT-1c (Notify Local Fire Departments), Mitigation Measure M-UT-1d (Emergency Response Plan), Mitigation Measure M-UT-1e (Advance Notification), Mitigation Measure M-UT-1f (Protection of Other Utilities during Construction), Mitigation Measure M-UT-1g (Ensure Prompt Reconnection of Utilities), Mitigation Measure M-UT-1h (Avoidance of Utilities Constructed or Modified by Other SFPUC Projects), and Mitigation Measure M-UT-1i (Coordinate Final Construction Plans with Affected Utilities). Implementation of these mitigation measures would ensure that existing utilities are accurately located and protected during construction, and that emergency response procedures are in place to minimize potential damage during construction. With implementation of these mitigation measures, the GSR Project's contribution to cumulative impacts related to damage or disruption of existing utilities and relocation of utilities would not be cumulatively considerable (*less than significant with mitigation*).

Wastewater Treatment, Sanitary Sewer, and Storm Drain Capacity

Most of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would result in construction-related incremental additions to the local wastewater treatment plants, sanitary sewers, and storm drain systems as many of the projects require connection to the sanitary sewer and storm drain system. In particular, the Daly City "A" Street Well Replacement Project (cumulative project C) would likely require connection to the same sanitary sewer and storm drain system. Construction of the SFPUC's PPSU Project at the Colma Site (cumulative project D-1) would require discharge to the sanitary sewer and storm drain from pipeline testing.

As described in Impact UT-2, the GSR Project would have *less-than-significant* impacts on wastewater treatment, sanitary sewer, and/or storm drain capacity because GSR Project discharges would be for brief periods of time; discharges would be pumped to portable storage tanks and then released to the sanitary sewer collection system or the storm drain system, if necessary; the wastewater treatment plants have adequate additional capacity; and the wastewater and stormwater agencies would be notified in advance.

Depending on the extent of overlap between the construction schedules for the projects listed in Table 5.1-3, implementation of these projects together with the proposed GSR Project could result in a *significant* cumulative impact on wastewater treatment, sanitary sewer, and/or storm drain capacity. However, impacts on the sanitary sewer and storm drain systems would be temporary (only during construction) and brief (e.g., 48 hours for pump testing).

As described in Chapter 3, Project Description, Section 3.5.1.2 (Construction Methods for Well Facilities), the SFPUC would notify the stormwater and wastewater agencies in advance of the well testing discharge to determine the appropriate discharge method and the appropriate discharge rate for the various stormwater and wastewater agencies. If necessary, the groundwater discharge would be pumped to portable storage tanks and then released to the sanitary sewer such that the discharge rate would not exceed the capacity of the individual sanitary sewer system. With notification, the agencies would be able to account for the GSR Project's contribution to the stormwater and wastewater systems in the context of other discharges (potentially including cumulative projects C and D-1) and avoid exceeding capacity.

Because of these notification and discharge procedures, as well as the limited impact to the sanitary and storm drain systems, the GSR Project's contribution to a potential cumulative impact on wastewater treatment, sanitary sewer, or storm drain capacity from construction-related activities would not be cumulatively considerable (*less than significant*).

Landfill Capacity

Most of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would result in construction waste that would require offsite disposal at the Ox Mountain Sanitary Landfill, because most projects would create construction waste and are in the service area of that landfill.

As described in Impact UT-3, the GSR Project would have *less-than-significant* impacts on remaining capacity at the landfill, because GSR Project construction waste for the largest component of the Project's solid waste -- excavated soils -- would be 3,365 cubic yards (not accounting for the 50 percent diversion rate requirements of AB939).

The construction phase of the cumulative projects identified in Table 5.1-3, together with the proposed GSR Project, could generate substantial quantities of waste for disposal at the landfill, reducing the remaining capacity of the landfill, which was estimated in March 2012 to be 24,600,000 cubic yards. This would be a *significant* cumulative impact. However, the proposed GSR Project's contribution to the reduction of landfill capacity would not be cumulatively considerable, because the volume of solid waste generated by the Project would be very small in relation to the remaining capacity. Therefore, the GSR Project's contribution to a cumulative impact would not be cumulatively considerable (*less than significant*).

Compliance with Solid Waste Statutes and Regulations

The cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would generate construction waste and would need to comply with local solid waste diversion and disposal regulations. However, because specific quantification of waste volumes of the cumulative projects is not specifically known at this point, it is unknown whether the cumulative projects diversion rate from local landfills would be consistent with local regulations. Although construction waste volumes are expected to be relatively small, since these volumes are not quantified at this time, it is unknown whether the proposed GSR Project's management of construction waste would be consistent with the local jurisdictional diversion requirements, which has been identified as a *significant* impact above in Impact UT-4. Therefore, cumulative impacts related to compliance with solid waste statutes and regulations during construction could be *significant* and the GSR Project's contribution to this cumulative impact could be cumulatively considerable.

However, as discussed in Impact UT-4, the GSR Project's impacts related to compliance with solid waste statutes and regulations during construction would be reduced to a *less-than-significant* level with implementation of Mitigation Measure M-UT-4 (Waste Management Plan). Implementation of this mitigation measure would ensure that local regulations pertaining to disposal and diversion of solid waste would be complied with during construction of the GSR Project. With implementation of this mitigation measure, the GSR Project's contribution to cumulative impacts related to compliance with solid waste statutes and regulations during construction would not be cumulatively considerable (*less than significant with mitigation*).

Operation

Most of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would result in incremental additions to the local wastewater treatment plants, sanitary sewers, and/or storm drain systems on a permanent basis, as new housing, commercial, or industrial uses are occupied and operated.

As described in Impact UT-5, the GSR Project would have *less-than-significant* impacts on sanitary sewer and wastewater treatment capacity, because GSR Project discharges from the filter systems during dry years when the wells would be operating would be very small (0.04 mgd to be treated at the NSMCSD and 0.06 mgd at the SSF-SB WQCP plus very small flows from the sinks at up to 14 of the well facilities) compared to the available capacity of these wastewater treatment plants (approximately 1.15 mgd of unused capacity at the NSMCSD and 4.0 mgd of unused capacity at the SSF-SB WQCP). Impact UT-5 also describes that the proposed GSR wells would be exercised for approximately four hours per month during normal and wet years, which would have a *less-than-significant* impact on storm drain capacity.

The cumulative projects identified in Table 5.1-3, together with the proposed GSR Project, could generate substantial volumes of wastewater, reducing the remaining capacity of the wastewater treatment plants and reducing the available capacity in sanitary sewers and storm drains. This would be a *significant* cumulative impact. However, the proposed GSR Project's contribution to the reduction in capacity of the wastewater treatment plants, sanitary sewers, and storm drains is not cumulatively considerable, because the volume of sewer or storm drain discharge is very small in relation to the remaining capacity. As a result, the GSR Project's contribution to a cumulative impact would not be cumulatively considerable (*less than significant*).

5.12.4 References

California Department of Transportation (Caltrans). 1999. *Caltrans Project Development Procedures Manual – Appendix LL*.

CalRecycle. 2011. *County Waste Profiles*. Website accessed April 21, 2011 at: http://www.calrecycle.ca.gov/Profiles/Facility/LandFill/LFProfile1.asp /.

CalRecycle. 2012. *Per Capita Disposal and Goal Measurement (2007 and Later).* October 12. Website accessed March 1, 2013 at: http://www.calrecycle.ca.gov/lgcentral/Basics/PerCapitaDsp.htm.

CalRecycle. 2013. *Countywide, Regionwide, and Statewide Jurisdiction Diversion/Disposal Progress Report*. 2007-2011. Website accessed March 2, 2013 at: http://www.calrecycle.ca.gov/lgcentral/Reports/jurisdiction/diversiondisposal.aspx.

Colma, Town of. 1999. *Town of Colma General Plan*. June.

Colma, Town of. n.d. *Construction and Demolition Recycling Criteria*. Website accessed February 19, 2013 at: www.recycleworks.org/pdf/colma.pdf.

Daly City. n.d. *City of Daly City Municipal Code Chapter 15.64, Recycling and Diversion of Construction and Demolition Debris.* Website accessed March 2, 2013 at: http://library.municode.com/showDocument.aspx?clientID=16311&jobId=182467&docID=2.

Millbrae, City of. 2013. *City of Millbrae Recycling & Waste Prevention Program*. Website accessed February 19, 2013 at: www.ci.millbrae.ca.us/index.aspx?page=232.

MWH with AGS, M. Lee, and Talavera & Richardson. 2008. *Groundwater Conjunctive Use Project Conceptual Engineering Report.* Prepared for the San Francisco Public Utilities Commission. November.

Pacific Gas and Electric Company (PG&E). 2012a. *Natural Gas System Frequently Asked Questions*. Website accessed April 4, 2012 at: http://www.pge.com/myhome/edusafety/systemworks/gas/faq/.

PG&E. 2012b. *Gas Transmission Pipelines, Gas Transmission Pipeline System Map*. Website accessed May 16, 2012 at: http://www.pge.com/myhome/edusafety/systemworks/gas/transmissionpipelines/.

Regional Water Quality Control Board (RWQCB). 2001. *NPDES Permit No. CA0037532 Waste Discharge Requirements for City of Millbrae.*

RWQCB. 2003. *NPDES Permit No. CA0038130 Waste Discharge Requirements for Cities of South San Francisco and San Bruno Water Quality Control Plant.*

RWQCB. 2006. *NPDES Permit No. CA0037737 Waste Discharge Requirements for North San Mateo County Sanitation District.*

RWQCB. 2011. *NPDES Permit No. CAS612008 California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit.* Adopted October 14, 2009, revised November 28, 2011.

Republic Services, Central-Cal Post-Collection. 2012. Personal Communication, Frank Turk, March 28, 2012.

San Bruno, City of. 2011. *Streets and Stormwater Divisions.* Website accessed April 21, 2011 at: http://www.sanbruno.ca.gov/pw_streets_main.html.

San Bruno, City of. n.d. City of San Bruno Municipal Code. *Chapter 10.23, Recycling and Diversion of Debris from Construction and Demolition*. Website accessed February 19, 2013 at: http://qcode.us/codes/sanbruno/view.php?topic=10-10_23&showAll=1&frames=on.

San Francisco Planning Department. 2009. *Crystal Springs Pipeline No. 2 Replacement Project Draft Environmental Impact Report (State Clearinghouse No. 2008112050)*. December 10.

San Francisco Public Utilities Commission (SFPUC). 2011. *CEQA Exemption Request, Water Quality Wells Investigation*. May 2.

San Mateo County. 2002. *Ordinance No. 04099. An Ordinance Adding a New Chapter 4.105 to the San Mateo County Ordinance Code Relating to Recycling and Diversion of Construction and Demolition Debris*. Website accessed March 27, 2012 at: http://www.recycleworks.org/con_dem/or_04099.html.

San Mateo County. 2009. *San Mateo County General Plan Water Suppliers Map*.

San Mateo County. 2011. *Garbage and Recycling Collection in San Mateo County.* Website accessed April 21, 2011 at: http://www.recycleworks.org/resident/map.html.

San Mateo County, RecycleWorks Program. 2012. Construction Site Recycling, A Guide for Building Contractors.

San Mateo County. n.d. *San Mateo County General Plan Wastewater Service Areas Map*.

South San Francisco, City of. 1999. *General Plan*.

South San Francisco, City of. 2012. *Water Quality Control Plant.* Website accessed April 18, 2012 at: http://www.ssf.net/index.aspx?NID=506.

South San Francisco, City of. n.d. *City of South San Francisco Municipal Code Chapter 15.60, Recycling and Diversion of Debris from Construction and Demolition*. Website accessed February 19, 2013 at: http://qcode.us/codes/southsanfrancisco/view.php?topic=15-15_60&showAll=1&frames=on.

Underground Service Alert–Northern California (USA North). 2013. *Dig Safely Brochure*. Website accessed January 28, 2013 at: http://www.usanorth.org/USAColorBrochure.pdf.

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5.13 PUBLIC SERVICES

This section describes the existing conditions and regulatory setting for public services and evaluates impacts on public services that could occur as a result of the implementation of the proposed Project. Public services addressed in this section include law enforcement services, fire protection services, emergency services, and schools. Impacts on emergency response or access (i.e., disruption of emergency services due to access restrictions) are addressed in Section 5.6, Transportation and Circulation. Impacts on recreational facilities are addressed in Section 5.11, Recreation. Impacts on solid waste disposal facilities are addressed in Section 5.12, Utilities and Service Systems, while energy and power issues are addressed in Section 5.18, Mineral and Energy Resources.

5.13.1 Setting

Project facilities would be constructed and operated as part of the proposed Project at locations in the cities of Daly City, South San Francisco, San Bruno, Millbrae, the Town of Colma, and unincorporated San Mateo County as shown on Figure 2-1 (Project Vicinity Map) in Chapter 2, Introduction and Background. The public services study area includes the proposed facility sites and the jurisdictions that provide public services for the sites. A description of the public services in these jurisdictions is presented below.

5.13.1.1 Law Enforcement Services

Police services in the study area are provided by the Broadmoor Police Department, a special police protection district serving the unincorporated community of Broadmoor in San Mateo County and the local police departments of Daly City, Colma, South San Francisco, San Bruno, and Millbrae. The California Highway Patrol (CHP) provides law enforcement services for the State highway facilities and unincorporated county roadways throughout the study area. The Golden Gate National Cemetery (GGNC) is under the jurisdiction of the U.S. Department of Veterans Affairs (VA) Police (Federal Police), and is also served by the San Bruno Police Department (VA 2011a, 2011b). Table 5.13-1 (Law Enforcement and Fire Protection Services within the Project Area) lists each facility site's jurisdictional law enforcement agency.

TABLE 5.13-1
Law Enforcement and Fire Protection Services within the Project Area

Sites	Jurisdiction	Law Enforcement Services	Fire Protection Services
Sites 1, 2, 5, 6, Westlake Pump Station	Daly City	Daly City Police Department	North County Fire Authority
Sites 3, 4	Unincorporated San Mateo County (Broadmoor)	Broadmoor Police Department (Special Protection District)	Colma Fire Protection District
Sites 7, 8, 17 (Alternate)	Colma	Colma Police Department	Colma Fire Protection District
Sites 9, 10, 11, 12, 13, 18 (Alternate), 19 (Alternate)	South San Francisco	South San Francisco Police Department	South San Francisco Fire Department
Sites 14, 15	San Bruno	San Bruno Police Department VA Federal Police (GGNC)	San Bruno Fire Department
Site 16	Millbrae	Millbrae Police Department	Millbrae Fire Department

Sources: Broadmoor Police Department 2010; CHP 2012; Daly City 1987; Millbrae 1998; San Bruno 2009; South San Francisco 1999; VA 2011a , 2011b; NCFA n.d.; San Mateo County 1986a, 1986b; Colma 1999

5.13.1.2 Fire Protection Services

Daly City contracts for fire services from the North County Fire Authority (NCFA n.d.). The Colma Fire Protection District serves Colma and the surrounding unincorporated areas, including the unincorporated community of Broadmoor (Colma 1999). Local fire departments serve the cities of South San Francisco, San Bruno, and Millbrae. The GGNC is served by the San Bruno Fire Department (VA 2011b). Table 5.13-1 (Law Enforcement and Fire Protection Services within the Project Area) lists each jurisdiction's fire protection agency.

5.13.1.3 Emergency Services

For emergency services, San Mateo County is served by a public/private partnership of the American Medical Response (AMR), the fire protection agencies within the County and the County Health Services Department's Emergency Medical Services office (San Mateo 2010). 911 emergency medical calls are responded to by AMR and firefighter paramedics on fire engines.

Hospitals near the Project include:

- Seton Medical Center
  1900 Sullivan Avenue
  Daly City, CA 94015

- Kaiser Permanente, South San Francisco Medical Center
  1200 El Camino Real
  South San Francisco, CA 94080
- The Emmanuel Convalescent Hospital of Millbrae
  33 Mateo Avenue
  Millbrae, CA 94030
- Mills-Peninsula Medical Center
  1501 Trousdale Drive
  Burlingame, CA 94010

San Mateo Medical Center is the public hospital for San Mateo County, although it is not located within the study area.

5.13.1.4 Schools

Public elementary, middle school, and high school districts in the vicinity of facility sites that could be affected by the Project include the Jefferson Elementary School District and the South San Francisco Unified School District, which provide various services for adult and student populations with the study area.

5.13.2 Regulatory Framework

5.13.2.1 Federal

There are no federal regulations governing public services that apply to the Project.

5.13.2.2 State

There are no State regulations governing public services that apply to the Project.

5.13.2.3 Local

The Colma General Plan and the Daly City General Plan Safety Element set forth performance objectives of an average emergency response time of two to four minutes to all locations in Colma and Daly City (Colma 1999; Daly City 1994). The San Bruno General Plan establishes an implementing policy to maintain existing or better levels of police and fire service to neighborhoods in the northern and western neighborhoods (San Bruno 2009). The South San Francisco General Plan establishes a service ratio of 1.5 police officers per 1,000 residents and sets a response time goal of two to three minutes for high priority calls (South San Francisco 1999). The Millbrae General Plan requires the City to maintain adequate manpower for police and fire departments, but does not set a specific service ratio (Millbrae 1998). The San Mateo County General Plan does not have a policy related to performance objectives of public services relevant to the Project.

5.13.3 Impacts and Mitigation Measures

5.13.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on public services if it were to:

- Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, emergency services, or schools.

5.13.3.2 Approach to Analysis

Due to the nature of the proposed Project, there would be no impacts related to the following criterion for the reasons described below and, therefore, the criterion is not discussed further.

Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, emergency services or schools. During the proposed 21-month construction period, an average of 193 daily construction workers would be employed at the facility construction sites[1] (see Table 3-8 [Estimated Daily Worker and Construction Equipment Trips for Well Facilities Construction], in Chapter 3, Project Description, Section 3.5.1.2 [Construction Methods for Well Facilities]). It is expected that construction workers could come from any part of the San Francisco Bay Area (Bay Area). While some workers might temporarily relocate from other areas, the proposed Project would not result in a substantial increase in local populations and would not affect established service ratios for law enforcement, fire protection, emergency services, or schools. Potential incidents requiring law enforcement, fire protection, or emergency services could occur during Project construction. However, the potential temporary increase in incidents would not exceed the capacity of local law enforcement, fire protection, and emergency facilities, compared to the existing overall population and service area. Any increase in incidents as a result of Project construction would be negligible and could be accommodated by existing service providers. Construction of the proposed Project would not result in impacts related to the need for new or physically altered

[1] Table 3-8 in Chapter 3, Project Description, Section 3.5.1.2 (Construction Methods for Well Facilities), describes the typical daily construction worker trips for each Project construction component/phase and identifies the facility sites to which that phase applies. The average daily construction workers was determined by multiplying the typical daily construction worker trips for each phase by the number of facility sites to which that phase applies. Then the results for all phases were added together. A total of 193 average daily construction workers is a conservative figure, because it assumes the simultaneous construction of all phases and all facility sites. Construction of all facilities would only overlap for a portion of the 21-month construction period.

governmental facilities in order to maintain existing levels of public services; therefore, no construction-related impacts would occur.

The proposed Project would not result in a permanent increase in the local population. Operation and post-construction maintenance activities would be similar to existing maintenance activities and would not result in substantial increases in the demand for public services, including law enforcement, fire protection, emergency services, or schools. Therefore, operational impacts related to public services are not applicable.

5.13.3.3 Construction and Operational Impacts and Mitigation Measures

As described above, implementation of the proposed Project would not result in impacts related to public services. Therefore, no mitigation measures related to this resource topic are required.

5.13.3.4 Cumulative Impacts and Mitigation Measures

Because the GSR Project would not result in Project-specific impacts related to public services, implementation of the Project would not contribute to cumulative impacts.

5.13.4 References

Broadmoor Police Department. 2010. *Broadmoor Police Commission*. Website accessed April 18, 2011 at: http://www.broadmoorpolice.org/commission.html.

California Highway Patrol (CHP). 2012. *CHP & California State Police Merger*. Website accessed March 21, 2012 at: http://www.chp.ca.gov/html/merger.html.

Colma, Town of. 1999. *Town of Colma General Plan*. June.

Daly City, City of. 1987. *City of Daly City General Plan, Housing, Land Use & Circulation Elements*. November.

Daly City, City of. 1994. *City of Daly City General Plan Safety Element.* August.

Millbrae, City of. 1998. *City of Millbrae General Plan 1998-2015*. November.

North County Fire Authority (NCFA). n.d. *NCFA Overview.* Website accessed April 20, 2011 at: http://www.northcountyfire.org/sections/home/overview.htm.

San Bruno, City of. 2009. *San Bruno General Plan*. March.

San Mateo County. 1986a. *General Plan Overview Background & Issues Chapters 1-16*. November.

San Mateo County. 1986b. *General Plan Policies*. November.

San Mateo County, Emergency Medical Services. 2010. *Who We Are, What We Do.* Website accessed April 20, 2011 at: http://www.co.sanmateo.ca.us/portal/site/health/menuitem.e61f1c321415a767a181dda7917332a0/?vgnextoid=be1ad069cf1a0210VgnVCM1000001d37230aRCRD&vgnextfmt=DivisionsLanding.

South San Francisco, City of. 1999. *South San Francisco General Plan*.

U.S. Department of Veterans Affairs (VA), Golden Gate National Cemetery. 2011a. Personal Communication, Kathleen McCall, April 19, 2011.

US Department of Veteran Affairs (VA), Golden Gate National Cemetery. 2011b. Personal Communication, Scott Rush, May 2, 2011.

5.14 BIOLOGICAL RESOURCES

This section describes the biological resources present in the vicinity of the proposed Project and evaluates the potential effects of construction and operation the proposed Project on biological resources. The discussion focuses on site-specific information pertaining to special-status wildlife and plant species and other protected biological resources (e.g., trees, wetlands, streams, habitats) potentially occurring in the Project vicinity. Included is a discussion of the existing plant communities, wildlife habitats, potentially occurring special-status plant and wildlife species, and natural communities at the Project facility sites, as well as the identification of mitigation measures, as applicable.

5.14.1 Setting

5.14.1.1 Definitions

Project area refers to the area that would experience Project-related temporary or permanent effects caused by surface disturbance, tree removal, or other alterations of habitat within the Project construction area.

Study area refers to the larger area within which biological resources could be subject to effects (e.g., disturbance to wildlife from construction-related noise). The study area for the proposed Project is the facility sites and the nearby areas surrounding the sites. The study area includes areas that would experience Project-related temporary or permanent effects caused by surface disturbance, tree removal, or other alterations of habitat within the construction area. The study area also includes lands surrounding the proposed facility sites with biological resources that could be subject to the Project's effects (e.g., disturbance to wildlife from construction-related noise). Typically, the study area in relation to biological resources encompasses habitats adjacent to the work zone which could support wildlife species whose life cycles may be substantially disrupted by construction activities or project operations.

Special-status biological resources include special-status plants, animals, and natural communities, plus wetlands and other waters of the United States and State, as defined by the U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW)[1], and the State Water Resources Control Board (SWRCB).

A special-status natural community is a natural habitat community that receives regulatory recognition from municipal, county, State, and/or federal entities, such as the CDFW's California Natural Diversity Database (CNDDB), because it is unique in its constituent components, restricted in distribution, supported by distinctive soil conditions, and/or considered locally rare.

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[1] The California Department of Fish and Wildlife (CDFW) was known as the California Department of Fish and Game (CDFG) until January 1, 2013. CDFW documents published prior to that date are cited under the former name of CDFG.

Special-status plant and animal species are defined as:

- Species listed under the federal Endangered Species Act (FESA), Marine Mammal Protection Act, California Endangered Species Act (CESA), California Fish and Game Code (CFGC), and the California Native Plant Protection Act (NPPA) as endangered, threatened, or depleted; species that are candidates or proposed for listing; or species that are designated as rare or fully protected.

- Locally rare species, which may include species that are designated as sensitive, declining, rare, locally endemic, or as having limited or restricted distribution by various federal, State, and local agencies, organizations, and watch lists. This includes species on Lists 1B and 2 of the California Native Plant Society (CNPS).

5.14.1.2 Information Sources and Methods

Nineteen potential well facility sites (16 of which are proposed for development under the proposed Project) and one pump station upgrade site in northern San Mateo County were evaluated. The area within the construction boundary for the 20 sites, including the groundwater production well, pump station, underground distribution piping (including alternate pipeline connections), utility connections, access, and construction staging areas, was assessed for impacts on existing or potentially occurring biological resources, as well as impacts on habitat in areas surrounding each site.

Information about each site is based on the following:

- A CNDDB search for the San Francisco North, San Francisco South, Montara Mountain, and San Mateo 7.5 minute USGS quadrangles (CDFG 2011e);
- An assessment of habitat types and surrounding land uses using aerial photographs[2]; and
- Reconnaissance-level field surveys conducted by a qualified biologist on April 22, 23, and 25, 2009. Follow-up surveys were conducted on May 28, 2010, March 23, 2011, and March 4, 2012.

Additional information regarding special-status plants, animals, and habitats was compiled through a review of published literature of the California Department of Fish and Game (CDFG) (CDFG 2011a, 2011b, 2011c, 2011d), the CNPS (CNPS 2011), U.S. Fish and Wildlife Service (USFWS) (USFWS 2011a), and Corelli and Chandik (Corelli and Chandik 1995). Nomenclature for common, widespread plants and animals conforms to Hickman (Hickman 1993) and CDFG (CDFG 2005), respectively; plant names have been updated to conform to the Jepson Online Interchange[3]. Nomenclature for special-status plants conforms to CDFG (CDFG 2011a). Plant community names conform to Sawyer, et al. (Sawyer et al. 2009), Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolf 1995), and Cowardin, et al. (Cowardin et al. 1979). Tables of potentially occurring special-status species were prepared using the CalBiota database (CalBiota 2011).

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[2] Source: GoogleEarth, images dated between 1993 and 2010
[3] Available online at http://ucjeps.berkeley.edu/interchange.html.

As noted above, reconnaissance-level surveys were performed at each facility site by a qualified biologist. Habitat types were classified and mapped, and observed plant and wildlife species were recorded. Trees rooted within, and adjacent to, the construction area boundaries were identified, mapped, and the trunk diameters measured and recorded. A separate Biological Survey Report was prepared for the Project (Ward & Associates 2012).

5.14.1.3 Plant Communities and Wildlife Habitats

The facility sites are mostly highly disturbed, being either paved or having been previously cleared and recolonized by primarily non-native plant species. The vegetation at most of the sites that are within the San Francisco Public Utility Commission's (SFPUC) right-of-way is routinely maintained by mowing or clearing, as is required under the SFPUC Integrated Vegetation Management Policy (SFPUC 2007). Some sites (e.g., Site 3, the area between Sites 6 and 7, and Sites 12, 13, 14, and 15) are mowed and maintained[4]. Other sites are paved or disturbed and not actively maintained, such as vacant lots. Habitats recorded during the surveys include ruderal, non-native annual grassland, and anthropogenic habitats. A single plant community dominated by native species, Central Coast riparian scrub is present adjacent to Sites 1, 6, 11, and 17 (Alternate). A discussion of relevant plant communities and their associated wildlife species is presented below. Aerial views of each Project site are presented in Figures 3-11 to 3-40 in Chapter 3, Project Description. Plant communities occurring at each facility site are identified in Table 5.14-1 (Plant Communities Present within or near Facility Sites and near Lake Merced).

[4] Site 3, the area between Sites 6 and 7, and Sites 13 and 14 are within the SFPUC right-of-way. Sites 12 and 15 are not located within the SFPUC right-of-way.

TABLE 5.14-1
Plant Communities Present within or near Facility Sites and near Lake Merced

Plant Community	Locations where Community is Present
Ruderal	Sites 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 15, 16, 17 (Alternate), 18 (Alternate), and Westlake Pump Station
Non-native annual grassland	Sites 8, 9, 10, 11, 17 (Alternate), 18 (Alternate), and 19 (Alternate)
Anthropogenic herbaceous/woodland	Sites 1, 3, 4, 6, 7, 11, 12, 13, 14, 15, and Westlake Pump Station. This community is also near Sites 10, 16, and 18 (Alternate).
None (i.e., paved/developed)	Sites 1, 2, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, and Westlake Pump Station
Central coast riparian scrub	Sites 1[(a)], 6[(a)], 11, and 17 (Alternate)[(a)]
Annual grassland	Lake Merced
Central dune scrub	Lake Merced
Coast live oak woodland	Lake Merced
Coastal scrub	Lake Merced
Developed	Lake Merced
Herbaceous	Lake Merced
Non-native forest	Lake Merced
Non-native scrub	Lake Merced
Perennial grassland	Lake Merced
Arroyo willow riparian scrub	Lake Merced
Bulrush wetland	Lake Merced
Cattail wetland	Lake Merced
Giant vetch wetland	Lake Merced
Swamp knotweed wetland	Lake Merced
Rush meadow	Lake Merced

Note:

(a) Habitat is isolated and not associated with a surface tributary.

Ruderal Habitat

Ruderal communities are found in areas from which the native vegetation has been completely removed by grading, filling, or clearing and are typical of vacant lots and roadsides (Holland and Keil 1990). Ruderal habitat is not specifically described by Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolf 1995) and would be classified as upland following Cowardin, et al. (Cowardin et al. 1979). Left undeveloped, such areas typically become recolonized by invasive exotic species. Scattered native species might recolonize such sites after disturbance has ceased. Ruderal sites are typically dominated by herbaceous (i.e., non-woody) species, although scattered woody shrubs and trees may also begin to appear if left undisturbed long enough.

Ruderal habitat areas occurring within the study area are mostly sparsely vegetated. Characteristic herbaceous plants commonly identified include non-native species, such as wild radish (*Raphanus sativus*), foxtail barley (*Hordeum murinum*), ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua*), cut-leaved plantain (*Plantago coronopus*), sweet fennel (*Foeniculum vulgare*), Italian thistle (*Carduus pycnocephalus*), bur clover *(Medicago polymorpha*), common vetch (*Vicia sativa*), crown daisy (*Chrysanthemum coronarium*), bristly ox-tongue (*Picris echioides*), red-stemmed filaree (*Erodium cicutarium*), and Italian ryegrass (*Lolium multiflorum*), among others. In many cases, ruderal habitat at facility sites is adjacent to, and merges with, landscaped lands (see discussion of Anthropogenic Habitats below).

Wildlife species associated with ruderal habitats in urban settings could include native mammals such as California ground squirrel (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*). Ground nesting or foraging birds such as house finch (*Carpodacus mexicanus*) or American goldfinch (*Carduelis tristis*) are expected. Raptors (predatory birds) may forage over ruderal areas, including red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*). Depending on cover opportunities, ruderal habitat may also support a variety of reptiles, such as western fence lizard (*Sceloporus occidentalis*), northern alligator lizard (*Elgaria coerulea*), common side-blotched lizard (*Uta stansburiana*), gopher snake (*Pituophis catenifer*), ring-necked snake (*Diadophis punctatus*), and terrestrial gartersnake (*Thamnophis elegans*).

Non-native wildlife species associated with ruderal habitats include Virginia opossum (*Didelphis virginiana*), Norway rat (*Rattus norvegicus*), and a variety of mice (*Mus* spp., *Perognathus* spp.). Ground nesting or foraging birds, such as European starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), house sparrow (*Passer domesticus*), and feral pigeon (*Columba livia*), are expected.

Ruderal habitat was identified on Sites 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 15, 16, 17 (Alternate), and 18 (Alternate) as well as at the Westlake Pump Station (see Table 5.14-1 [Plant Communities Present within or near Facility Sites and near Lake Merced]).

Non-native Annual Grassland

Non-native annual grassland is generally found in open areas in valleys and foothills throughout coastal and interior California (Holland 1986). Non-native annual grassland conforms to the California Annual Grassland series as described in Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolf 1995) and would be classified as an upland plant association, following Cowardin, et al. (Cowardin et al. 1979). Although non-native annual grasslands can be found on a variety of other soil types, they typically occur on soils consisting of fine-textured loams or clays that are somewhat poorly drained (Holland 1986). This plant association is characterized by non-native annual grasses and weedy annual and perennial forbs, primarily of Mediterranean origin, that have replaced native perennial grasslands, scrub and woodland as a result of human disturbance. Scattered native wildflowers and grasses, representing remnants of the original vegetation, may also be common.

Within the sites owned by or within the SFPUC right-of-way, non-native annual grassland is similar to ruderal habitat. It is distinguished from ruderal habitat by the density of the vegetation, which is kept short through routine mowing. Characteristic herbaceous plants commonly identified include non-native grass species such as ripgut brome, wild oats, foxtail barley, Italian ryegrass, and rattail fescue (*Vulpia myuros*), and non-native forbs such as red-stemmed filaree, bur clover, rose clover (*Trifolium hirtum*), English plantain (*Plantago lanceolata*), common dandelion (*Taraxacum officinale*), and cut-leaved geranium (*Geranium dissectum*), among others. In many cases, non-native annual grassland habitat at facility sites is adjacent to, and merges with, ruderal and anthropogenic habitats.

Wildlife species associated with non-native annual grassland are similar to those described for ruderal habitat above. Additional native mammals that may occur in the urban setting of the study area include brush rabbit (*Sylvilagus bachmani*), meadow vole (*Microtus californicus*), striped skunk (*Mephitis mephitis*), and coyote (*Canis latrans*), as well as the non-native red fox (*Vulpes vulpes*). Grasslands provide foraging habitat for a wide variety of raptors and passerines (perching birds). Native raptors that can be expected to forage over grasslands in the area include red-tailed hawk, white-tailed kite (*Elanus leucurus*), short-eared owl (*Asio flammeus*), and barn owl (*Tyto alba*). Native passerines, such as mourning dove, rock dove (*Columba livia*), Brewer's blackbird (*Euphagus cyanocephalus*), northern mockingbird (*Mimus polyglottos*), American crow (*Corvus brachyrhynchos*), and black phoebe (*Sayornis nigricans*), are common visitors and residents within the study area.

Non-native annual grassland was identified on Sites 8, 9, 10, 11, 17 (Alternate), 18 (Alternate), and 19 (Alternate) (see Table 5.14-1 [Plant Communities Present within or near Facility Sites and near Lake Merced]).

Anthropogenic Herbaceous/Woodland Habitat

Anthropogenic plant associations are those dominated by plant species introduced by humans and established or maintained by human disturbances or activities (Holland and Keil 1990). This vegetation type is not classified by Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolff 1995); it is classified as an upland following Cowardin, et al. (Cowardin et al. 1979). Some of these habitats are entirely artificial, such as areas under active cultivation (e.g., row crops, orchards, vineyards, and landscaped parks and gardens). Others include areas used as rangeland or pasture, ruderal, and areas influenced by urban or suburban landscaping or plantings. On such sites, the native vegetation has typically been removed by clearing in preparation for cultivation, landscaping, or development. Cleared areas that are planted with or colonized by non-indigenous plant species can create distinct communities dominated by annual grasses and forbs, shrubs, or trees. Some of these communities are only perpetuated with direct intervention, such as supplemental irrigation, mowing or livestock grazing, while others are capable of becoming naturalized (i.e., able to persist without human involvement). In some situations, introduced non-indigenous species invade adjacent native habitats, altering the composition of the native understory or canopy, or both.

Within the study area, anthropogenic habitats include open lawns areas associated with golf clubs, school play fields, and cemeteries. They also include ornamental shrub and tree plantings belonging to maintained gardens, as well as non-maintained or abandoned landscaped areas. In many cases, screen tree plantings around the open areas are tall and dense, comprising a woodland habitat in terms of potential wildlife usage.

Within the study area, the most commonly planted, non-indigenous trees in or adjacent to the facility sites are Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), and Tasmanian blue gum (*Eucalyptus globulus*). Other ornamental trees present include Canary Island pine (*P. canariensis*), Aleppo pine (*P. halepensis*), ever-blooming acacia (*Acacia retinodes*), horsetail casuarinas (*Casuarina equisetifolia*), Peruvian pepper (*Schinus molle*), myoporum (*Myoporum laetum*), Lombardy poplar (*Populus nigra*), and Torrey pine (*P. torreyana*), among others. A variety of ornamental shrubs and vines were identified on the facility sites, including pampas grass (*Cortaderia selloana*), Himalayan blackberry (*Rubus discolor*), Boston ivy (*Parthenocissus tricuspidata*), French broom (*Genista monspessulana*), Hottentot fig (*Carpobrotus edulis*), firethorn (*Pyracantha angustifolia*), and cotoneaster (*Cotoneaster* sp.). Invasive species identified include Bermuda buttercup (*Oxalis pescaprae*), veldtgrass (*Ehrharta erecta*), English ivy (*Hedera helix*), Algerian ivy (*H. canariensis*), Cape ivy (*Delairia odorata*), fumitory (*Fumaria officinalis*), and garden nasturtium (*Tropaeolum majus*)[5].

Many native and non-native wildlife species have adapted to human activities and can persist in anthropogenic habitats such as landscaped parks and yards. Such wildlife species can utilize ornamental landscapes for shelter, foraging, and breeding. In addition, some species can tolerate the conversion of natural ecosystems to anthropogenic habitats, and most will use landscaping or structural components (rock walls, ornamental trees, landscape bushes, woodpiles, and buildings) as escape cover, roosting sites, and nesting sites. Native species that readily adapt to landscaped terrain include Canada geese (*Branta canadensis*), barn owl, Botta's pocket gopher, raccoons (*Procyon lotor*), striped skunks, and mule deer (*Odocoileus hemionus*). Certain exotic species such as European starling, house sparrow, feral pigeon, house mouse (*Mus musculus*), Norway rat, and the Virginia opossum may occur in landscaped habitats close to human habitation. Under some circumstances, exotic rodents can represent significant forage sources for native and non-native predators.

The large and tall canopies associated with some eucalyptus trees provide good nesting habitat for larger native raptors including red-tailed hawk, red-shouldered hawk, great horned owl (*Bubo virginianus*) and golden eagle (*Aquila chrysaetos*). Additionally, some common smaller native passerine and corvid species such as western scrub jay (*Aphelocoma californica*), American crow, and raven (*Corvus corax*), will also use this tree for nesting. Particularly when situated near water, eucalyptus groves provide suitable roosting habitat for such native birds as great blue heron (*Ardea herodias*), black-crowned night heron (*Nycticorax nycticorax*), and great egret (*Ardea alba*). Eucalyptus trees also provide daytime foraging opportunities for a variety of native hummingbirds (*Calypte* spp.; *Selasphorus* spp.) and native passerines such as chestnut-backed chickadee (*Poecile rufescens*) and yellow-rumped warbler (*Dendroica coronata*).

Anthropogenic habitats were identified at Sites 1, 3, 4, 6, 7, 11, 12, 13, 14, 15, and the Westlake Pump Station (see Table 5.14-1 [Plant Communities Present within or near Facility Sites and near Lake Merced]).

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[5] Although Monterey pine, Torrey pine, and Monterey cypress are native to portions of California, specimens on site are planted as ornamentals and are not locally indigenous.

Central Coast Riparian Scrub

Central Coast riparian scrub typically consists of scrubby streamside, thickets composed of any of several species of willows. This plant community occurs close to river channels and near the coast on fine-grained sand and gravel bars with a high water table. It is distributed along and at the mouths of most perennial and many intermittent streams of the South Coast Ranges, from the San Francisco Bay Area to near Point Conception (Holland 1986) is generally regarded as early seral, meaning that it typically precedes the development of other riparian woodland or forest communities in the absence of severe flooding. However, outside of riparian situations, that is, near groundwater seeps, willow-dominated scrub represents a relatively stable plant community and is not considered seral (i.e., transitional between different plant assemblages).

Within the study area, Central Coast riparian scrub consists of dense stands dominated by arroyo willow (*Salix lasiolepis*) which conforms to the Arroyo Willow Series, as described in Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolf 1995). Other plant species co-occurring with willows include Himalayan blackberry, California blackberry (*Rubus ursinus*), and Algerian ivy. Central Coast riparian scrub was identified near Sites 1, 6, 11, and 17 (Alternate). The willow stands adjacent to Sites 1, 6 and 17 (Alternate) are not associated with any surface water channel and are assumed to be supported by groundwater. The Central Coast riparian scrub habitat near Site 11 is associated with surface water runoff from nearby paved areas. Central Coast riparian scrub typically provides cover and nesting habitat for a variety of bird species. A variety of native passerine species can be expected to occur and nest in this habitat, including the black phoebe, white-crowned sparrow (*Zonotrichia leucophrys*), song sparrow (*Melospiza melodia*), yellow warbler, and yellow-rumped warbler. Urban-adapted mammals expected to occur within this habitat include the native raccoon and striped skunk, as well as non-native Virginia opossum and feral cats (*Felis silvestris catus*).

Lake and Freshwater Marsh

While not part of the proposed Project footprint, Lake Merced may be affected by the Project. Lake Merced is a natural lake that has been modified from historical conditions. Lake Merced is suitable habitat for aquatic wildlife, including native species such as mallard (*Anas platyrhynchos*), American coot (*Fulica americana*), great blue heron (*Ardea herodias*), grebe (*Podiceps* spp.), egret (*Egretta* spp.), and the non-native red-eared slider (*Trachemys scripta*). Special-status species that may be present include western pond turtle (*Actinemys marmorata)*, which is known to occur in Lake Merced. California red-legged frogs were known to occur historically at Lake Merced, but the species is now considered extirpated from the lake based on a lack of recent sightings, survey results since 2000, and the presence of predators, such as bullfrogs (Jones and Stokes 2007; San Francisco Planning Department 2011).

Freshwater marsh has largely vanished from San Francisco, but there are still areas of native bulrush-cattail marsh at Lake Merced. Freshwater emergent wetland habitat is valuable for many aquatic species, including nesting songbirds. For example, there are records of native species such as marsh wren (*Cistothorus palustris*), common yellowthroat (*Geothlypis trichas*), pied-billed grebes (*Podilymbus podiceps*), and ruddy duck (*Oxyura jamaicensis*) in Lake Merced marshes (San Francisco Field Ornithologists 2003). The Lake Merced fishery does not include special-status fish species.

Plant Communities near Lake Merced

Because lake levels at Lake Merced would be affected by the Project, information regarding the plant communities near Lake Merced is provided as shown on Figure 5.14.1 (Lake Merced 2012 Vegetation Types) and Figure 5.14-2 (Lake Merced Sensitive Habitats and Species). Plant communities and habitat types at Lake Merced are described below:

Annual Grassland

Annual grassland is present north of East Lake near Sunset Circle and on the west and east sides of Impound Lake. Dominant species include non-natives such as ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua*), brome fescue (*Festuca bromoides*), hare's tail grass (*Lagurus ovatus*), cut-leaved geranium (*Geranium dissectum*), broadleaf filaree (*Erodium botrys*), sheep sorrel (*Rumex acetosella*), spring vetch (*Vicia sativa*), smooth cat's ear (*Hypochaeris glabra*), and wild radish. Native herbs include Canadian horseweed (*Conyza canadensis*), beach strawberry (*Fragaria chiloensis*), and annual lupine (*Lupinus bicolor*). Scattered native shrubs are present, including coyote brush (*Baccharis pilularis*) and dune bush lupine (*Lupinus chamissonis*). Annual grassland at Lake Merced would support a similar set of wildlife species as described above for anthropogenic areas.

Central Dune Scrub

Central dune scrub is present at Impound Lake, on the north side of East Lake and on the north side of North Lake, on very sandy soils. Dune scrub vegetation is located in restoration areas where dune plants have been planted. Dune scrub at Lake Merced is characterized by a mix of dune species with varying cover, including dune bush lupine, yellow lupine (*Lupinus arboreus*), coast buckwheat (*Eriogonum latifolium*), coyote brush, coastal sagewort (*Artemisia pycnocephala*), dune knotweed (*Polygonum paronychia*), California goldenbush (*Ericameria ericoides*), and lizard-tail (*Eriophyllum staechadifolium*). Characteristic herbs include California acaena (*Acaena pinnatifida* var. *californica*), contorted sun cup (*Camissonia contorta*), beach evening primrose (*Camissonia cheiranthifolia* subsp. *cheiranthifolia*), hairy gumweed (*Grindelia hirsutula* var. *hirsutula*), and seaside fiddleneck (*Amsinckia spectabilis* var. *spectabilis*). Dune scrub is highly variable in terms of which species are dominant or co-dominant. These areas contain high plant species diversity and high native species cover. Non-native herbs present in dune scrub vegetation include ripgut brome, soft chess (*Bromus hordeaceus*), rattlesnake grass (*Briza maxima*), wild oats, hare's tail grass, little quaking grass (*Briza minor*), and sheep sorrel. Central dune scrub at Lake Merced also supports several special-status plant species, including blue coast gilia (*Gilia capitata* subsp. *chamissonis*; CNPS List 1B.1), San Francisco spineflower (*Chorizanthe cuspidata* var. *cuspidata*; CNPS 1B.2), and dune tansy (*Tanacetum camphoratum*; locally rare). Central dune scrub at Lake Merced likely supports western fence lizard, garter snakes, small rodents such as mice and voles, and a variety of birds similar to those found in anthropogenic areas, as described above.

Coast Live Oak Woodland

Coast live oak woodland is present at Lake Merced on the northwest side of East Lake. These stands are characterized by native coast live oak (*Quercus agrifolia*) trees of different sizes that form a fairly continuous to intermittent canopy. The understory supports both native shrubs and herbs, including California blackberry (*Rubus ursinus*), California coffeeberry (*Frangula californica*), poison oak (*Toxicodendron diversilobum*), California manroot, bracken fern, and miner's lettuce (*Claytonia perfoliata* ssp. *intermontana*). Non-native species include English ivy (*Hedera helix*), fine-leaved fumitory (*Fumaria parviflora*), upright veldt grass (*Ehrharta erecta*), ripgut brome, Bermuda buttercup (*Oxalis pes-caprae*), common chickweed (*Stellaria media*), and rattlesnake grass (*Briza maxima*).

Coastal Scrub

Coastal scrub at Lake Merced is made up of 14 different vegetation types classified according to their dominant species, including native California blackberry scrub, California sage scrub, poison oak scrub, and coyote brush scrub. For the purpose of this EIR analysis, these scrub types were grouped together under the broader classification of coastal scrub and mapped as such (see Figure 5.14-1 [Lake Merced 2012 Vegetation Types]). However, three scrub types were also identified as sensitive resources because the CNPS considers their dominant species to be locally significant. These sensitive scrub types at Lake Merced are canyon live oak scrub, thimbleberry scrub, and wax myrtle scrub. Coastal scrub at Lake Merced likely supports a similar set of wildlife species as described above for anthropogenic areas, central dune scrub, and annual grasslands.

Developed

Some areas near Lake Merced are developed, for example, paved roads. Although paved roads themselves generally lack habitat for wildlife, wildlife occasionally cross roads to get to nearby landscaped habitat or non-native forest. Thus, developed areas often have similar wildlife species as the anthropogenic and non-native forest communities discussed above, but with lower rates of occurrence.

Non-native Forest

As described above, the non-native forest throughout the project area, including the Lake Merced area, is primarily comprised of blue gum eucalyptus, Monterey pine, and Monterey cypress (Monterey pine and Monterey cypress are native to California but not to the San Francisco area).

Non-native Herbaceous

Areas mapped as non-native herbaceous are dominated by weedy, non-native plant species; they can be difficult to characterize and are often temporary assemblages. In areas of frequent human disturbance, the majority of wild plants are often introduced weeds rather than natives. Around Lake Merced, this vegetation type was identified adjacent to developed areas such as sidewalks, roads, the golf club, and the Pacific Rod and Gun Club. Non-native plant species typical of ruderal vegetation in this area include ripgut brome, wild oats, soft chess (*Bromus hordeaceus*), hare barley (*Hordeum murinum* ssp. *leporinum*), Italian ryegrass (*Festuca perennis*), red-stemmed filaree, wild radish, black mustard, prickly lettuce (*Lactuca serriola*), bristly ox-tongue (*Helminthotheca echioides*), cheeseweed (*Malva parviflora*), rattlesnake grass, hare's tail grass (*Lagurus ovatus*), scarlet pimpernel, miner's lettuce, everlasting cudweed (*Pseudognaphalium luteoalbum*), red sand spurrey (*Spergularia rubra*), crimson clover (*Trifolium incarnatum*), cut-leaved geranium, spring vetch, kikuyu grass (*Pennisetum* *clandestinum*), cape ivy (*Delairea odorata*), poison hemlock (*Conium maculatum*), and iceplant (*Carpobrotus edulis*).

Non-native Scrub

The non-native scrub present at Lake Merced consists of Himalayan blackberry scrub. There are four areas of Himalayan blackberry scrub at Lake Merced, three of which are in the vicinity of the Pacific Rod and Gun Club; the other is near the Lake Merced Boathouse. Native species, including California blackberry and swamp knotweed, are present at low cover. Non-native herbs in the area include sheep sorrel (*Rumex acetosella*) and ripgut brome. Himalayan blackberry scrub is fairly uncommon around the lake compared to native California blackberry scrub. Blackberries provide food and dense protective cover for a variety of birds, particularly ground nesters such as California towhee.

Perennial Grassland

There is a small patch of perennial grassland on the north shore of East Lake at the base of a steep slope adjacent to stands of blue gum forest and rush meadow. The dominant species within this grassland is Vancouver rye, which is a hybrid between the native species American dunegrass (*Elymus mollis*) and creeping wildrye (*Elymus triticoides*). Other species include the native shrub California blackberry as well as the non-natives sheep sorrel, wild radish, ripgut brome, hairy vetch (*Vicia villosa* ssp. *villosa*), spiny sowthistle (*Sonchus asper*), and Zorro fescue (*Festuca myuros*). This patch of Vancouver rye grassland is too small to support a distinct wildlife species assemblage. However, this EIR analysis considers Vancouver rye grassland to be a sensitive resource due to its local rarity.

Arroyo Willow Riparian Scrub

This vegetation community is present at Lake Merced around all of the lakes, forming dense thickets with a continuous canopy of native arroyo willow (*Salix lasiolepis*). Arroyo willow riparian scrub is typically adjacent to bulrush wetland or swamp knotweed wetland. Additional native species such as California blackberry, California bulrush (*Schoenoplectus californicus*), swamp knotweed (*Persicaria coccinea*), bracken fern (*Pteridium aquilinum* var. *pubescens*), and California manroot (*Marah fabacea*) are also present. Arroyo willow riparian scrub at Lake Merced is important habitat for migratory and resident birds, including Townsend's warbler (*Dendroica townsendi*), ruby-crowned kinglet (*Regulus calendula*), green heron (*Butorides virescens*), western kingbird (*Tyrannus verticalis*), and warbling vireo (*Vireo gilvus*).

Bulrush Wetland

Bulrush wetland is the most abundant wetland herbaceous vegetation type mapped at Lake Merced. Bulrush wetland forms an emergent, almost continuous band along the margin of the lakes, with the exception of the east side of South Lake. California bulrush is dominant, with swamp knotweed and scattered tules (*Schoenoplectus acutus* var. *occidentalis*) also present. The wildlife species using this vegetation type at Lake Merced are described above under the heading "Lake and Freshwater Marsh."

Cattail Wetland

A small cattail wetland was mapped at Lake Merced on the east side of South Lake. This wetland is near the Tournament Players Cup Harding Park on the edge of the lake in an area of standing water. The stand is dominated by the native broadleaf cattail (*Typha latifolia*), with small amounts of swamp knotweed and California bulrush.

Giant Vetch Wetland

Giant vetch wetland is present on the north and south shores of East Lake and North Lake, growing as dense stands adjacent to bulrush wetlands. Giant vetch (*Vicia gigantea*) (native) wetland occurs at the base of a steep slope covered with the native California sagebrush (*Artemisia californica*) scrub. Other native species within this vegetation community include bracken fern and California blackberry and small amounts of California bulrush, bee plant (*Scrophularia californica*), and Hooker's evening primrose (*Oenothera elata* ssp. *hookeri*). The non-natives black mustard (*Brassica nigra*) and wild radish are also present. This vegetation type may support Sierran treefrog (*Pseudacris sierra*), garter snake, and seed-eating birds such as house finch.

Swamp Knotweed Wetland

This vegetation community is abundant along the margins of the lakes making up Lake Merced, growing as emergent vegetation often interspersed with bulrush wetland. Swamp knotweed is the dominant species in this community. Natives such as California bulrush, stinging nettle (*Urtica dioica* ssp. *holosericea*), Pacific rush (*Juncus effusus* var. *pacificus*), and Pacific oenanthe (*Oenanthe sarmentosa*) are also present. Swamp knotweed also occurs in slightly elevated adjacent habitats that are moist but not inundated. This vegetation type supports similar wildlife as described above for freshwater marsh.

Rush Meadow

Rush meadow was mapped at Lake Merced on North, East, and Impound Lakes. This community is generally located on the margin of the lake just above bulrush wetland and swamp knotweed wetland. The native Baltic rush (*Juncus balticus*) is dominant in the herbaceous layer. California blackberry is also present. This vegetation type may support Sierran treefrog (*Pseudacris sierra*), garter snake, and seed-eating birds such as lesser goldfinch (*Carduelis psaltria*).

5.14.1.4 Special-status Plant Species

The laws comprising California's legal framework and authority for plant species conservation include the FESA, CESA, the NPPA, and the California Environmental Quality Act (CEQA). Special-status plants include: those listed as endangered, threatened, or rare; those listed as candidates for listing under FESA or CESA; those listed as rare under the NPPA; those meeting the definition of rare or endangered under

CEQA[6]; and those considered locally significant (CDFG 2009). Lists of special-status species are maintained by the USFWS (USFWS 2011a), CDFG (CDFG 2011a, 2011b, 2011f), and CNPS (CNPS 2011).

Based on a review of special-status plant species in San Mateo County (CDFG 2011f; CNPS 2011), the potential for occurrence of 72 special-status plant species within the study area was evaluated. No federally or State-listed plant species were identified within the construction area boundaries and none is expected to occur within the study area based on a lack of suitable habitat. None of the other special-status plant species (e.g., locally significant) is expected to occur at any of the facility sites due to the fact that no suitable habitat is present and/or because they would have been detectable during the present survey. A summary of the status, habitat affinities, reported localities in the study area, blooming period, and potential for occurrence within the study area for each of the 72 plant species and those with a low potential to occur is presented in Appendix F (Special-status Species Tables), of this EIR.

The proposed Significant Natural Resource Areas surrounding Lake Merced support two special-status plant species: San Francisco spineflower, a CNPS Rare Plant Rank 1B.2 species, and blue coast gilia, a CNPS Rare Plant Rank 1B.1 species. In addition, several locally rare species, designated as such by the Yerba Buena Chapter of the CNPS, are also found at Lake Merced. These include San Francisco wallflower (*Erysimum franciscanum*), dune tansy (*Tanacetum camphoratum*), California pipevine (*Aristolochia californica*), Wight's paintbrush (*Castilleja wightii*), Vancouver rye (*Leymus* x *vancouverensis*), wild cucumber (*Marah oreganus*), canyon live oak (*Quercus chrysolepis*), coastal black gooseberry (*Ribes divaricatum*), and thimbleberry (*Rubus parviflorus*). These species occur in areas of dune scrub or coastal scrub located at Lake Merced.

5.14.1.5 Special-status Animal Species

Based on a review of the CNDDB (CDFG 2011f), the potential for occurrence of 51 special-status animal species in the study area was evaluated. A summary of the formal status, habitat affinities, reported localities close to the facility vicinity, and potential for occurrence within the study area for each of the 51 special-status animal species is presented in Appendix F (Special-status Species Tables), of this EIR. Of the 51 species, 13 species are federally or State-listed species and none of the listed species have suitable habitat within the Project area or study area. The white-tailed kite, a fully protected species under the CFGC, may occur within the facility sites. Of the remaining non-listed, special-status species, the presence of eight other species could not be ruled out, due to the presence of suitable habitat at one or more of the facility sites. The potentially occurring species are listed in Table 5.14-2 (Special-status Animal Species Potentially Occurring within or near Facility Sites or at Lake Merced), and each species is discussed in more detail following the table.

[6] CEQA §15380(b) and (d)

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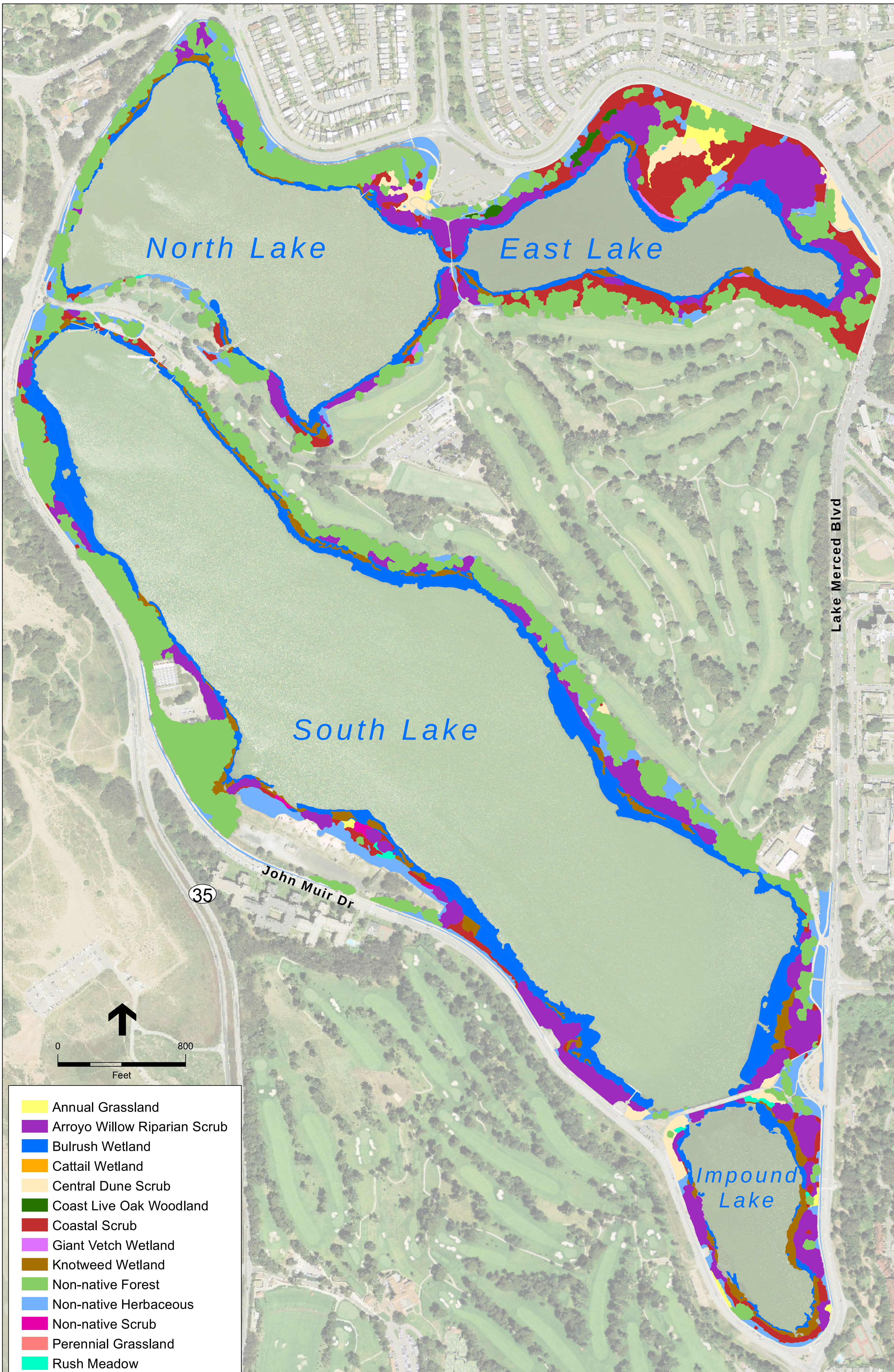

Lake Merced
2012 Vegetation

Regional Groundwater Storage and Recovery Project

Figure 5.14-1

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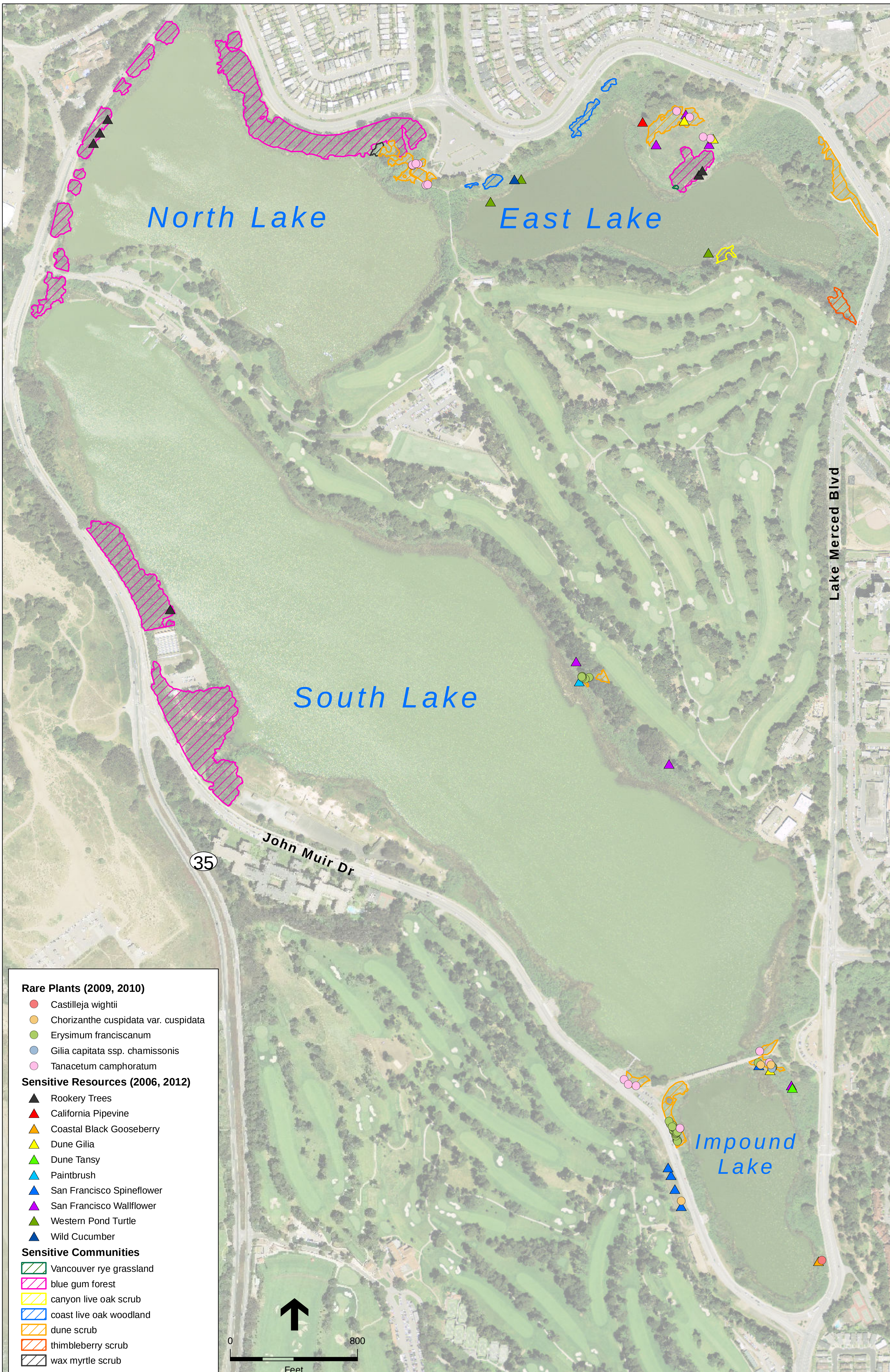

* See Figure 5.14-1 for Wetlands Locations

Lake Merced Sensitive Habitats and Species

Regional Groundwater Storage and Recovery Project

Figure 5.14-2

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TABLE 5.14-2
Special-status Animal Species Potentially Occurring within or near Facility Sites[(a)] or at Lake Merced

Common Name	Scientific Name	Location
State-listed Species		
White-tailed kite	*Elanus leucurus*	All Sites except Site 5
Other Special-status Species		
Monarch butterfly	*Danaus plexippus*	Sites 1, 3, 7, 10, and 12
Western pond turtle	*Actinemys marmorata*	Lake Merced
Oak titmouse	*Baeolophus inornatus*	All Sites except Site 5
Loggerhead shrike	*Lanius ludovicianus*	All Sites except Site 5
Allen's hummingbird	*Selasphorus sasin*	All Sites
California thrasher	*Toxostoma redivivum*	All Sites except Site 5
Migratory and special-status birds (see description below)		Lake Merced
Pallid bat	*Antrozous pallidus*	Sites 1, 3, 4, 7, 10, 11, 12, 15, 16, and Westlake Pump Station
Western red bat	*Lasiurus blossevillii*	Sites 1, 3, 4, 7, 10, 11, 12, 15, 16, Westlake Pump Station, and Lake Merced
Hoary bat	*Lasiurus cinereus*	Sites 1, 3, 4, 7, 10, 11, 12, 15, 16, and Westlake Pump Station
Yuma myotis	*Myotis yumanensis*	Lake Merced

Note:
(a) Includes facility sites with both suitable and marginally suitable habitat.

White-tailed Kite

White-tailed kite is listed by the CDFW as a fully protected bird species[7] and is protected under the Migratory Bird Treaty Act (MBTA) and the CFGC.[8] In the United States, white-tailed kites occur in California and Texas, with a separated group in Florida; the species has expanded its range into Washington and Oregon (Dunk 1995). Generally, white-tailed kites are observed in low elevation grasslands, agricultural, wetland, oak-woodland, or savannah habitats. The majority of their diet is made up of small mammals. This species nests in a wide variety of trees and, in some cases, shrubs. Nests usually consist of platforms of small sticks, leaves, weed stalks, and similar materials lined with grass, hay, or leaves. This species nests from February through August, with a peak in breeding occurring from late March through July.

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[7] CFGC §3511
[8] CFGC §3503.5

Although not observed during the reconnaissance-level survey, suitable nesting habitat for white-tailed kite is present in wooded areas with snags (i.e., dead, standing tree trunks) at or near facility sites. Specifically, nesting could occur at or near Sites 1 through 4, 6 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station.

Monarch Butterfly

The monarch butterfly is listed as a special animal by the CDFG (CDFG 2011c). This butterfly occupies winter roost sites along the Pacific coast from northern Mendocino County to Baja California, Mexico. Monarch butterflies begin to congregate in the fall in dense groves of trees (e.g., eucalyptus, Monterey pine, Monterey cypress) that provide shelter from prevailing winds and at sites with nectar and water sources nearby (CDFG 2011f). By February or early March, they resume their migration. Although, per the CDFW's CNDDB, there is no record of overwintering monarch butterflies in the vicinity of any of the facility sites, suitable stands of trees are present at Sites 1, 7, and 12. Suitable or marginally suitable habitat is also present adjacent to Sites 3 and 10.

Western Pond Turtle

This species—a California species of special concern—inhabits rivers, streams, natural and artificial ponds, and lakes. Adjacent terrestrial habitat is also critical for oviposition,[9] winter refuge, and dispersal. Although suitable habitat is not present within the proposed Project boundaries, this species occurs in Lake Merced (SFRPD 2006).

Oak Titmouse

The oak titmouse is listed as a special animal by the CDFG (CDFG 2011c) and is protected under the MBTA and CFGC.[10] The primary habitat for the oak titmouse includes warm, dry open woodlands typically characterized by oak or oak-pine woodlands. Nests are situated in natural or excavated cavities in trunks, primary and secondary branches, and stumps (Cicero 2000). Although not observed during the reconnaissance-level surveys, marginally suitable foraging and nesting habitat is present for oak titmouse in the wooded areas with trees and snags at or adjacent to Sites 1 through 4, 6 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station.

Loggerhead Shrike

Loggerhead shrike is listed as a Species of Special Concern by the CDFG (CDFG 2011c) and is protected under the MBTA and CFGC.[11] Loggerhead shrikes occur throughout California lowlands and foothills in open habitats such as grasslands, pastures with fence rows, old orchards, mowed roadsides, cemeteries, golf clubs, riparian areas and open woodlands (Yosef 1996). They are commonly observed perching on shrubs, trees, posts, fences, and utility lines. The species typically nests in densely vegetated, isolated

[9] The process of by which certain animals lay eggs.
[10] CFGC §3503
[11] CFGC §3503

trees and shrubs and occasionally man-made structures. The nesting season ranges from February through July. Loggerhead shrikes feed on a variety of small prey including arthropods, mammals, amphibians, reptiles, and birds (Yosef 1996).

Although not observed during the reconnaissance-level surveys, marginally suitable nesting habitat for the loggerhead shrike is present in the vegetation, trees and shrubs at or adjacent to Sites 1 through 4, 6 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station.

Allen's Hummingbird

Allen's hummingbird is listed as a Species of Special Concern by the CDFG (CDFG 2011c) and is protected under the MBTA and CFGC.[12] It is a common summer resident (January to July) and migrant along most of the California coast. Breeding Allen's hummingbirds are most common in coastal scrub, valley foothill hardwood, and valley foothill riparian habitats, but also are common in closed-cone pine-cypress, urban, and redwood habitats. The species occurs in a variety of woodland and scrub habitats as a migrant. Although mostly coastal in migration, Allen's hummingbird is fairly common in the southern mountains in the summer and fall migrations and a few occur regularly in the Sierra Nevada.

Although not observed during the reconnaissance-level surveys, suitable nesting and foraging habitat for Allen's hummingbird is present in the trees and shrubs at or adjacent to each of the facility sites.

California Thrasher

The California thrasher is listed as a Species of Special Concern by CDFG (CDFG 2011c) and it is protected under the MBTA and CFGC.[13] This relatively common resident of foothills and lowlands occupies moderate to dense chaparral habitat and, less commonly, extensive riparian thickets, especially with blackberry patches. It nests close to the ground and feeds on invertebrates, acorns, and the seeds of forbs. California thrasher occurs across the length of California. Along the coastal fog belt north of San Francisco, it is restricted to drier sites.

Although not observed during the reconnaissance-level surveys, suitable nesting and foraging habitat for California thrasher is present in the shrubs at or adjacent to Sites 1 through 4, 6 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station.

Migratory and Special-status Birds

Several non-special-status migratory birds could nest in or adjacent to Lake Merced. Several raptors are known to nest in San Francisco, including red-tailed hawk (*Buteo jamaicensis*) red-shouldered hawk (*Buteo lineatus*), American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperi*) and great horned owl (*Bubo virginianus*). In addition, saltmarsh common yellowthroats (*Geolthlypis trichas sinuosa*) (a former federal species of concern and current California species of special concern) are known to nest in the wetlands

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[12] CFGC §3503
[13] CFGC §3503

along the periphery of Lake Merced (CDFG 2011e), and there is a double-crested cormorant (*Phalacrocorax auritus*) rookery in trees at Lake Merced (SFRPD 2006). Additional native birds may also nest in the area. The federal Migratory Bird Treaty Act (MBTA) and CFGC protect raptors and most native migratory birds and breeding birds (see Section 5.14.2 [Regulatory Framework] below).

Bats

Of the 25 known bat species in California, 21 appear on the State's special animals list (CDFG 2011c). In general, bats are classified as non-game mammals and are afforded protection under various sections of the CFGC (§3503). They also receive protection under the California Code of Regulations (CCR)[14] and the California Public Resources Code, Division 13. Federally or State-listed bat species are protected under FESA or CESA, respectively. Impacts to any special-status bat species would be deemed significant under CEQA and must be addressed in environmental review documents.

Mature trees within the study area provide potential roosting habitat for special-status bat species. Specifically, snags, tree cavities, and deep cracks in tree bark provide nocturnal, seasonal, or maternal roosting sites for bats. In addition to natural features, many bat species have adapted to using man-made structures such as buildings and bridges. Large trees present on or near many of the facility sites, especially the Monterey cypress trees, provide potential bat roosting habitat. Three special-status species, the pallid bat, western red bat, and hoary bat, are considered to have some potential to roost on or near several of the facility sites. Specifically, these species are of concern at Sites 1, 3, 4, 7, 10, 11, 12, 15, 16, and at the Westlake Pump Station.

Pallid Bat

Pallid bat is listed as a Species of Special Concern by CDFG (CDFG 2011c). It is a locally common inhabitant of low elevations throughout California and is a year-round resident in most of its range. This mostly solitary species is most common in open, dry habitats with rocky areas for roosting, although it can be found in a wide variety of habitats including grasslands, shrublands, woodlands, and forests. Day roosts include caves, rock crevices, mines, and occasionally tree cavities. Night roosts may be more open sites, including porches and open buildings. Maternity colonies can be found from as early as April through July; maternity colonies disband between August and October. No maternity colonies have been recorded in the Project vicinity and only two records dating to the 1940s have been reported from San Mateo County (Ward & Associates 2012).

Western Red Bat

The western red bat is listed as a Species of Special Concern by CDFG (CDFG 2011c). It is locally common in some portions of California, where it ranges from Shasta County to the Mexican border, west and east of the highest mountain elevations. Roosting habitat includes forests and woodlands from sea level up through mixed conifer forests.

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[14] Title 14, §251.1, Article 20, §§ 15380 and 15382

Western red bats roost primarily in trees, often in edge habitats adjacent to streams, fields, or urban areas. Preferred roosting sites are 2 to 40 feet above the ground, covered above, open below, and located above dark groundcover. Western red bats mate in late summer and early fall, with young born late May through early July. 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.

Hoary Bat

Hoary bat is listed as a special animal by the CDFG (CDFG 2011c). It is the most widespread North American bat and may be found throughout all of California. This solitary species winters in coastal and southern California. Hoary bats roost in dense foliage of medium to large trees, hidden from above, with few branches below and with dark ground cover. They mate in autumn, with young born late May through early July.

Yuma Myotis

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.

5.14.1.6 Special-status Natural Communities

Special-status natural communities are defined as those that have limited distribution in the region, support special-status plant or wildlife species, or receive regulatory protection. Examples would include waters of the United States covered under Section 404 of the federal Clean Water Act (CWA) and/or waters of the State[15] covered under Section 1600 et seq., of the CFGC and the Porter-Cologne Water Quality Control Act (Water Code Sections 13000–14920). The CNDDB has ranked a number of natural communities in terms of their significance and rarity (CDFG 2010).

The only special-status natural community in the study area is the Central Coast riparian scrub habitat, discussed above under Section 5.14.1.3 (Plant Communities and Wildlife Habitat).

5.14.1.7 Wetlands and Waters

No wetlands or open waters regulated under federal or State law were identified within any of the construction areas for the facility sites during field surveys. At Site 8, a tributary to Colma Creek runs beneath a portion of the construction area in a buried culvert and is a jurisdictional water of the United States, and possibly a jurisdictional water of the State.

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[15] Waters of the State are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" California Water Code Section 13050(e). These include nearly every surface or groundwater in California, or tributaries thereto, and include drainage features outside USACE jurisdiction (e.g., dry and ephemeral/seasonal stream beds and channels, etc.), isolated wetlands (e.g., vernal pools, seeps, springs and other groundwater-supplied wetlands, etc.), and natural and artificial channels.

Surface water tributaries[16] consisting of flood control channels are near Sites 9 and 11. The construction area at Site 9 is flanked by the Colma Creek Diversion Channel on the east and the San Mateo County Flood Control Channel on the west; the banks of both channels are concrete. Site 11 is approximately 190 feet from the Colma Creek Flood Control Channel at a location where the creekbed has also been concrete lined. Site 11 is also close to a small drainage that appears to originate from the Kaiser Permanente Medical Center garage and parking lot which supports a small area of Central Coast Riparian Scrub habitat. All three tributaries fall under the jurisdiction of the USACE and under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB) and CDFW.

5.14.1.8 Trees

Many of the facility sites support mature ornamental and non-native tree species; none of the trees is locally indigenous or a remnant of a native stand. A tree inventory prepared for the Project indicates that a total of 145 trees are present within the construction area of the facility sites, with another 63 trees having canopies that overhang the construction areas that could require trimming during construction (Ward & Associates 2012). The tree species recorded at or adjacent to the proposed facility sites include: Monterey pine, Japanese black pine, Torrey pine (*Pinus torreyana*), Aleppo pine (*Pinus halepensis*), Monterey cypress (*Cupressus macrocarpa*), Italian stone pine (*Pinus pinea*), Canary Island pine (*Pinus canariensis*), spruce (*Picea sp.*), horsetail casuarinas (*Casuarina equisetifolia*), eucalyptus (*Eucalyptus sp.*), Lombardy poplar (*Populus nigra*), acacia (*Acacia sp.*), Peruvian pepper (*Schinus molle*), myoporum (*Myoporum sp*), cotoneaster (*Cotoneaster sp*), plum (*Prunus sp.*), pittosporum (*Pittosporum sp.*), Spanish bayonette (*Yucca aloifolia*), olive (*Olea sp.*), and elm (*Ulmus sp.*).

5.14.1.9 Wildlife Movement Corridors

Wildlife corridors are important for persistence of wildlife over time. These are linear habitats that naturally connect and provide passage between two or more large habitats or habitat fragments. These corridors are used by wildlife to find suitable forage, nesting and resting sites, mates, and new home ranges. In addition, wildlife corridors are used for dispersal for breeding populations, which will decrease the likelihood that subpopulations will go extinct or become locally extirpated. Even where patches of pristine habitat are fragmented, as commonly occurs with riparian vegetation, wildlife movement between populations is facilitated through habitat linkages, migration corridors, and movement corridors.

Wildlife movement includes migration (i.e., usually one direction per season), inter-population movement (i.e., long-term genetic exchange), and small travel pathways (i.e., daily movement within an animal's home range). Daily movement patterns define an animal's home range where activities such as foraging, resting, and interactions between individuals of the same species occur. Generally, longer movements by dispersing individuals connect breeding populations, permitting gene flow between these subpopulations. Corridors generally provide adequate habitat for animals to disperse until reaching an area large enough to establish home ranges. Corridors are different depending on what type of organism

16 A stream that contributes its water to another stream or body of water.

may use it; a corridor for a butterfly or bird may be a series of "stepping stones" of suitable habitat, while a terrestrial vertebrate may need a continuous band of suitable habitat for successful movement. Habitat loss, fragmentation, and degradation resulting from a change in land use or habitat conversion can alter the use and viability of corridors.

None of the facility sites are within any significant wildlife movement corridors; however, two sites are located near surface water which may provide some marginal wildlife movement. Sites 9 and 11 are located near Colma Creek. Colma Creek has been contained in the Colma Creek Diversion Channel, flowing through a series of concrete lined channels and underground storm drains. Both sites are located near portions of the Colma Creek open channel. The short stretch of surface water near Site 9 does not provide for significant wildlife movement as the channel consists of a concrete lined open box culvert, and it provides no vegetative cover. At Site 11, although water flows through an open channel near the site, the channel does not serve as a major wildlife migration corridor as it connects only to the Kaiser Permanente Medical Center garage and parking lot.

5.14.2 Regulatory Framework

5.14.2.1 Federal

U.S. Army Corps of Engineers

Section 404 of the Clean Water Act

Proposed discharges of dredged or fill material into waters of the United States require USACE authorization under Section 404 of the CWA (33 U.S.C. 1344). Waters of the United States generally include tidal waters, lakes, ponds, rivers, streams (including intermittent streams), and wetlands (with the exception of isolated wetlands).

The USACE identifies wetlands using a "multi-parameter approach," which requires positive wetland indicators in three distinct environmental categories: hydrology, soils, and vegetation. According to the *Corps of Engineers Federal Wetlands Delineation Manual*, except in certain situations, all three parameters must be satisfied for an area to be considered a jurisdictional wetland (Environmental Laboratory 1987). The *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* is also utilized when conducting jurisdictional wetland determinations in areas identified within the boundaries of the arid west (USACE 2008). The study area falls within the arid west region (which includes most of the Central California Coast and inland) and, therefore, wetlands identified on the site were delineated using the arid west guidance and the federal manual.

Executive Order 11990, Protection of Wetlands

Executive Order 11990 provides for the protection of wetlands. The administering agency for this Order is the USACE.

U.S. Fish and Wildlife Service

Federal Endangered Species Act

The FESA of 1973 recognizes that many species of fish, wildlife, and plants are in danger of or threatened with extinction and establishes a national policy that all federal agencies should work toward conservation of these species. The Secretary of the Interior and the Secretary of Commerce are designated in FESA as responsible for identifying endangered and threatened species and their critical habitats, carrying out programs for the conservation of these species, and rendering opinions regarding the impact of proposed federal actions on endangered species. FESA also outlines what constitutes unlawful taking, importation, sale, and possession of endangered species and specifies civil and criminal penalties for unlawful activities.

Biological assessments are required under Section 7(c) of FESA if listed species or critical habitat may be present in the area affected by any major construction activity conducted by, or subject to issuance of a permit from, a federal agency as defined in Part 404.02. Under Section 7(a)(3) of FESA every federal agency is required to consult with the USFWS or National Marine Fisheries Service (NMFS) on a proposed action if the agency determines that its proposed action may affect an endangered or threatened species.

Section 9 of FESA prohibits the "take" of any fish or wildlife species listed under the FESA as endangered or threatened. Take, as defined by the FESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such action." However, Section 10 allows for the "incidental take" of endangered and threatened species of wildlife by non-federal entities. Incidental take is defined by the FESA as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." Section 10(a)(2)(A) requires an applicant for an incidental take permit to submit a "conservation plan" that specifies, among other things, the impacts that are likely to result from the taking and the measures the permit applicant will undertake to minimize and mitigate such impacts. Section 10(a)(2)(B) provides statutory criteria that must be satisfied before an incidental take permit can be issued.

Migratory Bird Treaty Act

The MBTA (16 USC 703–711; 50 CFR Subchapter B), includes provisions for the protection of migratory birds, including basic prohibitions against any taking not authorized by federal regulation. The administering agency for the above authority is the USFWS. There are several migratory bird species that might use habitat potentially occurring in the study area or that could be affected by Project construction. These species include oak titmouse, white-tailed kite, loggerhead shrike, Allen's hummingbird, and California thrasher.

National Oceanic and Atmospheric Administration (NOAA)

The U.S. Congress passed the Coastal Zone Management Act (CZMA) in 1972. The CZMA, administered by the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource

Management, provides for management of the nation's coastal resources, including the Great Lakes, and balances economic development with environmental conservation.

The CZMA outlines two national programs, the National Coastal Zone Management Program and the National Estuarine Research Reserve System. The Coastal Zone Management Programs aim to balance competing land and water issues in the coastal zone, while estuarine reserves serve as field laboratories to provide a greater understanding of estuaries and how humans affect them. The overall program objectives of CZMA remain balanced to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."

Coastal states prepare coastal management programs under the CZMA. Once the federal government approves a state's coastal management program, that state gains federal consistency-review authority. California's Coastal Management Program, federally approved in 1977, designates two coastal zone management agencies to implement the federal consistency provisions: (1) the California Coastal Commission (CCC) for all coastal areas outside San Francisco Bay; and (2) BCDC for the coastal areas along San Francisco Bay. CCC's mission is to "Protect, conserve, restore, and enhance environmental and human-based resources of the California coast and ocean for environmentally sustainable and prudent use by current and future generations."

5.14.2.2 State

California Environmental Quality Act

The laws comprising California's legal framework and authority for plant species conservation include the FESA, CESA, NPPA, and CEQA. Special-status plants include those listed as endangered, the California Native threatened, or rare or as candidates for listing under FESA[17] or CESA[18] (CDFG 2011b), those listed as rare under the NPPA[19], those that meet the definition of rare or endangered under CEQA,[20] and species considered to be locally significant[21] (CDFG 2009). Plant species routinely regarded as having special-status include plants listed by the CDFG (CDFG 2011a), as well as those found on lists 1B and 2 of the CNPS (CNPS 2011).

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[17] 50 CFR§17.12
[18] California Fish and Game Code §2050, *et seq.*
[19] California Fish and Game Code §1900, *et seq.*
[20] §15380(b) and (d)
[21] As specified under CEQA §15125(c) or CEQA Guidelines, Appendix G

Rare or endangered species are defined in the CEQA Guidelines (Section 15380) as follows:

(a) "Species" as used in this section means a species or subspecies of animal or plant or variety of plant.

(b) A species of animal or plant is:

(1) "Endangered" when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors; or

(2) "Rare" when either:

(A) Although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or

(B) The species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the federal Endangered Species Act.

(c) A species of animal or plant shall be presumed to be rare or endangered if it is listed in:

(1) Sections 670.2 or 670.5, Title 14, California Administrative Code;

or

(2) Title 50, Code of Federal Regulations Sections 17.11 or 17.12 pursuant to the federal Endangered Species Act as rare, threatened, or endangered.

(d) A species not included in any listing identified in subsection (c) shall nevertheless be considered to be rare or endangered if the species can be shown to meet the criteria in subsection (b).

The CEQA Guidelines, under Section 15065, Mandatory Findings of Significance, also define a significant biological impact as follows (Section 15065 [a][1]):

- The project has the potential to substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; substantially reduce the number or restrict the range of an endangered, rare or threatened species.

California Coastal Act

The California Coastal Act applies to projects that result in the diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes occurring in the coastal zone. The act limits these activities to certain types of projects (restoration projects, for example, are included among the permitted projects) and stipulates criteria under which development is permitted. Chapter 3 of the act details the coastal resources planning and management policies (Sections 30200 to 30265.5). The act also permanently established the California Coastal Commission (CCC).

The California Coastal Act includes specific policies that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works. The policies of the act are the statutory standards that apply to planning and regulatory decisions made by the commission and by local governments, pursuant to the act.

Implementation of the act's policies is accomplished primarily through the preparation of local coastal programs that include land use plans. To ensure that coastal resources are effectively protected in light of changing circumstances, such as new information and changing development pressures and impacts, the CCC is required to review each certified local coastal program at least once every five years.

Coastal Act policies include:

- Coastal Act Section 30107.5 defines environmentally sensitive habitat area as:

  "any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments."

- Coastal Act Section 30240 states in part that:

  (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas.

  (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

Within the coastal zone the CCC has authority to regulate development that would conflict with the provisions of the California Coastal Act. The coastal zone generally extends three miles seaward and about 1,000 yards inland. In order to carry out the policies of the Coastal Act, each of the 73 cities and counties in the coastal zone is required to prepare a local coastal program (LCP) for the portion of its jurisdiction within the coastal zone and to submit the program to the Commission for certification. The CCC manages protection of biological resources through a permitting process for all projects in the coastal zone. Once the CCC certifies an LCP, the local government gains authority to issue most coastal development permits (CDP). The CCC generally retains permit authority over certain specified lands (such as public trust lands or tidelands). Only the CCC can grant a coastal development permit for development in areas of its retained jurisdiction. The CCC has broad authority to regulate development in the coastal zone, and a permit is required for any project that might change the intensity of land use in the coastal zone. For example, a project that would require a building or grading permit from a city or county would also require a CDP. Other projects, such as major vegetation clearing or subdividing, may also require a CDP. The local government or the CCC reviews applications before it to determine whether the project would substantially change any existing biological resources, including wetlands, and to consider the net effects of the project on rare and endangered species.

None of the facility sites would be located within CCC jurisdiction, but the CCC has retained jurisdiction over the waters at Lake Merced, which may be affected by the Project. San Francisco's LCP is discussed further below as the *Western Shoreline Area Plan* in Section 5.14.2.3 (Local).

BCDC has jurisdiction over the open water, marshes, and mudflats of greater San Francisco Bay, including Suisun, San Pablo, Honker, Richardson, San Rafael, San Leandro, and Grizzly Bays and the Carquinez Strait, as well as the first 100 feet inland from the shoreline around San Francisco Bay. BCDC's mission statement states that BCDC "is dedicated to the protection and enhancement of San Francisco Bay and to the encouragement of the Bay's responsible use." None of the facility sites would be located within BCDC jurisdiction, and Lake Merced is not within BCDC jurisdiction.

California Department of Fish and Wildlife

California Fish and Game Code

The CDFW enforces the CFGC, which provides protection for "fully protected birds" (Section 3511), "fully protected mammals" (Section 4700), "fully protected reptiles and amphibians" (Section 5050), and "fully protected fish" (Section 5515). With the exception of permitted scientific research, no take of any fully protected species is allowed. The white-tailed kite is the only fully protected species potentially occurring in the study area.

Section 3503 of the CFGC prohibits the take, possession, or needless destruction of the nest or eggs of any bird. Subsection 3503.5 specifically prohibits the take, possession, or destruction of any birds in the orders *Falconiformes* (hawks and eagles) or *Strigiformes* (owls) and their nests. These provisions, along with the federal MBTA, essentially serve to protect nesting native birds. Non-native species, including European starling and house sparrow, are not afforded any protection under the MBTA or CFGC.

California Endangered Species Act (Fish and Game Code Sections 2050 through 2085)

The CESA includes provisions for the protection and management of species listed by the State of California as endangered or threatened or designated as candidates for such listing. The act requires consultation "to ensure that any action authorized by a State lead agency is not likely to jeopardize the continued existence of any endangered or threatened species or results in the destruction or adverse modification of habitat essential to the continued existence of the species" (Section 2053). California plants and animals declared to be endangered, threatened, or rare are listed at 14 CCR 670.2 and 14 CCR 670.5, respectively. The State prohibits the take of protected amphibians (14 CCR 41), protected reptiles (14 CCR 42), and protected furbearers (14 CCR 460). The CDFW may also authorize public agencies through permits or a memorandum of understanding to import, export, take, or possess any endangered species, threatened species, or candidate species for scientific, educational, or management purposes (Section 2081[a]). The CDFW may also authorize, by permit, the take of endangered species, threatened species, and candidate species provided specific conditions are met (Section 2081[b]).

State Species of Special Concern and Special Plants List

The CDFW maintains an informal list of *species of special concern* (Jennings and Hayes 1994; Gardali and Evens 2008; CDFG 2011a, 2011c). These are broadly defined as species that are of concern to the CDFW because of population declines and restricted distributions, and/or they are associated with habitats that are declining in California; the criteria used to define special-status species are described by the CDFG (CDFG 2009). Impacts to special-status plants and animals may be considered significant under CEQA.

Native Plant Protection Act

The CDFW administers the NPPA (Sections 1900–1913 of the CFGC). These sections allow the California Fish and Game Commission to designate rare and endangered rare plant species and to notify landowners of the presence of such species. Section 1907 of the CFGC allows the Commission to regulate the "taking, possession, propagation, transportation, exportation, importation, or sale of any endangered or rare native plants." Section 1908 further directs that "…[n]o person shall import into this State, or take, possess, or sell within this State, except as incident to the possession or sale of the real property on which the plant is growing, any native plant, or any part or product thereof, that the Commission determines to be an endangered native plant or rare native plant."

California Species Preservation Act

The California Species Preservation Act (CFGC Sections 900–903) includes provisions for the protection and enhancement of the birds, mammals, fish, amphibians, and reptiles of California. The administering agency is the CDFW.

State Water Resources Control Board and the State of California's Porter-Cologne Water Quality Control Act

The State Water Resources Control Board (SWRCB) regulates construction stormwater through SWRCB Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges that Have Received State Water Quality Certification." The State's authority to regulate activities in wetlands and water at the Project facility sites resides primarily with the SWRCB, which in turn has authorized the State's nine RWQCBs, discussed below, to regulate such activities.

Regional Water Quality Control Board

Clean Water Act Section 401 Certification

Under Section 401 of the federal CWA, every applicant for a federal permit for any activity that may result in a discharge to a water body must obtain a Water Quality Certification that the proposed activity will comply with State water quality standards.

In the study area, the San Francisco Bay RWQCB would regulate construction in waters of the United States and waters of the State, including activities in wetlands, under both the CWA and the State of California's Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the CWA, the RWQCB has regulatory authority over actions in waters of the United States, through the issuance of water quality certifications, as required by Section 401 of the CWA, which are issued in conjunction with permits issued by the USACE under Section 404 of the CWA. The RWQCB must certify that a USACE permit action meets State water quality objectives (§401 CWA, and Title 23 CCR 3830, et seq.). Activities in areas that are outside of the jurisdiction of the USACE (e.g., isolated wetlands, vernal pool, or stream banks above the ordinary high water mark) are regulated by the nine RWQCBs, under the authority of the Porter-Cologne Act, and may require the issuance of either individual or general waste discharge requirements. The California Wetlands Conservation Policy (Executive Order W-59-93) establishes a primary objective to "ensure no overall net loss … of wetlands acreage and values in California." The RWQCBs implement this policy and the Basin Plan Wetland Fill Policy, both of which require mitigation for wetland impacts.

5.14.2.3 Local

Pursuant to California Government Code Section 53090, et seq., the SFPUC, as a public utility, has intergovernmental immunity from the local building and zoning ordinances of other cities and counties when it carries out a project outside of San Francisco. Nevertheless, this section presents the local tree protection ordinances that may be applicable to assessing the potential biological resources impacts of the Project. The Project would be located within the City of Daly City, Town of Colma, City of South San Francisco, City of San Bruno, the City of Millbrae, and an unincorporated part of San Mateo County (Broadmoor). Thus, the provisions of these jurisdictions' local tree protection ordinances are discussed below.

The following sections describe these local tree protection ordinances, which are the only local ordinances specific to protecting biological resources that were identified for the municipalities in the study area.

San Mateo County

San Mateo County has both a Heritage Tree Ordinance and a Significant Tree Ordinance (San Mateo County 1977, 1990). Under the Heritage Tree Ordinance (Ordinance Number 2427, Regulation of the Removal and Trimming of Heritage Trees on Public and Private Property) a heritage tree includes any tree or grove of trees so designated by the County Board of Supervisors, or includes any of the 16 native tree species listed in Table 5.14-3 (San Mateo County Heritage Trees) of varying diameter at breast height (dbh). The ordinance regulates activities that could impact heritage trees and provides guidelines for compensating for lost heritage trees when avoidance is not feasible.

The Significant Tree Ordinance (San Mateo County Ordinance Code: Part III, Division VIII. Part III, Division VIII) prohibits removal of trees with a circumference of 38 inches or larger (which is equivalent to 12 inches dbh) without a permit.

Removal of trees protected under the Heritage Tree Ordinance and the Significant Tree Ordinance requires a permit and replacement trees.

TABLE 5.14-3
San Mateo County Heritage Trees

Bigleaf Maple (more than 36″ dbh) *Acer macrophylumm*	Douglas Fir[(a)] *Pseudotsuga menziesii*	Valley Oak (more than 48″ dbh) *Quercus lobata*
Madrone[(b)] *Arbutus menziesii*	Coast Live Oak (more than 48″ dbh) *Quercus agrifolia*	Blue Oak (more than 30″ dbh) *Quercus douglasii*
Golden Chinquapin (more than 20″ dbh) *Chrysolepis chrysophylla*	Canyon Live Oak (more than 40″ dbh) *Quercus chrysolepis*	California Bay or Laurel[(c)] *Umbellularia californica*
Santa Cruz Cypress (all) *Cupressus abramsiana*	Oregon White Oak (all) *Quercus garryana*	California Nutmeg (more than 30″ dbh) *Torreya californica*
Oregon Ash (more than 12″ dbh) *Fraxinus latifolia*	Black Oak (more than 32″ dbh) *Quercus kellogii*	Redwood[(d)] *Sequoia sempervirens*
Tan Oak (more than 48″ dbh) *Lithocarpus densiflorus*	Interior Live Oak (more than 40″ dbh) *Quercus wislizenii*	

Source: San Mateo County 1977

Notes:

(a) More than 60″ dbh east of Skyline Boulevard and north of Highway 92.
(b) Single stem or multiple stems touching each other 4′-6″; more than 48″ dbh, or clumps visibly connected above ground with basal area greater than 20 square feet measured 4′-6″ above average ground level.
(c) Single stem or multiple stems touching each other 4′-6″; more than 48″ dbh, or clumps visibly connected above ground with basal area greater than 20 square feet measured 4′-6″ above average ground level.
(d) More than 84″ dbh west of Skyline Blvd., or 72″ dbh east of Skyline Boulevard.

City of Daly City

The City of Daly City regulates the removal of trees growing upon any parkway, easement, right-of-ways or other publicly owned area (Daly City Municipal Code, Title 12: Chapter 12.40. Chapter 12.40, Urban Forestry) (Daly City 1996). Protected trees include any woody perennial plant having a single main axis or stem commonly achieving 15 feet in height. The City of Daly City has no regulations governing the removal of trees on private property.

Town of Colma

The Town of Colma requires the issuance of a permit prior to the removal or significant alteration of any tree defined as having a single stem of 12 inches or more in diameter measured four feet above the natural grade, or a multi-stemmed tree having an aggregate diameter of 40 inches or more measured four feet above the natural grade (Town of Colma Municipal Code: Subchapter Six. Subchapter Six, Tree Cutting and Removal) (Colma 2006). The City Planner can issue a permit for tree removal unless the planner finds that the tree is of such size, type, condition and location that its removal or alteration would destroy the natural beauty of the area, contribute to erosion, increase the cost of drainage systems, reduce the protection against wind, or significantly impair the privacy and quiet of a residential area. Permit conditions may include tree replacement or substitution using specimen size trees. Replacement may occur on the same property as removal unless the planner determines that an off-site location better serves the Town's objectives.

City of South San Francisco

The City of South San Francisco requires a permit for the removal or pruning of any protected tree, defined as any tree with circumference of 48 inches (≥15.2 inches in diameter) measured 4.5 feet above ground level (City of South San Francisco Municipal Code: Chapter 13.30. Chapter 13.30, Tree Preservation) (South San Francisco n.d.). Damage or removal of a protected tree requires either replacement or reimbursement to the City for replacement. The City requires replacement of protected trees at a 3:1 ratio if a 24-inch box size is used or at a 2:1 ratio if a 36-inch box is used for each protected tree removed. The Parks, Recreation, and Maintenance Department Director can waive the replacement requirement if there are sufficient trees on the site to meet the tree preservation ordinance.

City of San Bruno

The City of San Bruno requires issuance of a permit for the removal of any tree or grouping of trees meeting the definition of a "heritage tree" (City of San Bruno Municipal Code: Chapters 8.24 and 8.25. Chapter 8.25, Heritage Tree Ordinance) (San Bruno 2002). Heritage trees are defined as follows: Any native bay (*Umbellurlaria californica*), buckeye (*Aesculus species*), oak (*Quercus species*), redwood (*Sequoia sempervirens*), and pine (*Pinus radiata*) tree that has a diameter of 6 inches or more measured at 54 inches above natural grade. In addition to these tree species, a heritage tree is any tree or stand of trees that makes each dependent on the other for survival; or any other tree with a trunk diameter of 10 inches or more measured at 4.5 feet above ground level. A tree removal or pruning permit requires replacement at a minimum of two 24-inch box size trees or one 36-inch box size tree for each heritage tree removed.

City of Millbrae

The City of Millbrae regulates street trees under its Tree Protection and Urban Forestry Program (City of Millbrae Municipal Code: Chapter 8.60. Chapter 8.60, City of Millbrae Tree Protection and Urban Forestry Program) (Millbrae n.d.), which states that unless authorized by permit, no person or property owner shall plant, prune, remove, alter or undertake any other work on a street tree, defined as any wood perennial plant having a single main axis or stem commonly achieving a minimum of 10 feet in height. The City of Millbrae does not regulate trees outside of the street corridor.

City of San Francisco

Western Shoreline Area Plan

The Western Shoreline Area Plan of the San Francisco General Plan is the San Francisco plan for the Local Coastal Zone and sets forth several policies governing development in the coastal zone. Therefore, most coastal development permits are issued by the San Francisco Planning Commission. However, the CCC has retained jurisdiction over the waters at Lake Merced. In addition, coastal development permits issued for projects located within a 100-foot buffer of Lake Merced are appealable to the CCC. None of the facility sites would be located within the 100-foot buffer from Lake Merced, and none of the facility sites would be located within the area governed by the Western Shoreline Area Plan.

Objective 5 of the Plan is to "Preserve the Recreational and Natural Habitat of Lake Merced". However, there are no specific policies relevant to biological resources.

San Francisco Recreation and Parks Department Significant Natural Resources Areas Management Plan

The San Francisco Recreation and Park Department is currently completing a Significant Natural Resource Areas Management Plan (SNRAMP) for designated significant natural areas in the City and County of San Francisco (CCSF). The purpose of the management plan is to establish a maintenance and preservation program related to the protection and enhancement of natural resource values. While the SNRAMP itself has not been finalized and adopted and thus is not in effect, the process began in 1995, with the adoption of a staff report on the SNRAMP. The staff report set forth general objectives, policies, and management actions to guide development of the SNRAMP. Adopted general policies and management actions in the staff report relevant to biological resources at Lake Merced include the following:

III. General Policies and Management Actions

A. Vegetation

   a. Maintain/promote indigenous plant species; propagate native plants using seed collected from the specific site to avoid alteration of unique genetic strains of native plant species.
   b. Control/remove invasive species; remove exotic plants which adversely affect indigenous plant growth.
   c. Enhance riparian areas.
   d. Reforest and/or replant areas where appropriate to maintain diversity of indigenous plant communities.
   e. Preserve habitat which supports wildlife.

B. Water Resources

   a. Maintain/improve water quality of streams and ponds
   b. Protect riparian zones from erosion and sedimentation.
   c. Maintain drainage and erosion prevention devices along roads and service trails.
   d. Control drainage/runoff from roads.
   e. Establish and maintain tule encroachment zone around lakes.
   f. Use proper controls when using aquatic herbicide.

5.14.3 Impacts and Mitigation Measures

5.14.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Supply and Recovery Project would have a significant effect on biological resources if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS.
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the federal CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan.

5.14.3.2 Approach to Analysis

The assessment of potential impacts on special-status botanical and wildlife resources, including habitat, was based on the relationship between species and habitat distribution and the locations and activities proposed for construction and operation of the proposed Project. Sources of information for determining special-status species that could occur in the study area included CNDDB, CNPS Online Inventory, and USFWS endangered and threatened species database. Field visits were conducted to determine the likelihood these species would occur at or near the facility sites and to determine the presence of wetlands, other waters, and sensitive habitats. Tree surveys were conducted. Potential impacts on special-status plants and wildlife were based on known occurrences or on the likelihood that suitable or marginally suitable habitat for special-status species would be affected. Potential impacts on sensitive habitats and other resources were based on the presence of these resources and locations of the proposed facilities. Potential conflicts with local tree protection ordinances were analyzed with reference to standards set forth in the tree ordinances for San Mateo County and municipal codes for the cities of Daly City, South San Francisco, San Bruno, and Millbrae, and the Town of Colma.

It was assumed that any biological resources located within the construction boundary for each facility site would be impacted by construction, including all 19 well facility sites and the pipeline and alternate pipeline connection for each site. Resources immediately outside the construction boundary were also evaluated on a site by site basis to determine the potential for impacts. This approach provides a conservative estimate of habitat impacts. For example, if habitat requirements of special-status species were present, the impact assessment assumed that the species was also present and that a significant adverse environmental impact could result from habitat impacts or inadvertent impacts on the species. Because impacts are primarily related to the presence or absence of resources at a site, the analysis for Sites 5, 6, and 7, which have two potential configurations, are only presented for the site. For example, the impacts of Site 5 (On-site Treatment) would be the same as for Site 5 (Consolidated Treatment at Site 6), and are discussed under Site 5. However, if there are differences in potential impacts between the two potential configurations, the impacts are discussed separately for each site.

Biological resources located near the permanent facility sites were evaluated for the potential to be affected by Project operations. The potential for special-status species or natural communities to be present near facility sites, together with the sensitivity of such species and communities to elements of Project operations were utilized to assess impacts.

Operational Impacts on Lake Merced Biological Resources

Impacts on biological resources would be significant if Project operations were to result in substantial effects on the biological resources of Lake Merced, which is hydraulically connected to the underlying groundwater basin.

As described in Section 5.16, Hydrology and Water Quality, Lake Merced water sources are primarily precipitation, limited local runoff, and groundwater inflow. Lake Merced water levels have fluctuated widely over time in response to climatic conditions, water discharges, and regional and local groundwater pumping. Water surface level (hydrologic) modeling in support of this EIR (Kennedy/Jenks 2012), including the biological resources impacts analysis, relied on historic water data to simulate water level conditions for Lake Merced over the next 47 years for the modeled existing conditions scenario, the GSR Project, and a cumulative scenario, which takes into account the effects of other projects that, should they be implemented, would play a role in influencing Lake Merced water levels (see Section 5.1, Overview, Section 5.1.6 [Groundwater Modeling Overview] for further details on the modeling).

Significance Thresholds for Influence of Changing Water Levels on Vegetation Types near Lake Merced

In large part, the mean annual water level of lake systems drives the elevational distribution of upland, wetland, and aquatic plant species around lakes and other water bodies, such as Lake Merced, primarily due to variations in adaptation to, and tolerance of, inundation. Seasonal timing, duration, water depth, and frequency of inundation are all critical factors in determining which species would persist in a given area. A rise in water levels could inundate a portion of existing wetland habitats so that they would be under water at too great a depth or for too long to persist. These newly inundated wetlands would then be converted to lacustrine habitat (i.e., open water). Some wetland habitats would persist, although their species composition could change due to the altered pattern (i.e., duration and depth) of inundation. New wetland habitats would then form within the new, higher annual fluctuation zone at elevations currently supporting upland habitats, which would be unable to persist under the new inundation regime. As groundwater levels rise, some wetlands, such as those dominated by giant vetch, may be induced or created at elevations above the new water level. Upland vegetation types would not move upslope with rising water levels, given that their distribution is not tied to water elevation, other than the fact that they can't persist in areas that are regularly inundated, and thus replacement of upland types with other upland types has no relation to water surface elevation.

To some extent, these processes are generally expected to operate in reverse as water levels recede over a period of years, but with some important differences. Under rising water level conditions, there is competition and resistance to replacement of existing vegetation types by those that dominate within the inundated or saturated zone. Under receding water levels, much of the land surface that becomes available for vegetation to occupy (with the exception of existing bulrush patches) would be newly exposed, unvegetated sediments of the former lake bottom. For instance, some upland types (such as non-native herbaceous and non-native and perennial grassland) are expected to move downslope if water levels drop substantially for long enough periods, given that receding water levels would result in the exposure of unvegetated sediment suitable for colonization by upland species at elevations of more than 1 foot above the new average annual water surface elevation.

The following describes the impact thresholds that apply to the analysis of impact on the biological resources of Lake Merced resulting from water level changes caused by the proposed Project, for the resources described in Section 5.14.1 (Setting).

Adverse Effects on Special-status Wildlife

As the only remaining large coastal lake and wetland between Pescadero to the south and Point Reyes to the north, Lake Merced provides valuable wildlife habitat, especially for birds. Many of these are special-status or otherwise protected water birds, which are discussed below relative to their nesting habitat. In addition, large eucalyptus along North and South Lake support rookeries for double crested cormorant and great blue heron and red-shouldered and red-tailed hawks nest in large trees around the lake (SFRPD 2006). This issue is discussed in detail below, under the subsection for adverse effects on wildlife nursery sites. Other special-status birds, such as Wilson's warbler, green backed heron, and black-crowned night heron nest in willow scrub around the lakes (SFRPD 2006; Murphy 1999). Impacts on willow scrub are discussed further below under the subsection for adverse effects on wetlands. Still other species protected under the CFGC, such as California towhee and Bewick's wren, nest in coastal scrub, which may also be lost in small amounts as discussed below in the next subsection.

Several special-status bird species are known to nest or have potential to nest at or near the water line at Lake Merced, including Clark's and pied-bill grebes, sora, and Virginia rail (SFPRD 2006). Additional species protected under the Migratory Bird Treaty Act and the CFGC, Section 3503, that nest in emergent vegetation at or near the water's edge include marsh wren, ruddy duck, mallard (Murphy 1999), and the California species of special concern, San Francisco common yellowthroat (Gardali and Evens 2008). Loss of emergent wetland breeding habitat for these species is discussed below under the subsection for adverse effects on wetlands. Increases in lake levels during breeding season could flood active nests. Decreases in lake levels could result in stranding of floating nests, such as those constructed by Clark's grebes. Research has shown that marsh birds are sensitive to fluctuations in water levels, especially rapid fluctuations. Thus, direct impacts on birds nesting at or near the water line would begin to occur with even small fluctuations in lake levels during the breeding season. Virginia rail and sora nest up to six inches above the water surface (Desgranges et al. 2006); marsh wren typically nest two or more feet above the water line; and Clark's grebes have been documented as abandoning their nests after a 16-inch reduction in water levels occurred over three weeks (Riensche et al. 2009).

Virginia rail (Desgranges et al. 2006) and sora (Erlich et al. 1988) nesting success would appear to be highly sensitive to water fluctuations and these can be utilized as an indicator species to determine significance thresholds. An examination of the typical nest height above water for each of these species combined with their egg incubation period of approximately 2.5 weeks[22] (Erlich et al. 1988) suggests that an increase or decrease in water level of 0.5 feet over a 2.5 week period during the nesting season would impact the reproductive success of birds nesting near the water line. Therefore, water level increases or decreases by greater than 0.5 feet over a two week period in any single nesting season (conservatively March 1 through August 15) would be considered to result in a significant impact on nesting birds.

Other special-status species documented at Lake Merced include western pond turtle sightings in East Lake and a California red-legged frog sighting in Impound Lake in 2000 (SFRPD 2006). California red-legged frog has not been observed since a single sighting in 2000 and prior to that had not been observed since the 1970's (SFPUC 2011). Based on the lack of sightings, negative protocol-survey results from 2000, and the presence of bullfrogs and largemouth bass, red-legged frog were considered extirpated from Lake Merced (SFRPD 2006; San Francisco Planning Department 2011; SFPUC 2011) and, with no evidence to the contrary, are presumed extirpated for the purposes of this analysis.

It is presumed that western pond turtle are still present in East Lake, although the presence of red-eared sliders and bullfrogs was considered a threat to the population over five years ago (SFRPD 2006) and they may have been extirpated since that time. It is unknown whether suitable western pond turtle nesting habitat is present at Lake Merced but it would be most likely to occur in dry sandy to hard soils on low gradient slopes with low, sparse vegetation (Jones and Stokes 2004). Suitable nesting sites can occur as far as 300 feet from the water line (CDFG 2000) but are typically much closer and could thus be vulnerable to inundation. Females move from aquatic sites to upland sites that are usually located above the floodplain (or in this case, above the highest average annual water level) and can lay their eggs, sometimes more than one clutch, anywhere between April and August, although most oviposition occurs in April and May. Nests must be dry (Jones and Stokes 2004) but also have a relatively high internal humidity for eggs to develop and hatch properly (CDFG 2000). Incubation can last up to three months and hatchlings typically overwinter in the nest, emerging the following spring (Jennings and Hayes 1994).

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[22]Nests that are not yet supporting eggs can be rebuilt and chicks of all the species in question are precocial, meaning they are capable of a high degree of independent activity immediately after hatching and can leave the nest and be relocated by their mother in response to fluctuations in water level.

Loss of potentially suitable turtle nesting habitat due to inundation by rising water levels would not be considered significant, since the majority of soils surrounding East and North Lakes are sandy (SFRPD 2006) and even at the maximum possible water surface elevation of 13 feet, sufficient habitat would remain to support ongoing western pond turtle reproduction. Pond turtles typically nest close to the water line but above areas prone to inundation. Since nests must be relatively dry, it would be expected that pond turtles would typically choose nest sites at least three feet above the annual high water level in any given year, so gradual increases in water surface elevations over time would not be expected to impact nesting pond turtles. Similarly, water surface elevation decreases, whether gradual or by several feet in less than a year would not impact nesting pond turtles as their nests would remain above water. However, loss of occupied nesting habitat inundated during a single year such that turtle eggs or nestlings were lost could threaten the Lake Merced western pond turtle population, if it still exists, and would therefore be considered a significant impact.

Adverse Effects on Rare Plants and Sensitive Communities

Rare plants

There are four special-status plant species documented recently at Lake Merced: San Francisco spineflower, San Francisco wallflower, blue coast gilia, and dune tansy (May & Associates 2009; Nomad Ecology 2011). In addition, there are seven plant species of local concern that occur at Lake Merced: California pipevine, Wight's paintbrush, Vancouver rye, wild cucumber, canyon live oak, coastal black gooseberry, and thimbleberry (May & Associates 2009; Nomad Ecology 2011). See Figure 5.14-2 (Lake Merced Sensitive Habitats and Species) in Section 5.14.1 [Setting] for locations of rare plants and sensitive plant communities.

None of these eleven species are federally or State listed, three are listed by CNPS, and the rest are listed by CNPS as locally rare and significant in the CCSF. Normally, only federal, State, and CNPS List 1 and 2 species are considered under CEQA. However, all eleven species noted occur in coastal dune scrub and coastal scrub habitat types, further described below, which have been severely reduced from their original extent within the CCSF.

Because special-status plants and their habitat are locally rare and thus at high risk of local extinction, impacts on rare plant habitat at Lake Merced would be considered significant under CEQA. All of these plant species occur outside the Lake Merced watershed and most are more common elsewhere throughout their range and extirpation of a local population would not pose a risk to the overall survival of the species. Given this context, some habitat loss could be acceptable and result in a-less-than significant impact under CEQA. However, due to the general lack of local habitat,, a relatively low threshold for loss is appropriate for this CEQA analysis, and impacts on special-status plant habitat would be considered significant for the purpose of this EIR if an increase in average lake levels were to result in the loss of more than 10 percent of occupied habitat, as mapped by the SFRPD (SFRPD 2006), May & Associates (May & Associates 2009), and Nomad Ecology (Nomad Ecology 2011), for one or more of the special-status or locally sensitive plants known to occur at Lake Merced.

Sensitive Communities

The following have been identified as sensitive vegetation and habitat types at Lake Merced: Central dune, thimbleberry, wax myrtle, and canyon live oak scrubs, Vancouver rye grassland (perennial grassland), fish-related habitat, wetlands (including arroyo willow riparian scrub), and blue gum eucalyptus forest. Arroyo willow riparian scrub is discussed below under wetlands and eucalyptus forest is discussed below under wildlife nursery sites.

*Central Dune Scrub***.** While there were no stands of dune scrub mapped at Lake Merced in 2002 (SFPRD 2006), restoration efforts have resulted in the establishment of over 3 acres of this vegetation type, which is rare on the San Francisco Peninsula. Dune scrub is not only locally rare, but also supports several rare plant species at Lake Merced, including San Francisco spineflower, Wight's paintbrush, dune tansy, and San Francisco wallflower and is therefore considered sensitive as rare plant habitat for the purposes of this EIR.

Locally sensitive coastal scrub types. The classification of coastal scrub at Lake Merced encompasses several different subtypes that are dominated by locally rare plant species and therefore considered sensitive natural communities for the purposes of this analysis. These subtypes include thimbleberry scrub, wax myrtle scrub, and canyon live oak scrub. These vegetation types occur in only one or two locations around Lake Merced (see Figure 5.14-2 [Lake Merced Sensitive Habitats and Species] in section 5.14.1 [Setting]) as well as in other parts of the CCSF (SFRPD 2006; CNPS 2011).

Vancouver rye grassland. This is a perennial grassland dominated by Vancouver rye, which is a hybrid between American dunegrass and creeping wild rye and thus reflective of both the dune and riparian ecological history of Lake Merced. At last report, this grassland occurred in one location on the north shore of East Lake at the base of a steep slope and adjacent to blue gum eucalyptus forest and rush meadow (Nomad Ecology 2011). Vancouver rye grassland was considered sensitive due to its local rarity by the SFRPD (SFRPD 2006) and the species is considered locally rare by CNPS. Therefore, impacts on this vegetation type would be considered significant.

Fisheries and Fish Habitat

The open waters and emergent wetlands of Lake Merced provide aquatic habitat, cover, and foraging habitat for a variety of native and non-native fish. Twenty-seven species have been collected there over the years, 18 of which are native species. Tidewater goby, a federally endangered species, are known to have occurred historically (1894) but are now presumed extirpated (CDFG 2011e). Several other species, including starry flounder, staghorn sculpin, and topsmelt, may have been present at least intermittently when Lake Merced was hydrologically connected to the ocean. At least 11 species have been introduced to the lake since 1893 and the most abundant species in recent studies were introduced largemouth bass and Sacramento blackfish (LMTF 2007). There is no spawning habitat for rainbow trout so this species must be stocked in order to maintain a fishery and stocked adults persist in the lake for only a short time. Native fishes with currently self-sustaining populations at Lake Merced include: tule perch, prickly sculpin, Sacramento blackfish, and threespine stickleback. Non-native fishes with self-sustaining populations include largemouth bass, common carp, and goldfish (LMTF 2007). There currently are no special-status fish species found in Lake Merced.

In 2004, the SFPUC retained EDAW (a San Francisco-based environmental consulting firm that is now part of AECOM) to assess the effect of water level rise on Lake Merced fisheries. EDAW's analysis anticipated that the greatest potential effect would come from reductions in littoral habitat (defined as areas with three feet or less of water around the lake perimeters) with rising lake levels, using a study baseline of 0.5 feet City Datum (EDAW 2004). The EDAW study has been reviewed by the preparers of this EIR and the study's methodology and conclusions have been determined to be adequately supported by the information presented therein. However, it was predicted that most of the loss would be in Impound Lake and much of this loss has already occurred. Decreases in littoral area were expected to impact warmwater species. But the EDAW study found that littoral area was already a very small component of the overall lake habitat, and that since there were other factors more likely to control warm water species (i.e., temperature, cover, and water clarity), this change was expected to have minimal impacts on warmwater fish population abundance, growth rates, or ability to reproduce. The EDAW study did not expect coldwater fish species to be affected by lake level increases. Water level decreases could result in increases of littoral habitat, at least to begin with, by regaining habitat lost when lake levels rose from the EDAW study baseline of 0.5 feet City Datum, and eventually, reductions in coldwater habitat through rising water temperatures, which could increase warmwater and reduce coldwater fish populations, respectively. Coldwater fish at Lake Merced are trout, which are not self-sustaining and are regularly stocked and prickly sculpin, which as of 2007 appeared to be self-sustaining (LMTF 2007). The remaining fish are warmwater species.

As described above, there are no special-status fish in Lake Merced, and the species most important for recreational purposes are regularly stocked; however, if decreased water levels were to cause fish populations to drop below levels needed to sustain the local bird populations that rely upon them—which include special-status and otherwise protected birds—the impact could potentially be significant. Population numbers for fish-eating birds as well as fish at Lake Merced are presently unknown. The Lake Merced Task Force Fish Community Study (LMTF 2007) noted that cormorants were not documented as nesting at Lake Merced prior to 1997 and that nest numbers increased from 18 in 1997 to around 200 in 2004. In 2007, 11 great blue heron and 319 double-crested cormorant nests were documented at Lake Merced and their increase in numbers may be attributable to lake level rises over low levels seen in the 1970's through the 1990's and consequent improvements in habitat (GGAS 2007). This conclusion would be speculative though, since no definitive studies have been conducted on fish population numbers or the foraging habits of fish-eating birds at Lake Merced. Nesting cormorants have been documented as flying to and from the ocean to forage while nesting at Lake Merced, which suggests that they, and presumably other fish-eating birds present at Lake Merced, do not depend exclusively on the fish available in Lake Merced (LMTF 2007). As noted above, the health of Lake Merced's fisheries is closely tied to availability of littoral habitat and water quality also plays an important role. These factors are likely the main drivers of fish abundance in Lake Merced and can be tied to the lake's beneficial uses.

The San Francisco Bay RWQCB defines several fish-related beneficial uses for Lake Merced: cold freshwater habitat, warm freshwater habitat, and fish spawning. A substantial degradation or loss of these beneficial uses, for example through significant changes in water temperature, loss of littoral habitat, or reduction in dissolved oxygen, would be considered significant. EDAW (EDAW 2004) assessed potential impacts on beneficial uses in relation to lake level rise up to 8 feet City Datum and water inputs from various potential sources and found that no effects on beneficial uses were expected. Similarly, as noted in Section 5.16, Hydrology and Water Quality, no significant correlation between lake levels and water quality has been identified in recent years, when lake levels were rising or stable. However, as also noted, and explained in greater detail, in Section 5.16, Hydrology and Water Quality, lake levels below 0 feet City Datum could result in adverse impacts on water quality through a variety of mechanisms, such as increased sedimentation due to erosion of exposed sediments or reductions in dissolved oxygen due to increased algal growth and eutrophication, and these impacts could have a substantial adverse effect on Lake Merced's beneficial uses related to fish habitat, and therefore fish populations and, indirectly, fish-eating bird populations, which, depending on the magnitude, duration, and frequency of the effect, could potentially be a significant impact.

Adverse Effects on Wetlands

As the only remaining large coastal lake and wetland between Pescadero to the south and Point Reyes to the north, Lake Merced provides valuable wildlife habitat, especially for birds. The lake's wetlands and willow riparian scrub provide wintering habitat for thousands of birds, resting and foraging habitat for fall and spring migrants, and are used as breeding and feeding habitat for nearly 50 species. The lake's wetlands also provide cover, foraging habitat, and nursery sites for warmwater fish as well as cover and foraging habitat for western pond turtle. Impacts on wetlands resulting from changing water levels could include direct wetland losses. Indirect effects due to water quality degradation at low water surface elevations are not expected to significantly affect wetland vegetation since healthy wetland vegetation has been maintained in the past at lower water levels. For example, the extent of bulrush wetlands was greater in 1996 (SFRPD 2006) and 2002 (Nomad Ecology 2011), with a mean water surface elevation of 0.5 feet City Datum, than they are today.

The slopes surrounding Lake Merced currently support approximately 27 acres of willow riparian scrub (see Table 15.4-4 [Lake Merced Vegetation Acreage: 2002, 2010, and 2012]). Since most of the willow scrub habitat at Lake Merced would also be considered jurisdictional wetlands, impacts on willow scrub are considered as part of the wetlands impact. This vegetation community is common throughout central and coastal California and as such is not always considered a sensitive natural community. However, willow scrub at Lake Merced provides high quality riparian habitat for a variety of special-status and common birds and is therefore considered sensitive by CDFW and RWQCB. In addition, the California Coastal Commission often considers willow scrub as an Environmentally Significant Habitat Area, whether or not it also has wetland status.

Lake level rise since 2002 has resulted in the conversion of a little over 1.5 acres of willow scrub to open water (see Table 15.4-4 [Lake Merced Vegetation Acreage: 2002, 2010, and 2012]) and further rise in lake levels is predicted to reduce the extent of this vegetation type. However, losses could be ameliorated somewhat through movement of willow upslope, as has also been observed since 2002 (Nomad Ecology 2011). Similarly, lake level reductions would allow willow scrub to move down slope with falling water levels.

Because habitat at Lake Merced would be considered wetlands by the USACE and/or CDFW and RWQCB (see Section 5.14-2 [Regulatory Framework]), the federal and State no-net-loss policies described in the Section 5.14-2 would reasonably be applied to the proposed Project when determining the significance of impacts on wetlands as may be caused by the Project.

Adverse Effects on Wildlife Nursery Sites

Large eucalyptus along the shores of North and South Lakes support several double crested cormorant and great blue heron rookeries, and red-shouldered and red-tailed hawks nest in large trees (eucalyptus, Monterey cypress, and pines) around all of the lakes (SFRPD 2006). Although red-shouldered and red-tailed hawks nest in parks throughout the City, heron rookeries are found only at Lake Merced and Stow Lake, with one small colony reported at the Palace of Fine Arts that may have since been extirpated (Kelly et al. 2006). In May, 2012, several rookery trees were located in the same general areas as previously mapped (SFRPD 2006) and most were approximately 1 to 5 feet above the water surface elevation, which was at or near its seasonally highest level of approximately 6.5 to 7 feet City Datum. Inundation for more than a month is expected to kill individual upland trees, which would reduce nesting substrate for herons, cormorants, and hawks. Results of the 2012 vegetation mapping update, described below, show that there are a total of 50.5 acres of non-native forest around Lake Merced, including nearly 18 acres of eucalyptus. As noted above, red-tailed and red-shouldered hawks nest in parks, open space, and some residential areas throughout the CCSF (SFFO 2003) and therefore, with relatively abundant nesting substrate available to raptors elsewhere, the loss of non-native forest at Lake Merced would not be considered significant for raptors.

Rookery trees typically die over time due to bird use and buildup of 'whitewash' on their branches. When a tree dies completely, the birds typically move their nests to an adjacent tree (USFWS 2011b) so the death of individual trees in and of itself is not considered significant. However, the distance from disturbance is typically important for nesting herons and a buffer of at least 300 feet is recommended (VFWD 2002). The rookery trees on North and South Lakes are about 80 feet and 200 feet, respectively, from busy roadways and a well-used walking trail. The third rookery, on East Lake, is more isolated and less prone to disturbance.

Since eucalyptus are an upland species, with distribution not tied to water levels, and the upper limits of most eucalyptus habitat are determined by adjacent roadways, this habitat type is not expected to move upslope with increasing water levels and would thus be permanently lost. Lake level reductions are not expected to impact rookery trees since wetlands would 'migrate' downslope along with gradually falling water levels and the trees would still be proximate to wetland and open water foraging habitat.

Predicted rises in water levels under modeled existing conditions would likely result in loss of rookery trees and other eucalyptus that provide potential alternate nesting substrate for great blue herons and cormorants below 12.4 feet City Datum. The rookery trees at South Lake would be expected to be lost with a rise in annual average water surface elevation to 7 feet City Datum but the eucalyptus stand that supports the rookery is likely large enough that the rookery could move to adjacent trees further upslope and still remain buffered from the roadway and pathways. The trees at North Lake would be inundated with a rise in annual average water surface elevation to 6.5 feet City Datum. Loss of these trees would likely require the rookery to move to a different area as there would be no buffer trees left. The rookery trees at East Lake would not be impacted as they are located at an approximate elevation of 20 feet City Datum.

Although rookeries are locally rare, there is sufficient eucalyptus forest present at Lake Merced to sustain the rookeries there should small losses of mature eucalyptus occur. In this case, there would still be sufficient trees located at sufficient distance from human disturbance to allow for the rookeries to move from one tree to another. Larger losses of eucalyptus forest could potentially result in the loss of rookery trees altogether, particularly the loss of more isolated stands, if the remaining trees were not suitable due to proximity to human disturbance. Therefore, a relatively low threshold for loss is appropriate for this CEQA analysis and a loss of 10 percent of the eucalyptus forest around Lake Merced as a result of the proposed Project would be considered significant for the purposes of this EIR.

Estimating Vegetation Response to Changes in Lake Levels

In order to determine whether Project-related impacts on biological resources could reach the thresholds defined above, vegetation responses to changes in lake levels were assessed. Building upon prior studies summarized in Section 5.14.1 (Setting), a geographic information system-based (GIS-based) vegetation map created by Nomad Ecology in 2010 was utilized as explained in the Approach to Analysis section. Using the computer program ArcGIS, ESA overlaid the 2010 vegetation data on high resolution 2010 aerial photographs and then compared the resulting imagery with existing conditions in the field. Table 5.14-4 (Lake Merced Vegetation Acreage: 2002, 2010, and 2012) presents the results of the vegetation mapping update, along with results from 2002 and 2010, for comparative purposes. See Figure 15.4-1 (Lake Merced 2012 Vegetation Types) in Section 5.14.1 (Setting) for the updated Lake Merced vegetation map.

A GIS-based analysis was then conducted to estimate vegetation response to changes in lake levels over time using the newly updated vegetation data, topography, bathymetry, slope, output from the hydrologic modeling, and 'action rules'[23] to dictate how vegetation would respond (Kennedy/Jenks 2012). For the purposes of the vegetation change analysis, the initial baseline estimates for existing vegetation acreage are those that would occur at a mean annual water surface elevation of 6 feet City Datum. This is slightly higher than the baseline 2009 water surface elevation of 5.7 feet City Datum 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 an April 2011 aerial photograph; at that time, according to historic water surface elevations data, Lake Merced water surface elevation was at about 7 feet City Datum (SFPUC 2011). The GIS-based analysis only examined vegetation at or below 13 feet City Datum, which is the existing spillway height and thus the maximum possible lake level at which vegetation changes would be expected due to changes in water level. Therefore, upland vegetation types and arroyo willow riparian scrub currently located above 13 feet City Datum, as mapped in Figure 15.14-1 (Lake Merced 2012 Vegetation Types), would remain unchanged. See Appendix J (Lake Merced Vegetation

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[23] ESA biologists developed action rules for each vegetation type to estimate how vegetation would respond to increases in water surface elevation. For example, bulrush only grows in saturated soils and cannot grow if completely submerged for extended periods of time. The action rules developed for bulrush, therefore, dictate the assumption that bulrush is removed (dies) at depths greater than five feet below the water surface elevation and would establish (grow) at and up to 5 feet below the new water surface elevation.

Change Analysis Methodology), for further details on the action rules used to analyze vegetation change in response changing water surface elevations.

TABLE 5.14-4
Lake Merced Vegetation Acreage: 2002, 2010, and 2012

Vegetation Community and Cover Type	2002 (Acres; Mean Annual Water Surface Elevation: 1 foot City Datum)	2010 (Acres; Mean Annual Water Surface Elevation: 5.9 feet City Datum)	2012[(a)] (Acres)	Acreage change 2002-2012
Annual grassland	7.11	1.24	1.26	-5.85
Perennial grassland	0.49	0.01	0.01	0.48
Non-native herbaceous	17.18	12.52	11.76	-5.42
Coastal scrub	13.48	14.82	14.78	+1.30
Dune scrub	0	3.32	3.30	+3.30
Non-native scrub	0.86	0.29	0.23	-0.63
Coast live oak woodland	0.13	0.58	0.54	+0.41
Non-native forest	63.32	50.49	50.51	-12.81
Developed	188.82	197.81	198.44	+9.62
Arroyo willow riparian scrub	28.33	26.11	26.78	-1.55
Giant vetch wetland	1.13	0.29	0.25	-0.88
Rush meadow	0.71	0.20	0.32	-0.39
Swamp knotweed wetland	6.93	8.97	6.42	-0.51
Cattail wetland	0.03	0.01	0.01	-0.02
Bulrush wetland	35.14	21.1	28.16	-6.98
Open water	244.94	269.91	264.69	+19.75

Source: Nomad Ecology 2011; ESA 2012

Note:

(a) Due to construction at the Lake Merced Pump Station, the transducer has been offline since summer 2011, and, therefore, 2012 average lake levels are not available.

Two different approaches were used to estimate changes in vegetation associated with increasing and decreasing water surface elevations under the Kennedy/Jenks hydrologic models. For impacts associated with water surface elevation increases, ESA biologists worked with the San Francisco Planning Department to develop action rules for each vegetation type dictating how vegetation would respond to increasing water surface elevation (see Appendix J [Lake Merced Vegetation Change Analysis Methodology] for further details). Under rising water level conditions, there is competition and resistance to replacement of existing vegetation types by those that dominate within the inundated or saturated zone. The action rules used by the GIS-based analysis account for this by prioritizing certain vegetation types over others based on their observed capacity to invade and replace existing vegetation as water levels rise. The resulting estimates of vegetative surface area, by type, were used to estimate impacts on vegetation types due to increases in water surface elevation.

For decreasing water levels, a statistical approach was used to estimate vegetation response because the majority of land that would become available for plants to establish as water levels decrease is currently inundated and free of vegetation (except for certain wetland species). Under receding water levels, much of the land surface that becomes available for vegetation to occupy (with the exception of existing bulrush patches) would be newly exposed, unvegetated sediments of the former lake bottom. As with rising conditions, the GIS-based analysis is best able to predict vegetation types near the waterline (i.e., bulrush, knotweed, and willow), because these vegetation types have predictable distribution patterns relative to water surface elevation, as well as timing and duration of inundation. However, this analysis also acknowledges the uncertainty in the patterns of upland vegetation establishment on newly exposed terrain. Early phases of vegetation establishment are characterized by a patchy distribution of plants that lack organization into recognizable, or easily mapped, plant communities, and may be dominated by weedy and non-native species for years before native plants and communities take hold. For this reason, the GIS-based analysis does not attempt to predict changes under receding water levels for specific upland vegetation types, but instead consolidates them into a single category. For this approach, ESA analyzed the proportions of each vegetation type at each elevation contour relative to the current water surface elevation (in 2012) and applied the estimates to lower water surface elevation. This approach keeps the vegetation distribution the same for each elevation range relative to the water surface elevation, but due to differences in area driven by lake topography, the area of each vegetation type changes at each decreasing water surface elevation. For example, if the contour range of 0 to 1 foot is currently inhabited by 60 percent bulrush wetland and 40 percent knotweed wetland, those proportions would be assigned to the -1 to 0 foot contour range when analyzing a water surface decrease of 1 foot. In other words, the decreasing water vegetation GIS-based analysis assumes that the same basic mix of species and percentages of each vegetation type that exist currently (in 2012) are maintained on the newly exposed ground as water levels recede.

For both lake level increases and declines, lake-level data provide direct insight into the likelihood of impacts on riparian communities and wetlands and are represented in the hydrology model by the following summary estimates: Project performance summary (percentage of time at a given level), and lake-level continuity (number of consecutive months at a given level) (Kennedy/Jenks 2012). In other words, an examination of the percentage of time the lake levels were modeled to be at a given elevation combined with the length of time waters were modeled to stay at that elevation provided information on whether or not there could be a substantial loss of habitat over time under each modeled hydrologic scenario.

Several assumptions were made in the vegetation change analysis:

- The water surface elevations used represent the mean annual water surface elevation. Lake Merced water levels vary seasonally due to hydrologic and climatic conditions; therefore, an annual range in water surface elevation from about 1 foot above and below the mean is assumed, based on the Kennedy/Jenks (2012) hydrologic modeling, which predicts a 1.6-foot mean annual range in lake levels over the 47-year model period for the modeled existing conditions scenario. So, for example, an elevation of 6 feet City Datum, as seen in Table 15.14-4 (Lake Merced Vegetation Acreage: 2002, 2010, and 2012) actually represents a range in water surface elevation between 5 feet and 7 feet City Datum.

- The acreages given for each vegetation type at each mean annual water surface elevation in Tables 15.4-12, 5.14-13, 5.14-14, 5.14-15, and 5.14-17 assume that the water level has been at that particular elevation for a long enough period of time for the changes predicted by the action rules, which incorporate a temporal element based on the tolerances of each general vegetation type, to have taken place. For example, the action rules dictate that upland vegetation types would die if inundated or if soils are saturated for more than 14 consecutive days and that willows would die if inundated for more than 3 consecutive months in the growing season. In addition, wetlands are predicted to establish in areas inundated for more than one month's time; however, the different wetland types are expected to become fully established over periods of time ranging from several months (herbaceous wetlands) to several years (willow riparian scrub).
- The acreages estimated by the GIS-based analysis represent the vegetation that would establish if the mean water surface elevation remained at or near the same level for durations long enough for the various wetland types to establish. The analysis is consistent with the fluctuations depicted in the Lake-level Model hydrographs in that the rate of change is generally slow and water surface elevations remain relatively consistent for relatively long periods of time (Kennedy/Jenks 2012). If annual fluctuations are greater, or the rate of change is faster, than modeled, then changes in vegetation would not necessarily follow the predictions of the vegetation analysis as vegetation would continuously be reestablishing at new water surface elevations.

The impact analysis sections that follow include the results of the GIS-based analysis of vegetation and habitat changes resulting from water level changes described above, determine the Project's biological resources impacts, and determine whether the Project-related impacts would be significant according to the thresholds described above.

Areas of No Project Impact

As explained below, the Project would not result in impacts related to four of the above-listed significance criteria. These significance criteria are not discussed further in the impact analysis for the following reasons:

Direct Impacts Due to Effects on Biological Resources within Project Facility Sites

Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special-status plant species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Based upon biological surveys conducted at the Project facility sites, no federally or State-listed or other special-status plant species are present and none are expected to occur due to the lack of suitable habitat (Ward & Associates 2012). Therefore, neither Project construction nor operation would result in impacts on special-status plant species.

Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. Operation of the Project would not result in impacts on riparian habitat or sensitive natural communities because operation of the well facilities would not result in ground-disturbing activities and very limited vehicle traffic and human presence (approximately 30 minutes per day during dry years; see Chapter 3, Project Description, Section 3.8.3 [Maintenance]). Therefore, neither riparian habitat nor other sensitive natural communities would be affected.

Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. Operation of the Project would not result in impacts to jurisdictional wetlands or waters, because operation of the well facilities would not result in ground-disturbing activities, and no fill to wetlands or waters would occur.

Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Based upon biological surveys conducted at the facility sites, no resident or migratory fish or wildlife species with established resident or migratory wildlife corridors are present at the facility sites (Ward & Associates 2012). Therefore, neither Project construction nor operation would result in impacts on the movement of native special-status wildlife species or on wildlife migration corridors. Construction impacts to wildlife nursery sites (i.e., nesting by birds and roosting by bats) are evaluated in the analysis of Impact BR-2; operational impacts to wildlife nursery sites are evaluated in the analysis of Impact BR-5.

Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan. Based on research of local, regional, and State habitat conservation plans and policies, no such plans have been adopted in the areas that would be affected by the Project. Thus, no conflict would occur between Project construction or operation and such plans.

Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. Operation of the Project would not result in removal or trimming of trees at the facility sites, so no conflict with tree preservation policies or ordinances would occur. No other local policies or ordinances protecting biological resources have been identified; therefore, Project operations would not conflict with any such policies.

Impacts Due to Potential Changes in Water Levels at Lake Merced

Because no facilities would be constructed at Lake Merced, there are no impacts associated with construction. There would be no removal of trees, or other direct effects. Potential impacts associated with changes in water levels are evaluated in the analysis of Impacts BR-6 through BR-9.

5.14.3.3 Summary of Impacts

Table 5.14-5 (Summary of Impacts – Biological Resources) and Table 5.14-6 (Summary of Impacts on Biological Resources at Lake Merced) summarize the biological resource impacts and significance determinations of the GSR Project.

TABLE 5.14-5
Summary of Impacts – Biological Resources

Sites	Construction				Operations	Cumulative
	Impact BR-1: Project construction would adversely affect candidate, sensitive, or special-status species.	Impact BR-2: Project construction could adversely affect riparian habitat or other sensitive natural communities.	Impact BR-3: The Project would impact jurisdictional wetlands or waters of the United States	Impact BR-4: Project construction would conflict with local tree preservation ordinances.	Impact BR-5: Project operations could adversely affect candidate or sensitive special-status species.	Impact C-BR-1: Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources.
Site 1	LSM	LSM	NI	NI	LSM	LSM
Site 2	LSM	NI	NI	NI	NI	LSM
Site 3	LSM	NI	NI	LSM	LS	LSM
Site 4	LSM	NI	NI	LSM	LS	LSM
Westlake Pump Station	LSM	NI	NI	NI	LSM	LSM
Site 5 (Consolidated Treatment 6 and On-site Treatment options)	LSM	NI	NI	NI	NI	LSM
Site 6 (Consolidated or On-site Treatment options)	LSM	NI	NI	NI	NI	LSM
Site 7 (Consolidated Treatment at Site 6)	LSM	NI	NI	LSM	LS	LSM
Site 7 (On-site Treatment)	LSM	NI	NI	LSM	LSM	LSM
Site 8	LSM	NI	LSM	NI	NI	LSM

TABLE 5.14-5
Summary of Impacts – Biological Resources

Sites	Construction				Operations	Cumulative
	Impact BR-1: Project construction would adversely affect candidate, sensitive, or special-status species.	Impact BR-2: Project construction could adversely affect riparian habitat or other sensitive natural communities.	Impact BR-3: The Project would impact jurisdictional wetlands or waters of the United States	Impact BR-4: Project construction would conflict with local tree preservation ordinances.	Impact BR-5: Project operations could adversely affect candidate or sensitive special-status species.	Impact C-BR-1: Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources.
Site 9	LSM	NI	LSM	LSM	NI	LSM
Site 10	LSM	NI	NI	LSM	LS	LSM
Site 11	LSM	NI	LSM	LSM	LS	LSM
Site 12	LSM	NI	NI	LSM	LSM	LSM
Site 13	LSM	NI	NI	LSM	LS	LSM
Site 14	LSM	NI	NI	LSM	NI	LSM
Site 15	LSM	NI	NI	LSM	LS	LSM
Site 16	LSM	NI	NI	NI	LS	LSM
Site 17 (Alternate)	LSM	NI	NI	LSM	LS	LSM
Site 18 (Alternate)	LSM	NI	NI	LSM	LSM	LSM
Site 19 (Alternate)	LSM	NI	NI	NI	NI	LSM

Notes:

NI = No Impact
LS = Less than Significant
LSM = Less then Significant with Mitigation

TABLE 5.14-6
Summary of Impacts on Biological Resources at Lake Merced

Impact	Operations	Cumulative
Impact BR-6: Operation of the Project would not 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	--
Impact BR-7: Operation of the Project could adversely affect sensitive habitat types associated with Lake Merced.	LSM	--
Impact BR-8: Operation of the Project could adversely affect wetland habitats and other waters of the United States associated with Lake Merced.	LSM	--
Impact BR-9: Operation of the Project could adversely affect native wildlife nursery sites associated with Lake Merced.	LSM	--
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 at Lake Merced.	--	LSM

Notes:
NI = No Impact
LS = Less than Significant
LSM = Less than Significant with Mitigation

5.14.3.4 Construction Impacts and Mitigation Measures

Impact BR-1: Project construction would adversely affect candidate, sensitive, or special-status species. (Less than Significant with Mitigation)

As discussed in the Areas of No Impact section above, no special-status plants are known to occur within the study area, as identified in Section 5.14.1.4 (Special-status Plant Species). Therefore, this impact discussion focuses on special-status animal species.

No animal species listed under FESA or CESA, or which are candidates for either list, are present at any of the well facility sites, and none are expected to occur due to a lack of suitable habitat, as identified in the Section 5.14.1.5 (Special-status Animal Species). Therefore, Project construction would not result in impacts on federally listed, State-listed, or candidate wildlife species.

Nine non-listed, special-status animal species may be present in the study area; these animals are identified by the CDFW as special animals, Species of Special Concern, or, in the case of the white-tailed kite, fully protected species. Migratory birds are also protected under the MBTA and CFGC. Although the potential for their occurrence is considered low, the presence of these special-status species could not be ruled out due to the presence of suitable habitat at or adjacent to one or more of the facility sites. The evaluation of impacts for each species or group of species is provided below. The evaluation of impacts discusses sites with no impacts first, followed with less-than-significant impacts, and sites with significant impacts.

Special-status Birds and Migratory Passerines and Raptors

<u>All Sites</u>

Construction activities could remove the nesting and foraging habitat of special-status birds and other wildlife that depend on grassland, woodland, and riparian habitat through direct removal of habitat, or could result in disruption of breeding and foraging habitat due to construction noise and activities. Project construction could result in the removal of large mature trees in developed and ruderal areas that provide important nesting habitat for nesting birds, raptors, and bats. Suitable nesting habitat for migratory birds is present within the construction areas of Sites 1, 3, 4, 7, 9, 11, 12, 13, 15, 17 (Alternate), and 19 (Alternate). Marginally suitable habitat for migratory birds is present adjacent to Sites 2, 5, 6, 8, 10, 14, 16, 18 (Alternate), and the Westlake Pump Station.

The facility sites have large trees and shrubs either within or near the construction area of the facility sites. The trees and shrubs could provide nesting habitat for special-status bird species including white-tailed kite, oak titmouse, loggerhead shrike, Allen's hummingbird, and California thrasher, as well as migratory raptors and passerine bird species. All facility sites have trees and shrubs in close proximity to the site that could be used for nesting by special-status and other migratory birds. Construction activities would result in tree removal or trimming of nearby trees at some sites which would result in impacts to special-status and migratory birds if present in the trees and shrubs. Construction activities could also disturb nesting and breeding birds in trees and shrubs near the facility sites. Potential impacts on special-status and migratory birds that could result from Project construction activities include the destruction of eggs or occupied nests, mortality of young, and the abandonment of nests with eggs or young birds prior to fledging. Such potential construction-related impacts on special-status and migratory birds would be *significant*.

However, implementation of Mitigation Measure M-BR-1a (Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors) would mitigate these potential impacts on special-status and migratory birds to *less-than-significant* levels by requiring pre-construction surveys by a qualified biologist to determine whether special-status or migratory bird nests are present at or near the well facility sites and implementing related protection measures.

> ***Mitigation Measure M-BR-1a: Protection Measures during Construction for Special-status Birds and Migratory Passerines and Raptors (All Sites)***
> The SFPUC shall conduct tree and shrub removal at the facility sites during non-breeding season (generally August 31 through February 28) for special status, migratory birds and raptors, to the extent feasible.

If construction activities must occur during the breeding season for special-status birds (March 1 to August 30), the SFPUC shall retain a qualified wildlife biologist who is experienced in identifying birds and their habitat to conduct a pre-construction survey for nesting special-status birds and migratory passerines and raptors. The preconstruction surveys must be conducted within two weeks prior to the initiation of tree removals or pruning, grading, grubbing, structure demolition, or other construction activities scheduled during the breeding season (March 1 to August 30). If the biologist detects no active nesting or breeding activity by special-status or migratory birds or raptors, then work may proceed without restrictions. To the extent allowed by access, all active passerine nests identified within 100 feet and all active raptor nests identified within 250 feet of the limits of work shall be mapped.

If migratory bird and/or active raptor nests are identified within 250 feet of a facility site or if an active passerine nest is identified within 100 feet of a facility site, a qualified biologist shall determine whether or not construction activities might impact the active nest or disrupt reproductive behavior. If it is determined that construction would not affect an active nest or disrupt breeding behavior, construction may proceed without any restriction.

If the qualified biologist determines that construction activities would likely disrupt raptor breeding or passerine nesting activities, then the SFPUC shall establish a no-disturbance buffer around the nesting location to avoid disturbance or destruction of the nest site until after the breeding season or after a wildlife biologist determines that the young have fledged (usually late June through mid-July). The extent of these buffers would be determined by a wildlife biologist in consultation with CDFW and would depend on the species' sensitivity to disturbance (which can vary among species); the level of noise or construction disturbance; line of sight between the nest and the disturbance; ambient levels of noise and other disturbances; and consideration of other topographical or artificial barriers. The wildlife biologist shall analyze and use these factors to assist the CDFW in making an appropriate decision on buffer distances.

Impact Conclusion: Less than Significant with Mitigation

Special-status Bats

The evaluation of impacts that follows discusses sites with no impacts first, followed by those with significant impacts.

<u>Sites 2, 5, 6, 8, 9, 13, 14, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

No trees suitable for bat roosting occur on or adjacent to these sites. Although the proposed Project could include demolition of an existing well and above-ground tank at Site 14, the features do not provide potential habitat for special-status bats. These sites do not support the habitat characteristics necessary for roosting; therefore, no construction-related impacts on special-status bats would occur at these sites.

Impact Conclusion: No Impact

Sites 1, 3, 4, 7, 10, 11, 12, 15, and 16

Significant impacts on special-status bat species could result from well facility construction activities that require tree removals or trimming of trees that provide suitable roosting habitat for special-status bat species or that are occupied by roosting bats. The demolition of the restroom facility (in addition to tree removal) at Site 1, where bats may roost, could also result in significant impacts on special-status bat species. The pallid bat, western red bat, and hoary bat could roost in trees on or near these sites. Disturbance during the maternity roosting season could potentially result in roost abandonment and mortality of young. For instance, bats could abandon their young if impacts were to occur during seasonal periods of breeding activity (about February 15 through April 15 and August 15 through October 30). Therefore, Project construction could result in both permanent and temporary loss of suitable or occupied habitat for, as well as mortality of, special-status bat species, which would be a *significant* impact.

However, implementation of Mitigation Measure M-BR-1b (Protection Measures for Special-status Bats during Tree Removal or Trimming) and Mitigation Measure M-BR-1c (Protection Measures during Structure Demolition for Special-status Bats) would reduce impacts on special-status bat species to *less-than-significant* levels by requiring pre-construction surveys and the avoidance of disturbance to roosting bats.

Mitigation Measure 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)

The SFPUC will ensure that, prior to the removal of large trees scheduled during seasonal periods of bat activity (February 15 through April 15 and August 15 through October 30), a qualified bat biologist conducts a bat habitat assessment to determine the presence of suitable bat roosting habitat. No more than 30 days before removal of any large tree or snag, a biologist familiar with identification of bats and signs of bats will conduct a pre-construction survey for signs of bat activity. If tree removal or trimming is postponed or interrupted for more than 30 days from the date of the initial bat survey, the biologist will repeat the pre-construction survey.

If a tree provides potentially suitable roosting habitat, but bats are not present, the SFPUC shall exclude bats by temporarily sealing cavities, pruning limbs, or removing the entire tree, in consultation with the qualified bat biologist. Trees and snags with cavities or loose bark that exhibit evidence of use by bats shall be scheduled for bat exclusion and/or eviction, conducted during appropriate seasons (i.e., February 15 through April 15 and August 15 through October 30) and supervised by the biologist.

If the biologist determines or presumes bats are present, the biologist shall exclude the bats from suitable tree cavities by installing one-way exclusion devices. After the bats vacate the cavities, the biologist shall plug the cavities or remove the limbs. The construction contractor shall only remove trees after the biologist verifies that the exclusion methods have successfully prevented bats from returning, usually in seven to 10 days. To avoid impacts on non-volant (i.e., non-flying) bats, the biologist shall only conduct bat exclusion and eviction from February 15 through April 15 and from August 15 through October 30. After construction activities are complete, the biologist will remove the exclusion devices.

Mitigation Measure M-BR-1c: Protection Measures during Structure Demolition for Special-status Bats (Site 1)

Not more than two weeks prior to building demolition at Site 1, a qualified biologist (i.e., one familiar with the identification of bats and signs of bats) shall survey the building for the presence of roosting bats or evidence of bats. If no roosting bats or evidence of bats are found in the structure, demolition may proceed. If the biologist determines or presumes bats are present, the biologist shall exclude the bats from suitable spaces by installing one-way exclusion devices. After the bats vacate the space, the biologist shall close off the space to prevent recolonization. The construction contractor shall only demolish the building after the biologist verifies that the exclusion methods have successfully prevented bats from returning, usually in seven to 10 days. To avoid impacts on non-volant (i.e., non-flying) bats, the biologist shall only conduct bat exclusion and eviction from February 15 through April 15 and from August 15 through October 30.

Impact Conclusion: Less than Significant with Mitigation

Overwintering Monarch Butterfly Habitat

The evaluation of impacts that follows discusses sites with no impacts first, followed by those with significant impacts.

<u>Sites 2, 4, 5, 6, 8, 9, 11, 13, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

No dense stands of eucalyptus, Monterey pine, or Monterey cypress trees occur at or adjacent to these sites. Therefore, these sites do not support the habitat suitable for overwintering by monarch butterflies. As a result, no construction-related impacts on roosting monarch butterflies would occur at these sites.

Impact Conclusion: No Impact

<u>Sites 1, 3, 7, 10, and 12</u>

Although unlikely, given that overwintering of monarch butterflies at these locations has not been reported (CDFG 2011f), the dense stands of large eucalyptus, Monterey pine, and Monterey cypress trees at these sites could nevertheless support overwintering monarch butterflies. This species' overwintering sites are considered to have special-status by the CDFG (CDFG 2011c). The removal or pruning of trees actively used by overwintering monarch butterflies during the winter roosting period would therefore constitute a *significant* impact on a special-status species.

However, implementation of Mitigation Measure M-BR-1d (Monarch Butterfly Protection Measures) would reduce this potential impact to *less-than-significant* levels by requiring an inspection by a qualified biologist prior to the limbing or felling of trees or the initiation of construction activities on these sites, whichever comes first; and by delaying construction at a particular site if overwintering congregations of monarch butterflies are identified on site or nearby.

Mitigation Measure M-BR-1d: Monarch Butterfly Protection Measures (Sites 1, 3, 7, 10, and 12)

The SFPUC will ensure that, two weeks prior to removing or pruning large eucalyptus, Monterey pine or Monterey cypress trees that occur in a dense stand, a qualified biologist conduct surveys for monarch butterflies if the trees are to be removed or limbed between October 15 and March 1. If no congregations of monarch butterflies are present within the contiguous stand of dense trees, work may proceed without restriction.

A pre-construction inspection is not needed for construction activities occurring between March 2 and October 14.

If overwintering congregations of monarch butterflies are identified within the tree stand, work may not proceed until the butterflies have left the roosting site. No limbing or tree cutting shall occur in a contiguous stand of trees occupied by monarch butterflies. A qualified biologist shall determine when the butterflies have left and when work in the area may proceed.

Impact Conclusion: Less than Significant with Mitigation

Impact BR-2: Project construction could adversely affect riparian habitat or other sensitive natural communities. (Less than Significant with Mitigation)

The evaluation of impacts that follows discusses sites with no impacts first, followed by those with significant impacts.

<u>Sites 2 through 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

No riparian habitat or other sensitive natural communities are present within the construction area boundaries or in areas adjacent to any of these facility sites. Project construction at these locations therefore would not result in impacts on riparian habitat or other sensitive natural communities; *no impact* would occur.

An isolated patch of willows, classified as ruderal (weedy or disturbed) habitat, is present inside the construction area boundary of Site 18 (Alternate). Ruderal habitat is not considered a sensitive natural community.

Isolated patches of Central Coast riparian scrub habitat not associated with a surface tributary are present near the construction areas for Sites 6 and 17 (Alternate); the habitat in these areas is assumed to be supported by groundwater. Also, an unnamed drainage channel supports a stand of Central Coast riparian scrub near Site 11. The location of the Central Coast riparian scrub near Sites 6, 11, and 17 (Alternate) is shown on Figures 5.14-3 through 5.14-6. Riparian habitat at Site 6 is located approximately 50 feet southwest of the construction area. Riparian habitat at Site 11 is located approximately 15 feet from the northwest corner of the construction area. The willow stand in this area is approximately 5,060 square feet. The habitat near Site 17 (Alternate) is located adjacent to the western edge of the construction area boundary on the north side of Collins Avenue. No Central Coast riparian scrub habitat would be directly impacted at Sites 6, 11, or 17 (Alternate) as the habitat is located outside of the construction area. In addition, the riparian habitat is located at a higher elevation than the construction areas at Sites 6, 11, and 17 (Alternate), so stormwater runoff from the construction site would not affect the habitat. As a result, *no impact* on riparian habitat or other sensitive natural habitat would occur at these facility sites.

Impact Conclusion: No Impact

<u>Site 1</u>

An isolated patch of Central Coast riparian scrub habitat not associated with a surface tributary is present adjacent to the construction area at Site 1. The habitat in this area is assumed to be supported by groundwater. No Central Coast riparian scrub habitat would be directly impacted at Site 1, as the habitat is located out of the construction area boundary. The 305 square feet of riparian habitat adjacent to Site 1 is located immediately adjacent to the northwest edge of the construction area boundary. Although construction at this site would not result in the loss of Central Coast riparian scrub habitat, construction near the habitat could result in stormwater runoff which could carry sediment into the area and adversely impact the habitat. If so, such impacts on Central Coast riparian scrub habitat from excessive sedimentation would be *significant*.

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) and M-BR-2 (Avoid Disturbance to Riparian Habitat) would reduce the potential impacts on riparian habitat at Site 1 to *less-than-significant* levels by requiring the installation of temporary fencing to demarcate the boundary for construction activities at this site and by protecting the area from construction-related runoff and sedimentation.

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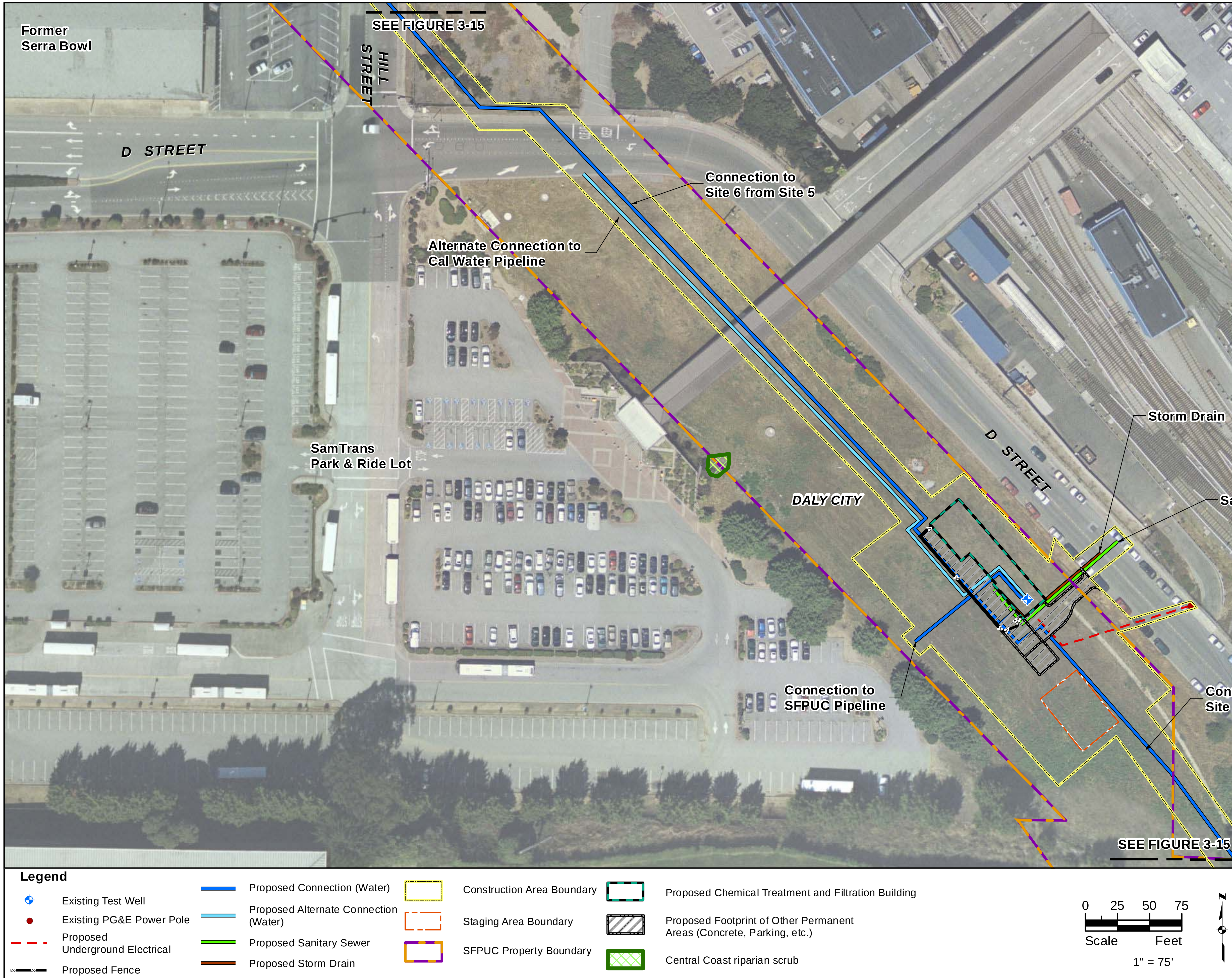

Site 6
Right-of-Way at Colma BART
Central Coast Riparian Scrub

Regional Groundwater Storage
and Recovery Project

Figure 5.14-3

Source: SFPUC and Kennedy/Jenks

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Site 11 Pipeline and Access Road
South San Francisco Main Area
Central Coast Riparian Scrub
and Jurisdictional Waters

Regional Groundwater Storage and Recovery Project

Figure 5.14-4

Source: SFPUC and Kennedy/Jenks

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Site 17 (Alternate)
Standard Plumbing Supply
Central Coast Riparian Scrub

Legend

- Proposed Well
- Proposed Underground Electrical
- Proposed Connection (Water)
- Proposed Alternate Connection (Water)
- Proposed Sanitary Sewer
- Proposed Storm Drain
- Construction Area Boundary
- Staging Area Boundary
- SFPUC Property Boundary
- Proposed Chemical Treatment Building
- Proposed Footprint of Other Permanent Areas (Concrete, Parking, etc.)
- Proposed Temporary Access Driveway
- Central Coast riparian scrub

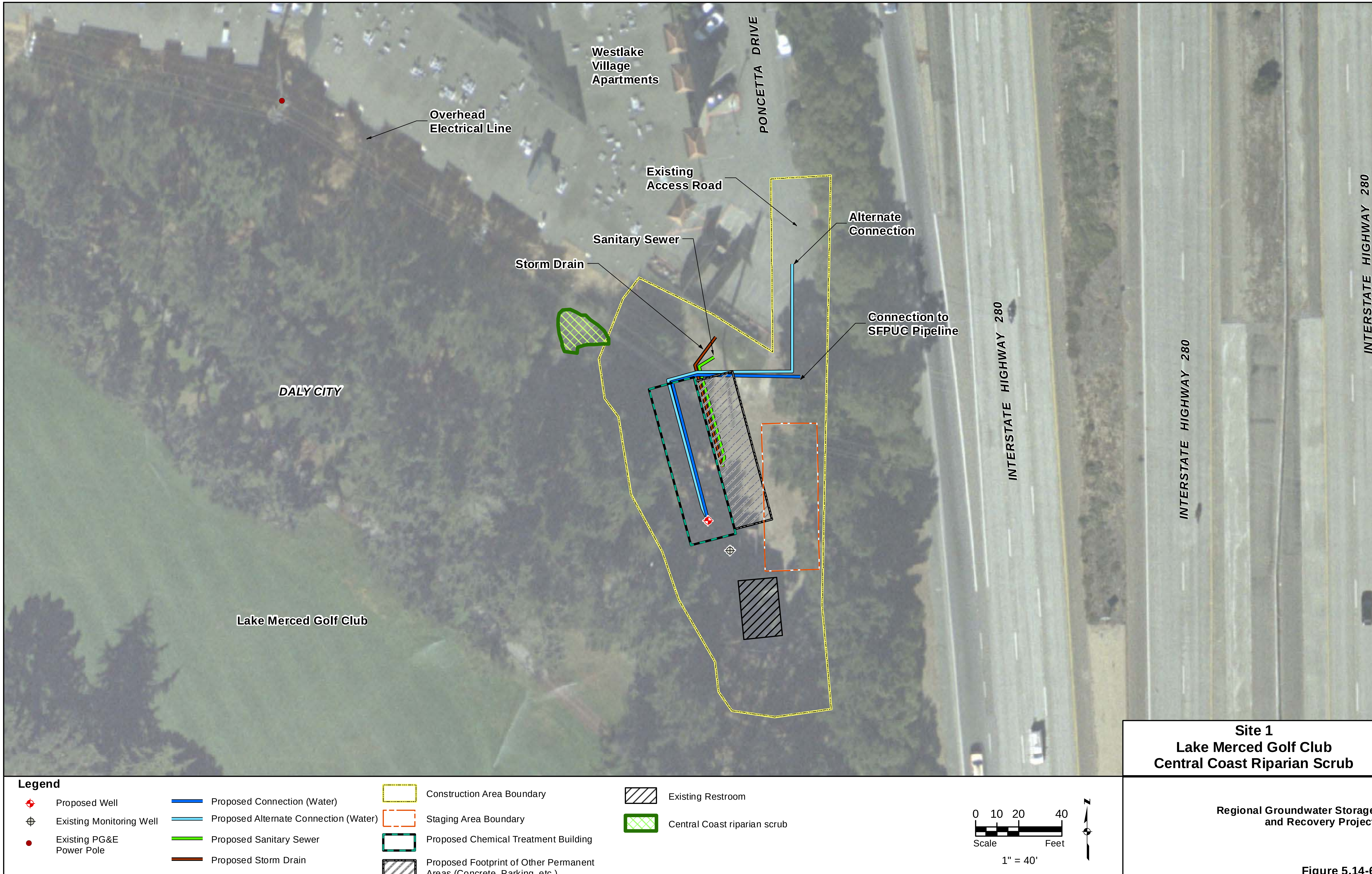
0 10 20 40
Scale Feet
1" = 40'

N

Regional Groundwater Storage and Recovery Project

Figure 5.14-5

Source: SFPUC and Kennedy/Jenks



Site 1
Lake Merced Golf Club
Central Coast Riparian Scrub

Regional Groundwater Storage and Recovery Project

Figure 5.14-6

Source: SFPUC and Kennedy/Jenks

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Mitigation Measure M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
(See Impact HY-1 in Section 5.16, Hydrology and Water Quality for a description)

Mitigation Measure M-BR-2: Avoid Disturbance to Riparian Habitat (Site 1)
The SFPUC shall require its construction contractor to avoid the riparian habitat at Site 1. Prior to any ground disturbing activity, a qualified biologist shall map the location of the Central Coast riparian scrub habitat, and the construction contractor shall install temporary fencing to protect the habitat for the duration of construction.

Impact Conclusion: Less than Significant with Mitigation

Impact BR-3: The Project would impact jurisdictional wetlands or waters of the United States (Less than Significant with Mitigation).

The evaluation of impacts that follows discusses sites with no impacts first, followed by those with significant impacts.

<u>Sites 1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

No federally regulated wetlands or surface waters of the United States/waters of the State are present within the construction area boundaries of these facility sites. Project construction at these locations would therefore result in *no impact* on wetlands or waters of the United States/waters of the State.

Impact Conclusion: No Impact

<u>Sites 8, 9, and 11</u>

An underground culvert crosses beneath a portion of the Site 8 construction area. Water in the culvert is a tributary to Colma Creek, and therefore would qualify as a jurisdictional water of the United States and the State. However, no direct impacts to the culvert or the tributary would occur as a result of Project construction.

Site 9 would be located approximately 25 feet from channelized sections of the Colma Creek Diversion Channel and the San Mateo County Flood Control Channel as illustrated on Figure 5.14-7 (Site 9, Treasure Island Trailer Court, Jurisdictional Waters). Stormwater runoff from this site could drain to either channel. Site 11 would be located approximately 200 feet from the Colma Creek Diversion Channel, and the construction area at the northwest edge of the site

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Site 9
Treasure Island Trailer Court
Jurisdictional Waters

Regional Groundwater Storage and Recovery Project

Figure 5.14-7

Source: SFPUC and Kennedy/Jenks

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would be within approximately 15 feet of an unnamed drainage channel that supports a stand of Central Coast riparian scrub. The Central Coast riparian scrub and jurisdictional waters at Site 11 are shown on Figure 5.14-4 (Site 11 Pipeline and Access Road, South San Francisco Main Area, Central Coast Riparian Scrub and Jurisdictional Waters). No direct impacts on the Colma Creek Diversion Channel, the San Mateo County Flood Control Channel, or the unnamed channel northwest of Site 11 would occur during construction, because these jurisdictional waters are not located within the construction area at Site 9 or Site 11.

Stormwater leaving the Site 11 construction area would not affect the unnamed drainage channel northwest of the site, because the facility is at a lower elevation than the channel. However, stormwater runoff leaving the construction area at Sites 8 and 9 could carry sediment or other contaminants into the on-site culvert at Site 8 or the Colma Creek Diversion Channel or the San Mateo County Flood Control Channel at Sites 9 and 11. Uncontrolled stormwater runoff could result in discharge and sedimentation to jurisdictional waters, which would be a *significant impact.* 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 impacts to *less-than-significant* levels by protecting the area from construction-related runoff and sedimentation.

Mitigation Measure M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)
(See Impact HY-1 in Section 5.16, Hydrology and Water Quality for a description)

Impact Conclusion: Less than Significant with Mitigation

Impact BR-4: Project construction would conflict with local tree preservation ordinances. (Less than Significant with Mitigation)

As identified in the regulatory framework discussion in Section 5.14.2.3 (Local), the relevant policies and ordinances protecting trees in the study area are the San Mateo County Significant and Heritage Tree Ordinances (San Mateo County Ordinance Code: Part III, Division VIII. (The Significant Tree Ordinance of San Mateo County) and Ordinance Number 2427 (Regulation of the Removal and Trimming of Heritage Trees on Public and Private Property), the City of Daly City Municipal Code (Daly City Municipal Code, Title 12: Chapter 12.40. Chapter 12.40, Urban Forestry), the Town of Colma Municipal Code (Town of Colma Municipal Code: Subchapter Six. Subchapter Six, Tree Cutting and Removal), the City of South San Francisco Municipal Code (City of South San Francisco Municipal Code: Chapter 13.30. Chapter 13.30, Tree Preservation), and City of San Bruno Municipal Code (City of San Bruno Municipal Code: Chapters 8.24 and 8.25. Chapter 8.25, Heritage Tree Ordinance). The criteria for tree protection in each of the local tree preservation ordinances were used to identify protected trees in the study area, assess the impact of the proposed Project on the trees at each facility site, and develop mitigations to address impacts.

The evaluation of impacts that follows discusses sites with no impacts first, followed by those with significant impacts.

Sites 1, 2, 5, 6, 8, 16, 19 (Alternate), and the Westlake Pump Station

Project implementation at the above-listed sites would not result in impacts on trees regulated under local ordinances because either no such trees are present on these sites or, at the Westlake Pump Station, they would be avoided during construction activities. The applicable local jurisdiction for each of these sites is as follows: Sites 1, 5, and 6 would be located in Daly City; Site 2 would be located in unincorporated San Mateo County (Broadmoor); Site 8 would be located in Colma; Site 16 would be located in Millbrae; and Site 19 (Alternate) in South San Francisco. As a result, development of these sites would not conflict with local ordinances aimed at protecting trees. Therefore, *no impact* would occur at these sites relative to this criterion.

Impact Conclusion: No Impact

Sites 3, 4, 7, 9, 10, 11, 12, 13, 14, 15, 17 (Alternate), and 18 (Alternate)

A total of 59 trees within the proposed construction areas that would qualify for protection under local tree protection ordinances could be removed, as shown in Tables 5.14-7 through 5.14-10, if all these sites were developed. An additional 53 protected trees located in the study area surrounding these sites (i.e., those that would be adjacent to the construction areas or along pipeline routes) could be trimmed to accommodate construction.

Sites 3 and 4 would be located in the Broadmoor community of unincorporated San Mateo County. No significant or heritage trees are present within the proposed construction area at Site 3; however, two protected Monterey pines, were identified adjacent to the construction boundary. These trees may be trimmed during construction, and tree trimming of protected trees is regulated in the local preservation ordinances. Three protected Monterey cypress trees are located within the construction area for Site 4 and would be removed during construction. In addition, two protected Monterey cypress trees would be trimmed during construction at this site. Protected trees to be removed or trimmed are identified in Table 5.14-7 (San Mateo County Protected Trees).

TABLE 5.14-7
San Mateo County Protected Trees

Site	Protected Trees *in* the Construction Area Boundary	Tree Species	Protected Trees *Adjacent to* the Construction Boundary	Tree Species
Site 3	0	N/A	2[(a)]	Monterey pine
Site 4	3	Monterey cypress	2[(a)]	Monterey cypress

Note:

(a) Trees do not meet the County's definition of a Heritage Tree (San Mateo County 1977)

Site 7, located in the Town of Colma, has 25 protected trees in the proposed construction area boundary and an additional 13 protected trees adjacent to the boundary and subject to trimming or pruning to accommodate construction activities in the area. Trees within the construction area boundary would be removed during construction. Protected trees to be removed or trimmed are identified in Table 5.14-8 (Town of Colma Protected Trees).

TABLE 5.14-8
Town of Colma Protected Trees

Site	Protected Trees *in* the Construction Area Boundary	Tree Species	Protected Trees *Adjacent to* the Construction Boundary	Tree Species
Site 7	1	Monterey pine	13	Tasmanian blue gum
	19	Tasmanian blue gum		
	1	Scarlet flowing gum		
	1	Horsetail casuarina		
	1	Peruvian pepper		
	1	Myoporum		
	1	Spruce		
Site 17 (Alternate)	0	NA	2	Monterey cypress

In South San Francisco, at Site 9, one large Monterey pine that would be removed during construction qualifies as a locally protected tree. No protected trees are present in the construction area for Sites 10, 11, or 13. However, several protected trees are located adjacent to the boundaries of Sites 10, 11, and 13 which may require trimming or pruning to accommodate construction activities in the area, as shown below. The South San Francisco Tree Preservation Ordinance regulates pruning or altering protected trees in any way. At Site 12, 28 protected trees may be removed and four protected trees trimmed. At Site 18 (Alternate), one protected tree may need to be removed. Protected trees to be removed or trimmed are identified in Table 5.14-9 (South San Francisco Protected Trees).

TABLE 5.14-9
South San Francisco Protected Trees

Site	Protected Trees *in* the Construction Area Boundary	Tree Species	Protected Trees *Adjacent to* the Construction Boundary	Tree Species
Site 9	1	Monterey pine	0	NA
Site 10[(a)]	0	NA	1	Monterey pine
			2	Monterey cypress
Site 11	0	NA	1	Lombardy poplar
			3	Torrey pine
			2	Tasmanian blue gum
Site 12	5	Monterey cypress	4	Monterey cypress
	10	Monterey pine		
	9	Dwarf blue gum		
	3	Tasmanian blue gum		
	1	Aleppo pine		
Site 13[(b)]	0	NA	5	Gum tree
			6	Italian stone pine
			1	Tasmanian blue gum
Site 18 (Alternate)	1	Ornamental plum	0	NA

Notes:

(a) Trees adjacent the Site 10 construction area boundary would not require trimming, but are listed in the table as trees adjacent to the construction area.

(b) Trees adjacent to Site 13 would not require trimming, but are listed in the table as trees adjacent to the construction area boundary. The trees are street trees along Huntington Avenue.

Site 15 would be located at the Golden Gate National Cemetery in San Bruno. The City's municipal code restricts removal or alteration of any tree without a permit. No protected tree would need to be removed at Site 14 (also at the Golden Gate National Cemetery in San Bruno). Site 15 has one elm tree in the construction area boundary that meets the definition of a protected tree and that would need to be removed. In addition, the pipelines for Sites 14 and 15 and removal of existing well building may require trimming of 22 protected trees along Sneath Lane and two trees within the cemetery during construction. Although the pipelines for both sites would be installed along Sneath Lane, for purposes of this analysis, these tree impacts are attributed to Site 15 only. Protected trees to be removed or trimmed are identified in Table 5.14-10 (San Bruno Protected Trees).

TABLE 5.14-10
San Bruno Protected Trees

Site	Protected Trees *in* the Construction Area Boundary	Tree Species	Protected Trees *Adjacent to* the Construction Boundary	Tree Species
Site 14	0	n/a	1	Olive
			1	Myoporum
Site 15	1	Elm	4	Monterey pine
			3	myoporum
			2	Spanish bayonette
			3	Tasmanian blue gum
			2	Elm
			3	Aleppo pine
			5	Canary Island pine

Tree removal or tree pruning that is inconsistent with the San Mateo County tree preservation ordinances, the City of Daly City Municipal Code, the Town of Colma Municipal Code, the City of South San Francisco Municipal Code, or the City of San Bruno Municipal Code would be a *significant* impact on a locally protected biological resource. However, these impacts would be reduced to *less-than-significant* levels by implementation of Mitigation Measure M-BR-4a (Minimize Impacts on Protected Trees to Avoid Tree Loss) and Mitigation and Measure M-BR-4b (Protected Tree Replacement), which would fulfill the intent of the local tree preservation ordinances and codes by minimizing impacts on protected trees and by requiring replacement trees for any protected trees that are removed, in substantial accordance with local jurisdiction requirements. These measures would therefore resolve the conflict with the local tree protection ordinances.

Mitigation Measure M-BR-4a: Identify Protected Trees (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate])

The SFPUC shall identify trees to be protected during construction activities. These trees shall be marked on construction plans and protected during construction activities according to requirements presented in Mitigation Measure M-AE-1b (see Section 5.3, Aesthetics for a description of the tree protection measures). For each protected tree that is removed as part of construction activities, replacement trees shall be planted according to local requirements, as stated in Mitigation Measure M-BR-4b (Protected Tree Replacement).

M-AE-1b: Tree Protection Measures (Sites 3, 4, 7, 10, 11, 12, 13, 14, 15, and 17 [Alternate])
(See Section 5.3, Aesthetics for a description)

Mitigation Measure M-BR-4b: Protected Tree Replacement (Sites 4, 7, 9, 12, 15, and 18 [Alternate])
The SFPUC shall replace protected trees in accordance with the requirements specified in this mitigation measure and at the ratios specified in this measure for the jurisdiction where the trees to be removed are located. Protected non-native trees removed shall be replaced with native tree species determined suitable for the site by a qualified arborist, horticulturist, landscape architect, or biologist.

Tree Replacement Requirements Common to All Jurisdictions

- Trees shall be replaced within the first year after completion of construction, or as soon as possible in areas where construction has been completed, during a favorable time period for replanting, as determined by a qualified arborist, horticulturist, or landscape architect.
- Selection of replacement sites and installation of replacement plantings shall be supervised by a qualified arborist, horticulturist, landscape architect, or landscape contractor. Irrigation of trees during the initial establishment period (generally for two to four growing seasons) shall be provided as deemed necessary by a qualified arborist, horticulturist, landscape architect, or landscape contractor.
- Trees shall be planted at or in close proximity to removal sites, in locations suitable for the replacement species. The specialist shall work with the SFPUC to determine appropriate nearby off-site locations that are within the same jurisdiction from which the trees are removed if replanting within the well facility sites is precluded.
- A qualified arborist, horticulturist, landscape architect, or landscape contractor shall monitor newly planted trees at least twice a year for five years. Each year, any trees that do not survive shall be replaced and monitored at least twice a year for five years thereafter.

San Mateo County Tree Ordinance Replacement Requirements

- For each significant/heritage tree removed during construction or lost due to construction-related impacts, a replacement tree shall be planted. Native trees shall be replaced with the same species, and nonnative trees shall be replaced with a native tree species determined suitable for the site by a qualified arborist, horticulturalist, or landscape architect.

- Each protected tree removed shall be replaced at a 1:1 ratio of a native variety that has the potential to reach a size similar to that of the removed trees.

Town of Colma Tree Replacement Requirements

- Each protected tree removed shall be replaced at a 1:1 ratio. Native trees shall be replaced with the same species, and nonnative trees shall be replaced with a native tree species determined suitable for the site by a qualified arborist, horticulturalist, or landscape architect.

City of South San Francisco Tree Replacement Requirements

- Each protected tree removed shall be replaced with three 24-inch-box sized or two 36-inch-box sized landscape trees.

City of San Bruno Tree Replacement Requirements

- Tree replacement shall be a minimum of either two 24-inch box size trees, or one 36-inch box size tree, for each heritage tree removed.

Impact Conclusion: Less than Significant with Mitigation

5.14.3.5 Operational Impacts and Mitigation Measures

Impact BR-5: Project operations could adversely affect candidate or sensitive special-status species. (Less than Significant with Mitigation)

The evaluation of impacts that follows discusses sites with no impacts first, followed by less-than-significant impacts, and significant impacts.

Special-Status Birds and Migratory Passerines and Raptors

Sites 2, 3, 4, 5, 6, 7 (Consolidated Treatment at Site 6), 8, 9, 10, 14, and 19 (Alternate)

Operation and maintenance activities would not result in a loss of habitat for special-status or other migratory birds and would not result in additional loss of suitable nesting trees. Well facilities at some sites (2, 3, 4, Site 7 [Consolidated Treatment at Site 6], Site 14, and Site 19 [Alternate]) would have a submersible pump. Submersible pumps would be installed underground and would, therefore, not result in measurable noise above ground (see Chapter 5.7, Noise and Vibration, Impact NO-5). Maintenance would include well exercising that would occur either weekly or monthly for one hour per week or for a single, four-hour period monthly. (see Chapter 5.7 Noise and Vibration, Impact NO-5, and Chapter 3, Project Description, Section 3.8.3 [Maintenance]). Other operational noise would be limited to supply trucks for operational and maintenance purposes which would slightly increase noise from local vehicle trips, and therefore there would be *no impacts* on sensitive biological resources relative to noise at the submersible pump sites. Sites 5, 6, 8, 9, and 10 would not be located at or near areas that support habitat for special-status birds or migratory passerines or raptors, and therefore these sites would have *no impacts* on such biological resources relative to operational noise.

Impact Conclusion: No Impact

Sites 11, 13, 15, 16, and 17 (Alternate)

Operation and maintenance activities would not result in a loss of habitat for special-status or other migratory birds and would not result in additional loss of suitable nesting trees. Operational noise from the well facilities would result primarily from running the well pump. Supply trucks for operation and maintenance purposes would also slightly increase the vehicle trips and noise generation at these sites (see Section 5.7, Noise and Vibration). Maintenance includes well exercising that would occur either weekly or monthly for one hour per week or for a single, four-hour period monthly (see Chapter 5.7, Noise and Vibration, Impact NO-5 and Chapter 3, Project Description, Section 3.8.3 [Maintenance]).

The proposed operational noise levels at these sites would be within the range of the existing ambient noise levels at the well facility sites or below 50 dBA (see Section 5.7, Noise and Vibration, Impact NO-5). Because of this, and also the limited amount of vehicle trips, operation and maintenance of the well facilities would not result in new or increased impacts on nesting special-status or other, migratory birds. Noise associated with operation and maintenance would not likely prevent any birds from nesting in the trees near these sites, given that this potential change in ambient conditions would not be substantial, as compared to existing conditions. Potential operational impacts on special-status and migratory bird species would therefore be *less than significant*.

Impact Conclusion: Less than Significant

Sites 1, 7 (On-site Treatment), 12, 18 (Alternate), and the Westlake Pump Station

As identified Section 5.7, Noise and Vibration, noise levels during well operation at Sites 1, 7 (On-Site Treatment), 12, 18 (Alternate), and the Westlake Pump Station would exceed the ambient noise or exceed 50 dBA. These sites would also be located near habitat for special-status birds that could be impacted by the operational noise expected at these sites, given that this noise could interfere with nesting. Therefore, this potential impact on sensitive biological resources would be *significant*.

However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would also have the effect of reducing this potential impact on sensitive biological resources to *less–than-significant* levels by requiring that the final design of pump stations incorporate features to reduce noise levels below (by at least 1 dBA) the most restrictive threshold (the local noise standard or the sleep interference threshold). The most restrictive threshold used by the noise analysis in Section 5.7, Noise and Vibration, is the sleep interference threshold, which is 50 dBA, as measured at the exterior of the building of the closest noise-sensitive receptor. Reducing operational noise below 50 dBA to address identified operational noise impacts would also have the effect of reducing this potential impact on special-status species utilizing the habitat adjacent to these well facility sites.

Upgrades to the Westlake Pump Station would be necessary to serve the well facilities at Sites 2, 3, and 4. The size and exact location of proposed new equipment at the Westlake Pump Station is not known at this time. Therefore, this analysis conservatively assumes that the impact of operational noise from the Westlake Pump Station on the special-status species habitat adjacent to the pump station would be potentially *significant*. However, implementation of Mitigation Measure M-NO-5 (Operational Noise Control Measures) would also have the effect of reducing this potential impact on sensitive biological resources to *less-than-significant* levels by requiring noise reduction measures at the site.

> ***Measure 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)***
> (See Impact NO-5 in Chapter 5.7, Noise and Vibration for a description)

Impact Conclusion: Less than Significant with Mitigation

Special-Status Bats or Bats of Special Concern

<u>Sites 2, 5, 6, 8, 9, 13, 14, 17 (Alternate), 18 (Alternate), and 19 (Alternate)</u>

No trees suitable for bat roosting occur on or near these sites. As a result, these sites do not support the habitat characteristics necessary for bat roosting. Therefore, no operation-related impacts on special-status bats would occur.

Impact Conclusion: No Impact

<u>Sites 1, 3, 4, 7, 10, 11, 12, 15, 16, and the Westlake Pump Station</u>

Operation and maintenance activities at these sites would not result in a loss of roosting habitat for special-status bats, as such activities would not result in an additional loss of trees suitable for roosting. Maintenance includes well exercising that would occur either weekly or monthly for one hour per week or for a single, four-hour period monthly. Operators may fine-tune the exercise schedule according to the characteristics of individual wells (see Chapter 3, Project Description, Section 3.8.3 [Maintenance]). Maintenance site visits, supply trucks for operation and maintenance purposes, and operation of the well pumps would slightly increase the vehicle trips and noise generation at each site. However, this would not likely result in a substantial increase in ambient noise levels that could affect special-status bats given that operational noise levels at these sites would be within the range of the existing ambient noise levels (see Section 5.7, Noise and Vibration, Impact NO-5). Therefore, operational noise levels would not prevent bats from utilizing habitat near these sites. As a result, potential impacts on special-status bats at these sites would be *less than significant*.

Impact Conclusion: Less than Significant

Overwintering Monarch Butterfly Habitat

Sites 2, 4, 5, 6, 8, 9, 11, 13, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station

Project operations would not impact monarch butterfly, because no dense stands of eucalyptus, Monterey pine or Monterey cypress trees occur at or adjacent to these sites, and potential winter roosting habitat would therefore not be affected during operations and maintenance activities.

Impact Conclusion: No Impact

Sites 1, 3, 7, 10, and 12

Although unlikely, given that overwintering of monarch butterflies at these locations has not been reported (CDFG 2011f), the dense stands of large eucalyptus, Monterey pine, and Monterey cypress trees at these sites could nevertheless support overwintering monarch butterflies. Project operations would have *less-than-significant* impacts on monarch butterflies because no additional trees would be removed during Project operations and potential winter roosting habitat would therefore not be affected during operations and maintenance activities. Maintenance includes well exercising that would occur either weekly or monthly for one hour per week or for a single, four-hour period monthly. Operators may fine-tune the exercise schedule according to the characteristics of individual wells (see Chapter 3, Project Description, Section 3.8.3 [Maintenance]). Maintenance site visits, supply trucks for operation and maintenance purposes, and operation of the well pump would slightly increase the vehicle trips and noise generation at each site, but would not likely result in a substantial increase in ambient noise levels (see Section 5.7, Noise and Vibration, Impact NO-5) or other disturbances likely to affect overwintering monarch butterflies, given that such activities would not occur in the midst of currently utilized winter roosts.

Impact Conclusion: Less than Significant

5.14.3.6 Impacts of Lake Level Changes on Biological Resources at Lake Merced and Mitigation Measures

The following description of modeled existing conditions and predicted impacts of the proposed Project present the data used for the subsequent impact analyses in Impacts BR-6 through BR-9, which address the potential that the project could change water levels at Lake Merced, with resulting effects on biological resources at the lake.

Modeled Existing Conditions

The modeled existing conditions represent a simulated estimation of hydrologic conditions that are expected to occur over the 47-year modeling period without construction and operation of the GSR Project, based upon historic hydrologic conditions. Under the modeled existing conditions, simulated water levels clearly respond to modeled climatic variations, including wet, normal, and dry precipitation years and the same hydrologic sequencing is used for each model scenario. See Section 5.1 Overview, Section 5.1.6 (Groundwater Modeling Overview), for further details on the hydrologic modeling. The modeled mean annual range between maximum and minimum lake levels would be 1.6 feet City Datum (Kennedy/Jenks 2012). Maximum lake levels over the model period are predicted at 12.4 feet City Datum, or 6.7 feet above the average baseline water surface elevation of 5.7 feet City Datum. Minimum water surface elevations could reach as low as -0.8 feet City Datum, or 6.5 feet below the baseline average water surface elevation of 5.7 feet City Datum (see Figures 5.16-11 [Simulated Lake Merced Level Changes] and 5.16-12 [Simulated Lake Merced Levels Relative to Modeled Existing Conditions]) (Kennedy/Jenks 2012).

While the lake-level models are based on historical records, the various hydrologic conditions would not necessarily happen in the same sequence as modeled, although it is assumed for the purposes of the lake level model and for this analysis that they would occur at some point during the modeled time period. The modeled existing conditions (see Figures 5.16-11 and 5.16-12) show an initial sharp increase in lake levels from 5.7 feet City Datum to over 12 feet City Datum, responding to a period of above-average precipitation in model years 1 to 4. Years 4 through 16 show a steady decline in modeled lake levels during a relatively dry period to about 1.5 feet City Datum. Between years 16 and 36, modeled lake levels fluctuate in response to relatively normal climatic conditions and show an increasing trend through the period, rising again to about 11 feet City Datum. Years 36 to 44 simulate a "design drought" period[24] more severe than any observed historical drought, and modeled lake levels decline over this eight-year period to a low of -0.8 feet City Datum. In the three years following the drought, modeled lake levels recover to about 5 feet City Datum.

Predicted Lake Levels under the Proposed Project Relative to Modeled Existing Conditions

For the purposes of this EIR, changes in water surface elevation modeled for the GSR Project are compared to changes predicted under the modeled existing conditions scenario to determine whether water surface elevation changes resulting from the proposed Project would be *significant*

[24] The SFPUC measures water supply reliability using an 8.5-year "design drought." A design drought is a planning and operations tool used by water agencies to define a reasonable worst-case drought scenario in order to establish design and operating parameters for the water system. The WSIP uses a design drought based on the hydrology of the six years of the worst historical drought (1987-1992) on record, plus the 2.5 years of the 1976-1977 drought, for a combined total of an 8.5-year design drought sequence.

when compared to the modeled existing conditions in the context of the effects of varying lake levels on biological resources.

Similar to the modeled existing conditions model, under the proposed Project water levels would also respond to modeled climatic variations in the same hydrologic sequence pumping (see Figures 5.16-11 [Simulated Lake Merced Level Changes] and 5.16-12 [Simulated Lake Merced Levels Relative to Modeled Existing Conditions]). Maximum lake levels over the model period are predicted at 13 feet City Datum, or 0.6 feet above the modeled existing conditions maximum. Minimum lake levels could reach as low as -2.5 feet City Datum, or 1.7 feet below the modeled existing conditions minimum water surface elevation (Kennedy/Jenks 2012).

Compared to the modeled existing conditions, the modeled water levels for the GSR Project (see Figures 5.16-11 and 5.16-12) show a similar initial sharp increase in lake levels from 5.7 feet City Datum to over 12 feet City Datum. Lake levels predicted to result from operation of the Project increase by about 5 feet as compared to modeled existing conditions in Years 1 through 10. This relative difference is maintained by the simulation over climatic variations until the start of the design drought in Year 36. During the design drought, lake levels drop to the predicted minimum of -2.5 feet City Datum and then slowly begin to rise again to reach about 2 feet City Datum at the end of the model period, where water levels are predicted to be about 4 feet lower than predicted under the modeled existing conditions.

Impact BR-6: Operation of the Project would not 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. (Less than Significant)

For special-status nesting birds, Project-related water surface elevation decreases of 0.5 feet or more over a 2.5-week period in any single nesting season (conservatively March 1 through August 15) would be considered to result in a *significant* impact on reproductive success. If water level decreases were to occur rapidly, nests could be stranded, resulting in the loss of nests and eggs and thus adversely affecting productivity. It is presently unknown whether western pond turtle are reproducing at Lake Merced. If they are, a water level rise of greater than 3 feet in any given year (measured from March 1st to March 1st) could potentially inundate western pond turtle nests, causing reproductive failure and/or hatchling mortality and would be considered *significant* if the increase were caused by the Project.

A summary of estimates generated by the Lake Merced Lake-Level Model for the modeled existing conditions, as well as the proposed Project, shows that the Project is predicted to result in a maximum modeled monthly lake level decrease of 0.04 feet (Kennedy/Jenks 2012). Therefore, relative to the significance threshold of 0.5 feet over a 2.5-week period, the Project would have a *less-than-significant* impact on the reproductive success of special-status birds nesting at or near the water line and no mitigation is required.

The summary of estimates presented in Attachment 10.2-A of Technical Memorandum 10.2 also include a summary of the predicted annual range between maximum and minimum lake levels possible under the various scenarios (Kennedy/Jenks 2012). As summarized therein and below in Table 5.14-11 (Summary of Predicted Annual Range in Lake Levels), the predicted mean modeled annual lake level elevation range is 1.6. This means that most of the time, modeled lake levels are expected to increase or decrease from the average annual water surface elevation by 0.8 foot. Under the most extreme conditions, such as during a series of above-normal precipitation years, the modeled existing conditions for lake levels are predicted to fluctuate as much as 2.25 feet above or below the predicted average annual water surface elevation in a single year. With implementation of the GSR Project, maximum lake level rise in one year is predicted to be only slightly greater at 2.35 feet; i.e., an increase of only 0.10 foot. Therefore, relative to the significance threshold and modeled existing conditions, the Project would have a *less-than-significant* impact on nesting western pond turtles, and no mitigation is required.

TABLE 5.14-11
Summary of Predicted Annual Range in Lake Levels

Predicted Lake Level Change	Modeled Existing Conditions (feet)	Project (feet)	Difference in Change Between Modeled Existing Conditions and the Project (feet)
Maximum annual range	5.5	5.6	+0.10
95th percentile	3.2	2.8	-0.4
90th percentile	2.7	2.7	0.0
Mean lake level range	1.6	1.5	-0.10

Source: Kennedy/Jenks 2012

Impact Conclusion: Less than Significant

Impact BR-7: Operation of the Project could adversely affect sensitive habitat types associated with Lake Merced. (Less than Significant with Mitigation)

The following have been identified as sensitive vegetation and habitat types at Lake Merced: dune scrub, thimbleberry, wax myrtle, and canyon live oak scrubs, Vancouver rye grassland (perennial grassland), fish-related habitat, wetlands (including arroyo willow riparian scrub), and blue gum eucalyptus forest. Impacts on wetlands are discussed below in Impact BR-8 and impacts on eucalyptus forest are discussed in Impact BR-9. Potential Project-related impacts on the remaining sensitive habitat types are discussed here.

Dune, Thimbleberry, Wax Myrtle, and Canyon Live Oak Scrubs, and Vancouver Rye Grassland Habitat

As discussed in the Section 5.14.3.2 (Approach to Analysis) under Significance Thresholds, reductions of the dune scrub, thimbleberry, wax myrtle, and canyon live oak scrubs, or Vancouver rye grassland (perennial grassland) habitats at Lake Merced would be considered *significant* if losses were to exceed 10 percent, when compared to the modeled existing conditions, for any of these single habitat types. Based on the vegetation analysis and additional GIS-based analysis comparing elevation contours with locations of sensitive biological resources, Table 5.14-12 (Predicted Loss of Sensitive Communities with Rising Water Levels) shows how sensitive plant communities are predicted to decrease with rising water surface elevations and shows the predicted water surface elevation at or near which effects are predicted to begin for each sensitive plant community. The presence of these species is not specifically dependent on water levels and it is expected that, due to their rarity and small patch size around the lake, they would not likely reestablish if they were inundated and then water levels recede. Therefore, unlike changes for wetlands, discussed below in Impact BR-8, predicted vegetation losses for these vegetation types, once they are inundated, are considered permanent and the elevations at which they are affected are considered absolute.

TABLE 5.14-12
Predicted Loss of Sensitive Communities with Rising Water Levels[(a)]

	Acres at Mean Annual Water Surface Elevations of 6 to 13 feet and Percent Change (City Datum)							
Sensitive Community	**6 feet**	**7 feet**	**8 feet**	**9 feet**	**10 feet**	**11 feet**	**12 feet**	**13 feet**
Dune scrub	3.30	3.30	3.29	3.29	3.28	3.24	3.19	3.13
Percent change	--	-0.06%	-0.15%	-0.36%	-0.73%	-1.73%	-3.19%	-5.02%
Canyon live oak scrub	--	--	0.13	0.13	0.13	0.13	0.12	0.12
Percent change	--	--	--	-0.08%	-1.31%	-2.62%	-7.00%	**-10.31%**
Wax myrtle scrub	--	--	0.08	0.08	0.07	0.05	0.03	0.01
Percent change	--	--	--	-2.00%	**-11.25%**	**-36.50%**	**-65.50%**	**-87.00%**
Vancouver rye grassland	--	--	0.013	0.012	0.007	0.005	0.002	0.001
Percent change	--	--	--	-8.59%	**-40.17%**	**-57.81%**	**-82.81%**	**-93.75%**

Note:

(a) Values in **bold** indicate the water surface elevation where a habitat loss of 10 percent or greater is predicted to occur. All acreage calculations were performed in GIS and therefore have a high degree of precision. However, this GIS analysis may not precisely predict actual changes in habitat on the ground, especially at very small scales.

As shown on Table 5.14-12 (Predicted Loss of Sensitive Communities with Rising Water Levels), it is estimated that water surface elevations between 12 and 13 feet City Datum would result in loss of 5 percent of dune scrub habitat at Lake Merced. The losses would be expected to occur primarily at Impound Lake in areas where several special-status plant species have been mapped recently (May & Associates 2009; Nomad Ecology 2011), although most special-status plant populations at Lake Merced are located above 13 feet City Datum. A water level rise to 13 feet City Datum at Impound Lake could also inundate and kill small populations of coastal black gooseberry, although that species is not precisely mapped (SFRPD 2006), and Wight's paintbrush, which occur in coastal scrub on the southeastern shore. It is estimated that thimbleberry scrub would not be inundated by rising water surface elevations under any scenario, as it occurs entirely above the elevation of the spillway at 13 feet City Datum. However, a 10 percent loss of canyon live oak scrub is predicted to occur between water surface elevations 12 and 13 and a 9 percent loss of wax myrtle scrub is predicted to occur at 10 feet City Datum. These vegetation types are not expected to regenerate naturally since the spread of canyon live oak is constrained by other upland vegetation types and the wax myrtle scrub was planted and is also constrained by other upland vegetation types. So the losses would be assumed permanent. Finally, it is estimated that water surface elevations exceeding 9 feet City Datum would result in loss of more than 10 percent of Vancouver rye grassland at Lake Merced.

Should Project operations result in water level increases above the water surface elevations described above, and the change in habitat attributed to the Project were greater than 10 percent, a *significant* impact would occur. In order to determine the Project's contribution to habitat loss potential, the GIS-based analysis was used to predict habitat acreages for the model period where the predicted Lake Merced water surface elevation resulting from the Project, compared to the predicted water surface elevation for the modeled existing condition, is greatest. This represents the potential 'worst case' acreage loss for each habitat type and is represented in model year 22 where modeled existing conditions reflect a normal climactic water year and the GSR Put Period is near completion.

The predicted water surface elevation for modeled existing conditions in model year 22 is 7 feet City Datum, while the predicted water surface elevation for the Project is approximately 12.8 feet City Datum, which is also the predicted maximum lake level under the Project over all model years. Therefore, water levels resulting from implementation of the Project are predicted to exceed the water surface elevations where substantial loss of canyon live oak scrub, wax myrtle scrub, and Vancouver rye grassland could occur, and, as a result, the acreage loss as a result of the Project is predicted to be greater than 10 percent. Table 5.14-13 (Comparison of Predicted Sensitive Community Acreages under Modeled Existing Conditions and the Project) compares the predicted modeled existing conditions acreages for sensitive habitats with the acreages predicted under the Project, and the percentage of acreage lost, for model year 22.

TABLE 5.14-13
Comparison of Predicted Sensitive Community Acreages under Modeled Existing Conditions and the Project[(a)]

Vegetation Community	Acreages Resulting from Modeled Existing Conditions (Model Year 22)	Acreages Resulting from Implementation of the Proposed Project (Model Year 22)	Difference in Acreages Resulting from Implementation of the Proposed Project as Compared to Modeled Existing Conditions	Percent Change Resulting from Implementation of the Proposed Project as Compared to Modeled Existing Conditions
Central dune scrub	3.30	3.13	-0.17	-5%
Canyon live oak scrub	0.13	0.12	-0.01	-10%
Wax myrtle scrub	0.08	0.01	-0.07	-87%
Perennial grassland (Vancouver rye grassland)	0.013	0.001	-0.012	-92%

Note:

(a) Based on modeled water surface elevations of 7 feet City Datum for modeled existing conditions and 12.8 feet City Datum for the proposed Project. Since the vegetation change analysis is based on whole number increments of change, acreages at 13 feet City Datum are given.

As shown on Table 5.14-13 (Comparison of Predicted Sensitive Community Acreages under Modeled Existing Conditions and the Project), the maximum loss of central dune scrub is predicted to be less than 10 percent as a result of the Project. Thus, impacts on this habitat type would be *less than significant*. However, relative to modeled existing conditions, canyon live oak scrub losses may slightly exceed 10 percent and losses of wax myrtle scrub and perennial grassland are predicted to substantially exceed 10 percent; thus, the impacts on these habitats would be *significant*. However, implementation of Mitigation Measure M-BR-7 (Lake Level Management for Water Levels Increases for Lake Merced) would serve to reduce potential impacts on canyon live oak scrub, wax myrtle scrub, and Vancouver rye grassland resulting from Project implementation to *less-than-significant* levels through management of water levels to avoid Project-related losses of sensitive communities. Mitigation Measure M-BR-7 (Lake Level Management for Water Levels Increases for Lake Merced) includes a requirement that Lake Merced water levels be maintained at no more than 9 feet City Datum, or the level that would occur without the Project based on lake-level modeling, whichever is higher. As shown on Table 5.14-13, a water surface elevation of 9 feet City Datum is predicted to result in a less than 10 percent loss of canyon live oak scrub and wax myrtle scrub and therefore, with implementation of Mitigation Measure M-BR-7 (Lake Level Management for Water Levels Increases for Lake Merced), loss of Vancouver rye grassland resulting from Project operation are predicted to be less than 10 percent. Should water levels without the Project be expected to exceed 9 feet City Datum, maintenance of Project-related water surface elevations at the same level as expected without the Project would ensure that loss of habitat is limited to that which would be expected to occur naturally.

Fisheries and Fish Habitat

Rising water levels associated with modeled existing conditions are not expected to have a *significant* impact on Lake Merced fisheries, given that rising water levels would increase the volume of fish habitat overall and would not substantially degrade the quality of fish habitat for warmwater or cold water fish species, because water clarity would not be degraded by rising water levels and temperature decreases would be small and within the normal range of fish species that inhabit an inland coastal lake (EDAW 2004). However, decreasing water levels could substantially reduce aquatic habitat and degrade water quality, thereby negatively affecting fish populations through impacts on fish habitat-related beneficial uses, which would be considered *significant* by this analysis. While no significant impacts on beneficial uses are expected due to a rise in water surface elevations, as noted in Section 5.16, Hydrology and Water Quality, water level decreases below 0 feet City Datum, which are predicted to occur under modeled existing conditions, could result in decreases in water quality with resulting adverse effects on fish-related beneficial uses

Under the modeled existing conditions, lake levels are predicted to drop as low as -0.8 feet City Datum. At about 4 feet City Datum, all of the individual lakes are hydraulically connected and below this water level, reduced hydraulic connection would eliminate water exchanges between these water bodies. Lake volume would decrease and thus lake temperatures and eutrophication would be expected to increase, as would periods of low dissolved oxygen. These factors could combine to lower water quality, resulting in adverse effects on beneficial uses related to fish habitat, as described above in the discussion on significance thresholds for fisheries and fish habitat in Section 5.14.3.2 (Approach to Analysis).

Relative to modeled existing conditions, the proposed Project is predicted to result in water levels approximately 5 feet higher for most of the modeled time period and, during that time, would have *less-than-significant* impacts on fisheries or fish habitat similar to conditions that are predicted to occur under modeled existing conditions when lake levels rise. However, during drought periods, water levels could reach as low as -2.5 feet City Datum, or nearly 2 feet lower than the predicted minimum for modeled existing conditions. This could mean a further significant decrease in water quality from modeled existing conditions, which would be attributable to the Project. However, Mitigation Measure M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) (see Section 5.16, Hydrology and Water Quality) and Mitigation Measure M-BR-7 (Lake Level Management for Water Levels Increases for Lake Merced), require the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels due to the Project at or below 9 feet City Datum and Mitigation Measure M-HY-9b requires the SFPUC to maintain water levels due to the Project at or above 0 feet City Datum. Implementation of this mitigation measure would therefore also serve to mitigate potential *significant* impacts on the fish habitat-related beneficial uses of Lake Merced through management of water levels to avoid a significant Project-related degradation of water quality (SFPUC 2013).

Mitigation Measure M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced
(see Impact HY-9 in Section 5.16, Hydrology and Water Quality for a description)

Mitigation Measure M-HY-9b: Lake Level Management for Lake Merced
(see Impact HY-9 in Section 5.16, Hydrology and Water Quality for a description)

Mitigation Measure M-BR-7: Lake Level Management for Water Level Increases for Lake Merced
In addition to ongoing monitoring and evaluation of lake levels, as well as maintenance of the Lake-level Model so as to be able to evaluate what lake levels may have been without implementation of the Project based on the actual hydrology that occurs during Project implementation, as described in Mitigation Measure M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced), the SFPUC shall implement corrective action if lake levels increase to 9 feet City Datum as an annual average due to the Project. Corrective action shall be taken to reduce the lake levels to 9 feet City Datum or less. These actions may include one of more of the following, which would result in lowering groundwater levels and thereby indirectly lowering lake levels:

- Temporarily suspend in-lieu delivery of surface water supplies to Daly City so that Daly City would increase pumping from Daly City wells.
- Increase pumping from GSR wells at Sites 1 through 4, which are within 1.5 miles of Lake Merced.

Impact Conclusion: Less than Significant with Mitigation

Impact BR-8: Operation of the Project could adversely affect wetland habitats and other waters of the United States associated with Lake Merced. (Less than Significant with Mitigation)

In order to determine the proposed Project's effect on wetlands, the thresholds of no-net-loss of wetlands were compared with the simulated Lake Merced lake levels (Kennedy/Jenks 2012) to assess whether wetland impacts would be expected occur under the Project and cumulative scenarios, relative to the modeled existing conditions scenario.

Wetland extent at Lake Merced is determined primarily by water levels and topography, and has moved up slope with the water levels over time (Stillwater 2009; Nomad Ecology 2011). As seen in Table 5.14-13 (Comparison of Predicted Sensitive Community Acreages under Modeled Existing Conditions and the Project), there are five distinct freshwater marsh and seasonal wetland types at Lake Merced and the wetlands vegetation type is one of the most widespread around the lake, although overall wetland acreage has decreased since 2002 as mean annual lake levels have risen. As noted above, willow riparian scrub has also decreased in acreage since 2002. As lake levels rise and fall, emergent wetlands are expected to follow closely, as willow riparian scrub would, although relative proportions of the various wetland types are expected to change as they move upslope and downslope, depending on topography and adjacent plant communities. Since this basic pattern has been observed and is borne out in the predictions of the GIS-based vegetation change analysis, it is predicted to continue to occur over the time period modeled for the various scenarios under consideration in this EIR.

The predicted vegetation response to rising or declining water levels would differ depending on the baseline water level for a given period, which changes annually due to natural hydrological variation independent of Project operation. Additionally, the amount of shoreline available for wetland establishment at a given water surface elevation differs according to the topography of the lakeshore, which generally is steeper at higher elevations and flatter at lower elevations. The GIS-based analysis predicted vegetation changes for increasing and decreasing water levels compared to each potential water level change, as shown in Appendix J (Lake Merced Vegetation Change Analysis Methodology). As an example of the predicted vegetation changes for increasing and decreasing water levels compared to a baseline value, Table 5.14-14 (Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Rising Water Levels) presents a summary of the predicted vegetation changes for increasing water levels, compared to a water surface elevation of approximately 6 feet City Datum, while Table 5.14-15 (Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Receding Water Levels) summarizes predicted vegetation changes for decreasing water levels compared to the same baseline water surface elevation.

TABLE 5.14-14

Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Rising Water Levels[(a)(b)(c)(d)]

Wetland Type	Mean Annual Water Surface Elevation (feet City Datum)							
	6 feet	**7 feet**	**8 feet**	**9 feet**	**10 feet**	**11 feet**	**12 feet**	**13 feet**
Arroyo willow riparian scrub	17.03	*12.59*	*11.86*	*8.44*	*6.14*	*4.26*	*2.88*	*0.00*
Percent change		-26.1%	-30.4%	-50.4%	-63.9%	-75.0%	-83.1%	-100.0%
Bulrush wetland	25.05	**28.15**	**32.57**	**38.18**	**44.74**	**48.97**	**40.05**	**26.81**
Percent change		12.4%	30.0%	52.5%	78.6%	95.5%	59.9%	7.0%
Giant vetch wetland	0.25	*0.17*	*0.17*	*0.16*	*0.13*	*0.08*	*0.05*	*0.03*
Percent change		-33.0%	-33.0%	-35.2%	-48.5%	-67.3%	-78.9%	-89.9%
Knotweed wetland	7.02	*6.42*	*6.89*	*6.13*	*3.26*	*1.20*	*0.52*	*0.33*
Percent change		-8.5%	-1.8%	-12.6%	-53.5%	-82.9%	-92.6%	-95.2%
Rush meadow	0.40	*0.29*	*0.31*	*0.26*	*0.14*	*0.13*	*0.07*	*0.02*
Percent change		-28.3%	-21.8%	-35.1%	-64.5%	-67.8%	-83.4%	-95.3%
Cattail wetland	0.01	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Percent change		-33.3%	-33.3%	-33.3%	-33.3%	-33.3%	-46.6%	-63.3%
Total herbaceous wetland	32.72	**35.02**	**39.94**	**44.74**	**48.27**	**50.38**	**40.69**	*27.19*
Percent change		7.0%	22.1%	36.7%	47.5%	54.0%	24.4%	-16.9%
Total wetland (riparian + herbaceous)	49.75	*47.61*	**51.80**	**53.18**	**54.41**	**54.64**	*43.57*	*27.19*
Percent change		-4.3%	4.1%	6.9%	9.4%	9.8%	-12.4%	-45.3%
Open water	256.40	**264.86**	**266.15**	**266.46**	**268.62**	**268.30**	**281.06**	**297.43**
Percent change		3.3%	3.8%	3.9%	4.8%	4.6%	9.6%	16.0%

Notes:

(a) Acreages in table are for vegetation at and below 13 feet City Datum.

(b) Values in **bold** indicate an increase in cover type.

(c) Values in *italic* indicate a decrease in cover type.

(d) Predicted vegetation change is measured against a baseline of 6-foot (City Datum) mean annual water surface elevation.

TABLE 5.14-15

Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Receding Water Levels[(a)]

Wetland Type	Mean Annual Water Surface Elevation (feet City Datum)																
	-10 feet	-9 feet	-8 feet	-7 feet	-6 feet	-5 feet	-4 feet	-3 feet	-2 feet	-1 feet	0 feet	1 feet	2 feet	3 feet	4 feet	5 feet	6 feet[(b)]
Arroyo willow riparian scrub	**37.89**	**32.02**	**27.15**	**24.11**	**21.80**	**20.15**	**19.31**	**18.82**	**18.35**	**17.77**	**18.36**	**21.15**	**24.45**	**26.07**	**24.95**	**21.54**	17.03
Percent change[(c)]	122.5%	88.0%	59.4%	41.5%	28.0%	18.3%	13.4%	10.5%	7.7%	4.4%	7.8%	24.2%	43.6%	53.1%	46.5%	26.5%	--
Bulrush wetland	**49.12**	**46.43**	**31.72**	**30.60**	**28.06**	*21.76*	*16.28*	*14.36*	*12.78*	*11.78*	*10.82*	*10.42*	*10.58*	*11.80*	*14.49*	*19.23*	25.05
Percent change	96.1%	85.4%	26.6%	22.2%	12.0%	-13.1%	-35.0%	-42.7%	-49.0%	-53.0%	-56.8%	-58.4%	-57.7%	-52.9%	-42.2%	-23.2%	
Giant vetch wetland	**0.38**	**0.33**	**0.27**	*0.20*	*0.17*	*0.17*	*0.17*	*0.17*	*0.17*	*0.16*	*0.20*	**0.29**	**0.38**	**0.43**	**0.42**	**0.35**	0.25
Percent change	52.3%	33.2%	7.2%	-19.6%	-29.5%	-31.1%	-31.7%	-32.3%	-32.9%	-33.6%	-20.7%	16.8%	54.9%	74.4%	70.2%	40.7%	--
Knotweed wetland	*9.56*	*6.15*	*4.94*	*4.75*	*3.41*	*1.91*	*1.40*	*1.38*	*1.39*	*1.41*	*1.43*	*1.45*	*1.50*	*1.97*	*3.46*	*5.63*	7.02
Percent change	36.2%	-12.4%	-29.6%	-32.4%	-51.4%	-72.7%	-80.0%	-80.4%	-80.2%	-79.9%	-79.7%	-79.3%	-78.6%	-71.9%	-50.7%	-19.8%	--
Rush meadow	**0.49**	**0.40**	*0.32*	*0.24*	*0.18*	*0.16*	*0.15*	*0.15*	*0.15*	*0.16*	*0.18*	*0.27*	*0.38*	**0.48**	**0.53**	**0.50**	0.40
Percent change	23.6%	0.7%	-19.3%	-39.3%	-55.2%	-60.1%	-61.5%	-61.4%	-61.3%	-61.1%	-54.4%	-33.0%	-3.8%	21.1%	31.6%	24.4%	--
Cattail wetland	**0.01**	**0.01**	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	0.01
Percent change	*35.2%*	*5.0%*	*-28.4%*	*-52.5%*	*-60.8%*	*-60.4%*	*-59.9%*	*-59.4%*	*-58.9%*	*-58.4%*	*-50.4%*	*-15.3%*	*44.0%*	*87.1%*	*85.6%*	*47.2%*	--
Total herbaceous wetland	**59.54**	**53.31**	**37.24**	**35.79**	*31.83*	*24.01*	*18.01*	*16.05*	*14.49*	*13.51*	*12.63*	*12.43*	*12.85*	*14.68*	*18.89*	*25.70*	32.71
Percent change	82.0%	63.0%	13.9%	9.4%	-2.7%	-26.6%	-45.0%	-50.9%	-55.7%	-58.7%	-61.4%	-62.0%	-60.7%	-55.1%	-42.2%	-21.4%	--
Total wetland (riparian + herbaceous)	**97.44**	**85.33**	**64.39**	**59.90**	**53.62**	*44.16*	*37.31*	*34.88*	*32.84*	*31.29*	*30.99*	*33.58*	*37.31*	*40.75*	*43.85*	*47.24*	*49.74*
Percent change	95.9%	71.5%	29.5%	20.4%	7.8%	-11.2%	-25.0%	-29.9%	-34.0%	-37.1%	-37.7%	-32.5%	-25.0%	-18.1%	-11.9%	-5.0%	--

TABLE 5.14-15

Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Receding Water Levels[(a)]

Wetland Type	Mean Annual Water Surface Elevation (feet City Datum)																
	-10 feet	**-9 feet**	**-8 feet**	**-7 feet**	**-6 feet**	**-5 feet**	**-4 feet**	**-3 feet**	**-2 feet**	**-1 feet**	**0 feet**	**1 feet**	**2 feet**	**3 feet**	**4 feet**	**5 feet**	**6 feet[(b)]**
Open Water	*128.78*	*149.87*	*176.77*	*185.61*	*196.09*	*208.97*	*218.34*	*223.08*	*227.45*	*231.36*	*235.23*	*238.76*	*242.17*	*245.57*	*249.14*	*252.35*	*265.75*
Percent change	-51.5%	-43.6%	-33.5%	-30.2%	-26.2%	-21.4%	-17.8%	-16.1%	-14.4%	-12.9%	-11.5%	-10.2%	-8.9%	-7.6%	-6.2%	-5.0%	--

Notes:

(a) Acreages in the table are for vegetation at and below 13 feet City Datum

(b) Vegetation change is measured against a baseline of 6-foot (City Datum) mean annual water surface elevation.

(c) Percent change is relative to vegetation acreage at 6 feet City Datum.

All upland vegetation types were combined for the analysis of receding lake levels.

Values in **bold** indicate an increase in cover type.

Values in *italic* indicate a decrease in cover type.

Under the example where the water surface elevation is approximately 6 feet City Datum, the vegetation change analysis predicts incremental increases in wetlands at average annual water surface elevations between 7 and 11 feet City Datum (Table 5.14-14 [Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Rising Water Levels]), with a net loss occurring between 6 and 7 feet City Datum and between 11 and 13 feet City Datum. This is due primarily to the fact that between 6 and 12 feet City Datum, water level increases would inundate several large areas of low gradient topography at depths conducive to emergent wetland establishment (between -5 and 2 feet above the water surface elevation). Above 11 feet City Datum, topography begins to steepen, which reduces the area available for wetland colonization because lake depths increase more rapidly and there is less area for wetland species to grow. The analysis also predicts loss of wetlands at water surface elevations lower than 6 feet City Datum, and continuing down to -6 feet City Datum. Again, this is due primarily to topography, as areas of low gradient topography allow for areas of greater wetland establishment and when topography steepens, wetland establishment is restricted by more rapidly increasing water depths. Then wetland acreage begins to increase again to above the estimated baseline acreage between -5 and -10 feet City Datum. Above 6 feet City Datum, bulrush wetlands are predicted to increase in extent at each incremental rise up to 12 feet City Datum and then decrease between 12 and 13 feet City Datum but still remain above the acreage mapped in 2012. Bulrush wetlands are predicted to replace willow scrub, as this vegetation type would die with prolonged inundation, as well as knotweed wetlands, due primarily to changes in topography and water depth. Below 6 feet City Datum, the extent of the various emergent wetland types would vary with elevation and topography relative to water surface elevations, with initial losses primarily of bulrush wetland and increases in the other emergent types, as well as willow scrub. Losses would occur in non-bulrush wetlands generally between 2 and -8 feet City Datum and then increases in all wetland types would occur at the low end of the water surface elevation range.

In general, the predicted vegetation areas compare relatively well with those documented in previous studies at lower water surface elevations (see Table 5.14-15 [Predicted Change in Vegetation Acreages and Percent Change Relative to a 6-foot Water Surface Elevation: Receding Water Levels]). However, for bulrush, there are considerable differences between the current analysis and observations at lower water levels. In part, this may be explained by the uncertainty inherent in predicting patterns of establishment on newly exposed terrain, as described above. In addition, this analysis recognizes that earlier accounts of the extent of bulrush were effectively under rising water surface elevation conditions. For example, bulrush that established when the water surface elevation was at 0 feet City Datum would likely persist when the water rises to 5 feet City Datum. In contrast, bulrush would not establish as readily in deeper water as the water surface drops, so the amount of area available to colonize, in the near term, would be more limited.

As described above, for each water surface elevation that could occur due to hydrologic conditions alone, the GIS-based vegetation change analysis conducted for this EIR predicts that there is an elevation range within which there would be no net loss as a result of the Project, as shown in Appendix J (Lake Merced Vegetation Change Analysis Methodology), and summarized in Table 5.14-16 (Lake Merced Water Surface Elevation Range that Results in a Predicted No-Net-Loss of Wetlands). If Project operations were to exceed the identified ranges, then a net wetlands loss is predicted to occur and, therefore, a *significant* impact on wetlands would result. For example, if the water surface elevation without the Project was projected to be 8 feet City Datum, there would be no project-related effect on wetlands if the water surface elevation was between 7 feet and 11 feet City Datum.

TABLE 5.14-16
Lake Merced Water Surface Elevation Ranges that Result in a Predicted No-Net-Loss of Wetlands[(a)(b)]

Modeled Water Surface Elevation without the Project (City Datum)	Corresponding Project-Related Water Surface Elevation Resulting in a Predicted No-Net-Loss of Wetlands (City Datum)
13 feet	No restriction needed
12 feet	4 to 12 feet
11 feet	9 to 11 feet
10 feet	9 to 11 feet
9 feet	8 to 11 feet
8 feet	7 to 11 feet
7 feet	4 to 11 feet
6 feet	5 to 11 feet
5 feet	4 to 11 feet; -6 to -10 feet
4 feet	3 to 12 feet; -5 to -10 feet
3 feet	2 to 12 feet; -5 to -10 feet
2 feet	1 to 12 feet; -4 to -10 feet
1 feet	0 to 12 feet; -3 to -10 feet
0 feet	-10 to 12 feet
-1 feet	-10 to 12 feet
-2 feet	0 to 12 feet; -2 to -10 feet
-3 feet	1 to 12 feet; -3 to -10 feet
-4 feet	1 to 12 feet; -4 to -10 feet
-5 feet	3 to 12 feet; -5 to -10 feet
-6 feet	8 to 11 feet; -6 to -10 feet
-7 feet	-7 to -10 feet
-8 feet	-8 to -10 feet
-9 feet	-9 to -10 feet
-10 feet	-10

Note:

(a) The water surface elevation values used represent the predicted annual average water surface elevations. Lake Merced water levels vary seasonally due to hydrologic and climatic conditions; therefore, an annual average range in water surface elevation from about 1 foot above and below the mean is assumed. For example, an elevation of 6 feet City Datum, as seen in Table 5.14-16 (Lake Merced Water Surface Elevation Range that Results in a Predicted No-Net-Loss of Wetlands), actually represents a range in water surface elevation between 5 feet and 7 feet City Datum.

(b) According to Mitigation Measure M-BR-7 (Lake Level Management for Water Level Increases for Lake Merced), Lake Merced lake levels would be prohibited from exceeding 9 feet City Datum, so some of the lake levels that would be acceptable relative to wetlands impacts would not be acceptable relative to sensitive habitats.

In order to distinguish the Project's predicted contribution to effects on wetland habitats from the predicted effects of the modeled existing conditions (i.e., to calculate the Project's incremental effect), the threshold for a net loss of wetlands was compared with the simulated Lake Merced water levels (Kennedy/Jenks 2012) to assess whether impacts would occur. During some of the modeled years, no net loss, or even wetlands gains, are expected to occur, while in other years, wetlands losses are expected. For instance, as shown on Figures 5.16-11 (Simulated Lake Merced Level Changes) and 5.16-12 (Simulated Lake Merced Levels Relative to Modeled Existing Conditions), the lake level predicted under modeled existing conditions for model year 16 is approximately 6 feet City Datum and lake level predicted under Project conditions is approximately 7 feet City Datum. As shown on Table 5.14-16 (Lake Merced Water Surface Elevation Range that Results in a Predicted No-Net-Loss of Wetlands), when the water surface elevation without the Project is predicted to be 6 feet (see the row with "6 feet" in the column labeled "Water Surface Elevation without the Project [City Datum]"), an increase of up to 5 feet resulting from Project operations could occur without resulting in loss of wetlands (i.e. the acceptable water surface elevation would be 5 to 11 feet). Therefore, the increase of 1 foot over conditions without the Project that is predicted in model year 16 would not result in a net loss of wetlands. However, the lake level predicted under modeled existing conditions for model year 22 is approximately 7 feet City Datum, whereas the lake level predicted under Project conditions for that same year is approximately 12 feet City Datum. Model year 22 represents modeled existing conditions under a normal climatic water year during a Put Period, and is the year when the difference between the two lake levels is predicted to be the greatest. As shown on Table 5.14-16, when the water surface elevation without the Project is predicted to be 7 feet City Datum, an increase of up to 4 feet resulting from Project operations (which would be up to 11 feet City Datum) could occur without resulting in a net loss of wetlands. Therefore, the increase of 5 feet over conditions without the Project (which would be 12 feet City Datum) that is predicted in model year 22 would result in loss of wetlands, which would be a *significant* impact. The lake levels following the design drought (model year 44) are predicted to be approximately 1 foot City Datum for modeled existing conditions and approximately -2 feet City Datum for the Project, which would also result in a net loss of wetlands, because the decline from a 1 foot City Datum elevation without the Project would need to be greater than 4 feet City Datum to avoid wetland loss (per Table 5.14-16). However, implementation of Mitigation Measures 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), and M-HY-9b (Lake Level Management for Lake Merced) would maintain water levels in a way that would mitigate wetlands impacts to *less-than-significant* levels. Under Mitigation Measures M-BR-8 (Lake Level Management for No-Net-Loss of Wetlands for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced), for each water surface elevation that could occur due to hydrologic conditions alone (i.e., first column of Table 5.14-16), the GIS-based vegetation change analysis conducted for this EIR indicates the elevation range within which no net loss of wetlands would occur as a result of the Project (i.e., last column of Table 5.14-16). Mitigation Measure M-BR-8 (Lake Level Management for No-Net-Loss of Wetlands for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) require that lake levels be maintained within these ranges (i.e., right-hand column of Table 5.14-16), thereby reducing potential impacts on wetlands resulting from Project implementation to *less-than-significant* levels.

Mitigation Measure M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced
(See Impact HY-9 in Section 5.16, Hydrology and Water Quality for a description)

Mitigation Measure M-HY-9b: Lake Level Management for Lake Merced
(See Impact HY-9 in Section 5.16, Hydrology and Water Quality for a description)

Mitigation Measure M-BR-8: Lake Level Management for No-Net-Loss of Wetlands for Lake Merced
In addition to ongoing monitoring, evaluation of lake levels, and maintenance of the Lake-level Model so as to be able to evaluate what lake levels may have been without implementation of the Project based on the actual hydrology that occurs during Project implementation, as described in Mitigation Measure M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced), the SFPUC shall implement corrective action if lake levels exceed the range of lake level changes shown in Table 5.14-16 (Lake Merced Water Surface Elevation Range that Results in a Predicted No-Net-Loss of Wetlands), due to the Project (i.e., the right-hand column). Note that according to Mitigation Measure M-BR-7 (Lake Level Management for Water Level Increases for Lake Merced), Lake Merced lake levels due to the project would be prohibited from exceeding 9 feet City Datum, so some of the higher lake levels that would be acceptable relative to wetlands impacts as identified in Table 5.14-16 would not be acceptable relative to sensitive habitats. In addition, according to Mitigation Measure M-BR-9b (Lake level Management for Lake Merced), Lake Merced lake levels due to the Project would be prohibited from decreasing below 0 feet City Datum, so some of the lower lake levels that would be acceptable relative to wetlands impacts identified in Table 5.14-16 would not be acceptable relative to water quality and associated beneficial uses.

Corrective actions may include one or more of the following, which would result in the lowering of groundwater levels and thereby indirectly lowering lake levels:

- Suspend in-lieu delivery of surface water supplies to Daly City. Daly City would thus increase pumping from Daly City wells, which would lower groundwater levels in the vicinity of Lake Merced.
- Increase pumping from GSR wells at Sites 1 through 4, which are within 1.5 miles of Lake Merced.

Impact Conclusion: Less than Significant with Mitigation

Impact BR-9: Operation of the Project could adversely affect native wildlife nursery sites associated with Lake Merced. (Less than Significant with Mitigation)

As discussed in Section 5.14.3.2 (Approach to Analysis), large eucalyptus along the shores of North and South Lakes support several double crested cormorant and great blue heron rookeries. A loss of 10 percent or more of the eucalyptus forest around Lake Merced, particularly the more isolated stands, as a result of the proposed Project would be considered significant for the purposes of this EIR. Table 5.14-17 (Predicted Loss of Eucalyptus Forest with Rising Water Levels) shows how eucalyptus forest is predicted to decrease with rising water surface elevations and shows the predicted average annual water surface elevation at or near which effects are predicted to begin. As shown, the results of the vegetation modeling prepared for this EIR indicate that a 10 percent loss of eucalyptus forest would begin to occur at a water surface elevation of 8 feet City Datum. However, since the vegetation mapping relies on aerial photograph interpretation of the canopy and individual eucalyptus stems were not mapped, the potential losses at this elevation are likely overestimated. Currently, there are healthy eucalyptus trees at the high water line. Most trees are located at higher elevations than that, and on steeper slopes the trunks may be located well above the 8 foot contour. Therefore, it is conservatively assumed by this EIR analysis that a substantial loss of eucalyptus forest would occur if a water surface elevation of 9 feet City Datum were to be exceeded and persist for more than one month. Similar to impacts on scrub and grassland habitat (see Impact BR-7), the presence of eucalyptus is not specifically dependent on water levels and it is expected that, while they could reestablish if they were inundated and then water levels were to recede, it would be decades before new trees could grow to a size sufficient to support a rookery. Predicted eucalyptus loss following inundation is considered by this analysis to be permanent, and the elevation at which this habitat is affected is considered absolute.

TABLE 5.14-17
Predicted Loss of Eucalyptus Forest with Rising Water Levels[(a)]

Sensitive Community	Acres of Eucalyptus Forest at Mean Annual Water Surface Elevation (City Datum)							
	6 feet	**7 feet**	**8 feet**	**9 feet**	**10 feet**	**11 feet**	**12 feet**	**13 feet**
Blue gum eucalyptus forest	17.63	17.24	15.79	14.93	14.39	13.96	13.58	13.22
Percent change[(b)]	--	-2.24%	**10.42%**	**-15.30%**	**-18.37%**	**-20.83%**	**-22.98%**	**-25.04%**

Notes:

(a) Values in **bold** indicate an increase in cover type.

(b) Due to canopy cover over the lake shoreline, the predicted change for blue gum eucalyptus is likely overestimated.

Should Project operations result in water level increases above 9 feet City Datum that persist for more than one month, and the change in habitat attributed to the Project were 10 percent or greater, a *significant* impact on this wildlife nursery site would occur. In order to determine the Project's contribution to this potential habitat loss, the GIS-based analysis was used to predict habitat acreages for the model period where the predicted Lake Merced water surface elevation resulting from the Project, compared to the water surface elevation for the modeled existing condition is greatest, similar to the analysis described in Impact BR-7. This would represent the potential 'worst case' acreage loss for each habitat type, and is represented in model year 22 where modeled existing conditions reflect a normal climatic water year and the GSR Put Period is near completion. The predicted water surface elevation for modeled existing conditions in model year 22 is 7 feet City Datum, while the predicted water surface elevation for the Project is approximately 12 feet City Datum. Therefore, water levels resulting from implementation of the Project are predicted to exceed the water surface elevations of 9 feet City Datum, the elevation at which the Project could result in a loss of blue gum eucalyptus forest of 10 percent or more. Table 5.14-18 (Comparison of Eucalyptus Forest Acreages with Predicted Acreages under Modeled Existing Conditions and the Project) compares the modeled existing conditions acreages for eucalyptus with the acreages predicted under the Project, and the percentage of acreage lost, for model year 22.

TABLE 5.14-18
Comparison of Eucalyptus Forest Acreages with Predicted Acreages under Modeled Existing Conditions and the Project[a]

Vegetation Community	Predicted Acreages Resulting from Modeled Existing Conditions (Model Year 22)	Predicted Acreages Resulting from Implementation of the Proposed Project (Model Year 22)	Difference in Predicted Acreages Resulting from Implementation of the Proposed Project as Compared to Modeled Existing Conditions	Predicted Percent Change Resulting from Implementation of the Proposed Project as Compared to Modeled Existing Conditions
Blue gum eucalyptus forest	17.24	13.58	-3.66	-21%

Note:

Based on modeled water surface elevation of 7 feet City Datum for modeled existing conditions and 12 feet City Datum for the proposed Project.

As shown on Table 5.14-18 (Comparison of Eucalyptus Forest Acreages with Predicted Acreages under Modeled Existing Conditions and the Project), the predicted loss of eucalyptus forest would exceed 10 percent; thus, the impact on native wildlife nursery sites would be *significant*. However, implementation of M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and Mitigation Measure M-BR-7 (Lake Level Management for Water Level Increases for Lake Merced) would serve to reduce potential impacts on eucalyptus forest resulting from Project implementation to *less-than-significant* levels through management of water levels to avoid Project-related losses of this habitat, along with other sensitive communities (see Impact BR-7). Mitigation Measure M-BR-7 (Lake Level Management for Water Level Increases for Lake Merced) includes a requirement that Lake Merced water levels be maintained at no more than 9 feet City Datum, or the level projected to occur without the Project based on lake level modeling, whichever is higher. Should water levels without the Project exceed 9 feet City Datum, maintenance of Project-related water surface elevations at the same level as expected without the Project would ensure that loss of habitat is limited to that which would be expected to occur naturally (SFPUC 2013.

Mitigation Measure M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced.
(See Impact HY-9 in Section 5.16, Hydrology and Water Quality for a description)

Mitigation Measure M-BR-7: Lake Level Management for Water Level Increases for Lake Merced
(See Impact BR-7 for a description)

Impact Conclusion: Less than Significant with Mitigation

5.14.3.7 Cumulative Impacts

The geographic scope for the analysis of potential cumulative impacts on biological resources consists of the overall region in which the facilities are being constructed. Projects throughout the region could have adverse effects on the same sensitive species and habitats that occur within the GSR Project facility sites. Table 5.14-1 (Plant Communities Present within or near Facility Sites and near Lake Merced) identifies the biological resources that are within the geographic scope of analysis for cumulative biological resources impacts relative to the GSR facility sites. Refer to Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis) in Section 5.1, Overview for the location of the cumulative projects.

Impact C-BR-1: Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources. (Less than Significant with Mitigation)

Construction

Impacts on Special-status Species

As discussed in Impact BR-1, construction of the GSR Project would result in potentially *significant* impacts associated with the temporary, construction-related impacts to habitat loss and disruption of breeding and foraging habitat for nesting birds, raptors, bats, and overwintering Monarch butterflies. It is assumed that several of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), particularly those projects located in the same geographic area, could adversely affect some of the same special-status species through tree removal and potential disturbance during nesting and breeding season. In particular, the Centennial Village Project (cumulative project I) would include demolition and reconstruction of a large shopping center located 400 feet southwest from the well facility and adjacent to the pipeline installation proposed for GSR Site 16. Both projects include construction activities near trees along Huntington Drive that provide nesting habitat for migratory birds. Therefore, cumulative impacts related to the potential for impacts on special-status species would be *significant*, and the GSR Project's contribution to this cumulative impact could be cumulative considerable, given that without mitigation, it could also result in *significant* impacts on special-status species.

However, as discussed in Impact BR-1, the GSR Project's temporary impacts on special-status species would be reduced to *less-than-significant* levels with implementation of 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), M-BR-1c (Protection Measures during Structure Demolition for Special-status Bats), and M-BR-1d (Monarch Butterfly Protection Measures). These measures address temporary impacts on special-status species by specifying that tree removal occur during the non-breeding season for special-status birds, and by requiring preconstruction surveys to determine if nesting birds are in the area before construction, if trees must be removed during the breeding season. The measures also require special protection measures for special-status bats during tree removal and trimming, and during demolition of buildings, as well as protection measures for Monarch butterflies during tree removal or trimming. Therefore, with implementation of these mitigation measures, the GSR Project's contribution to cumulative impacts related to impacts to special-status species would not be cumulatively considerable (*less than significant*).

Impacts on Riparian Habitat and Other Sensitive Natural Communities

Some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) could result in construction-related temporary disturbance to riparian habitat in the area. In particular, the Holy Cross Cemetery Expansion Project (cumulative project E) would expand the cemetery into areas east of Hillside Boulevard that could support riparian habitat or other natural communities.

As described in Impact BR-2, the GSR Project would potentially impact 305 square feet of Central Coast riparian scrub adjacent to Site 1 during construction. Therefore, because other cumulative projects, such as the Holy Cross Expansion Project, could also result in impacts on Central Coast riparian scrub or other sensitive natural communities, cumulative impacts related to impacts to riparian habitat and other sensitive natural communities would be *significant*, and the GSRs Project's contribution to this cumulative impact could be cumulatively considerable, given that, without mitigation, it could also result in *significant* impacts on sensitive natural communities.

However, the GSR Project's impact on these sensitive biological resources would be reduced to a *less-than-significant* level 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-BR-2 (Avoid Disturbance to Riparian Habitat). Implementation of these mitigation measures would ensure the protection of riparian habitat during construction. Therefore, with implementation of these measures, the GSR Project's contribution to cumulative impacts related to the disturbance of riparian habitat and other sensitive natural communities would not be cumulatively considerable (*less than significant*).

Impacts on Jurisdictional Waters

Some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) could result in a temporary impact on, or permanent loss of, jurisdictional waters. The SFPUC's Peninsula Pipeline Seismic Upgrade Project Colma Site (cumulative project D-1) would replace an existing water pipeline that traverses proposed GSR Site 8, with the proposed replacement pipeline to be constructed over an existing culvert that may be part of the headwaters of Colma Creek, and if so, would qualify as jurisdictional waters of the United States.

As described under Impact BR-3, the GSR Project could indirectly degrade waters near Site 9 and Site 11. Therefore, cumulative project impacts on jurisdictional waters could be *significant*, and the GSR Project's contribution to this cumulative impact could be cumulatively considerable, given that without mitigation, it could also result in *significant* impacts on jurisdictional waters.

However, the GSR Project's impact on jurisdictional waters would be reduced to a *less-than-significant* level 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). The measure requires that an erosion control measures be developed and implemented to control stormwater runoff and reduce the sedimentation of jurisdictional waters. Therefore, with implementation of this measure, the GSR Project's contribution to cumulative impacts related to jurisdictional waters would not be cumulatively considerable (*less than significant*).

Impacts related to Conflicts with Local Policies or Ordinances

Many of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) could adversely affect trees that are protected under local tree preservation ordinances and codes, including the San Mateo County Significant and Heritage Tree Ordinances, the City of Daly City Municipal Code, the Town of Colma Municipal Code, the City of South San Francisco Municipal Code, and the City of San Bruno Municipal Code. In particular, the Holy Cross Cemetery Expansion Project (cumulative project E) would expand the cemetery into areas east of Hillside Boulevard that support a variety of trees that would also be regulated under the Town of Colma Municipal Code.

As discussed in Impact BR-4, construction would result in removal or trimming of protected trees both inside and outside the SFPUC right-of-way at well facilities and along pipeline routes. Trees protected by the San Mateo County Tree Ordinance, and the Town of Colma, the City of South San Francisco, and the City of San Bruno Municipal Codes would be affected resulting in potentially *significant* cumulative impacts related to conflicts with local policies or ordinances. Therefore, the GSR Project's contribution to this cumulative impact could be cumulatively considerable, given that without mitigation, it could also result in *significant* impacts on locally protected trees.

However, as discussed in Impact BR-4, the GSR Project's impacts related to conflicts with local tree ordinances would be reduced to *less-than-significant* levels with implementation of Mitigation Measures M-BR-4a (Minimize Impacts on Protected Trees to Avoid Tree Loss), M-AE-1b (Tree Protection Measures), and M-BR-4b (Protected Tree Replacement), which would substantially fulfill the intent of the local tree preservation ordinances and codes by minimizing impacts on protected trees and by requiring replacement trees for any protected trees that are removed. Therefore, with implementation of these measures, the GSR Project's contribution to cumulative impacts related to conflicts with local policies protecting biological resources would not be cumulatively considerable (*less than significant*).

Operations

As discussed under Impact BR-5, only Sites 1, 7 (On-Site Treatment), 12, 18 (Alternate), and the West Lake Pump Station have the potential to produce operational noise and would be located at or near areas that support habitat for special-status birds or migratory passerines or raptors. Of these sites, only Site 12 would be located near a cumulative project, the Peninsula Pipeline Seismic Upgrade Project South San Francisco Site (cumulative project D-2), which would not generate any operational noise. Other than operational noise at these sites, the proposed GSR Project would not have permanent or ongoing impacts on biological resources during operations given that the Project does not include additional habitat disturbance following construction, and operation of the Project would not impact individual species or their habitat. Therefore, no cumulative operational impact on biological resources would occur, and the GSR Project would have no contribution to a *significant* cumulative impact on biological resources during operation (*less than significant*).

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 at Lake Merced. (Less than Significant with Mitigation)

Approach to Cumulative Analysis

As noted above, not all projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) and shown in Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis) would affect Lake Merced lake levels and the biological resources supported by the Lake and its surrounding habitats. Specific additional proposed and existing projects that would affect lake levels were considered in this Lake Merced operational cumulative analysis. As noted in greater detail in the cumulative analysis presented in Section 5.16, Hydrology and Water Quality, these include the SFPUC's proposed San Francisco Groundwater Supply (SFGW) Project (cumulative project A-1 through A-6) and Daly City's proposed Vista Grande Drainage Basin Improvement Project (cumulative project B). The former would affect Lake Merced water surface elevations most directly through groundwater pumping and the latter through direct hydrologic input of stormwater to the Lake (Vista Grande), as well as projected pumping by Partner Agencies in the South Westside Groundwater Basin and potentially increased pumping at the Holy Cross cemetery (i.e., other existing projects).

Predicted Lake Merced water levels, under the cumulative scenario conditions, respond to modeled climatic variations in the same hydrologic sequence as was used for the modeled existing conditions (see Figures 5.16-11 [Simulated Lake Merced Level Changes] and 5.16-12 [Simulated Lake Merced Levels Relative to Modeled Existing Conditions]). The mean annual range between the maximum and minimum lake levels under cumulative conditions is predicted to be 1.6 feet City Datum, which is the same as modeled existing conditions, whereas the mean annual range for the GSR Project alone is predicted to be 1.5 feet over the model period. (Kennedy/Jenks 2012)

The maximum lake level (as a monthly average) under cumulative conditions is predicted to be 9.5 feet City Datum, which is 2.9 feet less than the maximum level under modeled existing conditions, and 3.5 feet less than the maximum level for the GSR Project alone. The minimum lake level (as a monthly average) under cumulative conditions is predicted to be -4.9 feet City Datum, which is 4.1 feet lower than the minimum level under modeled existing conditions, and 2.4 lower than the minimum level for the GSR Project alone. Lake Merced water levels under cumulative conditions are predicted to be consistently within 3 feet above or below the level predicted for the modeled existing conditions, except during the modeled design drought, at which time lake levels under cumulative conditions are predicted to be 4 to 5 feet lower than predicted under the modeled existing conditions. (Kennedy/Jenks 2012)

Overall, the cumulative condition is expected to exhibit less dramatic water level fluctuations in most years than those predicted for the GSR Project alone, as the combined cumulative projects would provide hydrologic inputs that would balance the effects of groundwater pumping from the GSR and SFGW projects by themselves. For example, the proposed Vista Grande Drainage Basin Improvement Project is proposed to provide hydrologic inputs to Lake Merced in the form of excess stormwater buffering lake levels losses that would occur due to the GSR Project during dry years. Also, the SFGW Project would increase pumping to the north of the GSR Project, buffering lake level increases that would occur due to the GSR Project during normal and wet years.

Special-status wildlife species

The cumulative scenario model predicts periods of relatively rapid water surface elevation increase and decrease (see Figures 5.16-11 [Simulated Lake Merced Level Changes] and 5.16-12 [Simulated Lake Merced Levels Relative to Modeled Existing Conditions]). However, as the analysis for Impact BR-6 shows, rapid increases and decreases in water levels, if any were to occur, would be associated with natural hydrologic conditions. As indicated, the GSR Project is expected to have an incremental and less-than-cumulatively considerable contribution to any such increases or decreases. Rapid increases could be associated with the proposed Vista Grande Drainage Basin Improvement Project (cumulative project B), depending on the rate of stormwater inputs to the lake, which is not known at this time. However, the SFGW project and other potential increased groundwater pumping would not increase groundwater levels, and lake levels would not increase as a result of the SFGW project. Nevertheless, due to the potential for the Vista Grande project to cause a rapid increase in lake levels, there could be a *significant* cumulative impact on birds nesting at or near the water line, and on nesting pond turtles, if present, at Lake Merced. However, the contribution of the GSR Project to such rapid increases would be at most 0.04 feet (i.e., less than 0.5 inch) per month, which would have negligible effects on bird or pond turtle nesting, and, therefore, the contribution of the GSR Project to such rapid lake level increases would not be cumulatively considerable (*less than significant*)

Sensitive communities

<u>Dune scrub</u>. Under the cumulative scenario, and for the purposes of this analysis, it is assumed that water surface elevations could not rise higher than 9.5 feet City Datum due to relocation of the spillway to that elevation under the Vista Grande Drainage Basin Improvement Project. Not only would the losses predicted under the project-specific analysis be avoided, but there would be no cumulative impact on dune scrub or rare plant populations at Lake Merced, under this assumption (*no impact*).

<u>Locally sensitive coastal scrub types.</u> Thimbleberry scrub would not be inundated by rising water surface elevations under any of the modeled conditions as it occurs entirely above the existing Lake Merced spillway elevation of 13 feet City Datum. For canyon live oak scrub, a significant loss of greater than 10 percent would not occur unless water surface elevations were to rise to between 12 and 13 feet City Datum, as predicted by the GIS-based vegetation change analysis conducted in support of this EIR. Similarly, a significant loss of greater than 10 percent of wax myrtle scrub would not occur unless water surface elevations were to exceed 10 feet City Datum, as also predicted by the vegetation change analysis. Therefore, cumulative impacts on these sensitive communities would be *less than significant*, as water surface elevations are assumed not to exceed 9.5 feet City Datum under the cumulative scenario (*less than significant*).

<u>Vancouver rye grassland.</u> Based on the 2012 vegetation modeling and further GIS analysis prepared for this EIR, a water surface elevation of 9 feet City Datum would result in loss of 8.5 percent of Vancouver rye grassland and a water surface elevation of 10 feet City Datum is predicted to result in a 40 percent loss of Vancouver rye grassland. With implementation of the cumulative projects and an assumed maximum

possible water surface elevation of 9.5 due to the Vista Grande project, it can be assumed that a greater than 10 percent but less than a 40 percent loss would occur. Therefore, the potential cumulative loss of Vancouver rye grassland is considered *significant* by this analysis. However, implementation of Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-BR-7 (Lake Level Management for Water Level Increases for Lake Merced) for the GSR Project would result in water levels being held below 9 feet City Datum, and therefore, with mitigation, the Project's incremental contribution to cumulative impacts on Vancouver rye grassland would not be cumulatively considerable (*less than significant*).

Fisheries and Fish Habitat

As noted in the modeled existing conditions and project-specific impacts analyses, rising water levels are not expected to have a *significant* impact on Lake Merced fisheries or beneficial uses. However, as described in Section 5.16, Hydrology and Water Quality, water levels decreasing below 0 feet City Datum could substantially reduce aquatic habitat and degrade water quality, thereby negatively affecting fish populations and the fish-related beneficial uses of Lake Merced, as well as potentially indirectly impacting special-status birds.

As modeled by Kennedy/Jenks (Kennedy/Jenks 2012), the cumulative scenario operations are predicted to result in water levels above 0 feet City Datum for about 90 percent of the model period and during that time would have no adverse impacts on fisheries or fish habitat. However, during pumping associated with the Take Periods proposed by the Regional Groundwater Storage and Recovery (GSR) Project combined with the proposed SFGW project pumping during the simulated prolonged drought (see Figures 5.16-11 [Simulated Lake Merced Level Changes] and 5.16-12 [Simulated Lake Merced Levels Relative to Modeled Existing Conditions]), water levels are predicted to fall as low as -4.9 City Datum, or 4.1 feet lower than the predicted minimum water surface elevation for modeled existing conditions. Relative to the modeled existing conditions, this would likely result in a further potential for a decrease in water quality from modeled existing conditions. Therefore, a *significant* cumulative impact on water quality could occur. However, for the majority of the approximately 10 percent of the model period where the water surface elevation is predicted to fall below 0 feet City Datum, which includes GSR Take Periods, the modeling consistently shows that the water surface elevation under the GSR Project is expected to be lower than the modeled existing conditions, but higher than the cumulative water surface elevation, while the water surface elevation under the SFGW project is expected to be significantly lower than any of the other model scenarios (see Figures 5.16-11 and 5.16-12). This suggests that the GSR Project's individual effects would ameliorate the project-specific effects of the SFGW project and that the GSR Project's contribution to the cumulative impact on water quality, fisheries, and fish-related beneficial uses would therefore not be cumulatively considerable (*less than significant*).

The Project's contribution to cumulative impacts is *less than significant*. Nevertheless, Mitigation Measures M-HY-9a (Lake Level Monitoring and Modeling for Lake Merced) and M-HY-9b (Lake Level Management for Lake Merced) require the SFPUC to implement lake level management procedures to address Project-specific impacts by maintaining Lake Merced at water levels similar to conditions that are predicted to occur without the Project. Implementation of this mitigation measure would therefore also serve to mitigate potential impacts on the fish habitat-related beneficial uses of Lake Merced by ensuring that adverse effects to water quality are avoided through lake level management. As a result, the contribution of the GSR Project to a *significant* cumulative impact relative to fish habitat would not be cumulatively considerable (*less than significant*).

Wetlands

Under the modeled cumulative condition, the water surface elevation of Lake Merced is predicted to fluctuate between -4.9 and 9.5 feet City Datum, with a mean of 6.1 feet (Kennedy/Jenks 2012). In addition, the water surface elevation is predicted to be between 6 and 9.5 feet City Datum (levels at which the extent of wetlands is predicted to increase such that there would be no net loss of wetlands) for about 65 percent of the time, and for periods of up to 19 to 26 months. For the remaining 35 percent of time, the water surface elevation of Lake Merced is predicted to be less than 6 feet City Datum, lasting for periods of up to 12 to 68 consecutive months. These durations would provide ample time to induce a loss of wetlands and their conversion to other habitat types. The GIS-based vegetation change analysis prepared for this EIR predicts losses, when compared to existing conditions, of up to 37 percent of wetland area (about 16 acres) at a lake surface elevation of 1 foot City Datum (Tables 5.14-14 and 5.14-15), much of which (about 10.5 acres) would be regained as water levels decline further to the cumulative predicted minimum of -4.9 feet City Datum. Therefore, wetland loss is also expected under the cumulative condition, but the losses would be less than those under modeled existing conditions, due to less frequent and shorter durations of inundation. Nonetheless, with implementation of the cumulative projects, water surface elevations would promote wetland loss for about 35 percent of the model period, and water surface elevations would promote wetland increases for about 65 percent of the model period. Therefore, over the model period, it is not expected that there would be a permanent cumulative loss of wetlands, and therefore the potential cumulative impact relative to loss of wetlands would be *less than significant*.

Wildlife nursery sites

As described in the modeled existing conditions impacts discussion, predicted rises in water surface elevations could result in a loss of rookery trees and other eucalyptus trees that provide potential alternate nesting substrate for herons and cormorants. Under the modeled cumulative scenario, the maximum water surface elevation is assumed not to exceed 9.5 feet City Datum, as discussed previously. The 2012 GIS-based vegetation change analysis conducted in support of this EIR predicts that about 10 percent of eucalyptus forest would be lost at a water surface elevation of 9 feet City Datum and 15 percent would be lost at 10 feet City Datum. Therefore, it is estimated that less than 15 percent would be lost at the maximum cumulative water surface elevation of 9.5 City Datum. While some rookery trees at North and South Lakes would be lost, ample eucalyptus forest would remain for nesting herons and cormorants to utilize. The most isolated stand of eucalyptus on East Lake would remain intact, with no expected loss of rookery trees due to water level rise. As shown in Table 5.14-17 (Predicted Loss of Eucalyptus Forest with Rising Water Levels) in the Impact BR-9 analysis, relative to predicted losses under modeled existing conditions, losses due to the cumulative projects would represent no more than an additional five percent loss of eucalyptus forest. Therefore, the cumulative impact on wildlife nursery sites would be *less than significant*.

5.14.4 References

CalBiota. *A California Species Compendium*. 2011. *Version 2.1. Electronic database of the biota of California*. Prepared by Michael Wood, Wood Biological Consulting, Walnut Creek.

California Department of Fish and Game (CDFG). 2000. *California Wildlife Habitat Relationships System, Species profile for western pond turtle* (Actinemys marmorata). Website accessed June 6, 2012 at: nrm.dfg.ca.gov/FileHandler.ashx?DocumentVersionID=18106. March.

CDFG. 2005. *California Wildlife Habitat Relationships System*. CWHR Version 8.1 for personal computer program. Sacramento, CA. Website accessed May 4, 2011 at: http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp.

CDFG. 2009. *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. Website accessed April 11, 2011 at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf. November 24.

CDFG. 2010. *List of Terrestrial Natural Communities recognized by the California Natural Diversity Database. Natural Diversity Database, Wildlife and Habitat Data Analysis Branch*. Database accessed April 11, 2011 at: http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf. September.

CDFG. 2011a. *Special Vascular Plants, Bryophytes, and Lichens List*. *Biannual publication, Mimeo*. Database accessed April 11, 2011 at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPPlants.pdf. January.

CDFG. 2011b. *State and Federally Listed Endangered, Threatened, and Rare Plants of California.* Habitat Conservation Division, California Natural Diversity Data Base. Database accessed April 11, 2011 at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEPlants.pdf. January.

CDFG. 2011c. *Special Animals*. California Natural Diversity Data Base. Database accessed April 11, 2011 at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPAnimals.pdf. January.

CDFG. 2011d. *State and Federally Listed Endangered and Threatened Animals of California.* Habitat Conservation Division, California Natural Diversity Data Base. Database accessed April 11, 2011 at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEAnimals.pdf. January.

CDFG. 2011e. *California Natural Diversity Database for San Francisco North and San Francisco South 7.5 minute topographic quadrangles*. February 27. Accessed on April 14, 2011.

CDFG. 2011f. *California Natural Diversity Data Base Print-out for the San Francisco North, San Francisco South, Montara Mountain and San Mateo 7.5-Minute USGS Topographic Quadrangles.* February 27.

California Native Plant Society (CNPS). 2011. *Inventory of Rare and Endangered Plants (online edition, v8-01a).* Online search San Francisco and San Mateo counties. California Native Plant Society. Sacramento, CA. Website accessed March 21, 2011 at: www.rareplants.cnps.org/.

Cicero, C. 2000. *Oak Titmouse* (Baeolophus inornatus), *The Birds of North America*, No. 485 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D. C.

Colma, Town of. 2006. *Colma Municipal Code. Subchapter Six: Tree Cutting and Removal*.

Corelli, T. and Z. Chandik. 1995. *The Rare and Endangered Plants of San Mateo and Santa Clara Counties.* Monocot Press, Half Moon Bay, California. 139 pp.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 131 pp. Website accessed at: http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm

Daly City, City of. 1996. *Municipal Code Title 12, Chapter 12.40, Urban Forestry*.

Desgranges, J., Ingram, J., Drolet, B., Morin, J., Savage, C., and Borcard, D. 2006. *Modeling Wetland Bird Response to Water Level Changes in the Lake Ontario-St. Lawrence River Hydrosystem, Environmental Monitoring and Assessment 113:* 329-365.

Dunk, J. E. 1995. *White-tailed kite* (Elanus leucurus), *The Birds of North America*, No. 178 (A. Poole and F. Gill, eds.) The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

EDAW. 2004. *Lake Merced Initiative to Raise and Maintain Lake Level and Improve Water Quality*, *Task 4 Technical Memorandum*. September.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1.* U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. 100 pp. Website accessed May 4, 2011 at: http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/pdf/delineation_manual.pdf. January.

Erlich, P.R., Dobkin, David S., and Wheye, D. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds, Simon and Schuster: NY.*

Gardali, T. and Evens, J. 2008. *San Francisco Common Yellowthroat*, , *California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California, [Studies of Western Birds 1]*., Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Golden Gate Audubon Society (GGAS). 2007. *Golden Gate Audubon's 90 Years at Lake Merced*, *The Gull, vol 92 (7),* pp. 1, 10-11. October.

Hickman, J.C. 1993. *The Jepson Manual: Higher Plants of California.* University of California Press, Berkeley, California. 1400 pp.

Holland, R. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California.* CDFG, The Resources Agency. 156 pp. Website accessed May 4, 2011 at: http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf.

Holland, V.L. and D.J. Keil. 1990. *California Vegetation, 4th edition*. Calif. Polytechnic State University, San Luis Obispo. 318 pp.

Jennings, M.R. and Hayes, M.P. 1994. *Amphibians and Reptiles of Special Concern in California*. Prepared for the California Department of Fish and Game Inland Fisheries Division Endangered Species Project.

Jones and Stokes. 2004. *Western Pond Turtle Habitat Management Plan*. Prepared for NASA Ames Research Center, December 17.

Jones and Stokes. 2007. *Probable Absence of California Red-Legged Frog from Lake Merced*.

Kelly, J.P., Etienne, K., Strong, C., McCaustland, M., and M.L. Parkes. 2006. *Annotated Atlas and Implications for the Conservation of Heron and Egret Nesting Colonies in the San Francisco Bay Area*. Prepared for Audubon Canyon Ranch [ACR Technical Report 90-3-17. August.

Kennedy/Jenks Consultants (Kennedy/Jenks). 2012. *Assessment of Groundwater-Surface Water Interactions for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project, Task 10.2 Technical Memorandum*. Prepared for San Francisco Public Utilities Commission (SFPUC). May 1.

Krauel, J.K. 2009. *Foraging Ecology of Bats in San Francisco, M.S. Thesis, San Francisco State University*. Available for review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2001.0016E.

Lake Merced Task Force (LMTF). 2007. *Lake Merced Fish Community Study*. Prepared by Maristics for Lake Merced Task Force and S.F. Department of Recreation and Parks.

Millbrae, City of. n.d. *Municipal Code Chapter 8.60, City of Millbrae Tree Protection and Urban Forestry Program*.

Murphy, D.P. 1999. *Breeding Bird Records for Lake Merced, San Francisco, California: 1997, 1998, 1999*. Golden Gate Audubon Society. Website accessed June 18, 2012 at: http://www.lmtf.org/FoLM/Data/bird_listing.html. July 19.

Nomad Ecology. 2011. *Lake Merced Vegetation Mapping Update, Lake Merced Natural Area, City and County of San Francisco, California (revised draft)*. Prepared for San Francisco Public Utilities Commission. May.

Riensche, D.L., Mena, John D., and Shawen, A.B. 2009. *Western and Clark's Grebe Nest Platforms Designed for Fluctuating Water Levels, Transactions of the Western Section of the Wildlife Society 45*: 7-16.

San Bruno, City of. 2002. *Heritage Trees*. Website accessed October 1, 2009 at: http://sanbruno.ca.gov/parks_heritagetrees.html.

San Francisco Field Ornithologists (SFFO).2003. *San Francisco Breeding Bird Atlas*. Website accessed June 18, 2012 at: http://www.markeaton.org/sffo1/Breeding%20Ecology/San%20Francisco%20Breeding%20Bird%20Atlas.pdf.

San Francisco Planning Department. 2011. *Significant Natural Resource Areas Management Plan Draft Environmental Impact Report, Planning Department Case No. 2005.1912E, State Clearinghouse No. 2009042102*. August.

San Francisco Public Utilities Commission (SFPUC). 2007. *Integrated Vegetation Management Policy*. February.

SFPUC. 2011. *Lake Merced Watershed Report*. January.

SFPUC. 2013. *Biological Impacts due to Increase in Lake Merced Water Levels and Feasibility of Mitigation Measures to Decrease Water Levels.* March 11.

San Francisco Recreation and Parks Department (SFRPD). 2006. *Significant Natural Resource Areas – Final Draft*. February.

San Mateo County, Planning and Building Division. 1977. *Ordinance No. 2427 – Regulation of the Removal and Trimming of Heritage Trees on Public and Private Property*. April 5.

San Mateo County, Planning and Building Division. 1990. *San Mateo County Ordinance Code, Part III, Division VIII. The Significant Tree Ordinance of San Mateo County.*

Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation.* California Native Plant Society, Sacramento. 471 pp. Website accessed at: http://davisherb.ucdavis.edu/CNPSActiveServer/index.html

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans. 2009. *A Manual of California Vegetation* (2nd edition). California Native Plant Society, Sacramento. 1300 pp. Website accessed April 13, 2011 at: http://www.cnps.org/cnps/vegetation/manual_2ed.php.

South San Francisco, City of. 2010. *Addendum to the 2000 El Camino Real Redevelopment Plan Amendment Supplemental Environmental Impact Report. SCH #1999-032051*. Prepared for 1309 Mission Road, South San Francisco, California. November.

South San Francisco, City of. n.d. *City of South San Francisco Municipal Code. Title 13 Public Improvements, Chapter 13.30 Tree Preservation.*

Stillwater Sciences. 2009. *Increased Lake Merced water level impacts on vegetation, Technical Memorandum.* Prepared for the San Francisco Public Utilities Commission. March 11.

USACE. 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0); Final Report.* ERDC/EL TR-08-28. U.S. Army Engineer Research and Development Center, Vicksburg, MS. Website accessed May 4, 2011 at: http://www.usace.army.mil/CECW/Documents/cecwo/reg/trel08-28.pdf.

U.S. Fish and Wildlife Service (USFWS). 2011a. *Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the San Francisco North, San Francisco South, Montara Mountain and San Mateo USGS 7.5' Quadrangles.* Threatened and Endangered Species System (TESS) printout. Database accessed March 21, 2011 at: http://www.fws.gov/sacramento/es/spp_lists/auto_list_form.cfm.

USFWS. 2011b. *Chesapeake Bay Field Office, Northeast Region, Great Blue Heron* (Ardea herodias). January. Website accessed June 1, 2012 at: http://www.fws.gov/chesapeakebay/heron.html.

Vermont Fish and Wildlife Department (VFWD), Agency of Natural Resources. 2002. *Guidelines for Protection and Mitigation of Impacts to Great Blue Heron Rookeries in Vermont*. Website accessed June 18, 2012 at: http://www.vtfishandwildlife.com/library/Reports_and_Documents/NonGame_and_Natural_Heritage/Guidelines%20for%20Great%20Blue%20Heron%20Rookeries.pdf.

Ward & Associates. 2012. *Biological Survey Report (including Tree Inventory) for the Regional Groundwater Storage and Recovery Project*. June.

Yosef, R. 1996. *Loggerhead Shrike* (Lanius ludovicianus), *The Birds of North America, No. 178*. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

5.15 GEOLOGY AND SOILS

The descriptions of geology, soils, and seismic hazards in this section rely on information gathered from the U.S. Geologic Survey (USGS), the Natural Resources Conservation Service ([NRCS]; previously known as the Soil Conservation Service), the California Geologic Survey (CGS), and three geotechnical investigations[1] prepared for the San Francisco Public Utilities Commission (SFPUC) by Geotechnical Consultants, Inc. for Sites 1, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, and 16 (Geotechnical Consultants 2009a, 2009b, 2012). These reports have been reviewed to determine relevant information for the EIR analysis and Project facility sites are evaluated for their potential to be affected by or to increase risks associated with identified geologic and seismic hazards. Appropriate mitigation measures are identified for impacts determined to be significant.

5.15.1 Setting

5.15.1.1 Regional Physiography

The Project would be located on the San Francisco Peninsula (Peninsula), which is part of the Coast Ranges Geomorphic Province (Coast Ranges). The topography of the Coast Ranges is characterized by northwest-southeast-trending mountain ridges and intervening valleys that have formed over millions of years due to movements of the earth's crust (referred to as tectonics). The bedrock underlying the Coast Ranges is referred to as the Franciscan Complex – a mixture of ancient seafloor sediments and volcanic rocks that have undergone alteration by heat and pressure deep within the earth. This rock unit forms most of the hills and mountains of the Peninsula. Overlying the Franciscan Complex bedrock are geologically young sedimentary deposits that are generally flat and underlie most of the urban core of the San Francisco Bay Area (Bay Area). Many of these basin deposits form when streams, bays, and estuaries deposit materials shed from surrounding hills and mountains. The mountains and hills of the San Francisco Peninsula are separated from the parallel range of the East Bay Hills by San Francisco Bay. The proposed facility sites on the Peninsula are located east of the San Andreas Fault Zone, along flatlands adjacent to San Francisco Bay.

5.15.1.2 Project Area Geology

The geological setting of the Project area is based on information from two USGS geologic maps (USGS 1998a, 1998b) and the three geotechnical reports mentioned above (Geotechnical Consultants 2009a, 2009b, 2012).

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[1] Due to the close proximity of sites, the information in the geotechnical investigation for Site 4 was used to characterize Sites 2 and 3; the information regarding Sites 8, 10, and 12 was used to characterize Sites 17 (Alternate), 18 (Alternate), and 19 (Alternate), respectively; and the information for Site 15 was used to characterize Site 14. Due to access issues, a geotechnical investigation has not yet been performed for Site 11. Regional geologic, liquefaction, and soil mapping was used to characterize Site 11. The SFPUC would conduct site specific investigations for alternate sites if they are chosen for construction (SFPUC 2012).

As shown on Figure 5.15-1 (Project Geology Map), the proposed facility sites would be located on flatlands underlain by Colma Formation, alluvium deposits, slope debris/ravine fill, natural levee deposits, and artificial fill. Table 5.15-1 (Geologic Units, Landslide, Liquefaction Susceptibility and Shaking Severity Levels at Facility Sites) lists the geologic units identified at each site where excavation or other ground disturbance would occur and the landslide and liquefaction susceptibilities of each unit. The Colma Formation consists predominantly of damp to moist, medium dense to very dense, silty sand, and poorly graded sand with silt. Artificial fill consists of damp to moist, loose to medium dense, silty sand, silty fine sand, and sandy silt. Natural levee deposits consist of damp to moist, loose to medium dense, poorly graded fine sand to silty fine sand (Geotechnical Consultants2009a, 2009b). The alluvium in the study area is mostly sand and silt, but locally contains clay, gravel, or boulders (USGS 1998a). Slope debris and ravine fill overlying the Colma Formation is typically silty to clayey sand, or gravel and unstratified or poorly stratified.

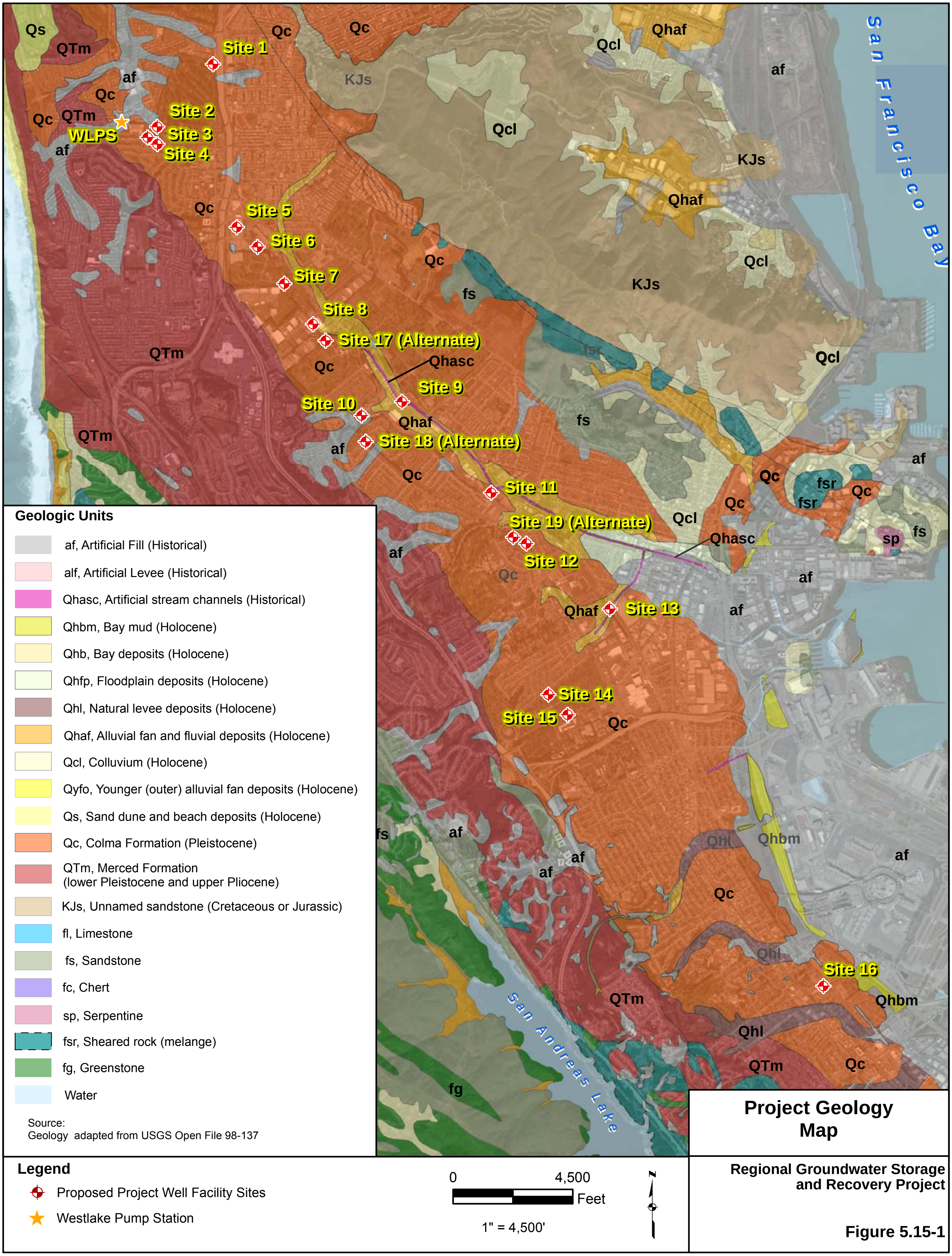
San Francisco Bay
San Andreas Lake
Site 1
Site 2
Site 3
Site 4
WLPS
Site 5
Site 6
Site 7
Site 8
Site 17 (Alternate)
Site 9
Site 10
Site 18 (Alternate)
Site 11
Site 19 (Alternate)
Site 12
Site 13
Site 14
Site 15
Site 16
Qs
QTm
Qc
af
KJs
Qcl
Qhaf
Qhasc
fs
fsr
sp
Qhl
Qhbm
fg
Geologic Units
af, Artificial Fill (Historical)
alf, Artificial Levee (Historical)
Qhasc, Artificial stream channels (Historical)
Qhbm, Bay mud (Holocene)
Qhb, Bay deposits (Holocene)
Qhfp, Floodplain deposits (Holocene)
Qhl, Natural levee deposits (Holocene)
Qhaf, Alluvial fan and fluvial deposits (Holocene)
Qcl, Colluvium (Holocene)
Qyfo, Younger (outer) alluvial fan deposits (Holocene)
Qs, Sand dune and beach deposits (Holocene)
Qc, Colma Formation (Pleistocene)
QTm, Merced Formation
(lower Pleistocene and upper Pliocene)
KJs, Unnamed sandstone (Cretaceous or Jurassic)
fl, Limestone
fs, Sandstone
fc, Chert
sp, Serpentine
fsr, Sheared rock (melange)
fg, Greenstone
Water
Source:
Geology adapted from USGS Open File 98-137
Legend
Proposed Project Well Facility Sites
Westlake Pump Station
0
4,500
Feet
1" = 4,500'
N
Project Geology Map
Regional Groundwater Storage and Recovery Project

Figure 5.15-1

TABLE 5.15-1
Geologic Units, Landslide, Liquefaction Susceptibility and Shaking Severity Levels at Facility Sites

Site	Geologic Unit [(a)]	Landslide Area Type [(b)]	Liquefaction Susceptibility [(c)]	Shaking Severity Level [(d)]
Site 1	Colma Formation, artificial fill	flat land	low	violent
Site 2	Colma Formation, Slope debris and ravine fill	flat land	very low	violent
Site 3	Colma Formation, Slope debris and ravine fill	flat land	very low	violent
Site 4	Colma Formation, artificial fill	flat land	low	violent
Westlake Pump Station	Colma Formation, artificial fill	flat land	low	violent
Site 5	Colma Formation, artificial fill	flat land	low	violent
Site 6	Colma Formation, artificial fill	flat land	low	violent
Site 7	Colma Formation, artificial fill	flat land	low	violent
Site 8	Colma Formation, artificial fill, natural levee deposits	flat land	low	violent
Site 9	Colma Formation, artificial fill	flat land	low	violent
Site 10	Colma Formation, artificial fill, natural levee deposits	flat land	low	violent
Site 11	Colma Formation, Alluvium	flat land	very low, high[(e)]	violent
Site 12	Colma Formation, artificial fill	flat land	low	violent
Site 13	Colma Formation, artificial fill, natural levee deposits	flat land	low	violent
Site 14	Colma Formation	flat land	very low	violent
Site 15	Colma Formation, artificial fill	flat land	low	violent
Site 16	Colma Formation, artificial fill	flat land	low	violent
Site 17 (Alternate)	Colma Formation, Alluvium	flat land	very low, high[(e)]	violent
Site 18 (Alternate)	Colma Formation, artificial fill	flat land	very low, moderate	violent
Site 19 (Alternate)	Colma Formation	flat land	very low	violent

Notes:

(a) From Geotechnical Consultants 2009a, 2009b, 2012; USGS 1998a.

(b) From USGS 1997.

(c) Liquefaction susceptibility for Sites 1, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, and 16 is based on site-specific geotechnical data (Geotechnical Consultants 2009a, 2009b, 2012). Liquefaction susceptibility for Sites 2, 3, Westlake Pump Station, 11, 14, 17 (Alternate), 18 (Alternate), and 19 (Alternate) is based on regional liquefaction mapping (USGS 2006).

(d) Modified Mercalli Intensity Scale Value of IX (Violent) as modeled for 1906 Earthquake.

(e) USGS regional liquefaction mapping indicates liquefaction susceptibilities ranging from “very low” to “high” at Site 11 and Site 17 (Alternate).

5.15.1.3 Geologic Hazards

Slope Failure

Slope failures and landslides involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience soil slumps, rapid debris flows, and deep-seated rotational slides. Slope stability can depend on a number of complex variables, including the geology, soil structure, and amount of groundwater, as well as external processes such as climate, topography, slope geometry, and human activity. The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope. Landslides can occur on slopes of 15 percent or less, but the probability is greater on steeper slopes that exhibit old landslide features such as scarps[2], slanted vegetation, and transverse ridges[3]. Landslides typically occur within slide-prone geologic units that contain excessive amounts of water, are located on steep slopes, or where planes of weakness are parallel to the slope angle.

In 1998, USGS released a preliminary map and geographic information system (GIS) database that provides a summary of the distribution of landslides evident in the landscape of the San Francisco Bay region (USGS 1997). The map is a digitized nine-county compilation of existing landslides, including San Mateo County and encompassing the facility sites. The landslide area type for each well facility site where excavation or other ground disturbance would occur is summarized in Table 5.15-1 (Geologic Units, Landslide, Liquefaction Susceptibility and Shaking Severity Levels at Facility Sites). The proposed facility sites are located in areas mapped as flat land, which is defined as areas of gentle slope at low elevation that have little or no potential for the formation of slumps, transitional slides, or earth flows except along stream banks or terrace margins (USGS 1997).

Although all sites have been mapped as flat land by the USGS, geotechnical investigations, surveys, and field visits indicate that mild to moderate slopes exist at Sites 4, 6, 7, 17 (Alternate), and 18 (Alternate). The terrain at Site 4 is characterized as mildly sloping, generally less than seven percent slopes, along Park Plaza Drive, with an embankment (about 20-foot high) that descends on an approximately 30 percent slope from the proposed site to the Jefferson Elementary School playing field (Geotechnical Consultants 2012). Site 6 would be located on mildly sloping terrain generally less than 20 percent slopes (Geotechnical Consultants 2009b). Site 7 would be located on mildly sloping grassy terrain (Geotechnical Consultants 2009a). Although geotechnical investigations have not been performed for Sites 17 (Alternate) and 18 (Alternate), field visits indicate that the sites have moderate slopes that are slightly greater than 20 percent.

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[2] A scarp is a cliff formed by faulting, erosion, or landslides.
[3] Transverse ridges are linear ridges within an existing landslide.

Naturally Occurring Asbestos

Asbestos is a common name for a group of naturally occurring fibrous silicate minerals that are made up of thin, but strong, durable fibers. Asbestos is a known carcinogen and presents a public health hazard if it is present in the friable (easily crumbled) form. The underlying geology of the facility sites consists primarily of the Colma Formation, with small pockets of alluvium, slope debris/ravine fill, and artificial fill. Franciscan ultramafic rock, including serpentine, is not mapped in the vicinity of the proposed facility sites (Geotechnical Consultants 2009a, 2009b, 2012; USGS 1998b). In addition, based on review of Open File Report 2000-19 (*A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally Occurring Asbestos*), no ultramafic rock units occur in the areas of the facility sites (CDC 2000). The potential to encounter naturally occurring asbestos is further addressed in Section 5.17, Hazards and Hazardous Materials.

Soils

Soil surveys performed by the NRCS, in cooperation with the Regents of the University of California, provide information on surface and near-surface soil materials in the Project area. Table 5.15-2 (Soil Properties in the Project Area) lists each soil type identified at facility sites and is based on the *Soil Survey of San Mateo County, Eastern Part, and San Francisco County* (NRCS 1991).

Problematic soils, such as those that are expansive or corrosive, can damage structures and buried utilities and increase maintenance requirements. Expansive soils are characterized by their ability to undergo significant volume change (i.e., to shrink and swell) due to variations in moisture content. Changes in soil moisture can result from rainfall, landscape irrigation, utility leakage, roof drainage, and/or perched groundwater. Expansive soils are typically very fine grained and have a high to very high percentage of clay. Expansion and contraction of expansive soils in response to changes in moisture content can lead to differential and cyclical movements that can cause damage and/or distress to structures and equipment.

The corrosivity of soils is commonly related to several key parameters, including soil resistivity, the presence of chlorides and sulfates, oxygen content, and pH. Typically, the most corrosive soils are those with the lowest pH and highest concentration of chlorides and sulfates. Wet/dry conditions can result in a concentration of chlorides and sulfates, as well as movement in the soil, both of which tend to break down the protective corrosion films and coatings on the surfaces of building materials. High-sulfate soils are also corrosive to concrete and may prevent complete curing, reducing the strength of the concrete considerably. Low pH and/or low-resistivity soils can corrode buried or partially buried metal structures. Depending on the degree of corrosivity of the subsurface soils, building materials such as concrete, reinforcing steel in concrete structures and bare-metal structures exposed to these soils can deteriorate, eventually leading to structural failures.

Soil types identified include Orthents, which are soils that have been cut and filled for recreational or urban development, and Urban Land, which is covered by asphalt, concrete, buildings, or other structures.

TABLE 5.15-2
Soil Properties in the Project Area

Soil Unit	Runoff Class	Water Erosion	Shrink/Swell Potential
Orthents, cut and fill, 0-15 percent slope	Medium	Moderate	Low
Orthents, cut and fill-Urban land complex, 5-75 percent slopes	Medium to Very Rapid	Moderate to Very High	Low
Urban Land	Not applicable	Not applicable	Not applicable
Urban land-Orthents, smoothed complex, 5-50 percent slopes	Medium to Rapid	Moderate to High	Low

Source: NRCS 1991

The properties and characteristics of the soil types described above are highly variable because of the differences in the kind and amount of fill material used. These soils vary greatly in thickness and in the texture of the surface layer. Most of these soil units in the Project area are overlain by recreational development, cemeteries, and urban development land uses (NRCS 1991).

5.15.1.4 Regional Faulting and Seismic Hazards

Seismicity

The Bay Area is situated near the boundary between two major tectonic plates, the Pacific Plate to the southwest and the North American Plate to the northeast. Since the Miocene epoch (approximately 23 million years ago), about 200 miles of right-lateral slip has occurred along the San Andreas Fault Zone to accommodate the relative movement between these two plates. This movement has juxtaposed the granitic rocks southwest of the San Andreas Fault with the Franciscan Complex rocks lying to the northeast. The movement between the Pacific Plate and the North American Plate generally occurs across a 50-mile zone extending from the San Gregorio fault in the southwest to the Great Valley Thrust Belt to the northeast. In addition to the right-lateral slip movement between tectonic plates, a compressional component of relative movement has developed during the last 3.5 million years between the Pacific Plate and the Sierran micro-plate of the North American Plate at the latitude of San Francisco Bay.

Figure 5.15-2 (Regional Fault Map) shows the locations of active[4] and potentially active[5] faults in the San Francisco Bay region. The San Andreas, San Gregorio, Hayward, Rodgers Creek, Calaveras, and Greenville strike-slip faults[6] are active faults of the San Andreas system that predominantly

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[4] An active fault is one that shows geologic evidence of movement within Holocene time (approximately the last 11,000 years).
[5] A potentially active fault is one that shows geologic evidence of movement during the Quaternary period (approximately the last 1.6 million years).
[6] Strike-slip faults involve the two blocks moving parallel to each other without a vertical component of movement.

accommodate lateral movement between the North American and Pacific tectonic plates. Active blind- and reverse-thrust faults[7] in the San Francisco Bay region that accommodate compressional movement include the Monte Vista-Shannon and Mount Diablo faults. The San Andreas Fault is the nearest active fault, located 1.2 to 2.3 miles from the various proposed facility sites (CDC 1982a, 1982b).

The USGS estimates that there is a 63 percent probability of a strong earthquake (magnitude 6.7 or higher on the Richter Magnitude Scale) occurring on one of the regional faults in the 30-year period between 2007 and 2036, with a 21 percent chance of such an earthquake occurring on the northern San Andreas fault, the closest fault to the proposed Project (USGS 2008). Strong groundshaking and other earthquake-related phenomena could occur at facility sites due to a major earthquake on the San Andreas fault or one of the other regional faults, including the Hayward and Calaveras faults – each of which parallels the San Andreas fault and is capable of generating large (greater than magnitude 6.7) earthquakes.

Fault Rupture

Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Surface ruptures associated with the 1906 San Francisco earthquake extended for more than 260 miles, with displacements of up to 21 feet. However, not all earthquakes result in surface rupture. The Loma Prieta earthquake of 1989 caused major damage in the Bay Area, but the fault movement did not break through to the ground surface.

Fault rupture almost always follows pre-existing faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they can suddenly displace structures and are accompanied by shaking. Fault creep is the slow rupture of the earth's crust. In developed areas, fault creep can offset and deform curbs, streets, buildings, and other structures that lie on the fault trace. Active fault traces do not cross facility sites (Geotechnical Consultants 2009a, 2009b, 2012; CDC 1982a, 1982b).

Groundshaking

The intensity of the seismic shaking, or strong ground motion, during an earthquake is dependent on the distance between the Project area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the Project area. Earthquakes occurring on faults closest to the Project area would most likely generate the largest ground motions.

The intensity of earthquake-induced ground motions and the potential forces affecting structures within the Project area can be described using peak ground accelerations, which are represented as a fraction of

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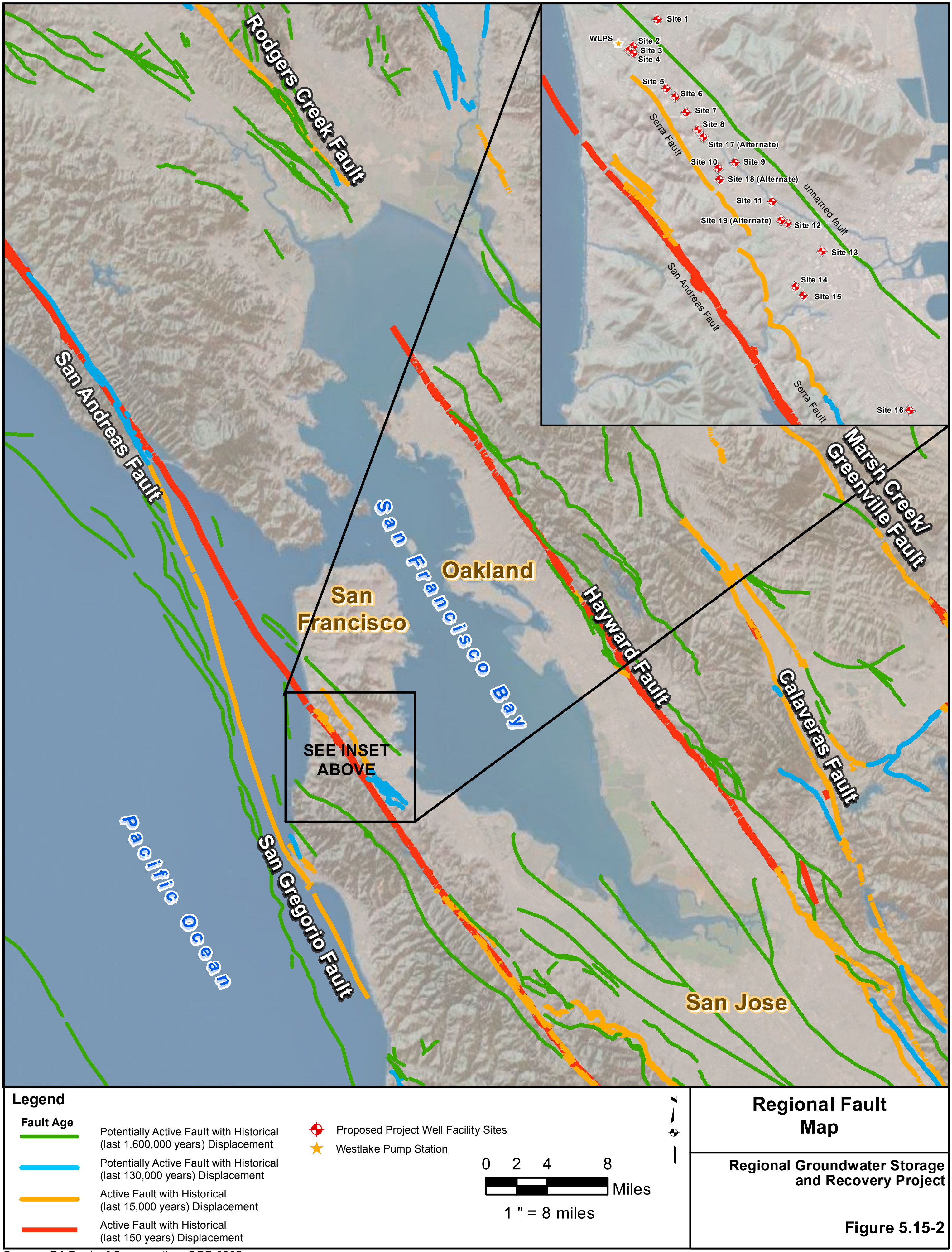
[7] A reverse fault is one with predominantly vertical movement in which the upper block moves upward in relation to the lower block; a thrust fault is a low-angle reverse fault. Blind-thrust faults are low-angled subterranean faults that have no surface expression.



Source: CA Dept. of Conservation, CGS 2005 the acceleration of gravity (g).[8] The CGS estimates the peak ground accelerations for the 10 percent probability of exceedance in 50 years (475-year return period) at 0.67g to 0.69g (USGS 2008).

Liquefaction

Liquefaction is a phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced, strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects.

The USGS classifies liquefaction susceptibility into five categories that describe: the likely proportion of all liquefaction occurrences that could take place in each category; the abundance or frequency of liquefaction occurrence within the category; the strength of shaking required to produce liquefaction; and the Quaternary-age geologic units included (USGS 2006). The five categories are described as follows:

- **Very High.** The USGS estimates that about 40 to 50 percent of future liquefaction effects would occur within geologic units assigned this category. Only modest groundshaking (peak ground acceleration of about 0.1g) would be required to cause liquefaction. Geologic map units that fall within this category include the latest Holocene and historical stream channel deposits, as well as artificial fills over bay and other estuarine mud.
- **High.** The USGS estimates that about 20 to 30 percent of future liquefaction effects would occur within geologic units assigned this category. Relatively modest groundshaking (peak ground acceleration of about 0.1g to 0.2g) would be required to cause liquefaction. Geologic map units within this category include the latest Holocene and historical alluvium, natural levees, and stream terraces.
- **Moderate.** The USGS estimates that about 20 to 30 percent of future liquefaction effects would occur within geologic units assigned this category. Somewhat stronger groundshaking (greater than peak ground acceleration of about 0.1g to 0.2g) would be required to cause liquefaction. Geologic map units within in this category include the latest Pleistocene and Holocene bay and other estuarine mud, alluvial fan and levee deposits, and stream terrace deposits.
- **Low.** The USGS estimates that about two percent of future liquefaction effects would occur within geologic units assigned this category. Stronger groundshaking (peak ground acceleration of about 0.5g) would be required to cause liquefaction. Geologic map units within in this category include the basin deposits, various late Pleistocene deposits and Pleistocene marine terrace deposits.

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[8] Acceleration of gravity (g) = 980 centimeters per second squared. 1.0g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

- **Very Low.** The USGS estimates that about two percent of future liquefaction effects would occur within geologic units assigned this category. Stronger groundshaking (greater than peak ground acceleration of about 0.6g) would be required to cause liquefaction. Geologic map units within in this category include Pleistocene deposits, pre-Quaternary deposits and bedrock.

The liquefaction susceptibility at each facility site requiring excavation or other ground disturbance is shown in Table 5.15-1 (Geologic Units, Landslide, Liquefaction Susceptibility and Shaking Severity Levels at Facility Sites). In general, liquefaction susceptibility levels are low because of the generally dense and clayey nature of the Colma Formation and the depth to groundwater at the sites. However, USGS regional liquefaction mapping indicates moderate to high liquefaction susceptibility at portions of some sites (USGS 2006). Because the USGS mapping has a regional focus, the mapping only generally correlates with areas of known liquefaction hazard. The site-specific data generated from on-site geotechnical borings are considered to be more indicative of liquefaction potential and, therefore, are used instead of the USGS mapping to characterize most of the sites (Geotechnical Consultants 2009a, 2009b, 2012). The aforementioned USGS regional mapping indicates a high liquefaction potential – and geotechnical investigations have not been performed – for portions of Sites 11, 17 (Alternate), and 18 (Alternate). However, these three well facility sites are located in proximity to sites for which geotechnical investigations have been performed (Sites 12, 8, and 10, respectively) and for which site-specific data indicate a low liquefaction susceptibility (Geotechnical Consultants 2009a, 2009b, 2012). Sites 11, 17 (Alternate), and 18 (Alternate) would be located close to, and within, similar geologic units and groundwater conditions as, Sites 12, 8, and 10, respectively; therefore, the liquefaction susceptibility levels at these sites are characterized as low.

Lateral Spreading

Of the liquefaction hazards, lateral spreading generally causes the most damage. Lateral spreading refers to landslides that commonly form on gentle slopes and that have rapid fluid-like flow movement, like water (USGS 2012). During lateral spreading, a mass moves toward an unconfined area, such as a descending slope or stream-cut bluff, and can occur on slope gradients as gentle as one degree. Drainages and swales between hill slopes are generally filled by alluvium[9], colluvium, landslide debris, and slope wash. Unconsolidated deposits often develop soils along steep and shallow slopes in these areas. Well facility Sites 17 (Alternate) and 18 (Alternate) have moderate slopes and are mapped by USGS as having moderate to high liquefaction susceptibility (USGS 2006). These characteristics could potentially make facilities at Sites 17 (Alternate) and 18 (Alternate) susceptible to lateral spreading. However, as described in the previous section on liquefaction, these sites are located in proximity to sites for which geotechnical investigations have been performed (Sites 8 and 10) and for which site-specific data indicate low liquefaction susceptibility (Geotechnical Consultants 2009a, 2009b, 2012). Sites 17 (Alternate) and 18 (Alternate) would be located close by, and within, similar geologic units with groundwater conditions similar to Sites 8 and 10, respectively. Therefore, the liquefaction and associated lateral spreading

[9] Alluvium consists of unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams.

susceptibility levels at these sites are characterized as low, consistent with the classification for Sites 8 and 10 in the geotechnical reports prepared by Geotechnical Consultants, Inc.

Earthquake-induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, non-compacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or bay mud. Facility sites with underlying artificial fills and other potentially unstable soils with a moderately high hazard from seismically induced settlement include Sites 1, 5, 8, 12, 13, 14, 15, and 16 (Geotechnical Consultants 2009a, 2009b, 2012). Sites 17 (Alternate) and 18 (Alternate) are close to, and within, similar geologic units and groundwater conditions as Sites 8 and 10, respectively. Therefore, this analysis assumes that hazards from earthquake-induced settlement may be moderately high at these sites, as well.

Seismic Slope Instability/Ground Cracking

Earthquake motion can also induce substantial stresses in slopes, causing earthquake-induced landslides or ground cracking when the slope fails. Earthquake-induced landslides can occur in areas with steep slopes that are susceptible to strong ground motion during an earthquake. The 1989 Loma Prieta earthquake triggered thousands of landslides over an area of 770 square miles. Well facility sites with moderate slopes that could potentially be susceptible to seismic slope instability include Sites 2, 4, 6, and 7 (Geotechnical Consultants 2009a, 2009b, 2012). Sites 17 (Alternate) and 18 (Alternate) also have moderate slopes. Therefore, this analysis assumes that Sites 17 (Alternate) and 18 (Alternate) may be susceptible to seismic slope instability.

5.15.2 Regulatory Framework

5.15.2.1 Federal

No federal regulations are associated with geology, soils, and seismicity for the proposed Project.

5.15.2.2 State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the State Geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Because many active faults are complex and consist of more than one branch, each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace.

Title 14 of the California Code of Regulations (CCR), Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. The proposed Project does not cross an Alquist-Priolo Earthquake Fault Zone (Figure 5.15-2 [Regional Fault Map]) and does not include buildings that meet this criterion for human occupancy. Therefore, these provisions of the act do not apply to the Project.

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (Public Resources Code [PRC] Sections 2690 to 2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong groundshaking, liquefaction and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act: the State is charged with identifying and mapping areas at risk of strong groundshaking, liquefaction, landslides, and other corollary hazards, with cities and counties required to regulate development within mapped Seismic Hazard Zones.

Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites within Seismic Hazard Zones until appropriate site-specific geologic and/or geotechnical investigations have been conducted and measures to reduce potential damage have been incorporated into the development plans. The Seismic Hazard Maps released for San Mateo County include liquefaction and landslides maps covering the southeastern portion of the County. The Seismic Hazard Maps for the San Francisco South and Montara Mountain USGS quadrangles, which cover the Project area, are under development and have not been published by the CGS.

Building Codes

The California Building Code (CBC), which is codified in CCR Title 24, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The 2007 CBC is based on the 2006 International Building Code (IBC) published by the International Code Conference. In addition, the CBC contains necessary California amendments that are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads, as well as other loads (e.g., flood, snow, wind) for inclusion in building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

5.15.2.3 Local

SFPUC General Seismic Design Requirements

The SFPUC established the General Seismic Design Requirements (SFPUC 2009) to implement consistent criteria for the design and retrofit of all facilities and components of the regional water system. These design requirements require that every Water System Improvement Program (WSIP) project must have project-specific design criteria based on the local seismic environment and the importance of the subject facility to achieve the water service delivery goals in the event of a major earthquake. A major earthquake is identified in the General Seismic Design Requirements as earthquakes of M 7.8 or larger on the San Andreas Fault, M 7.1 or larger on the Hayward Fault, or M 6.8 or larger on the Calaveras Fault. The design criteria are based on standard industry practices, codes and standards, but exceed these requirements for facilities that are located in a severe seismic environment and are needed to achieve water system delivery goals. Under these design requirements, each facility is evaluated for its necessity in meeting the water service delivery goals and assigned a seismic performance class for the purposes of determining appropriate seismic design criteria. As described in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types), the SFPUC has classified the proposed facilities as “Important” (Class II), which is defined as facilities that may experience damage, but should be capable of restoration to service within 30 days.

5.15.3 Impacts and Mitigation Measures

5.15.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect related to geology, soils, and seismicity if it were to:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (Refer to Division of Mines and Geology Special Publication 42).
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides.

- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property.
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.
- Change substantially the topography or any unique geologic or physical features of the site.

5.15.3.2 Approach to Analysis

The potential for impacts related to geology, soils, and seismicity are evaluated according to the significance criteria listed above. Regional and local geologic maps and reports, as well as Project-specific geologic and geotechnical reports, were reviewed to identify geologic conditions and geologic hazards in the study area that, because of their proximity, could be directly or indirectly affected by the proposed Project or could affect the Project.

Area of No Project Impact

The following four significance criteria will not be discussed further in this section for the following reasons:

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. This significance criterion is intended to address facility siting and design impacts and does not apply to temporary construction impacts. Therefore, this significance criterion is not applicable to Project construction activities and is only discussed below as it relates to potential long-term operational impacts.

Result in substantial soil erosion or the loss of topsoil. The proposed well facility sites have been highly altered from their original, natural state. As a result, the depth and amount of grading and excavation proposed by the SFPUC (see Table 3-10, Construction Soil Material Haul Amounts and Anticipated Haul Truck Trips) would result in little disturbance to native soils[10]. In addition, the proposed sites are near areas of moderate to intense urban uses, such as surface streets, schools, single- or multi-family residences, recreational, commercial, and industrial facilities, and the sites are not located in areas supporting agricultural uses. Consequently, no substantial loss of topsoil due to erosion or grading is anticipated during construction or operation of the Project.

[10] 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 (see Chapter 3, Project Description, Section 3.5.1.2 [Construction of Well Facilities]); whereas, in general, pipeline trenches would be excavated to a depth of up to six feet and would be approximately 10 feet wide (see Chapter 3, Project Description, Section 3.5.1.3 [Water Distribution and Utility Pipeline Installation]).

Therefore, this significance criterion is not discussed further in this section. In addition, there would be no loss of topsoil or accelerated erosion during well operations given that the disturbed areas around the well facility would be restored to the general pre-construction conditions, and disturbed areas would be hydroseeded and receive erosion control measures as necessary (see Chapter 3, Project Description, Section 3.5.1.1 [Construction Methods for Production Wells]). Nevertheless, potential construction and operation impacts on water quality associated with soil erosion are addressed in Section 5.16, Hydrology and Water Quality.

Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property. This significance criterion is intended to address facility siting and design impacts; it does not apply to temporary construction impacts. Therefore, this significance criterion is not applicable to Project construction activities and is only evaluated as it relates to potential long-term operational impacts.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems. Project facility sites would be connected to municipal sewer systems and would not involve the construction or use of septic tanks or alternative wastewater disposal system. Therefore, the criterion related to capability of soils to support septic tanks or alternative wastewater disposal systems is not applicable to construction or operation of the Project.

Change the topography or any unique geologic or physical features of the site(s). Operation of the well facilities would not change the topography or impact geologic features given that the wells and buildings would be in place and no additional ground disturbance would occur during project operations. Therefore, this significance criterion is not applicable to long-term operational impacts and is only discussed below as it relates to Project construction activities.

The evaluation of potential geology and soil impacts in this section relies on information gathered from geotechnical investigations prepared specifically for the proposed Project, as well on published geologic hazard maps and site visits. As stated above, three geotechnical investigations were performed for Sites 1, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, and 16 (Geotechnical Consultants 2009a, 2009b, 2012). For the purposes of this analysis, the information in the geotechnical investigations for Site 4 was used to characterize the conditions at Sites 2 and 3 because these sites are located in close proximity to one another. The information in the geotechnical reports for Sites 8, 10, and 12 were used to characterize conditions at Sites 17 (Alternate), 18 (Alternate), and 19 (Alternate), and information for Site 15 was used to characterize conditions at Site 14 for the purpose of this analysis. Due to access issues, a geotechnical investigation has not yet been performed for Site 11. Regional geologic, liquefaction, and soil mapping was used to characterize Site 11.

5.15.3.3 Impact Summary

For the remaining significance criteria, specific impact analyses below are divided into two subsections: (1) construction impacts (short-term or temporary) and (2) operational impacts (long-term or permanent). Table 5.15-3 (Summary of Impacts – Geology and Soils) provides a summary of geology and soils impacts from the Project.

TABLE 5.15-3
Summary of Impacts – Geology and Soils

	Construction		**Operations**			**Cumulative**
Sites	**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.**	**Impact GE-2: The Project would not substantially change the topography or any unique geologic or physical features of the site(s).**	**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.**	**Impact GE-4: The Project would be located on a geologic unit or soil that is unstable, or that would become unstable.**	**Impact GE-5: The Project would not be located on corrosive or expansive soil, creating substantial risks to life or property.**	**Impact C-GE-1: Construction and operation of the proposed Project could result in significant impacts related to soils and geology.**
Site 1	NI	LS	LSM	LSM	LS	LS
Site 2	NI	LS	LSM	LS	LS	LS
Site 3	NI	LS	LSM	LS	LS	LS
Site 4	LS	LS	LSM	LS	LS	LS
Westlake Pump Station	NI	LS	LSM	LS	LS	LS
Site 5 (Consolidated Treatment and On-site options)	NI	LS	LSM	LSM	LS	LS
Site 6	LS	LS	LSM	LS	LS	LS
Site 7 (Consolidated Treatment and On-site options)	LS	LS	LSM	LS	LS	LS
Site 8	NI	LS	LSM	LSM	LS	LS
Site 9	NI	LS	LSM	LS	LS	LS
Site 10	NI	LS	LSM	LS	LS	LS

TABLE 5.15-3
Summary of Impacts – Geology and Soils

	Construction		Operations			Cumulative
Sites	**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.**	**Impact GE-2: The Project would not substantially change the topography or any unique geologic or physical features of the site(s).**	**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.**	**Impact GE-4: The Project would be located on a geologic unit or soil that is unstable, or that would become unstable.**	**Impact GE-5: The Project would not be located on corrosive or expansive soil, creating substantial risks to life or property.**	**Impact C-GE-1: Construction and operation of the proposed Project could result in significant impacts related to soils and geology.**
Site 11	NI	LS	LSM	LS	LS	LS
Site 12	NI	LS	LSM	LSM	LS	LS
Site 13	NI	LS	LSM	LSM	LS	LS
Site 14	NI	LS	LSM	LSM	LS	LS
Site 15	NI	LS	LSM	LSM	LS	LS
Site 16	NI	LS	LSM	LSM	LS	LS
Site 17 (Alternate)	LS	LS	LSM	LSM	LS	LS
Site 18 (Alternate)	LS	LS	LSM	LS	LS	LS
Site 19 (Alternate)	NI	LS	LSM	LSM	LS	LS

Notes:

NI = No Impact
LS = Less than Significant
LSM = Less than Significant with Mitigation

5.15.3.4 Construction Impacts and Mitigation Measures

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. (Less than Significant)

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 1, 2, 3, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19 (Alternate), and the Westlake Pump Station</u>

Natural or constructed slopes could become destabilized during construction-related excavation and/or grading operations. Excavations for new pipelines, access roads, and well facilities could result in slope instability, potentially triggering slope failures that could result in landslides, slumps, soil creep, or debris flows. Slope failures are more likely to occur in areas with a history of previous failure and in weak geologic units exposed on unfavorable slopes, such as those areas mapped by the USGS as "few landslides," "many landslides," or "mostly landslides" (USGS 1997). As shown in Table 5.15-1 (Geologic Units, Landslide, Liquefaction Susceptibility and Shaking Severity Levels at Facility Sites), however, none of the proposed locations of the facility sites are mapped as being within these landslide area types.

Sites 1, 2, 3, 5, 9, 10, 11, 12, 13, 14, 15, 16, 19 (Alternate), and Westlake Pump Station would be located in relatively flat areas, which, accordingly, are not subject to slope failures (USGS 1997; Geotechnical Consultants 2009a, 2009b, 2012). Therefore, *no impact* would occur related to unstable soils at these sites.

Site 8 is also located in a flat area, and an elevated automobile dealership parking lot to the west that is at a higher elevation is not likely to pose landslide hazards to Site 8 because of an existing concrete retaining structure that would not be impacted and because Site 8 would have a 30 to 40-foot setback distance between the retaining wall and the proposed station building. Therefore, *no impact* would occur related to unstable soils at Site 8.

Impact Conclusion: No Impact

<u>Sites 4, 6, 7, 17 (Alternate), and 18 (Alternate)</u>

As described in Section 5.15.1.3, Geologic Hazards, geotechnical investigations and field visits indicate that mild (20 percent slopes or less) to moderate (greater than 20 percent slops but less than 30 percent slopes) slopes exist at Sites 4, 6, 7, 17 (Alternate), and 18 (Alternate). The potential for slopes at these sites to become destabilized during construction is considered unlikely 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 (Geotechnical Consultants 2009a, 2009b, 2012; USGS 1998b). Therefore, impacts related to unstable soils would be *less than significant* at these sites.

Impact Conclusion: Less than Significant

Impact GE-2: The Project would not substantially change the topography or any unique geologic or physical features of the site(s). (Less than Significant)

Unique Geologic or Physical Features

All Sites

The proposed Project would include grading to construct new access driveways, pipeline connections, staging areas and facility buildings. None of the facility sites include rock outcrops or unique geologic or physical features. As a result, *no impact* would occur to unique geologic or physical features at the sites.

Impact Conclusion: No Impact

Topography

All Sites

Sites 1, 3, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19 (Alternate), and Westlake Pump Station would be located on flat land; the Project would not cause a substantial change to the topography of the sites. Sites 2, 4, 6, 7, 17 (Alternate), and 18 (Alternate) are in areas of mildly to moderately sloping terrain. Project grading would not substantially alter the topography of the sites. Site excavation and grading for construction of well facilities 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 (see Chapter 3, Project Description, Section 3.5.1.2, [Construction of Well Facilities]). As a result, impacts related to a substantial change in existing topography would be *less than significant* for all sites.

Impact Conclusion: Less than Significant

5.15.3.5 Operation Impacts and Mitigations

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. (Less than Significant with Mitigation)

Fault Rupture

All Sites

Figure 5.15-2 (Regional Fault Map) shows the locations of active and potentially active faults in the San Francisco Bay region. The Serra Fault is the nearest active fault in the Project area, located approximately 0.25 to one mile from the various proposed well facilities. The San Andreas Fault Zone is located approximately 1.2 to 2.3 miles from the various proposed well facilities. The 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 (CDC 1982a, 1982b; Geotechnical Consultants 2009a, 2009b, 2012). Therefore, geologic impacts on people or structures related to surface fault rupture would be *less than significant.*

Impact Conclusion: Less than Significant

Groundshaking

<u>All Sites</u>

Groundshaking during an earthquake in the Project area is expected to be quite strong (i.e., greater than peak ground acceleration of approximately 0.7 to 0.9g per Geotechnical Consultants, Inc. 2009a, 2009b, 2012), which could result in disruption of water service or cause damage to well facility buildings or the Westlake Pump Station building. The potential for damage and subsequent disruption of water service from strong seismic ground shaking could therefore result in a *significant* impact.

The SFPUC's General Seismic Requirements for Design of New Facilities and Upgrade of Existing Facilities set forth criteria for the seismic design of facilities and components of WSIP facility improvement projects (SFPUC 2009). Under these design requirements, each facility is evaluated for its necessity in meeting the water service delivery goals and assigned a seismic performance class for the purpose of determining appropriate seismic design criteria. The SFPUC has classified the proposed facilities as "Important" (Class II), which is defined as facilities that may experience damage, but should be capable of restoration to service within 30 days (SFPUC 2009) (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types, Seismic Design Requirements]). The SFPUC requirements for ground shaking include specific design ground motion parameters and design spectra for engineering analysis and structure design.

Site-specific design criteria for sites with well facility buildings are provided in the site-specific geotechnical studies prepared for Sites 1, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, and 16 (Geotechnical Consultants 2009a, 2009b, 2012). Sites 2, 3, 14, 17 (Alternate), 19 (Alternate), and the Westlake Pump Station are adjacent to or very close to sites where a site-specific geotechnical study has been prepared, and where the design criteria for the adjacent site appear to be applicable. Mitigation Measure M-GE-3 (Conduct Site-Specific Geotechnical Investigations and Implement Recommendations) would reduce the impact of seismic ground shaking, as well as settlement (see Impact GE-4), on well facilities by requiring facilities to be designed and constructed in conformance with specific recommendations contained in design-level geotechnical studies, such as site-specific seismic design parameters and lateral earth pressures, use of engineered fill, and subgrade preparations for foundations systems and floor slabs. These measures are described in more detail in Mitigation measure M-GE-3 below. Therefore, with implementation of these measures, geologic impacts on people or structures related to seismic groundshaking following mitigation would be *less than significant*.

Mitigation Measure M-GE-3: Conduct Site-Specific Geotechnical Investigations and Implement Recommendations (All Sites)

The SFPUC shall conduct a site-specific design-level geotechnical study at Site 11 to provide recommendations for protection from property loss, injury, or death from ground shaking or settlement. Similarly, if Site 18 (Alternate) is selected, the SFPUC shall conduct a site-specific design-level geotechnical study for the site.

At all sites, the facilities shall be designed and constructed in conformance with the specific recommendations contained in design-level geotechnical studies. The recommendations made in the geotechnical studies shall be incorporated into the final plans and specifications and implemented during construction The site-specific recommendations in the design-level geotechnical studies relative to ground shaking include the following measures:

- Site-specific seismic design parameters in accordance with the International Building Code Static Force Procedure;
- Specified lateral earth pressures and seismic loading for retaining walls;
- Earthwork recommendations for site preparation, excavations, use of engineered fill and utility trench/pipe backfill; and
- Foundation recommendations for subgrade preparation, foundations systems, and floor slabs.

Site-specific recommendations in the design-level geotechnical studies relative to settlement include the following measures:

- Supporting structures at these sites on structurally rigid mat foundations with contact pressures in accordance with the bearing capacities identified in the geotechnical reports;
- Post-tensioning to reinforce and increase the structural rigidity of grade beams and shallow footings;
- Over-excavating artificial fill materials and loose granular soils and recompaction with moisture treated engineered fill to develop a mass of densified soil beneath the proposed well buildings; and
- Using flexible pipe connections to accommodate dynamic settlements due to seismic loading.

Impact Conclusion: Less than Significant with Mitigation

Seismically-induced Landslides

<u>All Sites</u>

As described under Impact GE-2, the facility sites would be located in areas mapped as flat land (USGS 1998a). However, geotechnical investigations, surveys, and field visits have indicated that mild to moderate slopes exist at Sites 4, 6, and 7. Although no site specific geotechnical reports exist for Sites 17 (Alternate) and 18 (Alternate), mapping shows these sites are underlain by the same geologic units as nearby well facilities, and similar groundwater levels would be expected given the close proximity to other wells for which geotechnical data is available (see Section 5.15.1.3, Geologic Hazards). The potential for seismically induced landslides is considered unlikely at the sites due to the presence of generally dense granular materials and the absence of shallow groundwater (Geotechnical Consultants 2009a, 2009b, 2012; USGS 1998b). At Site 4, roots from vegetation and trees provide additional strengthening of the near surface soil mass (Geotechnical Consultants 2012). Therefore, geologic impacts on people or structures related to seismically induced landslides or slope failures would be *less than significant* for all sites.

Impact Conclusion: Less than Significant

Impact GE-4: The Project would be located on a geologic unit or soil that is unstable, or that would become unstable. (Less than Significant with Mitigation)

Liquefaction

<u>All Sites</u>

Liquefaction-related phenomena can include lateral spreading, ground oscillation, loss of bearing strength, subsidence, and buoyancy effects, all of which could damage the proposed well facilities and associated pipelines. Seismically induced settlement can occur in areas underlain by compressible sediments, which can cause damage to structures when settlement does not occur evenly across the footprint of a structure, resulting in differential settlement. Stream channel deposits and recent valley alluvium are generally the most susceptible to earthquake-induced settlement. Additionally, artificial fills, especially fills placed before 1965 and those placed on top of bay mud, are highly susceptible to mobilization and densification, resulting in earthquake-induced subsidence. The liquefaction susceptibility for each site is summarized in Table 5.15-1 (Geologic Units, Landslide, Liquefaction Susceptibility and Shaking Severity Levels at Facility Sites).

Sites 1, 2, 3, 4, 5, 6, 7, 11 (not including the sanitary sewer pipeline), 12, 14, 15, 16, 19 (Alternate), and the Westlake Pump Station would be located in areas mapped by the USGS as having very low to low liquefaction susceptibility (USGS 2006). In addition, the site-specific data from geotechnical borings for Sites 1, 4, 5, 6, 7, 12, 15, and 16 indicate that these sites would not be susceptible to liquefaction because of the generally dense and clayey nature of the Colma formation (Geotechnical Consultants 2009a, 2009b, 2012). Therefore, potential geologic impacts on people or structures related to liquefaction would be *less than significant* for these sites.

Sites 9, 13, and 18 (Alternate) would be located in areas mapped by the USGS as having moderate liquefaction susceptibility associated with artificial fill and alluvial deposits of Colma Creek (USGS 2006). However, the site-specific data from the geotechnical borings at Sites 9 and 13 indicate that these sites would not be susceptible to liquefaction due to the generally dense and clayey nature of the Colma Formation at the sites (Geotechnical Consultants 2009a, 2009b). In addition, and as shown on Figure 5.15-1 (Project Geology Map), the Colma formation also underlies Site 18 (Alternate). Due to the dense and clayey nature of the Colma formation, this site would also not be susceptible to liquefaction. Therefore, potential geologic impacts on people or structures related to liquefaction would be *less than significant* for these sites.

Sites 8, 10, and 17 (Alternate) would be located in an area mapped by the USGS as having high liquefaction susceptibility associated with alluvial deposits of Colma Creek (USGS 2006). In addition, a portion of the proposed sanitary sewer connection at Site 11 would be located in an area mapped as having high liquefaction susceptibility. However, the site-specific data from the geotechnical borings at Sites 8 and 10 indicate that these sites would not be susceptible to liquefaction due to the generally dense and clayey nature of the Colma formation, including the clayey nature of the natural levee deposits at Site 10 (Geotechnical Consultants 2009a, 2009b). In addition, and as shown on Figure 5.15-1 (Project Geology Map), the Colma formation also underlies the sanitary sewer pipeline route at Site 11 and Site 17

(Alternate). Due to the dense and clayey nature of the Colma formation, these sites would also not be susceptible to liquefaction.

Moreover, the proposed facilities would be designed to meet current seismic standards in accordance with the 2010 California Building Code and with the SFPUC's General Seismic Design Requirements (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]), which include characterizing and addressing the potential for liquefaction through geotechnical evaluations, building design, and pipeline construction techniques and materials, such as chained joints. Therefore, geologic impacts on people or structures related to liquefaction would be *less than significant* for these sites.

Impact Conclusion: Less than Significant

Lateral Spreading

<u>All Sites</u>

At Site 1, an isolated layer of potentially liquefiable silty sand within the upper portion of the Colma formation was identified at a depth of about 35 feet. An approximately 8-foot high embankment descending on an about 3:1 slope is located approximately 20 feet to the west of the nearest edge of the proposed well facility building at Site 1. The potential susceptibility of Site 1 to lateral spreading toward the embankment free face is considered low because the isolated layer of potentially liquefiable medium is at a depth well below the toe of the 8-foot tall embankment (Geotechnical Consultants 2012).

The potential susceptibility of the other sites to lateral spreading is considered to be low, because the Colma formation soils at the sites are not susceptible to liquefaction. Therefore, potential geologic impacts on people or structures related to lateral spreading would be *less than significant* for all the sites.

Impact Conclusion: Less than Significant

Settlement

The evaluation of impacts that follows discusses sites with less-than-significant impacts, followed by sites with significant impacts.

<u>Sites 2, 3, 4, 6, 7, 9, 10, 11, 18 (Alternate), and the Westlake Pump Station</u>

The site-specific data from the geotechnical borings at Sites 4, 6, 7, 9, and 10 indicate that these sites would be located in soils susceptible to a low hazard from settlement due to strong groundshaking during an earthquake (Geotechnical Consultants 2009a, 2009b, 2012). The low hazard is related to the relatively dense nature of the near-surface Colma formation at the sites, and the relatively thin stratum of artificial fill and silty fine sands at the sites. Sites 2, 3, 11, 18 (Alternate), and the Westlake Pump Station are located in proximity to and in similar geologic units as Sites 4 and 10 and would, therefore, likely have a similarly low hazard from settlement. Therefore, potential geologic impacts on people or structures related to settlement would be *less than significant* for these sites.

Impact Conclusion: Less than Significant

Sites 1, 5, 8, 12, 13, 14, 15, 16, 17 (Alternate), and 19 (Alternate)

The site-specific data from the geotechnical borings at Sites 1, 5, 8, 12, 13, 15, and 16 indicate that these sites would be located in soils susceptible to a moderately high hazard from settlement due to strong groundshaking during an earthquake (Geotechnical Consultants 2009a, 2009b, 2012). The moderately high hazard is related to the presence of compressible soils at these sites, including up to 20 feet of unsaturated, loose to medium dense fill sand near the surface of Site 1, artificial fill at Sites 5 and 12, a relatively loose layer of poorly graded sand near the upper stratum of natural levee deposits at Site 8, a loose layer of silty fine sand that spans the upper six feet of the natural levee deposits at Site 13, medium dense silty sand within the upper 15 feet at Site 15, and medium dense silty sand in the Colma Formation above the groundwater level at Site 16. Site 17 (Alternate), Site 19 (Alternate), and Site 14 are located in proximity to Sites 8, 12, and 15, respectively, and could, therefore, have similar soils with a moderately high hazard from settlement. The potential for damage and subsequent disruption of water service from settlement at these sites represents a *significant* potential impact.

Geotechnical recommendations relative to settlement are provided in the site-specific geotechnical studies prepared for Sites 1, 5, 8, 12, 13, 15, and 16 (Geotechnical Consultants 2009a, 2009b, 2012). Sites 14, 17 (Alternate), and 19 (Alternate) are adjacent to or very close to sites where a site-specific geotechnical study has been prepared, and where the design criteria for the adjacent site appear to be applicable. Mitigation Measure M-GE-3 (Conduct Site-Specific Geotechnical Investigations and Implement Recommendations) would reduce the impact of settlement on these well facilities by requiring facilities to be designed and constructed in conformance with specific recommendations contained in design-level geotechnical studies, such as over-excavation of artificial materials, re-compaction with moisture treated engineered fill, supporting structures on structurally rigid mat foundations, post-tensioning to reinforce and increase structural rigidity, and using flexible pipe connections. Therefore, geologic impacts on people or structures related to settlement following mitigation would be *less than significant* for these sites.

> ***Mitigation Measure M-GE-3: Conduct Site-Specific Geotechnical Investigation and Implement Recommendations (All Sites)***
> (See Impact GE-3 for a description)

Impact Conclusion: Less than Significant with Mitigation

Impact GE-5: The Project would not be located on corrosive or expansive soil, creating substantial risks to life or property. (Less than Significant)

All Sites

Soil types identified at facility sites include Orthents and Urban Land (NRCS 1991). As indicated in Table 5.15-2 (Soil Properties in the Project Area), Orthents soils have a low shrink/swell potential, while Urban Land consists of areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, and other structures. Therefore, potential soils impacts on life or property related to expansive soils would be *less than significant*.

The geotechnical investigations for Sites 5, 6, 7, 8, 9, 10, 12, 13, 15, and 16 indicated that the soils present are mildly to highly corrosive to ferrous metals (Geotechnical Consultants 2009a, 2009b). Given that the mapped soil types at other sites are similar to the confirmed soil types found at sites for which geotechnical investigations have been undertaken, it is reasonable to assume that the remaining sites would also display mild to high corrosive characteristics in soils. Corrosive soils could, over time, deteriorate the newly installed pipelines proposed under the Project. If such deterioration were to cause a rupture in the pipelines, substantial damage to adjacent properties could result from the temporary uncontrolled flow of water (until valves can be operated to cease the flow of water). However, a combination of coating and/or pipe wrapping, and possibly passive cathodic protection would be used to protect the new pipelines from corrosion. The pipeline coating would be made of materials that would prevent the external corrosion process. In addition, a cathodic protection system would be placed along the length of the new pipeline to prevent corrosion of the pipeline (see Chapter 3, Project Description, Section 3.4.2.4 [Water Connection, Sanitary Sewer, and Storm Drain Piping]). With incorporation of these design features, as proposed, soils impacts on life or property related to corrosive soils would be *less than significant.*

Impact Conclusion: Less than Significant

5.15.3.6 Cumulative Impacts and Mitigation Measures

Impact C-GE-1: Construction and operation of the proposed Project could result in significant impacts related to soils and geology. (Less than Significant)

The geographic scope for cumulative impacts on geology and soils consists of each proposed GSR facility site (including the construction area for the well, the well facility, and the pipelines) and the immediate vicinity around each of these sites. Geologic and seismic impacts are generally site-specific, because they depend upon the local geology and soil conditions.

The Peninsula Pipelines Seismic Upgrade (PPSU) Project, Colma Site (cumulative project D-1) would occur in the vicinity of Sites 8 and 17 (Alternate). Because of the dense and clayey nature of the Colma formation underlying these sites, the sites would not be subject to geologic or soil instability. Because of the localized nature of the geologic and soils impacts, the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), including the PPSU Project, Colma Site, would not contribute to potential cumulative impacts associated with the GSR Project, including geologic or soil instability (Impact GE-1 during construction and Impact GE-4 during operations), topographic changes (Impact GE-2), fault rupture and ground shaking (Impact GE-3) and exposure to corrosive or expansive soil (Impact GE-5). For this reason, the potential cumulative impact related to geology and soils would be *less than significant*.

5.15.4 References

California Department of Conservation (CDC), Division of Mines and Geology. 1982a. *State of California Special Studies Zones, Mountara Mountain*. January.

CDC, Division of Mines and Geology. 1982b. *State of California Special Studies Zones, San Francisco South*. January.

CDC, Division of Mines and Geology. 2000. *A General Location Guide for Ultramafic Rocks in California – Areas More Likely to Contain Naturally Occurring Asbestos*. August.

CDC, California Geological Survey. 2005. *Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, Version 2.0.* Data compiled by W.A. Bryant with assistance from J.A. Treiman. July 15.

Geotechnical Consultants, Inc (Geotechnical Consultants). 2009a. *Geotechnical Report, South Westside Groundwater Basin Conjunctive Use Project.* April.

Geotechnical Consultants. 2009b. *Geotechnical Report CUP Well Locations CUP-11A, CUP-23, CUP-36-1, CUP-44-1 and CUP-M-1, South Westside Groundwater Basin Conjunctive Use Project.* December.

Geotechnical Consultants. 2012. *Geotechnical Report CUP-3A and CUP-7 Sites, Regional Groundwater Storage and Recovery Project.* January.

Natural Resources Conservation Service (NRCS). 1991. *Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California.* May.

San Francisco Public Utilities Commission (SFPUC). 2009. *General Seismic Requirements for Design of New Facilities and Upgrade of Existing Facilities, Revision 2.* October 6.

SFPUC. 2012. Personal Communication, Ernie Tom, May 7, 2012.

U.S. Geological Survey (USGS). 1997. *Open-File Report 97-745C. San Francisco Bay Region Landslide Folio Part C. Summary Distribution of Slides and Earth Flows in the San Francisco Bay Region, California. C.M. Wentworth et. al.* Revision 1 February 17.

USGS. 1998a. *Open-File Report 98-354. Preliminary Geologic Map of the San Francisco South 7.5′ quadrangle and part of the Hunters Point 7.5′ quadrangle, San Francisco Bay area, California. M.G. Bonilla et. al.*

USGS. 1998b. *Open-File Report 98-137. Geology of the Onshore Part of San Mateo County, California.*

USGS. 2006. *Open-File Report 06-1037, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, Liquefaction Susceptibility.*

USGS. 2008 *San Francisco Bay Region Earthquake Probability Map.* Website accessed September 1, 2009 at: http://earthquake.usgs.gov/regional/nca/ucerf/.

USGS. 2012. *Earthquake Hazards Program Glossary*. Website accessed September 4, 2012 at: http://earthquake.usgs.gov/learn/glossary/?term=lateral%20spread%20or%20flow.

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5.16 HYDROLOGY AND WATER QUALITY

This section describes the existing conditions and regulatory setting for hydrology and water quality in the Project area and assesses potential impacts on hydrology and water quality that could result from implementation of the proposed Project. For construction of the Project, the surface water effects are generally associated with construction-related stormwater runoff and discharges; therefore, the study area is restricted to the individual well facility sites and the pipeline routes. For operation of the Project, surface water effects would be related to stormwater runoff from the well facilities; effects from operation of the Project could also occur in the Westside Groundwater Basin as a whole because of Project-related groundwater pumping and in-lieu recharge of the Basin. Therefore, the study area is expanded to the Westside Groundwater Basin for the analysis of impacts on groundwater from operation of the proposed Project.

5.16.1 Setting

5.16.1.1 Climate and Precipitation

The study area is located in a valley between the Pacific Ocean and San Francisco Bay, giving it a variable, but mild, marine climate. Winters are mild and moderately wet and summers are cool and dry. Most precipitation occurs as rainfall from November through April, with annual precipitation ranging from less than 20 inches along San Francisco Bay near the San Francisco International Airport (SFO) to approximately 24 inches in the center of the valley near Colma and South San Francisco (San Bruno et al. 2012).

5.16.1.2 Regional Surface Water Hydrology

San Mateo County encompasses four hydrologic basins and a total of 34 watersheds, all of which ultimately drain west to the Pacific Ocean or east to the San Francisco Bay (San Francisco Bay or Bay). The Pacific Ocean coast is located to the west of the proposed GSR facility sites and the San Francisco Bay is located to the east.

The proposed Project is located within the hydrologic boundaries of several watersheds in San Mateo County, including the watersheds of Vista Grande Drainage Canal, Colma Creek, San Bruno Creek, Green Hills Creek, and Millbrae Creek as illustrated on Figure 5.16-1 (Surface Water Hydrology Map). These watersheds are described below.

The relation of surface water features, including Lake Merced, Pine Lake, and the Golden Gate Park Lakes, to groundwater is described in Section 5.16.1.4 (Groundwater-Surface Water Interactions) below.

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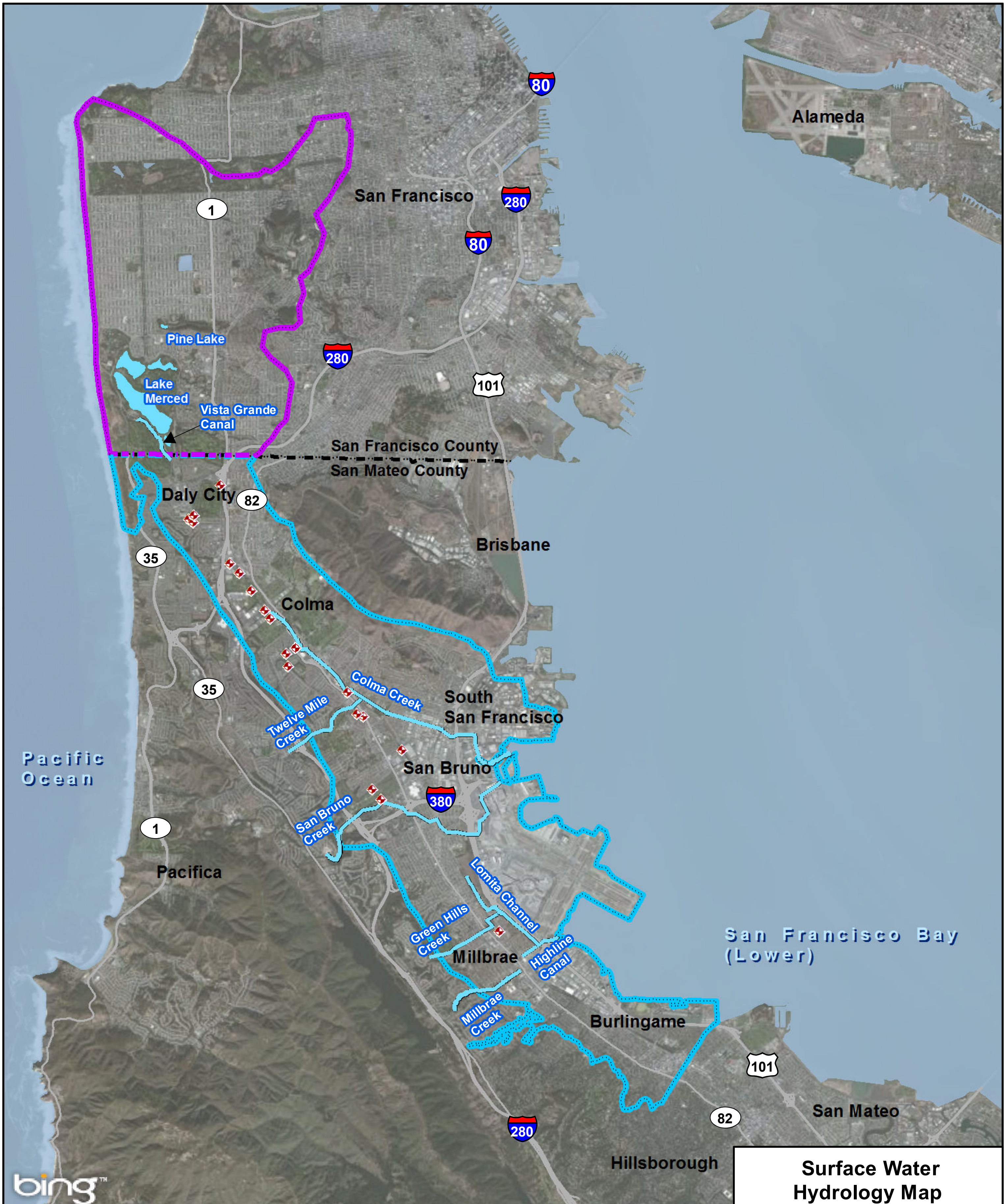

Surface Water Hydrology Map

Regional Groundwater Storage and Recovery Project

Figure 5.16-1

Legend

- Proposed Project Well Facility Sites
- County Boundary
- Creeks and Other Waterbodies
- North Westside Groundwater Basin[1]
- South Westside Groundwater Basin[1]

0 0.5 1 2

Scale Miles

1 " = 2 miles

[1]The Westside Groundwater Basin has been administratively divided at the San Francisco-San Mateo County line.

Data Sources: San Mateo County 2010; Oakland Museum, Upper Peninsula Watershed Finder; SF Public Works Dept. 2004. As modified by GHD 2012.

Vista Grande Canal Watershed

The Vista Grande Watershed historically drained into Lake Merced but has since been altered to flow to the Pacific Ocean. The Westlake Pump Station and Sites 1, 2, 3, and 4 would be located within the Vista Grande Watershed, with stormwater from the sites flowing northward through underground storm drains to the Vista Grande Drainage Canal. Stormwater flows through the Vista Grande Drainage Canal for about 3,500 feet before flowing into the Vista Grande Outfall Tunnel, which discharges to the Pacific Ocean through an outfall beach structure below Fort Funston in Golden Gate National Recreation Area. (San Bruno et al. 2012)

Colma Creek Watershed, including Twelve Mile Creek

Colma Creek is a small creek draining much of South San Francisco and the surrounding area before entering into San Francisco Bay just north of SFO and the eastern terminus of Interstate 380 (I-380). Sites 5 through 13 would be located within the Colma Creek Watershed. Within the valley portion of the watershed, Colma Creek is an open, concreted lined engineered channel from San Francisco Bay to near the Colma/South San Francisco city limits. This engineered section of creek is maintained by the San Mateo County Flood Control District. Much of the area upstream of South San Francisco and some small tributaries within South San Francisco flow through underground storm drains. Some of the uppermost reaches of the creek on San Bruno Mountain are natural channels (San Bruno et al. 2012). The Colma Creek Watershed includes Twelve Mile Creek, which flows northeast in underground storm drains and enters Colma Creek upstream of Woodlawn Memorial Park in the vicinity of Sites 12 and 19 (Alternate) in South San Francisco.

San Bruno Creek Watershed

San Bruno Creek flows from the uplands along the west side of the South Westside Basin near Highway 35, discharging into the Bay at a location just south of the Colma Creek discharge. Sites 14 and 15 would be located within the watershed for San Bruno Creek, which flows eastward, primarily through underground storm drains.

Green Hills Creek Watershed, including Lomita Channel and Highline Canal

Green Hills Creek flows east through underground storm drains from the Millbrae Meadows through the City of Millbrae. The creek connects to the Lomita Channel, which is an open channel that parallels the west side of U.S. Highway 101 (U.S. 101), and then to the Highline Canal also adjacent to U.S. 101. Highline Canal is an engineered concrete-lined channel that crosses under U.S. 101 and discharges to the Bay south of SFO. Site 16 would be located in the eastern portion of the Green Hills Creek Watershed, with stormwater flowing through underground storm drains to the Highline Canal adjacent to U.S. 101.

Millbrae Creek Watershed

Millbrae Creek is in the southernmost part of the South Westside Basin, with its headwaters also located in the western uplands and with a discharge to the Bay south of SFO. No GSR facility sites are planned within the Millbrae Creek Watershed.

Surface Water Quality

In accordance with Section 303(d) of the federal Clean Water Act, state governments must present the U.S. Environmental Protection Agency (U.S. EPA) with a list of "impaired water bodies." Such water bodies are defined as those that do not meet surface water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. This is explained in greater detail in Section 5.16.2 (Regulatory Framework). The surface water bodies in the Project area included on the list of impaired water bodies are shown in Table 5.16-1 (Impaired Surface Water Bodies). The remaining water bodies in the Project area, including the Vista Grande Drainage Canal, Twelve Mile Creek, San Bruno Creek, Green Hills Creek, Highline Canal, and Millbrae Creek are not listed as impaired water bodies (SWRCB 2007; RWQCB 2011).

TABLE 5.16-1
Impaired Surface Water Bodies

Water Body	Pollutant/Stressor
Lake Merced	Low Dissolved Oxygen, pH
San Francisco Bay (Lower)	Chlordane, DDT, Dieldrin, Dioxin Compounds (including 2, 3, 7, 8-TCDD), Exotic Species, Furan Compounds, Mercury, PCB's (Polychlorinated biphenyls), PCB's (dioxin-like), Trash (proposed)
Colma Creek	Trash (proposed)

Sources: SWQCB 2007; RWQCB 2011

Flood, Seiche, and Tsunami

The Federal Emergency Management Agency (FEMA) delineates regional flooding hazards as part of the National Flood Insurance Program. The most recent Flood Insurance Study for San Mateo County became effective on October 16, 2012, and investigates the existence and severity of flood hazards in the Project area (FEMA 2012). The primary area of mapped 100-year flooding in the Project area is located along Colma Creek in the City of South San Francisco, near Site 9. A Colma Creek Flood Control Zone was created in 1964 by the San Mateo County Flood Control District to alleviate flooding in the City of South San Francisco. Flood control projects have included channel and culvert improvements, as well as bridge replacements. Localized areas of 100-year flooding are also located in South San Francisco at the intersection of Spruce Avenue and Huntington Avenue near Site 13 and in Millbrae along the Lomita Channel, which flows adjacent to U.S. 101 east of Site 16. The City of San Bruno has no mapped flood hazard areas identified (FEMA 2012).

Water supply reservoirs in San Mateo County can also present a remote risk of downstream inundation in the event of a dam failure. Dam failure inundation maps prepared by the Association of Bay Area Governments (ABAG) and San Mateo County indicate that the proposed Project is not located within an area subject to inundation from failure of a levee or dam (ABAG 2012; San Mateo County 2005).

Flooding hazards can also occur as a result of seiches (i.e., earthquake-induced oscillating waves in an enclosed water body) and tsunamis (i.e., earthquake-induced waves formed in the open ocean that reach a shoreline). The proposed Project is not located near isolated bodies of water that would be subject to inundation by seiche, and the proposed well sites are not located within an area subject to inundation from tsunami (Cal EMA 2009).

5.16.1.3 Regional Groundwater Hydrology

Most of northern San Mateo County is underlain by the Westside Groundwater Basin, shown on Figure 5.16-1 (Surface Water Hydrology Map) (DWR 2006). With an area of about 45 square miles, this groundwater basin extends from San Francisco south to San Mateo County. The Westside Groundwater Basin is separated from the Lobos Basin to the north by a northwest-trending bedrock ridge through the northeastern part of Golden Gate Park. San Bruno Mountain and San Francisco Bay form the eastern boundary, and the San Andreas Fault and Pacific Ocean form the western boundary. The southern limit of the Westside Groundwater Basin, which roughly follows the Burlingame-San Mateo common city limit, is defined by an area of high bedrock that separates it from the San Mateo Plain Groundwater Basin. The basin opens to the Pacific Ocean on the northwest and San Francisco Bay on the southeast.

There is no geologic feature that restricts groundwater flow between the northern and southern parts of the groundwater basin. However, groundwater development in the two parts of the Basin are different from each other, as groundwater has been more heavily developed as a water supply in the South Westside Groundwater Basin. For discussion purposes, the 14-square-mile portion of the Westside Groundwater Basin north of the San Francisco/San Mateo County line is referred to in this EIR as the North Westside Groundwater Basin and the 31-square-mile portion of the Westside Groundwater Basin south of the San Francisco/San Mateo County line is referred to herein as the South Westside Groundwater Basin. The South Westside Groundwater Basin underlies Daly City, Colma, South San Francisco, San Bruno, Millbrae, and portions of unincorporated San Mateo County, Burlingame, and Hillsborough.

Regional Geology

The five major geologic units in the Westside Groundwater Basin are the Mesozoic-age Franciscan Complex, Pleistocene-age Merced and Colma Formations, and the Pleistocene to recent Dune Sands and Bay Mud deposits. There are also minor, but widespread, units of recent alluvium along historical stream channels. (LSCE 2010)

Exposed in the low hills east and northeast of Lake Merced, the Franciscan Complex forms the basement rock for the aquifer system, which defines the lateral and vertical limits of the primary groundwater-bearing formations in the Westside Groundwater Basin. To the north of Lake Merced, the bedrock slopes gently westward towards the Pacific Ocean; beneath Golden Gate Park there is an apparent buried stream valley that results in a thicker accumulation of sediment in that area. South of Lake Merced to the Daly City area, the surface of the bedrock slopes southwestward to Daly City, occurring at depths of almost 600 feet near the center of Lake Merced and nearly 1,000 feet beneath the southern portion of Daly City. The bedrock configuration is more speculative beneath the Pacific Ocean, to the west of the Westside Groundwater Basin.

The Merced Formation is a 5,000-foot-thick sequence of shallow marine and non-marine deposits comprising three units (lower, middle, and upper). It is the thickest water-bearing formation overlying the basement rock (see Figure 5.16-2 [North South Geologic Cross Section, Westside Groundwater Basin]). The lower unit of the Merced Formation is about 4,000 feet thick and is composed of fine sandstone to siltstone. This unit is strongly to moderately deformed and shows some evidence of folding. The middle unit of the Merced Formation is up to about 600 feet thick and is composed of thinner bedded, near-shore marine, beach, estuary, dune, and fluvial deposits of fine sandstone, siltstone, and mudstone. The middle unit of the Merced Formation is moderately deformed with some evidence of folding and steeper dip near the Serra Fault. The upper unit of the Merced Formation is approximately 500 feet thick and consists of a sequence of thin bedded beach, dune, estuarine, and fluvial deposits of weakly consolidated fine sandstone with some gravel and mudstone beds. This unit is only deformed in a minor fashion. A thick clay unit referred to as the "W" clay layer is present in this unit.

The Colma Formation and Dune Sands comprise the majority of the surficial geologic units in the North Westside Groundwater Basin. The Colma Formation is a surficial unit consisting of fine- to medium-grained sand with some clay, silt, and gravel beds of fluvial, floodplain, alluvial fan, and dune sand origin. It is exposed from Lake Merced, south to San Bruno, and the maximum thickness is about 200 feet. The separation between the Colma Formation and the underlying Merced Formation is not clearly defined because of the similarity in the geologic materials comprising the units.

Dune Sands are also a surficial unit of fine- to medium-grained sands that are exposed across the San Francisco Peninsula north of Lake Merced. Because of the similarity in geologic materials comprising the Dune Sands and older formations, there is uncertainty regarding the thickness of this unit.

The Bay Mud deposits generally consist of clays and silts with some sand. In the Westside Groundwater Basin, the extent of this surficial unit is limited to the San Francisco Bay shore in the South Westside Groundwater Basin.

There are two primary structural features affecting the groundwater basin, including the San Andreas Fault system and the Serra Fault. The northwest-trending San Andreas Fault system, defining the southwest boundary of the Westside Groundwater Basin, is an active right-lateral, strike-slip fault with the west side moving northward relative to the east side. The Serra Fault parallels the San Andreas Fault and is a southwest dipping reverse fault with the west side up thrust relative to the east side. The fault extends from south of San Bruno to the Lake Merced area and extends offshore.

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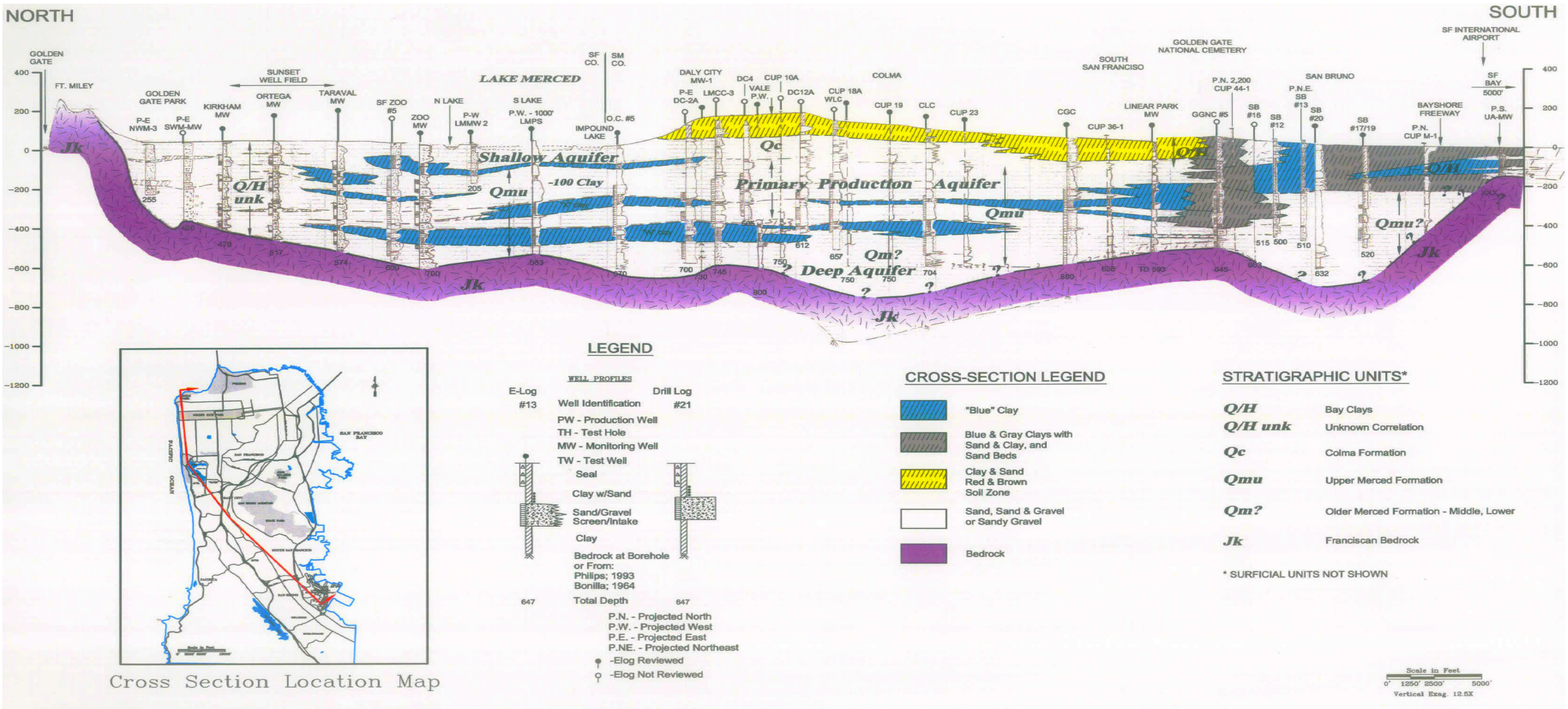

North-South Geologic Cross Section, Westside Groundwater Basin

Regional Groundwater Storage and Recovery Project

Figure 5.16-2

Source: LSCE 2010

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Offshore of the Westside Groundwater Basin, the ocean floor dips gently westward with ocean depths reaching only 60 feet at two miles offshore, 100 feet at eight miles offshore and 300 feet at 25 miles offshore at the edge of the continental shelf. The continental shelf is underlain by a thick sequence of Quaternary and Tertiary age sedimentary deposits, crossed by the San Andreas Fault approximately two miles offshore, and possibly crossed by the Serra Fault as well. These faults may act as hydraulic barriers and, combined with the thick sequence of sedimentary rocks beneath the ocean floor, may preclude direct communication between the water-bearing units of the Westside Groundwater Basin and the Pacific Ocean.

South Westside Groundwater Basin Geology

The majority of the surficial geologic units in the South Westside Groundwater Basin are composed of the Colma and Merced Formations. In the Daly City and Colma area, the upper Merced is poorly defined, massive, fine-grained sand to sandstone with thinner, discontinuous clay horizons. The upper 200 feet of these deposits (Colma Formation) appear to be more non-marine in nature, possibly reflecting alluvial fan aprons or dune fields fed by sources from the north and, possibly, the south. (LSCE 2010)

Beneath the Colma area, a thick sequence of massive fine sand occurs with a few thin clay beds. Overlying the thick sands in the Colma area is a surficial clayey sand to clay and sand that is interpreted to be a weathered zone of the Colma Formation and younger units. The higher, finer-grained clay and sand sequence appears to thicken and grade into clay beds toward the Bay. These relationships may reflect changing depositional character, from sand-dominated upper Merced and Colma to the west, to the fine-grained estuary and mudflat deposits of the San Francisco Bay region to the east. (LSCE 2010)

In the San Bruno area, well logs and geophysical logs indicate a deep sandy unit overlain by about 200 to 250 feet of predominately fine-grained material that includes silts, clays, sandy clays, and gravelly clays. A southward extending ridge of Franciscan bedrock along with fine-grained Bay Deposits appear to separate San Bruno from the San Francisco Bay to the east. South of San Bruno, surficial mapping may indicate a relationship to exposures of sand and gravel deposits in the Burlingame area, which are mapped as non-marine Santa Clara Formation. (LSCE 2010)

Aquifer System

The Westside Groundwater Basin includes three aquifers informally known as the Shallow Aquifer, Primary Production Aquifer, and Deep Aquifer shown on Figure 5.16-2 (North South Geologic Cross Section, Westside Groundwater Basin) (LSCE 2010). In the North Westside Groundwater Basin, the Shallow Aquifer is present to a depth of about 100 feet and the aquifer is unconfined. In the Lake Merced area and southern portion of the Sunset District, south to Daly City, this aquifer is separated from the Primary Production Aquifer by the "-100-foot clay" layer. The Primary Production Aquifer is at least partially confined and is separated from the Deep Aquifer by the "W" clay layer, and also includes two discontinuous clay layers referred to as the "X" and "Y" clay layers that may locally restrict groundwater flow within the aquifer. The Deep Aquifer underlies the "W" clay layer.

The -100-foot clay layer and "W" clay layer extend north approximately to the vicinity of where the West Sunset well facility is proposed; these clay layers are absent from that point to the northern extent of the groundwater basin. Because these clay layers are absent, the aquifers are hydraulically connected and can effectively be considered one aquifer beneath Golden Gate Park. The Shallow Aquifer is absent in the South Westside Groundwater Basin from Daly City to the south.

Cross-section data oriented north-south and east-west through the South Westside Basin indicate that from Daly City south to South San Francisco, the Primary Production Aquifer is separated from shallow groundwater by at least 50 feet to 100 feet aggregate thickness of intervening clay and sand deposits. Some groundwater elevation data suggest the shallowest groundwater may be locally perched. The relatively low-permeability shallow sediments in the Daly City to South San Francisco area are markedly different than the higher-permeability shallow sands found in the North Westside Basin. South of Daly City in the eastern area of South San Francisco, San Bruno, and Millbrae, the presence of thick surficial Bay Mud deposits of even lower relative permeability likely provides an even greater degree of isolation to the Primary Production Aquifer in that area. (Kennedy/Jenks May 2012e)

Additional evidence for hydraulic separation between shallow groundwater and the Primary Production Aquifer beneath Colma and Millbrae is apparent from relative groundwater levels measured in multi-level Project monitoring well clusters installed in 2008 and 2009. At each monitoring well location, there are three or four separate wells installed at discrete depths. The completion depths for these wells generally correspond to potential water bearing zones in the Primary Production Aquifer and the Deep Aquifer. Differences in groundwater levels measured in the Project monitoring wells suggest the presence of unsaturated zones and localized perched water at shallow depths and likely hydraulic separations between the localized perched zones, shallow groundwater zones, Primary Production Aquifer, and Deep Aquifer in the central and southern portions of the South Westside Basin. (Kennedy/Jenks 2012e)

Groundwater Monitoring Network and Program

The SFPUC, in cooperation with its Partner Agencies,[1] has implemented a groundwater monitoring program since 2001 to evaluate groundwater and lake elevations and groundwater quality throughout the Westside Groundwater Basin, including both the North and South Basins and the portion of the Basin near Lake Merced. (Kennedy/Jenks 2012d)

A network of monitoring facilities consisting of 46 wells includes existing monitoring wells plus new monitoring wells that have been installed at Sites 1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 15, and 16 (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]). Several of the monitoring wells are "nested;" that is, multiple wells are located together in the same borehole and screened at different depths. In addition, two monitoring well clusters are used to collect groundwater level and groundwater quality data near the San Francisco Bay (see Figures 5.16-3 [Groundwater Quality Monitoring Network] and Figure 5.16-4

[1] Since the 1990s the SFPUC has worked cooperatively on Westside Groundwater Basin investigations, monitoring and coordinated studies with the Partner Agencies (SFPUC 2011b).

[Groundwater Elevation Monitoring Network]). Those wells that comprise the monitoring network in the North Westside Groundwater Basin are also shown on Figures 5.16-3 and 5.16-4.

The coastal monitoring network consists of five locations in San Francisco along the Pacific Coast extending from the western end of Golden Gate Park south to the vicinity of Lake Merced (South Windmill Replacement, Kirkham, Ortega, Taraval, and Zoo). Each monitoring location includes two to four individual monitoring wells completed at different depths to monitor groundwater levels and quality in the Shallow, Primary Production and Deep aquifers. Each well in the coastal monitoring network is sampled for water quality parameters that are indicative of the potential for seawater intrusion, including chloride, total dissolved solids (TDS), and electrical conductivity.

The lake-aquifer monitoring network around Lake Merced includes continuous monitoring of water levels in South Lake and a dedicated network of eight monitoring sites that include four groundwater monitoring well clusters (LMMW1, LMMW2, LMMW3, and LMPS MW) around Lake Merced that are screened in the Shallow, Primary Production, and Deep aquifers to provide data on lake-aquifer interactions. Each of these well clusters includes at least one well screened in the Shallow Aquifer. At some locations there are two wells completed in the Shallow Aquifer, with one well completed in the shallower part of the aquifer (designated with an "SS") and one well completed in the deeper portion of the Shallow Aquifer (designated with an "S"). The remaining monitoring sites include monitoring wells screened in the Shallow Aquifer (LMMW4, LMMW7, LMMW8, and LMMW9). An additional well cluster (LMMW-5SS and 5S) is located near Pine Lake. Water levels in Lake Merced are monitored on a continuous basis, and additional monitoring is conducted on a periodic basis.

Three monitoring well clusters in the South Westside Groundwater Basin are used to collect groundwater level and groundwater quality data near the San Francisco Bay (Figures 5.16-3 and 5.16-4, Groundwater Quality Monitoring Network and Groundwater Elevation Monitoring Network, respectively). The "SFO" well cluster consists of two wells that were installed in the northern portion of SFO in 2006. These wells are identified as SFO-S and SFO-D: SFO-S is 74 feet deep and monitors the shallow groundwater zones; and SFO-D is 146 feet deep and monitors the Primary Production Aquifer. The "UAL" well cluster also consists of two wells that were installed in the southern part of SFO in 2003. These wells are identified as UAL MW13C and UAL MW13D: UAL MW13C is 146 feet deep and monitors the Primary Production Aquifer; and UAL MW13D is 41.5 feet deep and monitors the shallow groundwater zones. The southernmost monitoring well cluster was installed in 2006. The three wells in this cluster are identified as Burlingame-S, Burlingame-M, and Burlingame-D: Burlingame-S is 98 feet deep and monitors the shallow groundwater; Burlingame-M is 166 feet deep; and Burlingame-D is 280 feet deep and monitors the Primary Production Aquifer. (Kennedy/Jenks 2012e)

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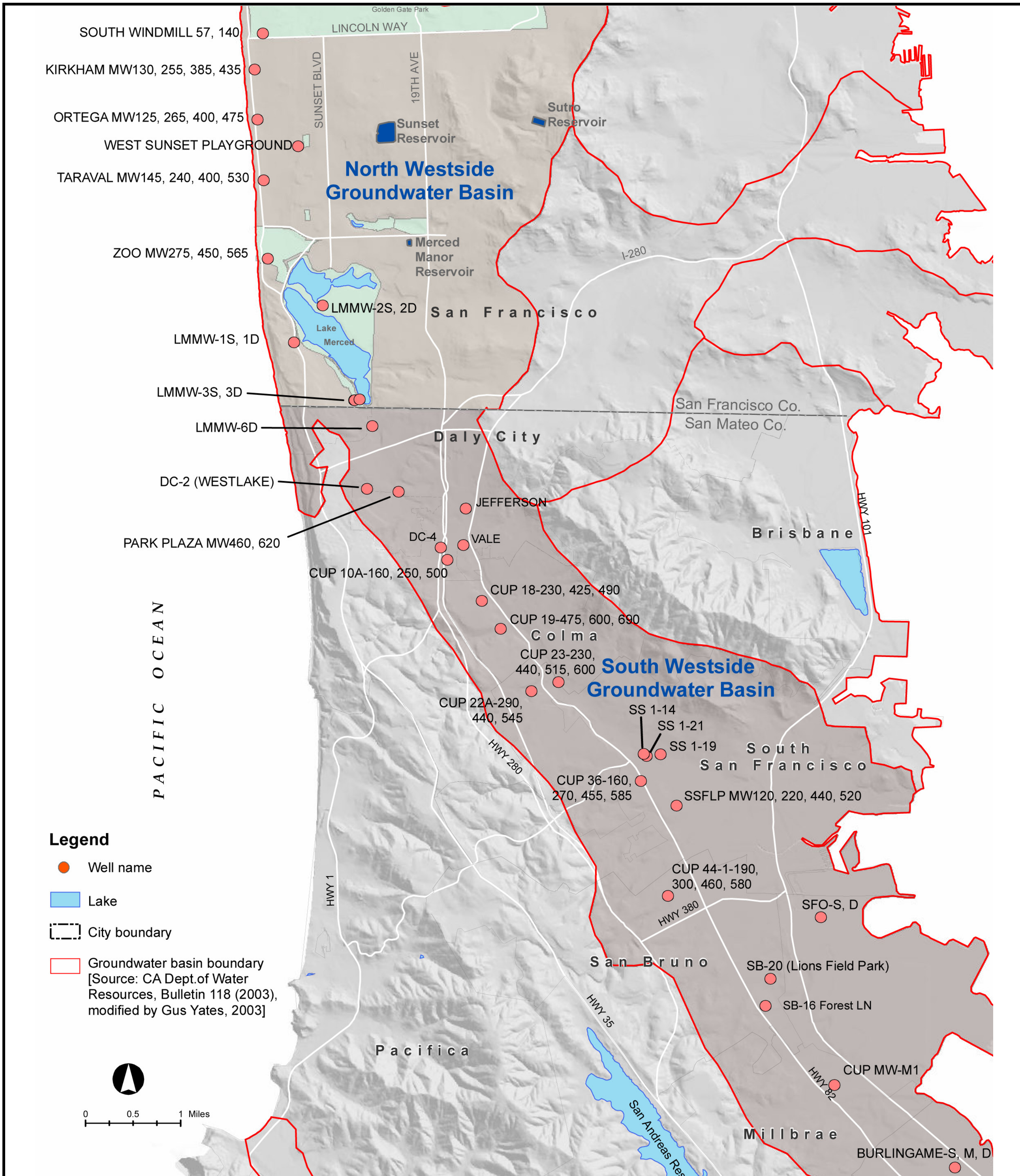

Groundwater Quality Monitoring Network

Regional Groundwater Storage and Recovery Project

Figure 5.16-3

Source: SFPUC 2012b

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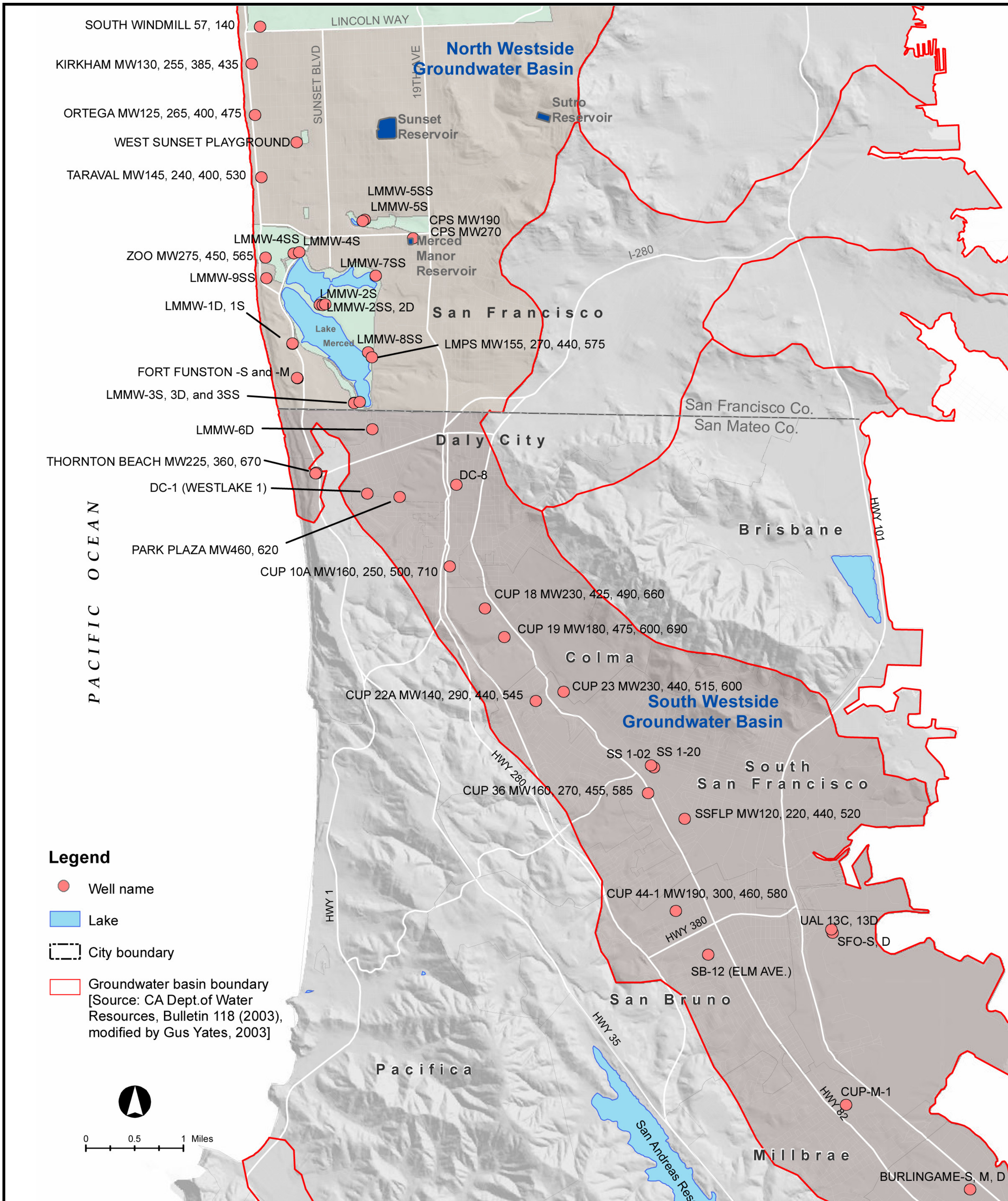

Source: SFPUC 2012b

Groundwater Elevation Monitoring Network

Regional Groundwater Storage and Recovery Project

Figure 5.16-4

Groundwater Levels and Flow Directions

North Westside Groundwater Basin

Prior to the early 1940s, water levels in the North Westside Groundwater Basin and in the northern portions of San Mateo County were above sea level, with a northwesterly gradient in the shallow and primary production aquifers (SFPUC 2005). Based on regular monitoring of groundwater levels in the North Westside Groundwater Basin since 2004, groundwater levels along the Pacific Ocean coast, north of Lake Merced, generally remain above sea level in the Shallow and Primary Production Aquifers, with the exception of Primary Production Aquifer groundwater levels in the vicinity of South Windmill location in Golden Gate Park where irrigation season groundwater levels have been below sea level (SFPUC 2011b). At the San Francisco Zoo, groundwater levels have, during drought periods, occasionally declined to levels slightly below sea level. At the South Windmill location, Primary Production Aquifer levels periodically decrease below sea level due to irrigation pumping at the South Windmill Replacement well.

In the southern portion of Lake Merced, Primary Production Aquifer groundwater levels in LMMW-3D have historically been below sea level, probably due to pumping in the adjacent South Westside Groundwater Basin. Primary Production and Deep Aquifer levels in the North Westside Groundwater Basin have historically decreased to below sea level at some locations, but since 2001 (Primary Production Aquifer) and 2004 (Deep Aquifer), when comprehensive monitoring began, were generally on the rise.

Groundwater levels generally remained stable or increased from 2004 through 2010 (SFPUC 2012e). The increase is likely due to decreased pumping from the groundwater basin including reduced golf club irrigation pumping in the vicinity of Lake Merced and reduced municipal pumping in the South Westside Groundwater Basin under the In-Lieu Recharge Demonstration Study (discussed below) (LSCE 2005). In 2010, the groundwater flow direction in the Shallow Aquifer of the North Westside Groundwater Basin was westerly and groundwater levels ranged from approximately 10 to 39 feet, pursuant to the North American Vertical Datum of 1988 (NAVD 88)[2]. North of Lake Merced, the groundwater flow direction in the Primary Production Aquifer was also westerly and groundwater levels ranged from approximately 3 to 77 feet NAVD 88. South of Lake Merced, the groundwater flow in the Primary Production Aquifer shifts to the south toward the South Westside Groundwater Basin, with groundwater levels dipping to approximately -15 feet NAVD 88 at LMMW-6D, the

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[2] Groundwater elevations are commonly referenced to the North American Vertical Datum of 1988 (NAVD 88) and/or the National Geodetic Vertical Datum of 1929 (NGVD 29). NAVD 88 was established in 1991 and is the most up-to-date and accurate datum. NGVD 29 was used by surveyors and engineers for most of the 20th century and is 2.8 feet lower than NAVD 88 in San Francisco and northern San Mateo County. The technical reports prepared in support of the GSR Project used both datums; therefore, for consistency, this EIR uses the same datum employed in a given technical report when discussing information obtained from that report. Mean sea level is equivalent to 0 feet NGVD 29, which is also equivalent to 2.8 feet NAVD 88.

southernmost groundwater monitoring well in the Primary Production Aquifer in the North Westside Groundwater Basin.

South Westside Groundwater Basin

Beginning in the 1950s and 1960s, groundwater levels in the South Westside Groundwater Basin declined to below sea level. This decline continued into the 1970s, after which groundwater levels stabilized at elevations of more than 100 feet below mean sea level (msl), resulting in vacated aquifer storage[3] of up to 75,000 acre-feet (af) in the Daly City, South San Francisco, and northern San Bruno areas (Kirker, Chapman & Associates 1972; LSCE 2005).

In 2005, groundwater elevations in the Primary Production Aquifer in the South Westside Groundwater Basin ranged from approximately -8 feet NAVD 88 immediately south of Lake Merced to -102 feet NAVD 88 in Daly City and -75 feet NAVD 88 in South San Francisco. At that time, groundwater flow in the vicinity of Lake Merced continued to be to the south; the steepest groundwater gradient was between Lake Merced and Daly City (LSCE 2006). On the bayside, groundwater levels in the Primary Production Aquifer beneath San Bruno were approximately -180 feet NAVD 88 in 2005.

The depth to groundwater in the South Westside Groundwater Basin is largest in the eastern area of Daly City and in San Bruno in the Primary Production Aquifer. Overall, the depth to groundwater in the Primary Production Aquifer ranges from 200 feet to 300 feet below ground surface in the Daly City area, within 50 feet to 100 feet of the ground surface in the California Water Service Company (Cal Water) service area, and about 260 to 270 feet below ground surface in the San Bruno area (SFPUC 2011b). At the southern portion of Lake Merced and immediately to the south, the groundwater flow direction in the Primary Production Aquifer is to the south and southeast towards Daly City. In these areas and further south, the depth can exceed 300 feet below ground surface, due largely to the effects of long-term pumping in the Daly City, Colma, South San Francisco, and San Bruno areas. The groundwater depressions caused by concentrated areas of long-term pumping induce flow locally towards those depressions.

In the South Westside Groundwater Basin, shallow groundwater is also present within shallow units overlying the Primary Production Aquifer. In the eastern portion of the Basin from South San Francisco southward to Burlingame, shallow groundwater generally flows east towards the Bay. Throughout this eastern portion of the Westside Basin, groundwater flow in the Deep Aquifer is also generally east toward the Bay. In the vicinity of San Bruno, groundwater extraction has created a depression in the groundwater levels. A flow divide near the south end of SFO separates the area where groundwater flows toward the pumping depression in San Bruno from the area where groundwater flows toward the Bay. The divide trends southwest from near the Millbrae exit on U.S.

[3] Vacated aquifer storage is the volume of groundwater which is estimated to have been present historically in the aquifer, but which is no longer present, usually due to pumping.

101; groundwater northwest of the divide is captured by the City of San Bruno wells. (Kennedy/Jenks 2012e)

In-Lieu Recharge Demonstration Study

The SFPUC and the Partner Agencies participated in the In-lieu Recharge Demonstration Study in the South Westside Groundwater Basin from October 2002 through April 2007 to study the effects of the groundwater recharge component of a conjunctive use program, in which the Partner Agencies received supplemental surface water from the SFPUC in-lieu of their normal groundwater pumping. The purpose of the Demonstration Study was to determine if this in-lieu recharge would result in an accrual of groundwater storage that would result in an increase in groundwater availability for pumping in dry years and for emergency supply when the regional water system supply may be reduced. (Kennedy/Jenks 2012a)

The SFPUC undertook groundwater monitoring throughout the South Westside Groundwater Basin and adjacent areas along the Pacific Coast and San Francisco Bay, before, during, and after the Demonstration Study to determine the extent to which groundwater levels and storage were affected. After approximately three years (from fall 2002 to spring 2005) of operating the Demonstration Study, the SFPUC reported that in-lieu recharge can be successfully accomplished by reducing pumping, resulting in increases in groundwater storage. As expected, monitoring results indicated that reduction of pumping by the Partner Agencies resulted in increased groundwater levels in the Primary Production Aquifer, where the Partner Agencies' wells are screened. (LSCE 2005)

During the In-lieu Recharge Demonstration Study, the SFPUC delivered approximately 20,000 af of supplemental surface water to the Partner Agencies in exchange for a reduction in their groundwater pumping. This 20,000 af has been credited to the SFPUC Storage Account. However, this water would not be withdrawn unless and until the GSR Project and the Operating Agreement are approved by the SFPUC and the Project wells are constructed to enable use of the water in storage (see explanation of the SFPUC Storage Account in Chapter 3, Project Description, Section 3.8.1 [Operating Agreement]). (Kennedy/Jenks 2012a)

Seawater Intrusion

Seawater intrusion refers to the migration of seawater into a freshwater aquifer and can occur when groundwater levels are lowered by pumping. Seawater intrusion becomes an environmental concern when the degradation of groundwater quality would make the groundwater potentially unsuitable for its identified use, or when inland surface water features are affected by the seawater, compromising habitats or uses of the surface water.

Two areas of the Westside Groundwater Basin are susceptible to seawater intrusion under certain conditions. One area is in the North Westside Groundwater Basin along the Pacific Coast, where the Shallow Aquifer is open to the ocean; this area is discussed below in Section 5.16.1.3 (Regional Groundwater Hydrology) under the sub-heading "Seawater Intrusion in the North Westside Groundwater Basin." The other is in the South Westside Groundwater Basin along San Francisco Bay.

Seawater Intrusion in the North Westside Groundwater Basin

In the North Westside Groundwater Basin, the Shallow Aquifer is in direct hydraulic connection with the Pacific Ocean between Lincoln Park (north of Golden Gate Park) and the San Francisco Zoo area, indicating a potential for seawater intrusion to occur in the Shallow Aquifer in this area. Although existing offshore seismic studies suggest that there might be some depositional or structural features in the offshore sediments that would preclude seawater intrusion directly from the ocean into the Primary Production and Deep Aquifers, the geologic information for this offshore area is not sufficient to conclusively make this determination (Kennedy/Jenks 2012c). Therefore, seawater intrusion into the Primary Production Aquifer as a result of direct hydraulic connection with the ocean is considered possible.

If seawater intrusion were to occur within the Shallow Aquifer, the Primary Production Aquifer could also be affected in areas where no clay layer separates the aquifers or where gaps are present in the clay layers that separate the aquifers, assuming a downward hydraulic gradient between the two aquifers. South of the Sunset area in western San Francisco, the -100-foot clay layer separating the Shallow Aquifer and the Primary Production Aquifer may protect the Primary Production Aquifer from seawater intrusion occurring in the Shallow Aquifer (if it were to occur). However, there are gaps in the -100-foot clay layer (as illustrated in Figure 5.16-2 [North-South Geologic Cross Section, Westside Groundwater Basin]), including one between the Taraval and San Francisco Zoo coastal groundwater monitoring locations (refer to Section 5.16.1.3 [Regional Groundwater Hydrology] under the sub-heading “Groundwater Monitoring Network and Program”). At these gaps the Shallow and Primary Production Aquifers could be hydraulically connected. North of the Sunset District, including Golden Gate Park, there are not pronounced or laterally extensive clay layers and the Shallow Aquifer and Primary Production Aquifers are merged, meaning that in this area the aquifers are hydraulically connected to a greater degree and can effectively be considered one aquifer. South of the San Francisco Zoo, in the vicinity of Lake Merced, the Serra Fault could act as a barrier to seawater intrusion as far north as the Great Highway, where the fault heads offshore. (LSCE 2010)

<u>Coastal Groundwater Levels</u>

Coastal groundwater levels measured in the coastal monitoring network, as described in Section 5.16.1.3 (Regional Groundwater Hydrology) under the sub-heading “Groundwater Monitoring Network and Program”, provide an indication of the potential for seawater intrusion to occur. In general, the potential for seawater intrusion is lower when coastal groundwater levels are above sea level. Although coastal groundwater levels that are below sea level indicate a higher potential for seawater intrusion, the occurrence of seawater intrusion would need to be confirmed through other means, such as groundwater quality monitoring.

Shallow Aquifer Coastal Groundwater Levels

Through 2010, groundwater levels in all Shallow Aquifer coastal monitoring wells have been consistently above sea level, except at the South Windmill Deepwell monitoring location (USGS

South Windmill MW-57). Groundwater levels in the Shallow Aquifer at the South Windmill monitoring location have varied as much as approximately 19 feet seasonally and have historically declined to below sea level by as much as 2 feet during the irrigation season. However, none of the groundwater levels were below sea level in 2010, likely because of reduced irrigation pumping at the South Windmill Deepwell facility (SFPUC 2011b).

Primary Production Aquifer Coastal Groundwater Levels

Primary Production Aquifer groundwater levels at the coastal monitoring locations have consistently remained above sea level, except for brief deviations below sea level at the San Francisco Zoo location. At the Kirkham location, the Primary Production Aquifer groundwater levels also show a seasonal variation that may be a response to pumping at the South Windmill Deepwell facility, with dry-season elevations as low as approximately 3 feet NAVD 88 in 2007. (SFPUC 2011b)

Continuous monitoring at the South Windmill Deepwell location (USGS South Windmill MW-140[4]) was not conducted in the Primary Production Aquifer until 2008; however, current monitoring indicates that Primary Production Aquifer groundwater levels at this location have declined to below sea level by as much as 20 feet during the irrigation season while rebounding to above sea level by as much as 13 feet during the wet season. Groundwater levels in the Primary Production Aquifer at the South Windmill location have not shown the same declining trend as groundwater levels in the shallower portion of the aquifer at this monitoring location. (SFPUC 2011b)

Deep Aquifer Coastal Groundwater Levels

Groundwater levels in the Deep Aquifer have periodically declined to below sea level at the Kirkham, Ortega, Taraval, and San Francisco Zoo monitoring locations (SFPUC 2011b). In August and September 2007, groundwater levels in the Deep Aquifer at the Kirkham location were briefly as much as -1 foot NAVD 88. At the Ortega monitoring location, groundwater levels in the Deep Aquifer were below sea level for parts of 2006 and 2007, with the deepest elevation of -5 feet NAVD 88; groundwater levels at this location have been on the rise and consistently above sea level since 2008. At the Taraval monitoring location, groundwater levels were below sea level for most of the period between August 2004 and January 2009, declining to a minimum of -9 feet NAVD 88 in September 2007. Since late 2009, Deep Aquifer groundwater levels at this location have been above sea level, reaching approximately 4 feet NAVD 88 by the end of 2010. Except for March and April 2006, Deep Aquifer groundwater levels at the San Francisco Zoo monitoring location were consistently below sea level between January 2004 and January 2009 due to

[4] Note that this well is screened at an elevation that corresponds to the upper part of the Primary Production Aquifer as it exists further to the south where it is separated from the Shallow Aquifer by a clay layer. However, the sand pack extends partially into the uppermost portion of the aquifer. (SFPUC 2011a)

pumping at San Francisco Zoo Well No. 5 and Daly City's municipal wells, with a minimum elevation of approximately -14 feet NAVD 88. Throughout 2010, Deep Aquifer groundwater levels at this location have been much higher, ranging from about -2 to 2 feet NAVD 88. (SFPUC 2011b)

Coastal Chloride Concentrations

With the exception of the South Windmill Deepwell monitoring location in the southwestern part of Golden Gate Park (discussed below), chloride concentrations in the coastal monitoring wells were less than 75 milligrams per liter (mg/L) between 2004 and 2011. The highest concentrations were detected at the San Francisco Zoo monitoring location, and observed concentrations over the six years of reported monitoring data for all four locations are relatively constant (SFPUC 2011b). These results indicate that seawater intrusion into the Shallow, Primary Production, and Deep Aquifers has not occurred despite long-term irrigation pumping at the zoo since the 1930s and in Golden Gate Park since the 1920s.

Between 2006 and 2010, chloride concentrations in the uppermost portion of the aquifer at the South Windmill monitoring location ranged from a low of 115 mg/L in April 2006 to a high of 193 mg/L in November 2009. Since 2009, chloride concentrations have decreased; the concentration in November 2011 was 154 mg/L. Chloride concentrations in the Primary Production Aquifer at the South Windmill monitoring location ranged from a low of 48 mg/L in October 2007 to a high of 70 mg/L in November 2009. Since 2009, chloride concentrations have decreased; the concentration in November 2011 was 59 mg/L.

Monitoring results indicate that the highest chloride concentration (393 mg/L) was detected in the November 2009 Shallow Aquifer groundwater sample from well LMMW-1S; this well is not part of the coastal monitoring network but is located between Lake Merced and the Pacific Ocean (SFPUC 2011b). As of November 2011, this concentration had declined to 260 mg/L. The maximum chloride concentration in the Primary Production Aquifer at the same location (LMMW-1D) was 105 mg/L. The cause of these high chloride concentrations is unknown. While the proximity of these wells to the Pacific Ocean (which is approximately 1,300 feet to the west) indicates that the ocean is a potential source, LMMW-1S is separated from the ocean by the Serra Fault, which acts as a barrier to seawater intrusion (Kennedy/Jenks 2012c). Further, groundwater level elevations in this well have historically exceeded 12 feet, NAVD 88, and the average pH of the groundwater at this location is 6.8, which suggests a freshwater source and is lower than the pH of seawater (about 7.8 to 8.4). In addition, this pH is lower than the values measured in other monitoring wells in the basin (7.2 to 8.6), and other chemical constituents are not typical of seawater (Kennedy/Jenks 2012c).

Seawater Intrusion in the South Westside Groundwater Basin

Because the South Westside Groundwater Basin is in contact with the San Francisco Bay, seawater intrusion is possible along the eastern edge of the basin. The Bay Mud observed along the eastern edge of the Basin may impede seawater intrusion. However, the Bay Mud may also contain connate[5] waters with high salinity. Because the Bay Mud was deposited in the San Francisco Bay, any connate water in the Bay Mud will have salinities similar to seawater, and it will be difficult to distinguish between the two. Flow of these connate waters into the South Westside Groundwater Basin would have an impact identical to seawater intrusion.

The northwestern-most edge of the South Westside Groundwater Basin is in contact with the Pacific Ocean. The section that is in contact with the Pacific Ocean is west of the Serra Fault. The Serra Fault, along with steeply dipping and offset beds of the Merced Formation, likely provides a barrier to seawater intrusion (LSCE 2010; Kennedy/Jenks 2012c). Therefore, the main portion of the South Westside Groundwater Basin is not susceptible to seawater intrusion from the Pacific Ocean.

Groundwater Levels Relative to Sea Level

Shallow groundwater zone

Groundwater levels for the shallow groundwater zone near the San Francisco Bay are obtained from the SFO-S, Burlingame-S, and UAL MW13D monitoring wells. Groundwater levels measured in these wells have been consistently at or above zero feet NAVD 88. Groundwater levels in the SFO-S monitoring well have been measured since November 2006 and are consistently found at approximately 2 feet NAVD 88. Groundwater levels in UAL MW13D have been measured since 2000 and are consistently between zero and 3 feet NAVD 88. Groundwater levels in Burlingame-S have been measured since November 2006 and seasonally fluctuate between approximately 1.5 and 4 feet NAVD 88. The groundwater levels in the Burlingame-S monitoring well show a slight declining trend.

Primary Production Aquifer

Groundwater levels for the Primary Production Aquifer near the bayside are obtained from the SFO-D and UAL MW13C monitoring wells. Groundwater levels measured in these wells have been consistently between -29 and -35 feet NAVD 88. Groundwater levels in well SFO-D have been measured since November 2006, and show minor fluctuation between -29 and -31 feet NAVD 88. Groundwater levels in well UAL MW13C have been measured since 2000, and fluctuate between approximately -32 and -35 feet NAVD 88.

Chloride Concentrations as an Indicator of Seawater Intrusion

Chloride concentrations are generally higher in the northern portion of the bayside and lower in the southern portion of the bayside.

[5] Connate waters are seawater trapped in a formation when the sediments are deposited.

The two monitoring wells in the northernmost SFO well cluster both show chloride concentrations above the secondary MCL[6] of 250 mg/L (SFPUC 2012e). Chloride concentrations in the shallow monitoring well SFO-S have ranged between 8,400 and 12,000 mg/L with an average concentration of 9,910 mg/L, and do not show an increasing trend. Chloride concentrations in the deeper monitoring well SFO-D are generally at or below 500 mg/L with the exception of a single measurement of 2,210 mg/L, and show no apparent trend. These concentrations suggest either connate water or seawater has intruded into the shallow groundwater at this site. The chloride concentrations in the Primary Production Aquifer at this site are above the secondary MCL.

The two monitoring wells in the UAL cluster both show chloride concentrations above the secondary MCL of 250 mg/L. In 2006, a sample from the shallow monitoring well MW13D showed a chloride concentration of 13,000 mg/L. In 2006 and 2007, samples collected from monitoring well MW13C in the Primary Production Aquifer showed chloride concentrations of 510 and 530 mg/L (WRIME 2007).

The three monitoring wells in the southernmost Burlingame cluster show relatively lower chloride concentrations compared to the other two well clusters. Chloride concentrations in the shallow well Burlingame-S have ranged between 110 and 518 mg/L and show an increasing trend. Chloride concentrations in the middle Burlingame-M monitoring well have ranged between 63 and 140 mg/L. Chloride concentrations in the deep well Burlingame-D have ranged between 41 and 140 mg/L. These concentrations suggest either seawater or saline connate waters may have intruded into the shallow aquifer at this site (SFPUC 2010a). Detected chloride concentrations from the remaining San Bruno wells are below the secondary MCL (SFPUC 2011b).

Groundwater Budget

A groundwater budget (also referred to as a water balance or hydrologic budget) is a measure of the balance between the quantity of water supplied to a groundwater basin and the amount leaving the basin (Todd 1980). Groundwater entering a groundwater basin is called an "inflow," and groundwater leaving the basin is called an "outflow." The volume of groundwater in a basin is called "groundwater storage," and storage changes as the respective quantities of groundwater inflow and outflow vary from season to season and from year to year.

In the Westside Groundwater Basin, inflow or recharge components of the groundwater basin include subsurface inflows from outside of the basin, recharge from precipitation, recharge from applied water (irrigation), recharge from surface water such as Lake Merced and Pine Lake, and recharge from leakage of sewer and water pipes (LSCE 2010). Outflow components include groundwater pumping, subsurface outflows to the Pacific Ocean, and discharge to Lake Merced. Lake Merced can either lose water to the

[6] The U.S. EPA and Title 22 of the California Code of Regulations establish secondary Maximum Contaminant Limits (MCLs) to prevent drinking water that may appear colored or taste or smell bad, causing people to stop using water from their public water system These contaminants are not considered to present a risk to human health at the Secondary MCL, but are enforceable by the State nonetheless.

groundwater system or gain water and, therefore, can be considered a component of groundwater inflow or outflow, depending on lake and groundwater levels, which vary seasonally and annually. Pine Lake, on the other hand, discharges water to the groundwater system and would only be considered a component of the groundwater inflow.

The predicted average annual groundwater budget for the Westside Groundwater Basin under modeled existing conditions is shown in Table 5.16-2 (Modeled Annual Average Groundwater Budget for the Westside Groundwater Basin under Modeled Existing Conditions). As with all of the other modeling scenarios, the modeled existing conditions scenario includes a design drought for planning purposes (see Section 5.1 Overview, Section 5.1.6.1 [Westside Basin Groundwater Model]). This drought is longer than any experienced in the available historical record (1958-2005) and is largely responsible for the predicted overall negative change in annual average storage shown in Table 5.16-2.

The predicted annual decline in groundwater storage under modeled existing conditions is primarily due to the assumptions used for the hydrologic inputs to the modeling which are consistent with the design drought used in the PEIR (San Francisco Planning Department 2008). The design drought extends the 1976-77 drought. As a result, the modeling assumes a rainfall deficit over the 47-year modeling period of nearly 20 inches compared to the 1958-2005 sequence used in the HydroFocus 2008 No-Project Scenario (HydroFocus 2011). Over the duration of the HydroFocus 2008 No-Project Scenario there is little to no change in groundwater storage. Therefore, the hydrologic assumptions used for this EIR for modeled existing conditions provide a conservative analysis of groundwater storage (Kennedy/Jenks 2012b).

TABLE 5.16-2
Modeled Annual Average Groundwater Budget for the Westside Groundwater Basin under Modeled Existing Conditions

Inflow and Outflow Categories	Modeled Average Annual Inflow and Outflow Values (acre-feet per year [afy])[(a)]
Inflow from Surface Water to Groundwater	
Rain and irrigation water	14,034
Seepage from Lake Merced	846
Seepage from Golden Gate Park lakes	551
Inflow from San Francisco Bay and Ocean	12
Outflow from Groundwater to Surface Water	
Pumping of municipal and irrigation wells	-10,814
Outflow to San Francisco Bay and Ocean	-4,172
Seepage to Lake Merced	-960
Other Outflows	-94
Total	**-597**

Source: Kennedy/Jenks 2012b

Note:

(a) In this table, positive values represent water flowing into the groundwater basin (inflows), and negative values represent water flowing out of the groundwater basin (outflows).

Subsidence

Land subsidence is a gradual settling or sudden sinking of the Earth's surface due to subsurface movement of earth materials (Galloway et al. 1999). Land subsidence due to groundwater pumping can occur when groundwater levels are lowered and water drains out of clay layers that are within or between aquifers.

Subsidence can damage infrastructure, including pipelines, bridges, roads, railroads, and buildings, by causing them to crack during settling. Subsidence can also increase flooding or change drainage patterns by lowering the ground surface.

Subsidence either has not occurred in the Westside Groundwater Basin or insufficient monitoring information exists to document its occurrence (Fugro 2012b). No subsidence has been observed in land overlying the Westside Groundwater Basin, even though historical groundwater pumping has lowered the groundwater levels in portions of the Basin more than 200 feet (Fugro 2012b). Since the mid-1970s, pumping in the Westside Groundwater Basin has been between 6,000 and 8,000 acre-feet per year (afy) (LSCE 2010). These lowered groundwater levels from previous pumping have apparently not triggered any recognizable level of subsidence.

Groundwater Quality

Groundwater monitoring indicates that groundwater quality in the Westside Groundwater Basin generally meets drinking water standards according to the Maximum Contaminant Levels (MCLs) of the primary and secondary drinking water standards set by the California Department of Public Health (CDPH), with the exception of nitrate and volatile organic compounds (VOCs) in specific areas, and other secondary constituents in specific areas (i.e., pH, color, hardness, turbidity, conductivity, total dissolved solids [TDS], sulfate, chloride, manganese, and iron) (Kennedy/Jenks 2012e, Kennedy/Jenks 2012g). Refer to Section 5.16.2 (Regulatory Framework) for a discussion of primary and secondary drinking water standards, MCLs, and fluoridation.

Table 5.16-3 (Range of Existing Ambient Groundwater Quality for Selected Constituents in the Westside Groundwater Basin) provides the range of existing water quality for selected constituents from 2002 to 2011, as identified in the SFPUC 2011 annual monitoring report, together with the primary and secondary MCLs for these constituents, if they have been established. (SFPUC 2012e)

TABLE 5.16-3
Range of Existing Ambient Groundwater Quality for Selected Constituents in the Westside Groundwater Basin (mg/L)[(a), (b)]

Constituent	Range of Existing Water Quality[(c),(d)] North Westside Groundwater Basin	Range of Existing Water Quality[(c),(d)] South Westside Groundwater Basin	Primary MCL	Secondary MCL
Chloride	15 to 393	20 to 14,000	None	250
Iron	Non-detect to 5.07	Non-detect to 14.7	None	0.3
Manganese	Non-detect to 0.63	Non-detect to 1.71	None	0.05
Nitrate (as NO_3)	Non-detect to 65	Non-detect to 140	45	None
Sulfate	0.8 to 122	Non-detect to 1,200	None	250
Total Dissolved Solids (TDS)	129 to 1,305	128 to 21,200	None	500

Source: SFPUC 2012e

Notes:

(a) mg/L is milligrams per liter.

(b) Groundwater from municipal wells located in areas with higher nitrate concentrations is blended with SFPUC surface water prior to distribution; the resulting blend fully meets all Primary MCLs and Secondary MCLs (Kennedy/Jenks 2012e, Daly City 2012). Sample results are taken from throughout the Westside Groundwater Basin including shallow monitoring wells and monitoring wells adjacent to San Francisco Bay. Sample results do not include the Thornton Beach Monitoring Well or Fort Funston Monitoring Well located west of the Serra Fault, because those monitoring wells are not indicative of water quality in the central part of the Basin where the proposed Project would be located.

(c) Sample results reported as anomalous or questionable in the 2011 Annual Monitoring Report (SFPUC 2012e) were not included in the range of existing water quality.

(d) Sample results are from 2000 to 2011.

Monitoring data indicate isolated occurrences of elevated nitrate concentrations in groundwater above the primary drinking water MCL of 45 mg/L in portions of Daly City and South San Francisco, but not in the Colma or San Bruno areas. The extent of nitrate concentrations may at least be partially attributed to past agricultural fertilizer applications and possibly to past confined animal facilities such as stockyards. In the Daly City area, data available since 2000 show nitrate concentrations ranging up to 131 mg/L, but most sampling indicated concentrations range from 20 to 50 mg/L in supply wells perforated in the Primary Production Aquifer. In the South San Francisco area, data since 2000 show nitrate concentrations ranging up to 120 mg/L, with most sampling indicating concentrations from 40 to 80 mg/L in the upper portion of the Primary Production Aquifer. In the lower portion of the Primary Production Aquifer, nitrate concentrations decrease, often to levels at or below 1 mg/L (Kennedy/Jenks 2012e). (Note that groundwater from municipal wells located in areas with higher nitrate concentrations is blended with

SFPUC surface water prior to distribution; the resulting blend fully meets all drinking water standards (Kennedy/Jenks 2012e; Daly City 2012).

Based on sampling results, common contaminants, such as volatile organic compounds (VOCs), have rarely been found in the Primary Production and Deep Aquifers in the Westside Groundwater Basin (Kennedy/Jenks 2012e, Kennedy/Jenks 2012g). In a few cases, contaminants have reached groundwater, and the constituents have been detected in the shallow water-bearing zones approximately 30 to 50 feet below ground surface. The shallow water-bearing zones are underlain by low permeability fine-grained materials, separating the shallow zones from the Primary Production and Deep Aquifers. (Kennedy/Jenks 2012e)

The VOCs tetrachloroethylene (PCE) and trichloroethylene (TCE) have been detected in the Primary Production and Deep Aquifers at monitoring wells near Sites 1 and 11 in samples taken approximately 240 to 580 feet below ground surface. The source of the VOCs has not been identified (Kennedy/Jenks 2012g). In October 2012, the monitoring wells at Sites 1 and 11 were resampled. No VOCs were detected at Site 1, indicating that the earlier detections may not be representative of groundwater quality at Site 1 (SFPUC 2013c). VOCs were detected at Site 11, and the potential presence of these VOCs is under review by the SFPUC.

Information on the quality of groundwater in the South Westside Groundwater Basin is also available from the studies performed as part of the Groundwater Ambient Monitoring and Assessment (GAMA) program. The GAMA program is a comprehensive assessment of statewide groundwater quality implemented by the State Water Resources Control Board (SWRCB) in coordination with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory. The South Westside Groundwater Basin was included in a 2007 GAMA study as part of the investigation of the San Francisco Bay study unit, which includes portions of San Francisco, San Mateo, Santa Clara, and Alameda counties. Between April and June of 2007, the GAMA program included an assessment of groundwater quality in the San Francisco Bay study unit through sampling of 79 wells, 11 of which were located in or near the South Westside Groundwater Basin. (Ray et al. 2009)

As part of the GAMA study, groundwater samples were analyzed for a large number of organic constituents, including VOCs, pesticides, pharmaceutical compounds, and potential wastewater-indicator compounds. Groundwater samples were also analyzed for constituents of special interest (perchlorate and N-nitrosodimethylamine [NDMA]), naturally occurring inorganic constituents (e.g., nutrients, major and minor ions, trace elements), and radioactive constituents and microbial indicators.

The study was designed to provide an assessment of untreated groundwater quality. Although regulatory thresholds apply to treated water rather than untreated groundwater, in order to provide some context for the groundwater results, the GAMA report compared the concentrations of constituents measured in the untreated groundwater with regulatory limits. (Ray et al. 2009)

VOCs were detected in five of the 11 wells within the South Westside Groundwater Basin. All of the detections of VOCs were below health-based[7] thresholds, and most were less than one-tenth of the threshold values. Pesticides, pharmaceutical compounds, and wastewater indicator compounds were not detected in any of the 11 wells within the South Westside Groundwater Basin. Perchlorate was detected in seven of the 11 wells and NDMA in four of the wells. All detections of perchlorate and NDMA were below established thresholds. (Ray et al. 2009)

5.16.1.4 Groundwater-Surface Water Interactions

Lake Merced

This 300-acre freshwater lake is the largest freshwater lake in San Francisco and is composed of four individual, but connected, water bodies (North Lake, South Lake, East Lake, and Impound Lake). Lake Merced is located in southwestern San Francisco, approximately 0.25 mile east of the Pacific Ocean (see Figure 5.16-1 [Surface Water Hydrology]). The lake is incised into the upper portion of the Shallow Aquifer and is hydraulically connected to that aquifer (see Figure 5.16-2 [North-South Geologic Cross Section, Westside Groundwater Basin]) (Kennedy/Jenks 2012d). Previous investigations have shown that the lake is essentially an exposed part of the water table that defines the upper boundary of the Shallow Aquifer (LSCE 2002; 2004).

North and East Lakes, which are joined by way of a narrow channel, are almost completely separated from South Lake by natural or constructed barriers; however, a conduit connects South and North Lakes at an elevation of 3.35 feet City Datum[8]. Therefore, when the lake level drops below the conduit, North and South Lakes no longer have direct hydraulic connection and typically exhibit different lake levels. When the lake elevation in North and South Lakes is sufficiently higher than the bottom of the conduit, i.e., approximately 4 feet City Datum, water can freely flow through the conduit between the two lakes. South and Impound Lakes are also partially separated by a low berm; flow between these lakes is restricted below an elevation of approximately 4.3 feet. (Kennedy/Jenks 2012d)

Lake Merced does not currently have a natural outlet to the Pacific Ocean, but discharges instead to the Vista Grande Drainage Canal, which is a Daly City stormwater channel that serves a 2.5-square-mile basin within Daly City and which discharges to the Pacific Ocean in the vicinity of Fort Funston (Daly City 2011). Lake Merced discharges to the Vista Grande Drainage Canal at a spillway located near the

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[7] The GAMA study refers to "health-based" thresholds which include thresholds promulgated by the U.S. EPA and the CDPH, including primary MCLs, Action Levels, Notification Levels, Treatment Techniques, Lifetime Health Advisory Levels, and Risk Specific Dose 5 Levels.

[8] City Datum is a measurement system that has been used at Lake Merced since at least 1926 and is used throughout this document for Lake Merced water levels. The City Datum does not represent the depth of the lake. An elevation of 0 feet City Datum is equal to 11.37 feet above mean sea level (NAVD 88) and 8.57 NGVD 29. Since mean sea level is equivalent to 0 feet NGVD 29, a lake level of -8.57 City Datum is equal to mean sea level, and negative lake elevations above this level are not below mean sea level.

midpoint of the southwest bank of South Lake at an elevation of 13 feet City Datum (Kennedy/Jenks 2012d). The spillway is a 30-inch-diameter pipe that connects to the existing Daly City Tunnel immediately downstream of the tunnel connection to the Vista Grande Drainage Canal. This spillway limits the operational level of the lake to 13 feet City Datum.

The bottom elevation of each individual lake varies. The bottom of the two largest lakes, South Lake and North Lake, are at elevations of approximately -17 and -15 feet City Datum, respectively (EDAW/Talavera & Richardson 2003). East Lake and Impound Lake are smaller and shallower; the bottoms of these lakes are at elevations of approximately -11 and -6 feet City Datum, respectively.

Existing Uses of Lake Merced

Lake Merced supports numerous recreational activities, including boating and fishing as well as other uses managed by the San Francisco Recreation and Park Department (SFRPD), as described in Section 5.11, Recreation. The SFPUC also maintains Lake Merced as a nonpotable emergency water supply for the City to be used for firefighting or sanitation purposes if no other sources of water are available (SFPUC 2011a). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the City's drinking water distribution system to maintain firefighting, basic sanitary (e.g., toilet flushing), and other critical needs. In the event of such an emergency, residents would be directed to boil tap water before consuming it.

Historical Water-level Fluctuations and Water Additions

Historically, Lake Merced was fed by a combination of groundwater, surface water from local streams and springs, direct precipitation, and occasional saltwater inputs from the ocean. Urbanization during the 1900s resulted in the development of the lake's watershed, which rerouted streams out of the lake and closed it off from the ocean. The lake has historically experienced water-level declines due to rerouting of the natural streams and springs; closing the lake off from the ocean; diversions of stormwater runoff to the City's combined sewer system that previously discharged to the lake; drought conditions; and regional and local groundwater pumping. Increases in the amount of impervious surfaces within San Francisco have also reduced natural recharge to the Shallow Aquifer. Lake Merced is now replenished primarily by direct precipitation, limited runoff from immediate adjacent areas, periodic overflows of the Vista Grande Drainage Canal, and shallow groundwater inflows. As a result, lake levels are sensitive to annual changes in precipitation and can be slow to recover from drought conditions.

Prior to 1935 (before the completion of the Hetch Hetchy water system), the lake was used for municipal water supplies. Lake levels typically ranged from -10 to 0 feet City Datum, but increased to over 13 feet City Datum by the late 1930s and early 1940s after water deliveries from the Hetch Hetchy water system began. However, water levels began to decline again in the 1940s. During the 1940s to late 1950s, lake elevations varied between 8 and 13 feet City Datum. Between the late 1950s and early 1980s, lake levels experienced a long-term declining trend, with lake elevations ranging between 4 and 10 feet City Datum. The reasons for the overall decline in lake levels between the 1950s and 1980s are reported to be drought, increased municipal groundwater pumping in the Westside

Groundwater Basin, and diversion of runoff into the City's combined sewer system due to increased urbanization. (Kennedy/Jenks 2012d)

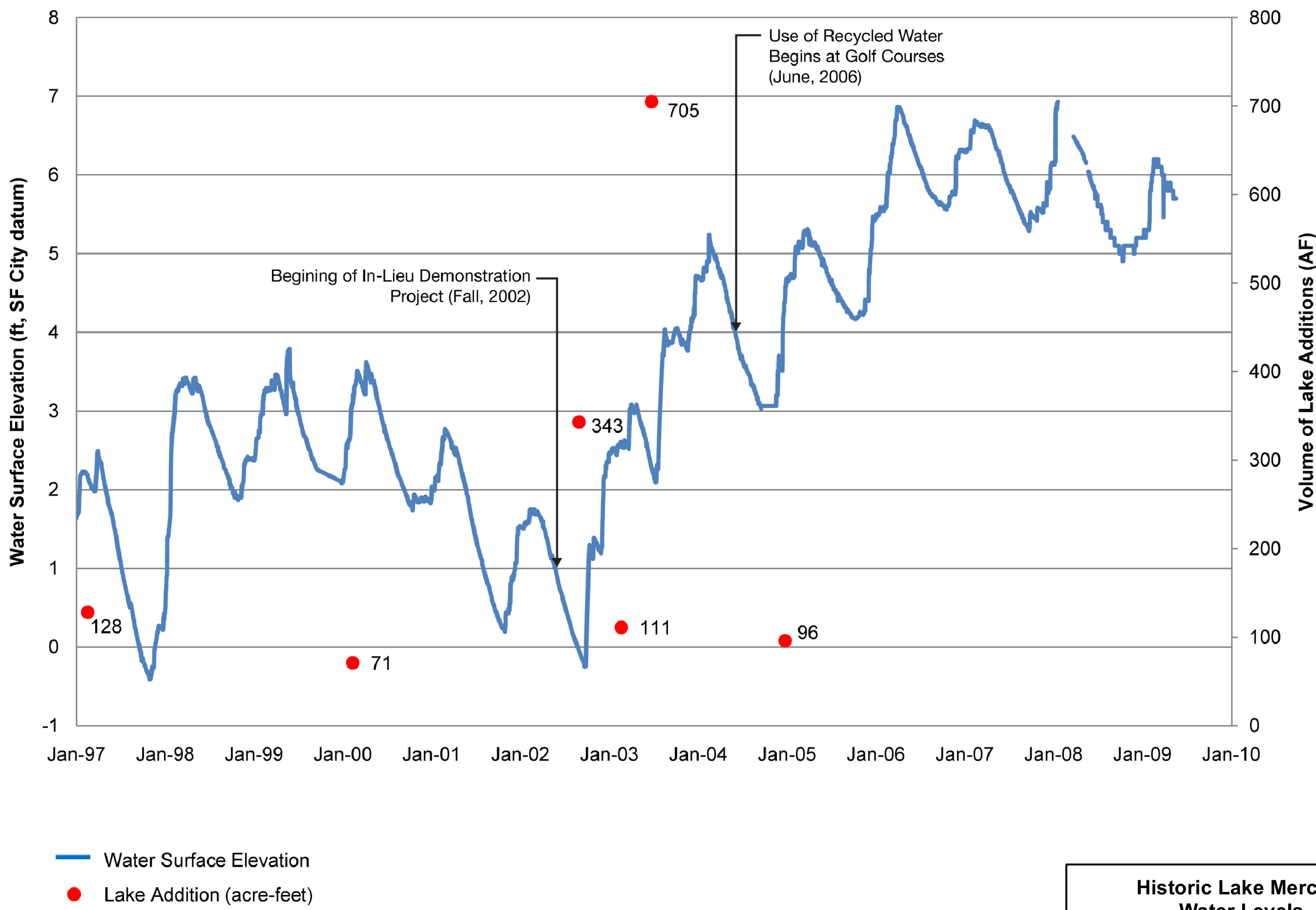
During the late 1980s and early 1990s, Lake Merced water levels declined well below historical averages. The lowest water level observed was about -3.2 feet City Datum in 1993 after the major drought of the late 1980s and early 1990s. Since that time, the lake levels have steadily risen as a result of above-average precipitation, SFPUC water additions to the lake between 2002 and 2005, reduced irrigation pumping at the Lake Merced-area golf courses as a result of recycled water deliveries, and reduced municipal groundwater pumping as a result of the SFPUC's In-lieu Recharge Demonstration Study (see Figure 5.16-5 [Historic Lake Merced Water Levels]). Since 2006, lake levels have consistently remained between about 5 and 7 feet City Datum. In 2009, the lake level ranged from approximately 4.9 to 6.9 feet City Datum. As of June 2009, the lake level was 5.7 feet City Datum. (Kennedy/Jenks 2012d)

Groundwater Interactions

As stated above, Lake Merced is incised in the Shallow Aquifer, and the lake surface is essentially considered an exposed part of the water table. This hydraulic connection was further demonstrated by groundwater monitoring conducted during the SFPUC's water additions in 2002 and 2003, when 70 to 80 percent of the volume of water additions contributed to lake storage and the remaining 20 to 30 percent contributed to the net outflow to groundwater and evaporative losses during the water addition periods. (Kennedy/Jenks 2012d)

Currently, the direction of groundwater flow in the unconfined Shallow Aquifer in the vicinity of, and north of, Lake Merced is predominantly toward the west. However, in the southern portion of Lake Merced, groundwater flow in this aquifer is more to the southwest. The general direction of groundwater flow in the underlying Primary Production Aquifer exhibits a more pronounced north-to-south flow direction from the southern portion of the Lake Merced area towards the Daly City area, probably due to greater pumping stresses in these aquifers to the south. This results in lower groundwater levels in the Shallow Aquifer at the southern portion of Lake Merced, indicating that there is a higher net outflow of lake water to the groundwater in South and Impound Lakes, and more inflow of groundwater to Lake Merced in North and East Lakes. (Kennedy/Jenks 2012d)

A 2009 aquifer test conducted on the Lake Merced Pump Station Test Well, completed in the Primary Production Aquifer, demonstrated that in the vicinity of Lake Merced, the lowermost portion of the Primary Production Aquifer exhibits characteristics of a confined aquifer (Kennedy/Jenks 2012d). The aquifer test also demonstrated that the Shallow Aquifer is unconfined and hydraulically separated from the lowermost portion of the Primary Production Aquifer by multiple confining layers.



Historic Lake Merced Water Levels

Regional Groundwater Storage and Recovery Project

Figure 5.16-5

Source: Kennedy/Jenks 2010a

Lake Merced Water Quality

Regulatory Considerations

As described in more detail in Section 5.16.2 (Regulatory Framework), the RWQCB has identified the following existing beneficial uses for Lake Merced: body-contact recreation (fishing), noncontact recreation, warm freshwater habitat, cold freshwater habitat, fish spawning, and wildlife habitat. Potential beneficial uses include municipal and domestic supplies. The RWQCB has established water quality objectives that are designed to be protective of beneficial uses. In addition, in 2007, the RWQCB listed Lake Merced as an impaired water body for dissolved oxygen and pH because of a listing made by the U.S. EPA (SWRCB 2011), despite a request by the SFPUC not to list Lake Merced based on existing water quality data (RWQCB 2009a). The listing does not identify a source for the impairment.

SFPUC's Existing Water Quality Monitoring Program

To monitor lake health, the SFPUC monitors a broad range of water quality constituents at various depths within Lake Merced on a quarterly basis at four locations: North, Northeast, South–Pistol Range, and South–Pump Station (Kennedy/Jenks 2010a). The sampling is conducted between three and eight times per year, but is typically conducted quarterly. For the majority of the parameters, samples at each location are collected at various depths, starting at the lake surface, and decreasing at five-foot intervals to the lake bottom. Table 5.16-4 (Lake Merced Water Quality Data and Basin Plan Water Quality Objectives) shows the range of values for each constituent measured between 1997 and 2009, as well as the corresponding water quality objectives provided in the *Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan, further discussed under Section 5.16.2 [Regulatory Framework]). A previous water quality evaluation (Kennedy/Jenks 2010a) identified seven water quality parameters that represent lake health; these parameters can be grouped as follows:

- Dissolved oxygen, which is required for fish habitat and healthy biological processes.
- Secchi depth, which is a measurement of lake clarity, and can be affected by algae production and suspended solids.
- Algae, total available nitrogen and nitrogen-to-phosphorous ratio (N:P), which are indicators of algal production and nutrients, both of which affect long-term lake health.
- Total coliform and Escherichia coli (E. coli), both of which are indicators of pathogenic microorganisms and fecal contamination.

Based on a review of these parameters, the previous water quality evaluation (Kennedy/Jenks 2010a) determined that the water quality of Lake Merced remained relatively constant from 1997 to 2009 and that there was a slight improvement in lake clarity (secchi depth). Also, during the 1997 to 2009 sampling period, no substantial changes in algal biomass levels occurred, although there were periodic increases in concentration due to algae blooms. Dissolved oxygen levels remained above the warmwater habitat criterion of 5 mg/L and the coldwater habitat criterion of 7 mg/L for the majority of the data set. However, dissolved oxygen levels were determined to be affected by periods of weak stratification[9], and there were episodes of dissolved oxygen lower than 5 mg/L during the summer and late fall in the deeper portions of the lake. Average pH levels never exceeded the freshwater criterion of 8.5 during the 1997 to 2009 sampling period.

TABLE 5.16-4
Lake Merced Water Quality Data and Basin Plan Water Quality Objectives

Parameter	Units	Range in Values, 1997 – 2009	Basin Plan Water Quality Objective
Algal biomass	Micrograms per liter (μg/L)	402-6,705	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Alkalinity	mg/L	136-230	None
Ammonium	mg/L	Not detected to 0.65	None
Bromide	mg/L	0.22-0.34	None
Chloride	mg/L	58-98	Controllable water quality factors shall not increase the total dissolved solids or salinity of the water so as to affect any designated beneficial uses, particularly fish migration and estuarine habitat.
Chlorophyll	μg/L	4.7-100	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Specific conductance	μmhos/cm	431-715	Controllable water quality factors shall not increase the total dissolved solids or salinity of the water so as to affect any designated beneficial uses, particularly fish migration and estuarine habitat.

[9] Lake stratification is the separation of a lake into layers. The amount of lake stratification can vary over the day, as well as seasonally, depending on a number of factors.

TABLE 5.16-4
Lake Merced Water Quality Data and Basin Plan Water Quality Objectives

Parameter	Units	Range in Values, 1997 – 2009	Basin Plan Water Quality Objective
Dissolved oxygen	mg/L	0.1-12.2	• Warmwater habitat: 7.0 mg/L • Coldwater habitat: 5.0 mg/L • The median dissolved oxygen level shall not be less than 80 percent saturation for three months.
E. Coli	CFU/100 mL	2.0-100	• Moderately used areas: 298 • Lightly used areas: 406 • Infrequently used areas: 576
Fluoride	mg/L	0.22-0.68	None
Hardness	mg/L	140-230	None
Iron	mg/L	Not detected to 0.14	None
Lead	µg/L	0.03-0.81	4-day average: 2.5 1-hour average: 2.4
Manganese	mg/L	0.02-0.3	None
MTBE	µg/L	Not detected to 1.9	None
Nitrate	mg/L	Not detected to 0.62	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Orthophosphate	mg/L	Not detected to 0.2	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.

TABLE 5.16-4
Lake Merced Water Quality Data and Basin Plan Water Quality Objectives

Parameter	Units	Range in Values, 1997 – 2009	Basin Plan Water Quality Objective
Oxidation-reduction potential	mV	29-543	None
pH	–	6.8-8.8	• The pH shall not be depressed below 6.5 or raised above 8.5. • Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.
Plankton	NU/mL	17-2,511	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Secchi depth (lake clarity)	feet	1.0-3.0	None
Sulfate	mg/L	6.5-16	None
Temperature	°F	50-72	The temperature of any coldwater or warmwater freshwater habitat shall not be increased by more than 5 °F above the natural receiving water temperature.
Total coliform	MPN/100 mL	109-2,420	• Municipal Supply: geometric mean less than 100 • Water Contact Recreation: median less than 240 and no sample greater than 10,000
Total dissolved solids	mg/L	276-458	Controllable water quality factors shall not increase the total dissolved solids or salinity of the water so as to affect any designated beneficial uses, particularly fish migration and estuarine habitat.
Total Kjeldahl nitrogen	mg/L	Not detected to 28.2	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.

TABLE 5.16-4
Lake Merced Water Quality Data and Basin Plan Water Quality Objectives

Parameter	Units	Range in Values, 1997 – 2009	Basin Plan Water Quality Objective
Total organic carbon	mg/L	Not detected to 16.4	None
Total phosphorous	mg/L	Not detected to 0.26	Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Turbidity	NTU	2.5-33	Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

Sources: Kennedy/Jenks 2010a; RWQCB 2011

Notes:

° C = degrees Celsius
F = degrees Fahrenheit
µmhos/cm = micromhos per centimeter
µg/L = micrograms per liter
mL = milliliters
mg/L = milligrams per liter
MPN = most probably number; mV = millivolts
NU/mL = natural units per milliliter
NTU = Nephelometric Turbidity Units
CFU = Colony-forming Units.

Lake Level Water Quality Analysis Conducted for the EIR

Existing water quality data from 1997 to 2009 were reviewed as part of this EIR analysis to identify any potential relationships between lake levels, stratification, and water quality. This analysis considered water quality data collected at various depths (lake surface, 10-foot depth, and lake bottom) and compared the data to lake levels at the time of sampling. During the monitoring period, lake levels ranged from approximately 0 to 7 feet City Datum, with the minimum level of 0 feet City Datum occurring in 1998 and 2003, prior to conducting the In-lieu Recharge Demonstration Study discussed above. The analysis focused on the following constituents and processes, as they are the primary drivers of ecosystem health, eutrophication,[10] biogeochemistry,[11] and the suitability of the lake for the Basin Plan's identified beneficial uses of freshwater habitat, recreation, and, potentially, municipal water supply:

- **Dissolved oxygen:** Dissolved oxygen is critical to the survival of aquatic species such as fish and invertebrates, and is an indicator of the lake's overall ecological health. Dissolved oxygen is affected by (and can in turn affect) a broad range of drivers such as external pollution inputs, internal loads of certain nutrients, mixing, and primary production[12] (described below). Low dissolved oxygen levels limit habitat for aquatic organisms and can contribute to internal nutrient loading (the release of ammonia, orthophosphates, and other compounds) from bottom sediments.
- **Algal biomass and chlorophyll:** Algal biomass and chlorophyll are indicators of the levels of primary productivity in the lake. Primary productivity is the conversion of inorganic nutrients such as nitrogen and phosphorus into organic biomass through uptake by organisms such as algae and cyanobacteria. Algae and other primary producers can increase dissolved oxygen during the day due to photosynthesis, and take up dissolved oxygen at night through respiration. In addition, the decomposition of dead algae uses dissolved oxygen and can exacerbate eutrophication.
- **Secchi depth:** Secchi depth is an indicator of turbidity (i.e., the cloudiness of the water) that can also be empirically linked to algal biomass/chlorophyll concentrations. Low secchi depths (high turbidity) can indicate the presence of organic and inorganic suspended solids that influence dissolved oxygen and nutrient levels. In general, areas with low secchi depths are considered aesthetically unappealing.
- **Nitrogen and phosphorus:** Nitrogen and phosphorus are the main nutrients that drive eutrophication and primary production in Lake Merced. They enter the lake primarily through external stormwater and internal nutrient cycling. Previous studies have shown that groundwater inflow to the lake introduces significant amounts of nitrogen (Yates et al. 1990). High levels of nitrogen and phosphorus can contribute to blooms of algae and cyanobacteria within a lake. At Lake Merced, nitrogen is measured as nitrate, ammonia/ammonium, and total Kjeldahl nitrogen (the sum of organic nitrogen and ammonia/ammonium). This analysis focuses on inorganic nitrogen (nitrate and ammonia/ammonium). Phosphorus at Lake Merced is measured as orthophosphate and total phosphorus; the former is considered in this analysis.

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[10] The process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates, which can promote excessive growth of algae.

[11] The scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment.

[12] Primary production is the production of organic matter from inorganic carbon sources, generally through photosynthesis. Through the process of photosynthesis, plants, and algae in lakes capture energy from light and use it to combine carbon dioxide and water to produce carbohydrates and oxygen.

- **pH:** The pH of a water body describes its acidity or alkalinity on a scale of 0 to 14, where 7 is neutral. Water bodies with a pH of less than 7 are acidic and water bodies with a pH above 7 are alkaline or basic. The pH level is influenced by a broad range of factors, including basin geology, watershed runoff, bacterial respiration/decomposition of organic matter, and primary productivity (more productive ecosystems tend to have higher pH levels).

The EIR investigation focused on three constituents, dissolved oxygen, orthophosphate, and ammonia, to evaluate whether lower lake levels would lead to decreased (less frequent, weaker, shorter in duration) stratification and increased mixing within the lake (see Appendix K [Lake Merced Water Quality Data and Graphs]). Increased mixing affects water quality in two primary ways:

- It brings surface water with generally higher dissolved oxygen levels into contact with hypoxic (less than 5 mg/L dissolved oxygen) or anoxic (less than 2 mg/L dissolved oxygen) bottom sediments. This contact can help form an oxygenated layer on the bottom sediments and biogeochemically "seal" them off from the water column, minimizing the release of nutrients such as ammonia and orthophosphate from sediments into the lake. The release of nutrients from bottom sediments is called "internal nutrient loading," and it can have a substantial effect on water quality within lakes, ponds, and reservoirs.
- It brings bottom water that has been in contact with sediments up to the surface into the photic zone[13], where any nutrients released from bottom sediments due to internal nutrient loading can fuel the growth of phytoplankton blooms. These blooms can exacerbate the process of eutrophication and create a positive feedback loop that results in further degradation of water quality.

In summary, this investigation indicated that from 1997 through 2009 there appeared to be no substantial correlations between the depth of Lake Merced and the indicator water quality parameters evaluated. While a depth threshold for Lake Merced water quality may exist (i.e., a depth below which water quality consistently and significantly decreases), none of the depths recorded from 1997 through 2005 appeared to represent such a threshold for the constituents analyzed. It is likely that factors external to Lake Merced are largely driving water quality or are, at the very least, a more dominant driver than lake level on its own. Specifically, the magnitude, duration, frequency, and characteristics (e.g., pollutants, dissolved oxygen demand) of urban runoff to the lake – from either the local watershed or the Vista Grande Drainage Canal – likely play a major role in introducing nutrients and other pollutants that can drive water quality impacts. Shallow, urban lakes such as Lake Merced tend to be strongly influenced by episodic events such as storms and wind events as well as more regular events such as urban runoff. While lake level is an important factor, it is likely that these factors have a relatively greater influence on water quality within Lake Merced than lake levels.

[13]The upper layer of water of a body, defined by the depth to which sunlight can penetrate to permit photosynthesis.

Pine Lake

Pine Lake is a relatively shallow 3.4-acre freshwater lake located in the westernmost portion of Stern Grove and Pine Lake Park, about 0.5 mile northeast of Lake Merced (Figure 5.16-1 [Surface Water Hydrology Map]). Like Lake Merced, Pine Lake is incised into the upper portion of the Shallow Aquifer. Although records pertaining to Pine Lake were limited until the past 10 to 15 years, it has been reported that in the 1930s as much as one-third of the total lake was filled at the eastern end to accommodate additional park development. (Kennedy/Jenks 2010d)

Historically, Pine Lake has received inflows from precipitation and stormwater runoff, and the primary outflows have been evapotranspiration and groundwater outflows (Kennedy/Jenks 2012d). Over time, the lake has become shallower; in the early 1900s, the depth of the lake was reportedly about 20 feet deep. During a period of low lake levels in the early 2000s, maximum depths were only 7 to 8 feet. In 2004, the lake level was reported to be very low, at an elevation of 33.5 feet, pursuant to the National Geodetic Vertical Datum of 1929 (NGVD 29)[14], or 3 to 5 feet deep. The historical change in Pine Lake levels has been attributed to a combination of long-term sedimentation and local declines in groundwater levels. It is also likely that intense urbanization in the area surrounding Pine Lake reduced the amount of natural inflow to the lake (Kennedy/Jenks, 2012d). Pine Lake is primarily a scenic resource used for recreational purposes (i.e., aesthetic enjoyment) and has never been used as a drinking water supply.

The SFRPD has conducted studies and implemented several projects under its capital improvement program to address declining water levels and ecological issues at Pine Lake. As part of these efforts, the SFRPD eradicated invasive plants in 2007 and replaced them with native vegetation. In addition, the SFRPD installed a new pump in the Stern Grove well and constructed a six-inch-diameter pipe from the well to an outlet channel that drains to Pine Lake, with the goal of maintaining lake levels at a water elevation of 40.1 feet NGVD 29. This elevation is about 4 feet higher than average historical lake levels, and about 7 feet higher than the lake level in 2004. (Kennedy/Jenks 2012d)

Lake levels in Pine Lake are currently maintained at the desired water elevation (i.e., 40.1 feet NGVD 29) with groundwater input from the Stern Grove well, which has resulted in a lake depth of about 10 to 12 feet NGVD 29. The Stern Grove well is 270 feet deep and draws water from the Primary Production Aquifer. Based on information from the SFRPD, this well is operated approximately three to four times each year to maintain Pine Lake water levels. At that pumping rate and operational duration, the total amount of water added to Pine Lake to maintain water levels is approximately 4.8 afy (Kennedy/Jenks

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[14] Groundwater elevations are commonly referenced to the North American Vertical Datum of 1988 (NAVD 88) and/or the National Geodetic Vertical Datum of 1929 (NGVD 29). NAVD 88 was established in 1991 and is the most up-to-date and accurate datum. NGVD 29 was used by surveyors and engineers for most of the 20th century and is 2.8 feet lower than NAVD 88 in San Francisco and northern San Mateo County. The technical reports prepared in support of the GSR Project used both datums; therefore, for consistency, this EIR uses the same datum employed in a given technical report when discussing information obtained from that report. Mean sea level is equivalent to 0 feet NGVD 29, which is also equivalent to 2.8 feet NAVD 88.

2012d). The SFRPD continues to use groundwater from the Stern Grove well to augment water levels in Pine Lake as part of its long-term goal of maintaining the water level at 40.1 feet NGVD 29.

Groundwater Interactions and Lake Levels

Shallow Aquifer groundwater levels in the vicinity of Pine Lake are monitored in two nearby monitoring wells: LMMW-5SS and LMMW-5S (Kennedy/Jenks 2012d). Monitoring well LMMW-5SS (shallow well adjacent to Pine Lake and screened between 38 and 48 feet below ground surface) was designed to monitor the uppermost groundwater zone in the Shallow Aquifer near Pine Lake, and measurements from this well can be used to infer water levels in Pine Lake. Since 2002, groundwater elevations in this well have typically ranged from 37 to 40 feet NGVD 29. However, during periods of low levels in Pine Lake, groundwater levels in this well declined to about 33 feet NGVD 29 (Kennedy/Jenks May 2012d). Variations in groundwater elevations measured in this well appear to closely approximate changes in water levels in Pine Lake.

Monitoring well LMMW-5S, which is screened between 65 and 85 feet below ground surface in the Shallow Aquifer, is also designed to monitor groundwater levels in the Shallow Aquifer near Pine Lake. However, this well monitors water from deeper within the Shallow Aquifer than does LMMW-5SS, and may be separated from the shallower portions of the aquifer by a clay layer. Generally, groundwater levels in LMMW-5SS are about 1 to 4 feet higher than those observed in LMMW-5S (Kennedy/Jenks, 2012d). Pine Lake levels can also be inferred to be slightly higher than groundwater levels in LMMW-5S. The Stern Grove well pumps groundwater from the Primary Production Aquifer, below the clay aquitard[15] that forms the base of the Shallow Aquifer; pumping from this well is not considered to directly affect shallow groundwater levels near Pine Lake. (Kennedy/Jenks 2012d)

As part of the studies discussed above, the SFRPD added approximately 14 af of groundwater from the nearby Stern Grove well to Pine Lake in November 2004 to evaluate the potential use of the well to maintain Pine Lake at the design water level. During the test, groundwater levels in LMMW-5SS rapidly rose about 5 to 6 feet and leveled out at an elevation of 40.2 feet NGVD 29, which was near the lake elevation at that time, confirming that Pine Lake is in direct hydraulic connection with the shallower portion of the Shallow Aquifer. Groundwater levels in LMMW-5S rose less than 1 foot during the test and were about 8 feet lower than the lake level at the end of the test, thus confirming that direct hydraulic connection between the lake and the deeper parts of the Shallow Aquifer is limited (possibly due to an intervening clay layer) (Kennedy/Jenks 2012d). This limited hydraulic connection with the deeper parts of the Shallow Aquifer limits losses from Pine Lake to the aquifer and allows for maintenance of Pine Lake water levels with minimal water additions.

[15] A semi-impermeable layer that confines an aquifer.

Golden Gate Park Lakes

Golden Gate Park is located over the northernmost part of the North Westside Groundwater Basin, approximately three miles north of the Lake Merced area. There are 13 lakes, ponds, or water features within Golden Gate Park in the northernmost extent of the Westside Groundwater Basin: Stow Lake, Spreckels Lake, North Lake, Lily Pond, Lloyd Lake, Elk Glen Lake, Metson Lake, Mallard Lake, South Lake, Middle Lake, Alvord Lake, Fly Casting Pools, and Rainbow Falls and Pond. The largest lakes are Stow, Spreckels, and North, with surface areas of approximately 13, six, and four acres, respectively (Kennedy/Jenks 2012d). The other lakes are smaller, ranging from about 0.2 to 0.5 acres in surface area. Alvord Lake, Fly Casting Pools, and Rainbow Falls and Pond are very small, with paved bottoms and fountains or falls; they are considered ornamental water features rather than lakes.

All of the Golden Gate Park lakes are either constructed or have been substantially altered by human activity. It is believed that Elk Glen, Middle, and North Lakes were originally natural groundwater-fed ponds that were deepened, while the other lake locations may or may not have coincided with preexisting natural surface water features. (Kennedy/Jenks 2012d)

The constructed Golden Gate Park lakes were excavated into the shallow soils approximately 100 years ago. Most of these lakes were constructed to a maximum depth of 5 feet; Elk Glen Lake was originally 7 feet deep. With subsequent accumulation of sediment in the lakes, the average depths by 1994 were about 1 foot shallower than originally constructed, except for the north portion of North Lake, which was deepened to approximately 9 to 10 feet in 1990.

Groundwater Conditions

As discussed above, the Shallow Aquifer is not present in this area. Rather, the Shallow and Primary Production Aquifers are merged because of the absence of the -100-foot clay layer in this area. Historically, shallow groundwater levels throughout most of Golden Gate Park have ranged from 40 to 60 feet below ground surface, but are as shallow as 14 to 15 feet below ground surface at the far western edge of Golden Gate Park, near the Pacific Coast. (Kennedy/Jenks 2012d)

Most of the lakes were constructed with a gravelly clay liner in an attempt to minimize leakage of lake water into the shallow soils. Lily Pond did not require this addition of material because it was constructed within an old shale quarry, and the existing gravelly clay bottom already minimized leakage. The natural lakes (Elk Glen, Middle, and North) have not been lined. A 1994 study determined that most of the Golden Gate Park lakes leak appreciable amounts of water, including those lined with clay materials. The study estimated that the combined leakage from the park lakes was about 0.5 mgd (1.5 af per day), with about 77 percent of the leakage coming from Elk Glen Lake, Middle Lake, and North Lake, which are the three natural lakes confirmed to be unlined (Kennedy/Jenks 2012d). Some of the water lost from the lakes is periodically made up by additions of groundwater pumped from the Elk Glen, South Windmill, and North Lake irrigation wells in Golden Gate Park, while the remainder is replenished by direct precipitation and stormwater runoff.

The average depths to groundwater in the Golden Gate Park area indicate that the shallow lakes do not intersect the groundwater table and are hydraulically separated from the groundwater. On the other hand, the lakes do recharge the aquifer through leakage to the shallow soils described above. However, this exchange is not considered a groundwater/surface water interaction because the water flows in one direction only, and the water table is too far below the bottom of the lakes for changes in groundwater levels to affect lake levels.

Colma Creek, San Bruno Creek, Millbrae Creek, and Lomita Channel

As is typical of surface water features located in heavily urbanized areas, much of the stream reaches of Colma Creek, San Bruno Creek, Millbrae Creek, and the Lomita Channel have been channelized, buried, and/or lined with impervious materials. Except for its upper reaches on San Bruno Mountain, all of historic Colma Creek and its tributaries have been diverted into engineered channels or underground storm drains. Similar alterations have also been made to San Bruno Creek and Millbrae Creek. These modifications have resulted in major changes to the natural hydrologic and ecologic processes that previously existed. In the portion of the South Westside Groundwater Basin where Colma Creek is located (except for the eastern area closer to the Bay), the depth to groundwater ranges from many tens to hundreds of feet below ground surface, due to drawdown of the groundwater caused by historic municipal pumping in the Daly City, South San Francisco, and San Bruno areas. Large production wells in these areas pump from the Primary Production and Deep Aquifers (the Shallow Aquifer is not present). Where the lower reaches of Colma Creek are located, in South San Francisco, the depth to groundwater is highly variable, depending largely on proximity to pumping wells and the depth of the aquifer being measured. (Kennedy/Jenks 2012d)

Where San Bruno Creek, Millbrae Creek, and the Lomita Channel are located (in San Bruno and Millbrae), the groundwater in the Primary Production Aquifer is typically at elevations ranging from -100 to -200 feet NGVD 29. However, in areas closer to the Bay, groundwater levels are in the range of approximately 10 to -30 feet NGVD 29. (Kennedy/Jenks 2012d)

Extensive modifications to Colma Creek, San Bruno Creek, the Lomita Channel and Millbrae Creek have effectively isolated almost all of the creek reaches from the underlying groundwater, precluding any substantial degree of groundwater-surface water interaction with the creeks. Furthermore, groundwater beneath much of Colma Creek is far below ground surface, further reducing the likelihood of direct groundwater-surface water interaction. Even where groundwater levels are relatively shallow in the southernmost portion of the South Westside Basin near the Bay, the heavy alteration of all three creeks (i.e., concrete lining) precludes exchanges between surface water and shallow groundwater. (Kennedy/Jenks 2012d)

Colma Creek is apparently in some degree of communication with shallow groundwater in its upper, least-altered reaches near San Bruno Mountain, because water use by stands of eucalyptus trees there is believed to deprive the creek of some baseflow. However, any shallow groundwater in this area exists in a highly localized system, far removed from the deeper groundwater of the Primary Production Aquifer, which exists at lower elevations in the Basin. Similar conditions are likely present for the unaltered upland portions of San Bruno Creek and Millbrae Creek. (Kennedy/Jenks 2012d)

5.16.2 Regulatory Framework

5.16.2.1 Federal and State Regulations

Clean Water Act

The federal Clean Water Act, enacted by Congress in 1972 and amended several times since, is the primary federal law regulating water quality in the United States and forms the basis for several State and local laws throughout the country. It was established to "restore and maintain the chemical, physical, and biological integrity of the Nations' waters." The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. The Clean Water Act gave the U.S. EPA the authority to implement federal pollution control programs, such as setting water quality standards for contaminants in surface water, establishing wastewater and effluent discharge limits for various industry categories, and imposing requirements for controlling nonpoint-source pollution. At the federal level, the Clean Water Act is administered by the U.S. EPA and U.S. Army Corps of Engineers (USACE). At the state and regional levels in California, the act is administered and enforced by the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs).

Drinking Water Regulations

U.S. Environmental Protection Agency/California Department of Public Health

The California Safe Drinking Water Act is implemented by the California Department of Public Health (CDPH) and provides that drinking water in the State shall not exceed primary and secondary Maximum Contaminant Levels (MCLs) (CDPH 2011). Primary and secondary MCLs for specific constituents are set in Title 22 of the California Code of Regulations (commonly referred to as simply "Title 22"). Primary MCLs are established to protect public health; secondary MCLs are established for contaminants that may cause the water to appear colored or taste or smell bad, causing people to stop using water from their public water system even though the water is safe to drink (U.S. EPA 2012b). The U.S. EPA also sets primary and secondary MCLs through its National Primary Drinking Water Regulations. California and federal MCLs are generally similar, although California's levels may be more stringent. MCLs are set for bacteria and other micro-organisms, chemicals and radionuclides. Title 22 also requires that public water systems with 10,000 service connections or more fluoridate their water supply to protect oral health; fluoride concentrations are specified by the regulations.

CDPH has also established Notification and Response Levels for 30 constituents for which no MCLs have been established. The Notification Levels are health-based advisory levels; public water systems must notify their customers annually if concentrations of these constituents exceed the Notification Level. The CDPH recommends removal of the drinking water source from service when concentrations of these constituents exceed Response Levels. (CDPH 2011)

After Project construction and prior to distribution of groundwater for domestic use, the CDPH would monitor water quality to confirm that primary and secondary MCLs are not exceeded at each connection point (MWH et al. 2008). California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) has set Public Health Goals at concentrations that pose no significant health risk if consumed for a lifetime. Public Health Goals may be more stringent than MCLs for certain constituents, because the CDPH must consider detectability, treatability, and cost of treatment, as well as health risk when setting MCLs.

Drinking Water Source Assessment and Protection Program

The State's Drinking Water Source Assessment and Protection (DWSAP) Program requires a Drinking Water Source Assessment to assess the potential for contamination and vulnerability of drinking water supplies (CDPH, Division of Drinking Water and Environmental Management 2000). The Assessment shows whether the source of the drinking water would be vulnerable to Potentially Contaminating Activities (PCA). If the source of drinking water would be vulnerable, a voluntary source water protection program is recommended. Source water protection is not a mandated element of the DWSAP program, but is required for a complete wellhead protection program and for permitting municipal supply wells and affords a public water system or community the opportunity to build on work performed for the drinking water source assessment.

The DWSAP for groundwater sources (i.e., wells) requires California drinking water purveyors to assess local hydrogeology, well construction and production, and land use in the vicinity of proposed water supply wells. These components are then used to delineate Groundwater Protection Zones for each well, which represent the area of groundwater that may be drawn in by the well in two (Zone A), five (Zone B5), and ten (Zone B10) years of pumping. The CDPH requires a minimum radius for each protection zone: 600 feet for Zone A, 1,000 feet for Zone B5, and 1,500 feet for Zone B10. Within these three Groundwater Protection Zones, PCAs are identified and evaluated.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act is the primary statute covering the quality of waters in California. Under the act, the SWRCB has the ultimate authority over the State's water quality policy. The nine RWQCBs regulate water quality under this Act through the regulatory standards and objectives set forth in Water Quality Control Plans (also referred to as Basin Plans) prepared for each region.

Regional Water Quality Control Board, Beneficial Uses

The *Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan), prepared by the San Francisco Bay RWQCB, identifies the beneficial uses of surface waters and groundwater within its region to maintain the continued beneficial uses of the groundwater (RWQCB 2011). The RWQCB is responsible for protecting the beneficial uses of San Francisco Bay Area water resources, including water bodies in the Project area. The Basin Plan was last revised on December 31, 2011 (RWQCB 2011). The water bodies in the Project area that have designated beneficial uses include Lake Merced, San Francisco Bay, Colma Creek, and San Bruno Creek. The beneficial uses provide the basis for determining appropriate water quality objectives for these water bodies. The RWQCB has not assigned beneficial uses for the Vista Grande Drainage Basin, Twelve Mile Creek, Green Hills Creek, Lomita Channel, Highline Canal, Millbrae

Creek, or Pine Lake. Although there are no designated beneficial uses of Pine Lake, the lake is used primarily for noncontact recreational purposes (i.e., aesthetic enjoyment) in Pine Lake Park.

Table 5.16-5 (Designated Beneficial Uses of Surface Water Bodies in Project Area) lists the designated beneficial uses for water bodies in the vicinity of the proposed Project. Agricultural supply is identified as an existing beneficial use for groundwater in the Westside Groundwater Basin in San Francisco; municipal and domestic supply as well as industrial service supply and industrial process supply are listed as "potential" beneficial uses. Existing beneficial uses of Lake Merced identified in the Basin Plan include body contact recreation (e.g., fishing), noncontact recreation (e.g., rowing), warm freshwater habitat, cold freshwater habitat, fish spawning, and wildlife habitat. Municipal and domestic supplies are also potential beneficial uses of Lake Merced.

TABLE 5.16-5
Designated Beneficial Uses of Surface Water Bodies in Project Area

Water Body	Designated Beneficial Uses [(a)]
Lake Merced	COMM, COLD, SPWN, WARM, WILD, REC-1, REC-2, MUN (potential)
San Francisco Bay (Lower)	IND, COMM, SHELL, EST, MIGR, RARE, SPWN, WILD, REC-1, REC-2, NAV
Colma Creek	WARM, WILD, REC-1, REC-2
San Bruno Creek	WARM, WILD, REC-1, REC-2

Source: RWQCB 2011

Notes:

(a) Beneficial Uses Key: COLD (Cold Freshwater Habitat); COMM (Commercial Sport and Fishing); EST (Estuarine Habitat); IND (Industrial Service Supply); MUN (Municipal and Domestic Supply); NAV (Navigation); RARE (Rare, Threatened, or Endangered); REC-1 (Body Contact Recreation); REC-2 (Noncontact Recreation); SHELL (Shellfish Harvesting); SPWN (Fish Spawning); WARM (Warm Freshwater Habitat); WILD (Wildlife Habitat)

The RWQCB also oversees and regulates groundwater investigations, cleanup, and abatement activities at sites with identified pollution problems in accordance with Resolution No. 92-49 – Policies and Procedures for Investigation and Cleanup and Abatement of Discharged Under California Water Code Section 13304 (the resolution established procedural and substantive requirements that apply cleanups of waste). The RWQCB manages groundwater investigations through five main program areas:

- Spills, Leaks, Investigations, and Cleanups (SLIC) Program;
- UST Program;
- Landfill Program;
- Department of Defense/Department of Energy (DOD/DOE) Program; and
- Aboveground Petroleum Storage Tank Program.

The RWQCB approves soil and groundwater clean-up levels for polluted sites. The overall clean-up level established for a waterbody is based upon the most sensitive beneficial use identified. Soil clean-up levels for the unsaturated zone are established using guidance from the U.S. EPA, Department of Toxic Substances Control and OEHHA.

Federal Clean Water Act Section 401 Water Quality Certification

Under Section 401 of the Clean Water Act, the RWQCB has regulatory authority over actions in waters of the United States and/or the State of California through the issuance of water quality certifications, which are issued in conjunction with any federal permit (e.g., permits issued by the USACE under Section 404 of the Clean Water Act, described below). Section 401 of the Clean Water Act provides the SWRCB and the RWQCBs with the regulatory authority to waive, certify, or deny any proposed activity that could result in a discharge to surface waters of the State. To waive or certify an activity, these agencies must find that the proposed discharge would comply with State water quality standards, including those protecting beneficial uses and water quality. If these agencies deny the proposed activity, the federal permit cannot be issued. This water quality certification is generally required for projects involving the discharge of dredged or fill material to wetlands or other water bodies.

Federal Clean Water Act Section 404

Proposed discharges of dredged or fill material into waters of the United States require USACE authorization under Section 404 of the CWA (33 U.S.C. 1344). Waters of the United States generally include tidal waters, lakes, ponds, rivers, streams (including intermittent streams), and wetlands (with the exception of isolated wetlands).

The USACE identifies wetlands using a "multi-parameter approach," which requires positive wetland indicators in three distinct environmental categories: hydrology, soils, and vegetation. According to the *Corps of Engineers Federal Wetlands Delineation Manual*, except in certain situations, all three parameters must be satisfied for an area to be considered a jurisdictional wetland (Environmental Laboratory 1987). The *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008) is also utilized when conducting jurisdictional wetland determinations in areas identified within the boundaries of the arid west. The study area falls within the Arid West Region (which includes most of the Central California Coast and inland) and, therefore, the assessment of wetlands used the Arid West guidance and the federal manual.

Section 303(d) List of Impaired Water Bodies and Total Maximum Daily Loads

In accordance with Section 303(d) of the Clean Water Act, state governments must present the U.S. EPA with a list of “impaired water bodies,” defined as those water bodies that do not meet water quality standards, even after point sources of pollution have been equipped with the minimum required levels of pollution control technology. Placement of a water body on the Section 303(d) List of Impaired Water Bodies acts as the trigger for developing a Total Maximum Daily Load (TMDL) pollution control plan for each water body and associated pollutant/stressor on the list. The TMDL is the quantity of a pollutant that can be safely assimilated by a water body without violating water quality standards. The TMDL serves as the means to attain and maintain water quality standards for the impaired water body to support designated and potential beneficial uses identified in the Basin Plan. During each Section 303(d) listing cycle, the water bodies on the list are prioritized and a schedule is established for completing the TMDLs. Table 5.16-1 (Impaired Surface Water Bodies) lists impaired water bodies in the Project area.

NPDES Waste Discharge Regulations

In 1987, amendments to the Clean Water Act added Section 402, which established a framework to protect water quality by regulating industrial, municipal, and construction-related sources of pollutant discharges to waters. In California, the National Pollutant Discharge Elimination System (NPDES) program is administered by the SWRCB through the RWQCBs and requires municipalities to obtain permits that outline programs and activities to control wastewater and stormwater pollution. The NPDES program provides two levels of control for the protection of water quality: technology-based limits and water-quality-based limits. Technology-based limits are based on the ability of dischargers to treat the water, while water-quality-based limits are required if technology-based limits are not sufficient to protect the water body. The water-quality-based effluent limitations required to meet water quality criteria in the receiving water are based on the National Toxics Rule, the California Toxics Rule, and the Basin Plan. NPDES permits must also incorporate TMDL waste load allocations when they are developed.

NPDES Construction General Permit (SWRCB Order No. 2009-09-DWQ)

The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The SWRCB, the permitting authority in California, adopted an NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) (Order No. 2009-0009, as amended by Order No. 2010-0014; SWRCB 2010, 2011). Order No. 2009-0009 took effect on July 1, 2010 and was amended on February 14, 2011. The Order applies to construction sites that include one or more acre of soil disturbance. Construction activities include clearing, grading, grubbing, excavation, stockpiling, and reconstruction of existing facilities involving removal or replacement.

The Construction General Permit requires that the landowner and/or contractor file permit registration documents prior to commencing construction and then pay a fee annually through the duration of construction. These documents include a notice of intent, risk assessment, site map, stormwater pollution prevention plan (SWPPP), and signed certification statement. The permit specifies a risk-based permitting approach that includes requirements specific to three overall levels of risk, which are determined based on the potential for a project to cause sedimentation, as well as the sensitivity of the receiving water to sedimentation. The three risk levels are used to determine specific numeric action levels and effluent limitations for pH and turbidity, as well as requirements for a rain event action plan, best management practices (BMP) implementation, monitoring, and reporting.

The SWPPP must include measures to ensure that: all pollutants and their sources are controlled; non-stormwater discharges are identified and eliminated, controlled, or treated; site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges; and the BMPs installed to reduce or eliminate pollutants after construction are completed and maintained. The SWPPP must demonstrate that calculations and design details, as well as BMP controls for site runoff, are complete and correct. Non-stormwater discharges include those from improper dumping, accidental spills, and leakage from storage tanks or transfer areas. The Construction General Permit specifies minimum BMP requirements for stormwater control based on the risk level of the site. Post-construction stormwater runoff reduction requirements must be implemented at project sites not covered by a Phase I or Phase II municipal stormwater permit. The post-construction stormwater standards address water quality, runoff reduction, drainage density, and channel protection requirements for the receiving water. San Mateo County, including the Project area, is covered under a Phase I municipal stormwater permit. Thus, the Project would not be subject to the post-construction stormwater standards specified in the Construction General Permit.

The Construction General Permit stipulates that effluent and receiving water monitoring must demonstrate compliance with permit requirements and that project proponents must take corrective action if these limitations are exceeded. The results of the monitoring and corrective actions must be reported annually to the SWRCB. The Construction General Permit specifies minimum qualifications for a qualified SWPPP developer and qualified SWPPP practitioner (SWRCB 2010).

5.16.2.2 Local Regulations

San Mateo Countywide Water Pollution Prevention Program

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) helps municipalities and unincorporated areas to comply with the countywide NPDES permit by ensuring that new development and redevelopment projects mitigate, to the maximum extent practicable, stormwater runoff impacts on water quality during both construction and operation of projects. As mentioned above, RWQCB Order No. R2-2009-0074 (Order) regulates discharges of stormwater water from municipalities in San Mateo County (RWQCB 2009b). Individual project sites creating more than 10,000 square feet of new impervious cover are subject to the "C.3" requirements established in Section C.3 of the Order and required to mitigate for water quality, including stormwater treatment measures to minimize stormwater pollutant discharges. In addition, development sites that create or replace one acre or more of impervious service may be subject to flow and volume reduction requirements. None of the GSR facility sites would create more than 10,000 square feet of new impervious cover and, therefore, are not subject to the C.3 requirements, nor to the flow and volume reduction requirements.

5.16.3 Impacts and Mitigations

5.16.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on hydrology and water quality if it were to:

Surface Water

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site.
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map.
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.
- Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow.
- Violate any water quality standards or waste discharge requirements.
- Otherwise substantially degrade water quality.

Groundwater

- Deplete groundwater supplies in a manner that would result in a lowering of the local groundwater to a level where the production rate of preexisting nearby wells would drop to a level that would not support existing or planned land uses.
- Lower groundwater levels in a manner that would result in onsite or offsite land subsidence that would cause substantial structural damage, increased flooding, or altered drainage patterns.
- Lower groundwater levels in a manner that would result in seawater intrusion such that loss of beneficial uses of groundwater would occur.
- Change groundwater levels in a manner that would affect beneficial uses of surface water bodies.
- Violate any water quality standards or waste discharge requirements.
- Otherwise substantially degrade water quality.
- Deplete groundwater supplies or interfere with groundwater recharge in a manner that would result in a substantial regional deficit in aquifer storage that would not support existing or planned land uses.

5.16.3.2 Approach to Analysis of Construction Impacts

This section describes the approach to analyzing impacts related to construction of the proposed Project on surface water and groundwater resources. As explained below, construction of the proposed Project would not result in impacts related to some of the above listed significance criteria. The following criteria are not discussed further in the impact analysis, below, for the following reasons:

Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map. The proposed Project does not include the construction of new housing or structures for human occupancy. Therefore, the significance criterion related to the placement of housing within a 100-year flood hazard zone is not applicable to the proposed Project and is not discussed further.

Place within a 100-year flood hazard area structures that would impede or redirect flood flows. The majority of the Project facility sites are not located within a FEMA mapped 100-year flood hazard zone. Although portions of the construction area boundaries at Sites 9 and 13 are located within a FEMA mapped 100-year flood hazard zone (FEMA 2012), construction within designated 100-year flood zones would have no impact given the negligible potential for stockpiles of soil or construction materials to displace floodwaters, raise flood elevations, or create new flooding impacts. Therefore, this significance criterion is not applicable to Project construction activities and is only discussed below as it relates to potential long-term operational impacts.

Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam. The proposed Project does not include the construction of structures within an area subject to inundation from failure of a levee or dam (ABAG 2012). Therefore, the significance criterion related to flooding as a result of the failure of a levee or dam is not applicable to the proposed Project and is not discussed further.

Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow. The proposed Project would have no effect on the frequency or probability of seiches (i.e., earthquake-induced oscillating waves in an enclosed water body), because the Project would not create new enclosed water bodies or affect the frequency of earthquakes. Further, the proposed Project does not include the construction of habitable structures near any isolated bodies of water subject to inundation by seiche. The proposed Project does not include the construction of structures within an area subject to inundation from tsunami (Cal EMA 2009). No mudflows have been mapped at the facility sites (USGS 1997). Other types of slope instability issues are discussed in Section 5.15, Geology and Soils. Therefore, the significance criterion related to inundation by seiche, tsunami, or mudflow is not applicable to the proposed Project and is not discussed further.

Surface Water Hydrology

The approach to analysis of construction impacts describes the methodology used to identify and evaluate impacts from construction activities. Construction could impact surface water hydrology and water quality.

The surface water hydrology and water quality analysis evaluates the proposed Project's construction activities that may have the potential to degrade existing water quality and increase erosion, or cause flooding. The analysis evaluates potential impacts from well facilities and proposed pipelines including the proposed and alternate water connection pipelines. Regional documents and maps were reviewed to identify hydrology and water quality resources that could be directly or indirectly affected by construction, operation, or maintenance activities. The analysis focuses on how construction of the proposed Project would affect hydrology or water quality of regional and local surface waters.

5.16.3.3 Approach to Analysis of Operational Impacts

This section describes the approach to analyzing impacts related to operations of the proposed Project.

The analysis of impacts of groundwater pumping operations relies on predicted groundwater-level changes in the South Westside Groundwater Basin that were modeled with the Westside Basin Groundwater Model, Version 3.1, supplemented by a spreadsheet-based Lake-Level model to evaluate predicted changes in Lake Merced water levels, as described in Section 5.1, Overview, Section 5.1.6 (Groundwater Modeling Overview). The technical report describing the groundwater modeling analysis is included as Appendix G (Groundwater Technical Reports) (Kennedy/Jenks 2012a). The results of the two models were used together with other appropriate analytical techniques to assess the potential for groundwater pumping to result in well interference, subsidence, surface water quality, groundwater quality, and groundwater depletion effects. Each impact analysis below includes a more detailed approach to analysis relevant to the particular impact.

Groundwater-level Modeling

As described in Section 5.1 Overview, Section 5.6.1 (Groundwater Modeling Overview), the Westside Basin Groundwater-flow Model was developed by the City of Daly City, with assistance from the City of San Bruno, Cal Water, and the SFPUC (HydroFocus 2011). The Westside Basin Groundwater-flow Model was used to model existing conditions and Project impacts to groundwater levels over a 47-year modeling period with initial conditions beginning in 2009, the year that the Notice of Preparation of an Environmental Impact Report (NOP) was issued (the NOP is provided in Appendix A). Three scenarios were modeled including the modeled existing conditions, pumping under the proposed Project, and cumulative pumping, which includes the proposed Project and other reasonably foreseeable groundwater pumping and surface water projects in the groundwater basin. The model inputs and results prepared for this EIR are called the Westside Basin Groundwater Model (Kennedy/Jenks 2012a).

As shown on Table 5.1-2 (Model Input – Pumping Assumptions for Modeling Scenarios) of Section 5.1, Overview, the modeled existing conditions include existing groundwater pumping under a variety of rainfall and temperature conditions for the entire 47-year simulation period, based upon historic hydrology data modified to include a design drought[16]. For the Project, the Westside Basin Groundwater Model considers a Put, Take, Hold sequence to simulate in-lieu groundwater recharge during wet (i.e., above-average) and normal rainfall years and groundwater extraction during dry years.

The cumulative model scenario combines the existing pumping in the Westside Groundwater Basin and Project pumping with other reasonably foreseeable changes in pumping in the basin (described in Section 5.1.6), including pumping that would occur with implementation of the San Francisco Groundwater Supply (SFGW) Project and the Holy Cross Cemetery buildout. The Vista Grande Drainage Basin Improvement Project is also included in the cumulative model scenario. While this project does not propose groundwater pumping, it is included as a cumulative project in the modeling because it would involve additions of stormwater runoff to Lake Merced, which would increase Lake Merced water levels and associated groundwater levels in the Shallow Aquifer.

As discussed in Section 5.1.6, the Westside Basin Groundwater Model is best used for evaluating relative changes in groundwater levels and also uses an assumed set of hydrologic conditions over the 47-year simulation period for each model scenario. Although future hydrologic conditions cannot be expected to occur exactly as modeled, using a broad range of hydrologic conditions observed over the recent 47-year historical period allows a reasonable evaluation of changes in groundwater levels that would be expected to occur over the simulation period. The modeled existing conditions include groundwater level changes that are predicted to occur over the 47-year simulation period in response to the assumed hydrology without Project-related or cumulative pumping. Therefore, in the impact analyses, the Project-related effects under Project and cumulative conditions are compared to the modeled existing conditions to distinguish the effect of Project-related pumping from the effects that would occur based only on changes in hydrologic conditions. Additional information used to evaluate specific impacts is addressed in the approach to analysis provided for each specific impact below.

The Westside Basin Groundwater Model was also used to predict groundwater levels during the 47-year simulation period. To characterize basin-wide groundwater conditions, which is necessary for the analysis of cumulative impacts, graphs showing modeled groundwater levels from representative locations in the North and South Westside Groundwater Basins are included in Appendix G (Groundwater Technical Reports). The graphs present results for each water year during the 47-year simulation period, which extends from October of the previous year through September of the subsequent year.

[16] The SFPUC measures water supply reliability using an 8.5-year "design drought." A design drought is a planning and operations tool used by water agencies to define a reasonable worst-case drought scenario in order to establish design and operating parameters for the water system. The WSIP uses a design drought based on the hydrology of the six years of the worst historical drought (1987-1992) on record, plus the 2.5 years of the 1976-1977 drought, for a combined total of an 8.5-year design drought sequence.

The graphs show predicted groundwater levels for modeled existing conditions, the proposed Project, and cumulative conditions in the Shallow Aquifer (or shallow water-bearing zones) and the Primary Production Aquifer. Evaluation of the water-level trends predicted in these graphs provides an overview of how the Project would likely affect groundwater levels in the North and South Westside Groundwater Basins. These effects are detailed in the impact analyses under the relevant hydrology and water quality impacts discussed below.

Summary of Groundwater Modeling Results

As indicated in the graphs, under the modeled existing conditions, there would likely be a normal variation in groundwater levels in the Basin in response to changing hydrologic conditions.

In the South Westside Groundwater Basin, groundwater levels in both the shallow water-bearing zone and the Primary Production aquifer are predicted to be higher under the Project than under modeled existing conditions for 70 to 80 percent of the simulation. As shown in Figure 5.1-2 (Effects of Project and Cumulative Conditions relative to Modeled Existing Conditions on Groundwater Storage Volumes in the Westside Groundwater Basin), groundwater storage volumes in the Westside Groundwater Basin as a whole are also predicted to be higher under the Project for 70 to 80 percent of the 47-year simulation than under modeled existing conditions. Groundwater levels and groundwater storage volumes are predicted to be lower under the Project than under modeled existing conditions for approximately 20 to 30 percent of the simulation, especially during the design drought.

In the South Westside Groundwater Basin, predicted changes in groundwater levels and groundwater storage volumes under the cumulative conditions generally follow the same trend as the Project, except with slightly lower groundwater levels relative to modeled existing conditions in the Daly City area, as a result of pumping under the SFGW Project. The effect of cumulative pumping would be diminished farther to the south, due to the intervening distance, and no effect would be observed as far south as San Bruno.

Westlake Pump Station

Due to the nature of the proposed Project, there would be no operational impacts on hydrology or water quality related to Project operations at the Westlake Pump Station for the reasons described below:

Project operations at the Westlake Pump Station would have no impacts on groundwater. The Project at this location includes operation of new or upgraded pumps to convey water from the Project wells at Sites 2, 3, and 4 to the Daly City water distribution system and does not include pumping of groundwater. Upgrades to the Westlake Pump Station would include new chemical storage tanks, metering pumps, a resized transformer, and new booster pumps. The upgrades would not discharge waste to the groundwater or pump groundwater to the surface. As a result, there would be no impact from potential groundwater contamination at this site. In addition, no discharges to surface waters would occur from increased treatment volumes at the pump station site, as any discharges would go to the sanitary sewer. Operational impacts at the Westlake Pump Station are therefore not discussed further.

Groundwater-surface Water Interactions

Due to the location of the proposed Project and its distance from Golden Gate Park, there would be no impact related to the Groundwater-Surface Water Interactions significance criterion for the Golden Gate Park lakes; therefore, no impact discussion is provided for the reasons described below:

Golden Gate Park Lakes Surface Water Effects. Golden Gate Park is located at the northernmost extent of the Westside Basin. The average depths to groundwater indicate that these shallow lakes do not intersect the water table and thus groundwater-surface water interaction does not affect surface water conditions in the Golden Gate Park lakes. The operation of the GSR Project, including both Put and Take Years, is not anticipated to affect this area, because it is too far away from Project pumping and in-lieu recharge. For both reasons – the lack of groundwater-surface water interaction and distance – the Project would not affect water levels or water quality in the Golden Gate Park lakes. (Kennedy/Jenks 2012d)

Water Quality Standards

As described below there would be no operation-related water quality impacts relative to the following issues:

Violate waste discharge requirements. The proposed Project operation would not discharge any type of waste to groundwater; therefore, no waste discharge requirements would apply to the Project relative to groundwater.

Violate drinking water standards relative to specific constituents for which the SFPUC would provide treatment. As described in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types), the SFPUC proposes to provide treatment as needed to meet State and federal drinking water standards for bacteria and micro-organisms, pH, iron, manganese, nitrate, VOCs, or other similar constituents. The SFPUC also proposes to provide fluoridation as required to meet Title 22 of the California Code of Regulations, as described in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types). Project Description Table 3-3 (Site-specific Facility Characteristics), describes the proposed treatment of groundwater at each of the well sites. Treatment systems include disinfection to comply with the primary MCLs for bacteria and micro-organisms, pH adjustment, iron and/or manganese removal to comply with secondary MCLs regarding odor and taste, and fluoridation. At Sites 12 and 19 (Alternate), blending of Project groundwater with existing surface water supplies is proposed to comply with secondary MCLs for iron and/or manganese. The proposed treatment systems are capable of providing required levels of disinfection, pH adjustment, reduction in iron and manganese concentrations, and fluoridation so that State and federal drinking water standards would be met (MWH et al. 2008). Because the SFPUC's proposal, as described in Chapter 3, Section 3.4.2.2 (Well Facility Types), provides treatment as needed to meet State and federal drinking water standards for these constituents, no additional analysis of the potential to violate these drinking water standards is needed. Therefore, the significance criterion related to drinking water standards (for constituents for which treatment would be provided) is not applicable to operation of the Project and is not discussed further.

5.16.3.4 Summary of Impacts

For the significance criteria that have not already been deemed “not applicable” in the Approach to Analysis section above, the specific impact analyses below are divided into two subsections: (1) construction impacts (short-term) and (2) operational impacts (long-term). Table 5.16-6 (Summary of Surface Water Hydrology and Water Quality Construction and Operational Impacts) provides a summary of potential impacts from construction and operation of the Project, including cumulative construction impacts that would occur on a site-specific basis. Table 5.16-7 (Summary of Hydrology and Water Quality Operational and Cumulative Impacts relative to Proposed Project Pumping and In-Lieu Recharge) provides a summary of potential impacts from operation of the Project, including cumulative impacts, which would occur due to overall Project pumping and in-lieu recharge. There would be no operational impacts at the Westlake Pump Station; therefore the Westlake Pump Station is not included in the operational impacts summary table.

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TABLE 5.16-6
Summary of Surface Water Hydrology and Water Quality Construction and Operational Impacts

	Construction		Operations			Cumulative
Sites	**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.**	**Impact HY-2: Discharge of groundwater could result in minor localized flooding, violate water quality standards, and/or otherwise degrade water quality.**	**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.**	**Impact HY-4: Project operations would not impede or redirect flood flows.**	**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.**	**Impact C-HY-1: Project construction could result in a cumulatively considerable contribution to cumulative impacts on surface water hydrology and water quality.**
Site 1	LSM	LSM	LS	NI	LS	LSM
Site 2	LSM	LSM	LS	NI	LS	LSM
Site 3	LSM	LSM	LS	NI	LS	LSM
Site 4	LSM	LSM	LS	NI	LS	LSM
Westlake Pump Station	LSM	NI	NI	NI	NI	LSM
Site 5 (Consolidated Treatment and On-site options)	LSM	LSM	LS	NI	LS	LSM
Site 6	LSM	LSM	LS	NI	LS	LSM
Site 7 (Consolidated Treatment and On-site options)	LSM	LSM	LS	NI	LS	LSM
Site 8	LSM	LSM	LS	NI	LS	LSM
Site 9	LSM	LSM	LS	LS	LS	LSM
Site 10	LSM	LSM	LS	NI	LS	LSM
Site 11	LSM	LSM	LS	NI	LS	LSM
Site 12	LSM	LSM	LS	NI	LS	LSM
Site 13	LSM	LSM	LS	NI	LS	LSM
Site 14	LSM	LSM	LS	NI	LS	LSM
Site 15	LSM	LSM	LS	NI	LS	LSM
Site 16	LSM	LSM	LS	NI	LS	LSM
Site 17 (Alternate)	LSM	LSM	LS	NI	LS	LSM
Site 18 (Alternate)	LSM	LSM	LS	NI	LS	LSM
Site 19 (Alternate)	LSM	LSM	LS	NI	LS	LSM

Notes:

NI = No Impact

LS = Less than Significant Impact

LSM = Less than Significant with Mitigation

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TABLE 5.16-7
Summary of Hydrology and Water Quality Operational and Cumulative Impacts relative to Proposed Project Pumping and In-lieu Recharge

Impact	Significance Level
Project Operational Impacts	
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.	SUM[a]
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.	LS
Impact HY-8: Project operation would not result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.	LS
Impact HY-9: Project operation could have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced.	LSM
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
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
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
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
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
Operational Cumulative Impacts	
Impact C-HY-2: Operation of the proposed Project would result in a cumulatively considerable contribution to cumulative impacts related to well interference.	SUM[a]
Impact C-HY-3: Operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to subsidence.	LS
Impact C-HY-4: Operation of the proposed Project would not have a cumulatively considerable contribution to seawater intrusion.	LS
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
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
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
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

Notes:

(a) Implementation of Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation) depends in part upon the willingness of the well owner to participate in the monitoring program. Therefore, while Mitigation Measure M-HY-6 could reduce the impacts of well interference to a *less-than-significant* level, its implementation cannot be assured at this time. As a result, Impact HY-6 is conservatively categorized as *significant and unavoidable with mitigation*.

LS = Less than Significant Impact, LSM = Less than Significant with Mitigation, SUM=Significant and Unavoidable Impacts

5.16.3.5 Construction Impacts and Mitigation Measures

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. (Less than Significant with Mitigation)

Discussion of Water Quality Degradation

The proposed Project could degrade water quality as a result of erosion caused by earthmoving activities during construction or the accidental release of hazardous construction chemicals. In general, water quality impacts would be substantial if a water quality standard were to be exceeded or a beneficial use were to be impacted due to changes in water quality caused by erosion and/or siltation or release of hazardous construction chemicals resulting from Project earthmoving activities.

Approach to Analysis

The surface water hydrology analysis evaluates the proposed Project's construction that may have the potential to increase erosion and/or siltation or otherwise degrade existing water quality. The analysis evaluates potential impacts from the construction of well facilities and proposed pipelines, including the proposed and alternate water connection pipelines.

Impact Discussion and Significance Determination

<u>All Sites</u>

Earthmoving activities associated with Project construction at well facility sites would temporarily alter existing drainage patterns at well facility sites, including vegetation removal, grading, excavation, and soil stockpiling. New pipelines would be installed using open-trench construction methods. Exposed soil from stockpiles, excavated areas, and other areas where ground cover would be removed could be transported elsewhere by wind or water. If not properly managed, this could increase sediment loads in receiving water bodies, thereby adversely affecting water quality and designated beneficial uses. Earthmoving activities could, therefore, have a *significant* impact on water quality.

Site excavation and grading would be minor, with grading to a maximum depth of five feet for building foundations and underlying utilities (see Chapter 3, Project Description, Section 3.5.1.2 [Construction of Well Facilities]). Pipelines to connect the new wells to the water, storm drain, and sanitary sewer systems would generally be excavated to a depth of up to six feet. The discharge of sediment-laden groundwater to the storm drain system during excavation dewatering could degrade water quality and violate water quality standards. Construction water discharges from excavation dewatering could, therefore, have a *significant* impact on water quality. Construction activities at all sites 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. Earthmoving activities and use of construction chemicals at all facility sites could, therefore, have a *significant* impact on 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 potential water quality impacts during Project construction activities to a *less-than-significant* level by requiring measures to control erosion and sedimentation of receiving water bodies and minimize the risk of hazardous materials releases to surface water bodies. At sites where more than one acre of land would be disturbed, compliance with the requirements of the NPDES General Permit for Storm Water Discharges Associated with Construction Activity would be required. As a result, the potential impact on water quality would be *less than significant with mitigation*.

Mitigation Measure M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan (All Sites)

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) shall 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, 19 Alternate, and the Westlake Pump Station), the SFPUC or its contractor(s) shall prepare and implement Erosion and Sediment Control Plans (ESCPs).

The SWPPPs and ESCPs shall include sufficient measures to address the overall construction of the Project and, at a minimum, construction contractors should all undertake the following measures, as applicable, to minimize any adverse effects on water quality:

Scheduling

- Schedule construction to minimize ground disturbance during the rainy season.
- Stabilize all disturbed soils as soon as possible following the completion of soil disturbing work in the Project area.
- Stabilize soil with vegetation or physical means in the event rainfall is expected.
- Install erosion and sediment control BMPs prior to the start of any ground-disturbing activities.

Erosion and Sedimentation

- Preserve existing vegetation in areas where no construction activity is planned or where construction activity will occur at a later date.
- Stabilize and revegetate disturbed areas as soon as possible after construction by planting or seeding and/or using mulch (e.g., straw or hay, erosion control blankets, hydromulch, or other similar material).
- Install silt fences or fiber rolls or implement other suitable measures around the perimeters of the construction zone, staging areas, temporary stockpiles, spoil areas, stream channels, and swales, as well as down-slope of all exposed soil areas and in other locations determined necessary to prevent offsite sedimentation.

- Install temporary slope breakers during the rainy season on slopes greater than five percent where the base of the slope is less than 50 feet from a water body, wetland, or road crossing at spacing intervals required by the SWRCB Construction General Permit.
- Use filter fabric or other appropriate measures to prevent sediment from entering storm drain inlets.
- Detain and treat water produced by the dewatering of construction sites using sedimentation basins, sediment traps (when water is flowing and there is sediment), or other measures to ensure that discharges to receiving waters meet applicable water quality objectives.

Tracking Controls

- Grade and stabilize construction site entrances and exits to prevent runoff from the site and to prevent erosion.
- Remove any soil or sediment tracked off paved roads during construction by employing street sweeping.

Non-stormwater Control

- Keep construction vehicles and equipment clean; do not allow excessive buildup of oil and grease.
- Check construction vehicles and equipment daily at startup for leaks and repair any leaks immediately.
- Do not refuel vehicles and equipment within 50 feet of surface waters to prevent run-on and runoff and to contain spills.
- Conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel. Collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility.
- Contain fueling areas to prevent run-on and runoff and to contain spills.
- Cover all storm drain inlets when paving or applying seals or similar materials to prevent the offsite discharge of these materials.

Waste Management and Hazardous Materials Pollution Control

- Remove trash and construction debris from the Project area regularly. Provide an adequate number of waste containers with lids or covers to keep rain out of the containers and to prevent trash and debris from being blown away during high winds.
- Locate portable sanitary facilities a minimum of 50 feet from creeks or waterways.
- Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the stormwater drainage system or receiving water.

- Maintain sanitary facilities regularly.
- Store all hazardous materials in an area protected from rainfall and stormwater run-on and prevent the offsite discharge of leaks or spills.
- Inspect dumpsters and other waste and debris containers regularly for leaks and remove and properly dispose of any hazardous materials and liquid wastes placed in these containers.
- Train construction personnel in proper material delivery, handling, storage, cleanup, and disposal procedures.

BMP Inspection, Maintenance and Repair

- Inspect all BMPs on a regular basis to confirm proper installation and function.
- Inspect all stormwater BMPs daily during storms.
- Inspect sediment basins, sediment traps and other detention and treatment facilities regularly throughout the construction period.
- Provide sufficient devices and materials (e.g., silt fence, fiber rolls, erosion blankets, etc.) throughout Project construction to enable immediate repair or replacement of failed BMPs.
- Inspect all seeded areas regularly for failures and remediate or repair as soon as feasible.

Permitting, Monitoring, and Reporting

- Provide the required documentation for inspections, maintenance and repair requirements.
- Monitor water quality to assess the effectiveness of control measures.
- Maintain written records of inspections, spills, BMP-related maintenance activities, corrective actions and visual observations of any offsite discharge of sediment or other pollutants.
- Notify the RWQCB and other agencies as required (e.g., California Department of Fish and Wildlife) if the criteria for turbidity, oil/grease, or foam are exceeded and undertake corrective actions.
- Immediately notify the RWQCB and other agencies as required (e.g., California Department of Fish and Wildlife) of any spill of petroleum products or other organic or earthen materials and undertake corrective action.

Post-construction BMPs

- Revegetate all temporarily disturbed areas as required after construction activities are completed.
- Remove any remaining construction debris and trash from the Project area and staging areas upon Project completion.

- Phase the removal of temporary BMPs as necessary to ensure stabilization of the site.
- At sites covered under the NPDES General Construction Permit, correct post-construction site conditions, as necessary, to comply with the SWPPP and any other pertinent RWQCB requirements.

Impact Conclusion: Less than Significant with Mitigation

Impact HY-2: Discharge of groundwater could result in minor localized flooding, violate water quality standards, and/or otherwise degrade water quality. (Less than Significant with Mitigation)

Discussion of Water Quality Degradation

The proposed Project could cause minor localized flooding and degrade water quality as a result of groundwater discharges associated with well construction as discussed below. In general, water quality impacts would be substantial if a water quality standard were to be exceeded or a beneficial use were to be impacted due to changes in water quality caused by discharge activities.

Approach to Analysis

The analysis evaluates potential impacts from groundwater discharge during well development and testing activities. The amount and location of groundwater discharge were evaluated to determine potential impacts on water quality and flooding for each well facility site. Regional documents and maps were reviewed to identify hydrology and water quality resources that could be directly or indirectly affected by construction activities. The analysis focuses on how discharge of groundwater would affect hydrology or water quality of regional and local surface waters.

Impact Discussion and Significance Determination

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with significant impacts.

Westlake Pump Station

Upgrades at the Westlake Pump Station would be located within the existing pump station building and would not generate groundwater that would need to be discharged to a local storm drain or sanitary sewer system. Therefore, there would be *no impact* on flooding or water quality resulting from groundwater discharges at the Westlake Pump Station.

Impact Conclusion: No Impact

Sites 1 through 19 (Alternate)

Sites 1, 3, 4, 7, 9, 11, 12, 14, 15, 16, 17(Alternate), 18 (Alternate), and 19 (Alternate)

Following drilling of the production wells at these sites, the wells would be developed and various well pumping tests would be performed. Final development of the well would be performed by surging and pumping using a temporary test pump. Well pumping tests would include pumping for durations of two hours each at different discharge rates, as well as continuous pumping for 12 to 48 hours at the final design capacity of the well. Up to three million gallons of groundwater would be produced from a well during the final well development and pumping tests, which would be discharged to the local storm drain and/or the sanitary sewer. The peak discharge rate during well development (lasting for a few hours) would be approximately 800 gallons per minute (gpm); the typical discharge rate would be closer to 500 gpm. The development and testing would occur over the course of approximately 150 hours for each well resulting in an average discharge of 0.5 million gallons per day (see Chapter 3, Project Description, Section 3.5.1.1 [Construction Methods for Production Wells]).

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. Depending on the rate of discharge, the discharged effluent could also cause minor localized flooding if discharge rates exceeded the capacity of local storm drains. Discharges of groundwater from well development and pump tests at these sites could, therefore, have a *significant* impact on water quality.

Before being placed into service, the chemical and filtration facilities and new pipelines would be flushed and disinfected to meet water quality regulations (see Chapter 3, Project Description, Section 3.5.1.4 [Dewatering and Other Potential Discharges]). All water used for flushing would come from the new wells and would be discharged to the nearest sanitary sewer and conveyed to local wastewater treatment plants for processing. Therefore, there would be *no impact* on surface water quality related to disinfection of new chemical and filtration facilities and pipelines.

Mitigation Measure M-HY-2 (Management of Well Development and Pump Testing Discharges) would reduce potential water quality impacts from well development and pump testing to a *less-than-significant* level by requiring the construction contractor to prepare and implement a Project-specific discharge plan that specifies how effluent would be managed to protect water quality.

Mitigation Measure M-HY-2: Management of Well Development and Pump Testing Discharges (All Sites, Except Westlake Pump Station)

To address potential impacts on receiving water quality that could result during the construction period related to well development and pump testing, the SFPUC and its contractor shall: 1) prepare and implement a site-specific discharge plan; and 2) fully comply with NPDES requirements.

The discharge plan shall specify how the water will be collected, contained, treated, monitored, and discharged to the vicinity storm drainage system or sanitary sewer system. Discharges to storm drains are subject to review and approval by the RWQCB. The discharge plan shall at a minimum:

- Identify methods and locations for collecting and handling water on site prior to discharge, determine treatment requirements, and determine the capacity of holding tanks.
- Identify methods for treating water on site prior to discharge, such as filtration, coagulation, sedimentation settlement areas, oil skimmers, pH adjustment, and other BMPs.

- Establish procedures and methods for maintaining and monitoring discharge operations to ensure that no breach in the process occurs that could result in a failure to achieve/maintain the applicable water quality objectives of receiving waters.
- Identify discharge locations and include details regarding how the discharge will be conducted to minimize erosion and scour.

The proposed discharge is anticipated to be conditionally covered under San Mateo County's municipal stormwater permit (Order No. 99-059, NPDES Permit No. CAS002992), contingent upon compliance with certain conditions (RWQCB 2009b, 2012). Prior to any discharge to a storm drainage system, the SFPUC and its contractor shall request a determination from the RWQCB as to the type of permit under which the Project effluent discharges will be regulated. Based on that determination, the SFPUC shall prepare and submit all required and relevant Project information so that the RWQCB can issue appropriate guidelines and requirements (e.g., numerical effluent limitations, monitoring and reporting requirements). Based on previous discussions with the RWQCB (RWQCB 2009a, 2012), anticipated conditions include, but would not be limited to:

- The SFPUC shall notify affected stormwater agencies of the volume, rate, and location of the planned discharge at least 14 days before discharging.
- The discharged water shall not exceed 50 NTU. Turbidity shall be monitored every 15 minutes during the first hour of operation of any sedimentation or filtration device used to meet discharge limitations and once every two hours thereafter. If turbidity limits are exceeded for more than two hours, the discharge shall be terminated until turbidity limits can be complied with.
- The pH of the discharged water shall be within the range of 6.5 and 8.5 and pH shall be measured once per day during the discharge.
- The discharged water shall not cause pollution, contamination, or nuisance.
- The discharged water shall not cause scouring or erosion at the point of discharge of downstream from the discharge.
- Self-Monitoring Reports shall be submitted no later than 30 days following the last day of each month in which the discharges occur. These reports shall summarize turbidity measurements and approximate volumes of the discharges.

The construction contractor(s) shall comply with all monitoring and reporting requirements established by the RWQCB for discharges to storm drainage system. Any failure to achieve/maintain established narrative or numeric water quality objectives shall be reported to the RWQCB and corrective action taken. Corrective action may include an increase in residence time in treatment features (e.g., longer holding time in settling tanks) and/or incorporation of additional treatment measures, which could include but are not limited to the addition of sand filtration prior to discharge.

Sites 2, 5, 6, 8, 10, and 13

Test wells at Sites 2, 5, 6, 8, 10, and 13 have been installed and, therefore, would not further generate groundwater associated with initial well drilling and pumping test activities that would need to be discharged to a local storm drain or sanitary sewer system. Therefore, there would be *no impact* on surface water quality related to discharges from well drilling and pumping test activities.

As summarized for the other well sites above, before being placed into service, the chemical and filtration facilities and new pipelines at these sites would be flushed and disinfected to meet water quality regulations. All water used for flushing would come from the new wells and would be discharged to the nearest sanitary sewer and conveyed to local wastewater treatment plants for treatment. Therefore, there would be *no impact* on surface water quality related to the disinfection of new chemical and filtration facilities and pipelines.

Mitigation Measure M-HY-2 (Management of Well Development and Pump Testing Discharges) would reduce water quality impacts from dewatering discharges at these sites to a *less-than-significant* level by requiring by requiring the construction contractor to prepare and implement a Project-specific discharge plan that specifies how effluent would be managed to protect water quality.

> ***Mitigation Measure M-HY-2: Management of Well Development and Pump Testing Discharges (All Sites, Except Westlake Pump Station)***
> (See above for a description)

Impact Conclusion: Less than Significant with Mitigation

5.16.3.6 Operational Impacts and Mitigation Measures – Surface Water

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. (Less than Significant)

Description of Flooding Impacts

Operational impacts that have the potential to increase runoff that results in water quality impacts or on- or off-site flooding impacts would be significant.

Approach to Analysis

The amount of new impervious coverage at each site was evaluated to determine if it would increase runoff and impact water quality or cause on- or off-site flooding.

Impact Discussion and Significance Determination

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Westlake Pump Station</u>

Upgrades at the Westlake Pump Station would be located within the existing pump station building and would not alter drainage patterns or add new impervious surfaces. Therefore, there would be *no impact* to water quality at the Westlake Pump Station related to alteration of drainage patterns.

Impact Conclusion: No Impact

<u>Sites 1 through 19 (Alternate)</u>

Project pipelines would be constructed below ground and would not increase the rate or amount of surface water runoff. The amount of proposed new impervious surfaces at the well facility sites ranges from a minimum of 205 square feet to a maximum of 3,675 square feet at individual sites (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]). The buildings and paved parking areas at all sites would result in limited amounts of new impervious surfaces. Therefore, project-related increases in stormwater runoff resulting from increases in impervious surfaces would not increase the potential for on- or off-site flooding and the impact would be *less than significant*.

Impact Conclusion: Less than Significant

Impact HY-4: Project operations would not impede or redirect flood flows. (Less than Significant)

Description of Flooding Impacts

Project facilities located within the 100-year flood hazard area could impede and redirect flood flows around the site resulting in inundation or flooding of the surrounding areas. If a Project facility were to be constructed in the 100-year flood hazard area and it were to redirect flood flows to a previously unaffected area, then the impact could be significant.

Approach to Analysis

As described in Section 5.16.1.2 (Regional Surface Water Hydrology) under the sub-heading "Flood, Seiche, and Tsunami," a portion of the construction areas for Sites 9 and 13 would be located in areas of a mapped 100-year flood zones. Locations, elevations, and sizes of the proposed facilities were evaluated to determine whether there would be a potential to redirect flood flows that could then impact previously unaffected areas with flooding.

Impact Discussion and Significance Determination

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station</u>

Permanent Project facilities at these sites would not be located within a FEMA mapped 100-year flood hazard zone. While portions of the construction work areas at Site 13 would be situated within 100-year flood hazard zones, there would be no permanent aboveground structures remaining in the flood zone at this site. Therefore, there would be *no impact* at these sites related to the potential for impeding or redirecting flood flows.

Impact Conclusion: No Impact

<u>Site 9</u>

Site 9 would be located approximately 25 feet from channelized sections of the Colma Creek Diversion Channel and the San Mateo County Flood Control Channel. According to the current FEMA Flood Insurance Rate Mapping for the area near Site 9, a portion of the proposed chemical treatment building and parking lot would be within the mapped 100-year flood hazard zone along the San Mateo County Flood Control Channel (FEMA 2012). The placement of fill and construction of aboveground facilities within a flood hazard zone have the potential to impede or redirect flood flows. Aboveground facilities that are not designed to withstand inundation can be damaged during flood events. Underground facilities, such as pipelines, would not affect flood flows.

The potential for the site facilities to displace floodwaters, raise flood elevations, create new flooding impacts (e.g., by causing flooding of existing facilities or structures that previously would not have been inundated), or exacerbate existing flooding problems would be *less than significant*, given that the chemical treatment building at Site 9 would be elevated above the 100-year flood elevation (Chapter 3, Project Description, Section 3.4.3 [Facility Sites]). Also, the presence of the at-grade parking area would have a negligible effect on impeding or redirecting flood flows and would therefore not adversely affect surrounding areas.

Impact Conclusion: Less than Significant

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. (Less than Significant)

Description of Water Quality Impacts

Water quality impacts could occur from groundwater discharge during well maintenance activities such that water quality standards are exceeded or a beneficial use is adversely affected. If groundwater discharges were to contribute to runoff that could exceed the capacity of an existing storm drain system or if runoff from maintenance activities were to alter existing drainage patterns of the site or area and thereby cause substantial erosion or siltation, then such impacts could be significant.

Approach to Analysis

The proposed groundwater discharge volumes and durations were evaluated to determine whether the existing storm drain and sanitary sewer systems could accommodate the anticipated flow rates.

Impact Discussion and Significance Determination

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

Westlake Pump Station

Upgrades at the Westlake Pump Station would be located within the existing pump station building and would not generate groundwater that would need to be discharged to a local storm drain or sanitary sewer system. Therefore, there would be *no impact* on water quality at the Westlake Pump Station related to groundwater discharges during Project operation.

Impact Conclusion: No Impact

Sites 1 through 19 (Alternate)

Weekly or monthly exercising of the production wells for one to four-hour periods would be required to ensure that the facilities remain operational. The wells at Sites 2, 3, 4, 5 (Consolidated at Site 6), 7 (Consolidated at Site 6), 14, and 19 (Alternate) would be connected to the storm drain system for disposing of pumped water that would be generated during well exercising. Chemical treatment and filtration would not be needed at these sites; therefore, these wells would not generate chloraminated water or filter backwash.

Underground piping would connect well facilities at Sites 1, 5 (On-site Treatment), 6, 7 (On-site Treatment), 8, 9, 10, 11, 12, 13, 15, 16, 17 (Alternate), and 18 (Alternate) to the local storm drain system and/or the sanitary sewer system to allow the discharge of groundwater during well exercising, including chloraminated water or filter backwash. Chloraminated water would be dechlorinated and sent to the storm drain or, if not treated, sent to the local sanitary sewer system, as described in Chapter 3, Project Description, Section 3.8.3, Maintenance. The determination of where to send the chloraminated water would be based on operational constraints such as the duration and volume of the discharge and the distance to the closest sanitary sewer. Backwash from the iron/manganese removal facilities would be sent to the local sanitary sewer system.

As discussed in the Section 5.12, Utilities and Service Systems, Section 5.12.1.1 (Utilities) and under Impacts UT-2 and UT-5, the existing sanitary sewer and storm drain systems have adequate capacity to accommodate the discharge volumes from the proposed well exercising. All discharge water would be sent to either the sanitary sewer or the storm drain system; therefore, the discharge water associated with operations of the Project would not violate water quality standards or degrade water quality and any such potential impacts would be *less than significant*.

Impact Conclusion: Less than Significant

5.16.3.7 Operation Impacts and Mitigation Measures – Groundwater

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. (Significant and Unavoidable with Mitigation)

Description of Estimated Project Effects on Existing Irrigation Wells

Existing irrigation wells are wells owned and operated by parties other than the Project Partner Agencies. The existing irrigation wells identified in the South Westside Groundwater Basin are wells used to irrigate cemeteries and golf clubs, as shown in Figure 5.16-6 (Existing Irrigation Wells in the South Westside Groundwater Basin). During most Put and Hold Years, the Project would increase groundwater levels relative to modeled existing conditions, and existing irrigation wells would benefit from the higher water levels, by experiencing increased production rates. Higher water levels are expected during about 70 to 80 percent of the modeled time period (Kennedy/Jenks 2012b). During Take Years (dry years), pumping at Project wells would take place and could cause groundwater levels to decline below levels that are predicted under modeled existing conditions (i.e., levels predicted to occur without operation of the Project under existing conditions considering the historic range of hydrologic and rainfall conditions). If the Project were to decrease groundwater levels in the Westside Groundwater Basin near existing irrigation wells, adverse effects from well interference could result. If well interference were great enough, irrigation water currently supplied by existing irrigation wells could be decreased to the extent that existing irrigation uses, such as for turf at cemeteries and at golf clubs, would not be fully supported. The quality of turf grass at cemeteries and golf clubs is an important component of the attractiveness of these facilities and hence for the economic viability of these land uses. Insufficient irrigation water would result in a deterioration of existing turf grass and landscaping, affecting operating conditions at both golf clubs and cemeteries.

Pumping at a well causes groundwater levels to decline in the area around the well. The area of groundwater level decline is known as the cone of depression. Well interference occurs when a well's cone of depression comes into contact with or overlaps the cone of depression from another well (see Figure 5.16-7 [Well Interference Schematic]) (Driscoll 1986).

Existing Irrigation Wells in the South Westside Groundwater Basin

Regional Groundwater Storage and Recovery Project

Figure 5.16-6

Data Source: Fugro 2012a, as modified by GHD. [1] The Westside Groundwater Basin has been administratively divided at the San Francisco-San Mateo County line.

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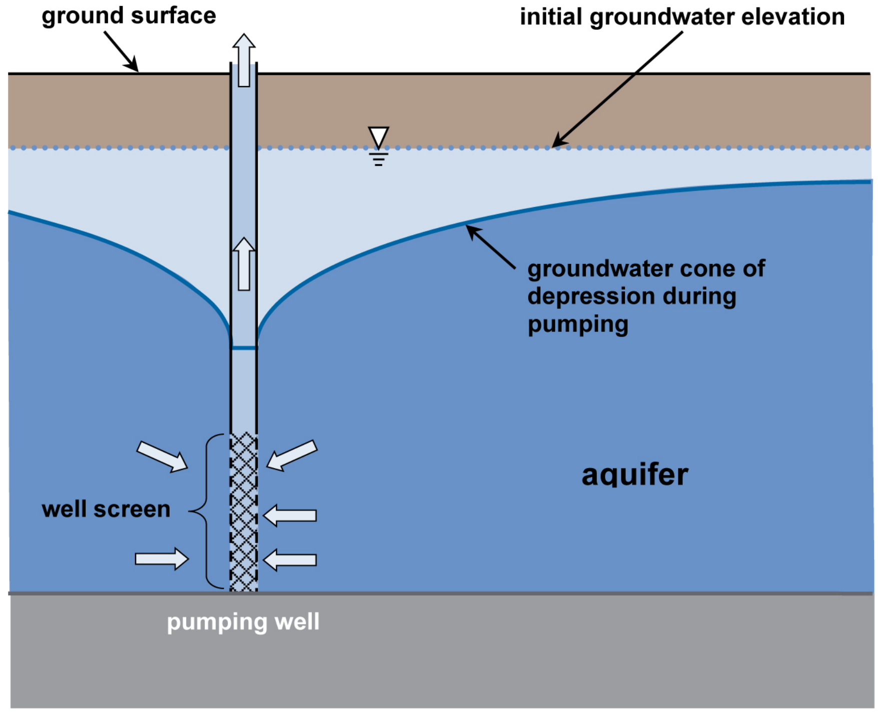
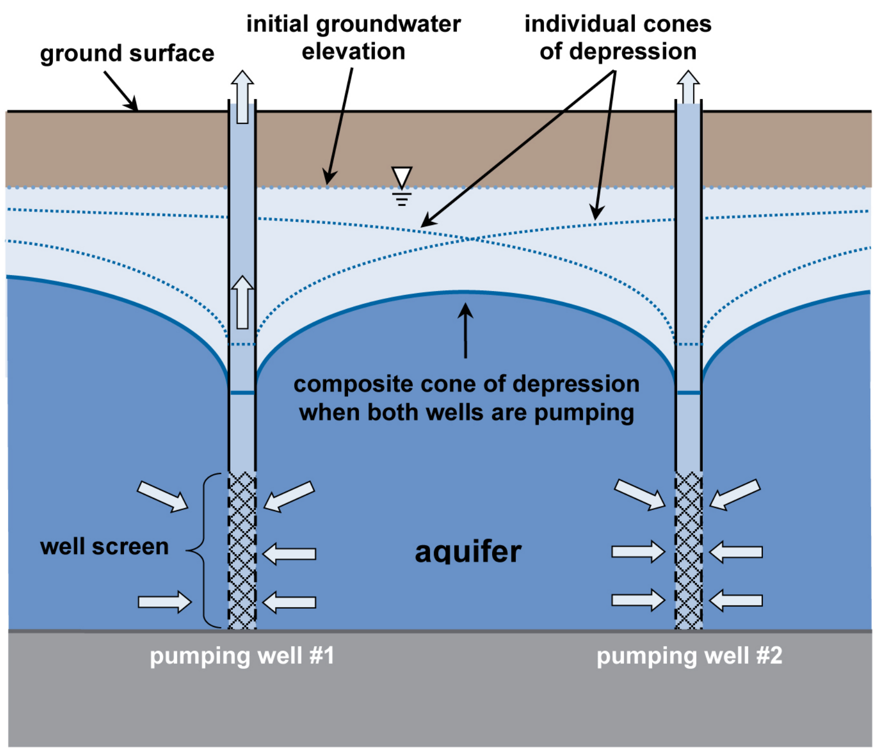


Cone of Depression around a Pumping Well



Well Interference from Overlapping Cones of Depression

Composite cone results in a lower pumping water level in each well, compared to individual cone of depression pumping water level.

Well Interference Schematic

Regional Groundwater Storage and Recovery Project

Figure 5.16-7

In the Westside Groundwater Basin, well interference (i.e., lower groundwater levels at an affected well) can affect operation of a well in several ways:

- Lower groundwater levels increases the distance the water has to travel vertically to reach the ground surface (this distance is known as the pumping lift). Greater pumping lift results in a decrease in the pump's discharge rate, which is the rate that water is delivered from the aquifer to the surface by the pump.
- If groundwater levels drop below the top of the well screen[17], less of the well screen provides water, which may result in a decrease in the pump's discharge rate.
- If groundwater levels drop below the top of the well screen, there is an increased risk of damage to the well from corrosion of the screen and/or to the pump from aeration of the well water. While such damage may not occur immediately or decrease the pump's discharge rate immediately, it may decrease the discharge rate over time.

The reduction in a pump's discharge rate or an increase in risk of damage to a pump or well does not necessarily prevent a well from meeting the demand for water needed to support a particular land use, because overall demand can sometimes be met with longer durations of pumping at a reduced rate.

To understand the potential for well interference impacts from the Project, this section describes existing wells that may experience well interference, including the depth and pump discharge rate of each well.

Existing Irrigation Wells and Associated Land Uses

Proposed Project wells would be located in areas near existing wells where well interference would potentially occur. These existing irrigation wells are not owned by the Project proponent (the SFPUC) or the Partner Agencies, but instead are owned by private land owners. Significant well interference is not expected to occur beyond 1.5 miles from a Project well and, therefore, the study area for well interference is limited to areas within 1.5 miles of a Project well[18]. The limitation of 1.5 miles was selected to represent a reasonable extent for a cone of depression given consideration of vertical leakage from one aquifer to another, groundwater recharge, interception of groundwater flow that otherwise discharges from the aquifer, and/or encountering a surface water body. (Fugro 2012a)

The primary land uses supported by groundwater in the South Westside Groundwater Basin – and within the study area – are cemeteries and golf clubs, which use groundwater to irrigate turf. Three of these golf clubs use mostly recycled water to irrigate their golf courses, but also use some groundwater

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[17] The well screen is a perforated section of the well casing which allows groundwater from the aquifer to be pumped into the well casing and then to the ground surface.

[18]The Green Hills Golf Club wells are approximately 0.75 mile from the southernmost proposed Project well at Site 16. The Green Hills Golf Club wells are screened in the Shallow Aquifer under unconfined conditions. The Green Hills Golf Club wells would not be affected by pumping from the Project due to the smaller proposed pumping capacity at Site 16 (which is the only Project well that would be within 1.5 miles) and because of differences in well screen depths and geologic conditions between the Green Hills Golf Club wells and the proposed Project well at Site 16 (Fugro 2012a).

(LSCE 2010). The other cemeteries and golf clubs are reliant upon groundwater or surface water as their source of irrigation water supply.

The SFPUC invited cemetery and golf club owners and representatives to a Project workshop held on June 25, 2009 at the Colma Town Hall. Plans for the Project were presented and attendees were informed that the SFPUC was conducting a survey of existing irrigators' well owners as part of a series of studies in the Westside Groundwater Basin. A data request list pertaining to the well survey was made available to all attendees. (Fugro 2012a)

As a follow-up to the workshop, the SFPUC conducted site visits and/or meetings at the cemeteries and golf clubs. If permitted by the site owner or representative, site visits included well visits where Global Positioning System (GPS) coordinates were obtained and water levels measured if the well had an access port. Well visits occurred at all the cemeteries and golf clubs listed in Table 5.16-8 (Existing Irrigators' Wells Identified as a Primary, Active, or Secondary Well that May Be Affected by the Project) (well visits to the San Francisco Golf Club and Olympic Club occurred prior to 2009). (Fugro 2012a)

Table 5.16-8 lists the cemetery and golf club irrigation wells in the South Westside Groundwater Basin that may be affected by well interference from the Project. The table includes wells identified as primary, active, or secondary wells. Backup wells are not included, because they do not support land use on a regular basis. Based on a review of California Department of Water Resources (DWR) well completion reports and information from well owners (Fugro 2012a), the cemetery and golf club wells are generally found to be screened in the Primary Production Aquifer (see Figure 5.16-6 [Existing Irrigation Wells in the South Westside Groundwater Basin]). Some of the cemetery and golf club wells have screen intervals that extend into the Deep Aquifer.

Table 5.16-8 also lists the top of screen of the wells. The screen of a well is open to groundwater inflow from the aquifer. The rated capacity of the pump installed in each well for which the information is available is also provided in Table 5.16-8 (Fugro 2012a). The rated capacity of the pump is the discharge rate established by the manufacturer applied to specified conditions.

TABLE 5.16-8
Existing Irrigators' Wells Identified as a Primary, Active, or Secondary Well that May Be Affected by the Project

Well Name	Top of Well Screen (feet below ground surface)	Rated Pump Capacity (gpm)
San Francisco Golf Club #2	360	700
Olympic Club #8	200	1000
Olympic Club #9	260	700
Lake Merced Golf Club #3	294	INA
Woodlawn Memorial Park	275	500
Italian Cemetery	300	260
Eternal Home Cemetery	280	200
Olivet Memorial Park	308	300
Home of Peace Cemetery	400	600
Hills of Eternity Cemetery	216	235
Cypress Lawn Memorial Park #3	191	INA
Cypress Lawn Memorial Park #4	330	INA
Holy Cross Cemetery #1	368	800
Holy Cross Cemetery #4	420	800
California Golf Club #7	255	200
California Golf Club #8	320	800

Source: Fugro 2012a

Note:

INA: Information not available.

Estimated Peak Irrigation Demand for Land Uses Supported by Existing Irrigators' Wells

The existing wells where interference may occur due to the Project are irrigation wells that pump groundwater to maintain turf at either cemeteries or golf clubs. In most cases, the SFPUC does not have data showing the actual volume of irrigation water used at the cemeteries and some golf clubs[19]. Therefore, demand for irrigation water at these facilities was estimated in order to determine if the water

[19] The volume of irrigation water used at cemeteries and golf clubs is not available in most cases, because the irrigation users do not meter their existing wells. In some cases, data regarding the volume of irrigation water may exist, but the irrigation user declined to provide such data to the SFPUC upon request. For detailed information about meetings with irrigation users, see *South Westside Basin Third Party Well Survey and Well Interference Analysis* (Fugro 2012a).

supply to support that demand could be affected by Project pumping. Irrigation water demand is estimated, as described below, using information from the *Final Recycled Water Feasibility Study* (Feasibility Study) (Carollo 2008). The Feasibility Study was developed cooperatively with the City of South San Francisco, the City of San Bruno, and the City of Brisbane, the SFPUC, and Cal Water. The Feasibility Study encompasses South San Francisco, San Bruno, Brisbane, and Colma and evaluated evapotranspiration in the study area and applied standard irrigation use coefficients to estimate the irrigation demand of cemeteries and golf clubs in the region. The annual water demand was estimated to be 1.7 af per acre of irrigated turf.

The Feasibility Study also estimated peak demand for irrigation water. Peak demand is important, because the need for irrigation water supply varies greatly throughout the year, with peak demand occurring on the hottest day of the hottest month. The peak month is estimated to require 20 percent of the total annual demand. The peak day is estimated to require 30 percent more than the average day in the peak month (Carollo 2008). Finally, golf clubs and cemeteries must be irrigated at night to accommodate daytime use by golfers and visitors and, therefore, must deliver the water over an approximately 12-hour period. As a result, peak demand is estimated be 0.0147 af/acre over a 12-hour period[20]. The acreage of potentially affected land uses was multiplied by this peak demand factor to determine the peak demand of each of the potentially affected irrigators, and the results are shown in Table 5.16-9 (Existing Irrigated Acreage and Estimated Peak Demand at Potentially Affected Land Uses).

TABLE 5.16-9
Existing Irrigated Acreage and Estimated Peak Demand at Potentially Affected Land Uses

Land Use	Irrigated Acreage (acres) [(a)]	Estimated Peak Demand (af per 12-hour period)
Woodlawn Memorial Park	50	0.7
Italian Cemetery	28	0.4
Eternal Home Cemetery	13	0.2
Olivet Memorial Park	57	0.8
Salem Cemetery, Hills of Eternity and Home of Peace	43	0.6
Cypress Lawn Memorial Park	146	2.2
Holy Cross Cemetery	150	2.2
California Golf Club	120	1.8

Note:
(a) Acreage from SFPUC 2010b

[20] The Feasibility Study (Carollo 2008) estimated that annual irrigation demand for turf in the Colma area is 1.7 af/acre and peak month demand is 20 percent of that – or 0.34 af/acre. An average day in the peak month is 1/30 of the monthly demand, or 0.011 af/acre. The peak day of the peak month is 30 percent higher than the average day, or 0.0147 af/acre. This water must be provided in a 12-hour period to accommodate nighttime irrigation.

The San Francisco Golf Club, the Olympic Club, and Lake Merced Golf Club use mostly recycled water to irrigate their golf clubs, but also use groundwater. Table 5.16-10 (Existing Average Annual Recycled Water and Groundwater Use and Estimated Peak Demand at Potentially Affected Land Uses that Use Recycled Water) shows average annual recycled water deliveries and groundwater use from 2005 to 2008 at these golf clubs (LSCE 2010). Peak groundwater demand (rather than annual average groundwater demand) is not known; therefore, peak demand is estimated using factors from the Feasibility Study to estimate total peak daily demand for both recycled water and groundwater. This estimated total peak daily demand is multiplied by the annual groundwater percentage to estimate the peak demand for groundwater over a 12-hour period[21]. Table 5.16-10 shows the estimated peak groundwater demand for each of the three golf club sites receiving recycled water.

TABLE 5.16-10
Existing Average Annual Recycled Water and Groundwater Use and Estimated Peak Demand at Potentially Affected Land Uses that Use Recycled Water [(a)]

Land Use	Average Annual Recycled Water Use 2005-2008 (af)	Average Annual Groundwater Use 2005-2008 (af)	Estimated Peak Day Demand for Groundwater (af per 12-hour period)
San Francisco Golf Club [(b)]	134	39	0.3
Olympic Club	321	10	0.1
Lake Merced Golf Club [(c)]	94	21	0.2

Notes:

(a) Data for the average annual recycled water use and groundwater use are taken from Final Task 8B Technical Memorandum #1, Hydrologic Setting of the Westside Basin (LSCE 2010). Slightly different data were subsequently made available for the San Francisco and Lake Merced golf clubs in the Final - 2011 Annual Groundwater Monitoring Report (SFPUC 2012e), which provides slightly different data for the years 2005 through 2008 and additional data for the year 2009. It is unknown which data from 2005 to 2008 are more accurate. The difference in groundwater use presented in the two sources is small and would not result in a change in the level of significance before or after mitigation compared to the results presented in this section, and therefore the earlier data from Technical Memorandum #1 have been used.

(b) Groundwater use for San Francisco Golf Club available for 2005, 2007 and 2008 from LSCE 2010.

(c) Groundwater use for Lake Merced Golf Club available only for 2005 and 2007 from LSCE 2010.

Approach to Analysis

Well interference could occur due to Project-related pumping in a manner that would result in a lowering of the local groundwater to a level where the production rate of preexisting nearby wells would drop to a level that would not fully support existing or planned land uses. For purposes of this analysis, a significant impact would result if the Project were to cause groundwater levels to decrease such that (1)

[21] For example, average annual combined recycled water and groundwater demand at San Francisco Golf Club is 172.4 af and peak month demand is 20 percent of that, or 34.5 af. An average day in the peak month is 1/30 of the monthly demand, or 1.15 af. The peak day of the peak month is 30 percent higher than the average day, or 1.5 af. The annual percentage of the total 172.4 af water use that is supplied by groundwater is 39/172.4, or 22 percent. The estimated peak groundwater daily demand is 22 percent of 1.5 af or 0.3 af.

the pump discharge rates of existing irrigators' wells decrease substantially enough that existing or planned land uses would not be fully supported, or (2) groundwater levels fall below the top of the well screen of existing irrigators' wells, resulting in decreased pump discharge rates and potential damage to the well that are substantial enough that existing or planned land uses would not be fully supported. The former cause of well interference is analyzed quantitatively and the latter cause is analyzed qualitatively, as described below.

Pump Discharge Rates at Existing Irrigators' Wells

The purpose of this analysis is to determine the extent to which groundwater levels at existing irrigators' wells would be decreased by the Project, thereby resulting in decreased pump discharge rates substantial enough that existing or planned land uses would not be fully supported. Groundwater level changes that are predicted to be caused by the Project are estimated by combining regional and localized groundwater level changes. Regional groundwater level changes during operation of the Project would include groundwater level decreases caused by pumping multiple Project wells and Partner Agency wells, as well as groundwater level increases caused by in-lieu recharge occurring when Partner Agency wells are not pumping groundwater. Localized groundwater level decreases would be caused by pumping nearby individual Project wells. Modeling conducted for this Project predicts that for 68 to 83 percent of the years during the 47-year simulation period (depending upon the location in the Basin), the Project would result in increased groundwater levels relative to levels predicted under modeled existing conditions (Fugro 2012a).

At each existing irrigation well, regional groundwater levels at the end of the modeled design drought are estimated for the Project based on the Project's hydrologic sequence of Put Years, Hold Years, and Take Years, as described above and in Chapter 3, Project Description, Section 3.8.1 (Operating Agreement). Calculation of regional groundwater level changes during Put Years and Take Years is based on groundwater level monitoring data collected as part of the SFPUC's In-Lieu Recharge Demonstration Study and proposed changes in pumping during Put Years and Take Years. Indicative regional groundwater level decreases during Hold Years and every year of the existing conditions are based on results of the Westside Basin Groundwater Model. (Fugro 2012a)

Localized drawdowns are combined with the regional groundwater levels to account for localized effects from pumping nearby proposed Project wells. Local drawdown caused by Project pumping is estimated using the Theis equation, a standard method for calculating well interference effects. Using the Theis equation, groundwater level declines at the existing irrigators' wells were calculated based on aquifer tests in Daly City and San Bruno in 2003 and adjusted to reflect aquifer conditions. (Fugro 2012a)

Combining localized drawdowns and regional groundwater levels results in estimates of groundwater levels at wells during droughts (Take Years). The groundwater level with the Project would be at its lowest at the end of the design drought.

Lowered groundwater levels increase pumping lift and decrease pump discharge rates. During operation of the Project, pump discharge rates at affected existing irrigation wells are estimated to have the greatest decreases at the end of the design drought when groundwater levels are estimated to be lowest. The impact of the Project on a given pump's discharge rate is calculated at the end of the design drought as the difference in the pump's discharge rate with and without the Project.

Pump discharge rates at each existing irrigation well are calculated based on the estimated groundwater level at the end of the design drought for both modeled existing conditions and for the Project scenario.

To determine the ability of the well or wells to support a land use, the estimated pump discharge rate in gpm is converted to the production capacity of the well over a 12-hour irrigation period in acre-feet. The 12-hour capacity for each well is calculated by multiplying the pumping discharge rate in gpm by the number of minutes in 12 hours, or 720 minutes. The 12-hour production capacity for each potentially affected land use is calculated by totaling the 12-hour capacities of all existing primary, active, and secondary wells serving the land use.

If primary, active, and secondary wells together cannot supply the estimated peak demand for a land use over a 12-hour period (nighttime irrigation) at the end of the design drought, due to well interference from the Project, then well interference impacts would be significant. In the case where the total capacity of existing primary, active, and secondary wells for a land use cannot supply the estimated peak demand under modeled existing conditions, the existing supply is only marginally adequate. Under these conditions, if well interference from the Project would cause any reduction in pumping capacity, the effect would be significant.

Well Screen Elevations at Existing Irrigators' Wells

The purpose of this analysis is to determine whether groundwater levels would drop below the top of the well screen of existing irrigators' wells, thereby resulting in decreased pump discharge rates and potential damage to the well substantial enough that existing or planned land uses would not be fully supported. Groundwater levels that drop below the top of well screens result in decreases in pump discharge rates and can potentially lead to well or pump damage. Both static groundwater levels and pumping groundwater levels are considered when evaluating whether the Project would cause groundwater levels to drop below the top of the well screens of existing irrigators' wells. The static groundwater level is the level when the well is not being pumped; the pumping groundwater level is the level when the well is pumping[22].

If predicted groundwater levels fall substantially below the top of the well screen due to the Project at the end of the design drought – and those levels are predicted to remain above the top of the well screen

[22] Both pumping and static groundwater levels are relevant when considering mitigation options. Pumping groundwater levels that drop below the top of well screen can result in both additional decreases in pump discharge rates and well or pump damage. Although higher than pumping groundwater levels, static groundwater levels are also important to consider because well owners have much less control over static groundwater levels than pumping groundwater levels. If groundwater levels drop below the top of the well screen only when the well is pumping, well owners potentially can lower the pump or install a new pump to maintain groundwater levels above the well screen. Although these changes may result in a decreased pump discharge rate, the rate may still be able to meet demand while eliminating the risk of well or pump damage. Similar pump management options are not available to the well owner if static (i.e., non-pumping) groundwater levels drop below the top of well screens. In this case, the increased risk of damage cannot be addressed by the well owner without more involved modifications to the well or well replacement.

under modeled existing conditions – then the risk of damage to the well or pump due to the Project may eventually prevent the well from meeting demand, and well interference would be significant.

Impact Discussion and Significance Determination

During wet and normal years, pumping from the GSR wells would be minimal (0.04 mgd to exercise the wells) and well interference effects would not result. During these years, groundwater levels would be higher than levels without the Project, which would reduce pump lifts at the irrigation wells with corresponding increases in production capacities during these times. However, Project pumping would occur at the maximum proposed rate (i.e., 7.2 mgd) during dry years. At the end of the design drought, Project pumping would have continued at maximum levels for 7.5 years. Therefore, this analysis focuses on the well interference that could occur at the end of the design drought.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) shows the projected static and pumping groundwater levels at the end of the design drought at the existing irrigators' wells, when the greatest groundwater level decreases would be expected to occur. Table 5.16-11 also shows which well facility sites could affect which existing irrigation wells.

TABLE 5.16-11
Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought

Existing Irrigators' Wells	Proposed GSR Sites Considered in Analysis at Existing Irrigators' Wells	Estimated Static Depth to Water (feet below ground surface)			Estimated Pumping Depth to Water (feet below ground surface)		
		Existing Conditions	With Project	Decrease from Project	Existing Conditions	With Project	Decrease from Project
San Francisco Golf Club #2	1-4	182	196	14	217	228	11
Olympic Club #8	1-4	122	136	14	185	195	10
Olympic Club #9	1-4	122	136	14	160	164	4
Lake Merced Golf Club #3	1-6	271	358	87	INA	INA	INA
Woodlawn Memorial	2-10	253	369	116	312	405	93
Italian Cemetery	2-10	290	400	110	345	430	85
Eternal Home Cemetery	4-10	258	363	105	280	374	94
Olivet Memorial Park	5-10	264	363	99	297	381	84
Home of Peace, also serving Salem Cemetery and Hills of Eternity	5-10	273	370	97	325	406	81
Hills of Eternity	5-10	239	334	95	253	342	89
Cypress Lawn Memorial Park #3	5-10	289	384	95	INA	INA	INA
Cypress Lawn Memorial Park #4	5-11	232	330	98	INA	INA	INA

TABLE 5.16-11
Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought

Existing Irrigators' Wells	Proposed GSR Sites Considered in Analysis at Existing Irrigators' Wells	Estimated Static Depth to Water (feet below ground surface)			Estimated Pumping Depth to Water (feet below ground surface)		
		Existing Conditions	With Project	Decrease from Project	Existing Conditions	With Project	Decrease from Project
Holy Cross Cemetery #1	6-12	233	337	104	307	393	86
Holy Cross Cemetery #4	5-11	253	352	99	386	467	81
California Golf Club #7	9-15	233	401	168	302	417	115
California Golf Club #8	9-15	233	402	169	286	433	147

Source: Fugro 2012a

Note:

INA: Information not available. Information on the existing irrigators' wells that would allow calculation of impacts of the Project on production capacity is not available.

The estimated decrease from the Project at the end of the design drought compared to existing conditions is less for the pumping water levels than the static water levels. As discussed below, the predicted lower water levels during Project operations at the end of the drought, compared to modeled existing conditions, would result in a lower pump discharge capacity, which would reduce the drawdown. Since pumping depth to water is the static depth to water plus drawdowns, decreases for pumping water levels are less than static water levels. When the wells at the San Francisco Golf Club and Olympic Club are not being pumped (i.e., static condition), groundwater levels at the end of the design drought are projected to decrease by approximately 14 feet due to the Project; when the wells are active (i.e., pumping condition), groundwater levels are projected to decrease approximately 4 to 11 feet due to the Project. When the wells at the other golf clubs and cemeteries are not being pumped (i.e., static condition), groundwater levels at the end of the design drought are projected to decrease by 85 to 169 feet due to the Project; when the wells are active (i.e., pumping condition), groundwater levels are projected to decrease by 81 to 147 feet due to the Project.

The Project pumping and resulting groundwater level decreases at the end of the design drought are projected to affect the pump discharge rates of existing irrigators' wells as shown in Table 5.16-12 (Estimated Pump Discharge Rate at the End of the Design Drought). Pump discharge rates at the San Francisco Golf Club and Olympic Club wells are projected to decrease by approximately two to four percent as a result of Project pumping. Pump discharge rates at the other golf clubs and cemeteries are projected to decrease by 10 to 87 percent. Higher percentage declines predicted at some wells are due to the characteristics of the specific pumps installed in the well, which can magnify the effect of lower water levels.

TABLE 5.16-12
Estimated Pump Discharge Rate at the End of the Design Drought

Existing Irrigators' Wells	Existing Conditions (gpm)	With Project (gpm)	Percent Reduction due to Project
San Francisco Golf Club #2	675	660	2
Olympic Club #8	970	935	4
Olympic Club #9	685	660	4
Lake Merced Golf Club #3	INA	INA	10-30
Woodlawn Memorial Park	450	60	87 [(a)]
Italian Cemetery	265	145	45
Eternal Home Cemetery	200	100	50
Olivet Memorial Park	300	180	40
Home of Peace, also serving Salem Cemetery and Hills of Eternity	600	440	27
Hills of Eternity Cemetery	235	135	43
Cypress Lawn Memorial Park #3	INA	INA	INA
Cypress Lawn Memorial Park #4	INA	INA	INA
Holy Cross Cemetery #1	800	625	22
Holy Cross Cemetery #4	800	700	13
California Golf Club #7	200	45	78 [(b)]
California Golf Club #8	800	475	41 [(b)]

Source: Fugro 2012a

Notes:

(a) The predicted large percentage reduction is largely due to the particular pump installed in the well as opposed to differences in water level declines (e.g., decline is about 15 feet more at Woodlawn than at other cemetery wells).

(b) The difference in pumping capacity decline predicted at the two California Golf Club wells is mostly a function of the characteristics of the pump curve for the specific pumps installed in each well.

INA: Information not available. Information on the existing irrigators' wells that would allow calculation of impacts of the Project on production capacity is not available.

If primary, active, and secondary wells supporting a land use together cannot supply the peak demand for that land use over a 12-hour period (nighttime irrigation) due to reduced pump discharge rates from the Project, then well interference impacts would be significant. For this analysis, Table 5.16-13 (Estimated Peak Demand and 12-Hour Production Capacities) compares the 12-hour production capacity at each golf club and cemetery to the estimated peak demand needed to maintain adequate irrigation for the land use.

TABLE 5.16-13
Estimated Peak Demand and 12-Hour Production Capacities

Land Use	Estimated Peak Demand (af per 12-hour period)	12-Hour Production Capacity for Primary, Active, and Secondary Wells (af)		Significant Impact relative to Pump Discharge Rates?	Significant Impact relative to Well Screen Elevations?[a]
		Existing Conditions	With Project		
San Francisco Golf Club	0.3	1.5	1.5	No	No
Olympic Club	0.1	3.7	3.5	No	No
Lake Merced Golf Club	0.2	INA	INA	INA	Yes
Woodlawn MemorialPark[b]	0.7	1.0	0.1	Yes	Yes
Italian Cemetery	0.4	0.6	0.3	Yes	Yes
Eternal Home Cemetery	0.2	0.4	0.2	No	Yes
Olivet Memorial Park	0.8	0.7	0.4	Yes	Yes
Salem Cemetery, Hills of Eternity and Home of Peace	0.6	1.3	1.0	No	Yes
Cypress Lawn Memorial Park	2.2	INA	INA	INA	Yes
Holy Cross Cemetery	2.2	3.5	2.9	No	Yes
California Golf Club[c]	1.8	2.2	1.1	Yes	Yes

Note:

(a) Results for this column are taken from Table 5.16-14 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought), below.

(b) The predicted large decline in capacity from 1.0 to 0.1 is largely due to the particular pump installed in the well as opposed to differences in water level declines (e.g., decline is about 15 feet more at Woodlawn than other cemetery wells).

(c) The predicted pumping capacity decline at the two California Golf Club wells is mostly a function of the characteristics of the pump curve for the specific pumps installed in each well.

INA: Information not available. Information on the existing irrigators' wells that would allow calculation of impacts of the Project on production capacity is not available.

If water levels were to fall below the top of screen, there could be decreases to discharge capacities in addition to those estimated in Table 5.16-13 and an increase in risk of damage to the well. Table 5.16-14 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) compares the estimated depth to water at the end of the drought with the top of the well screen.

TABLE 5.16-14
Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought

Existing Irrigators' Wells	Top of Well Screen (feet below ground surface)	Static Water Level Relative to Top of Well Screen (feet) [a]		Pumping Water Level Relative to Top of Well Screen (feet) [a]	
		Existing Conditions	With Project	Existing Conditions	With Project
San Francisco Golf Club #2	360	178	164	143	132
Olympic Club #8	200	78	64	15	5
Olympic Club #9	260	138	124	100	96
Lake Merced Golf Club #3	294	23	-64	INA	INA
Woodlawn Memorial Park	275	22	-94	-37	-130
Italian Cemetery	300	10	-100	-45	-130
Eternal Home Cemetery	280	22	-83	0	-94
Olivet Memorial Park	308	44	-55	11	-73
Home of Peace, also serving Salem Cemetery and Hills	400	127	30	75	-6
Hills of Eternity Cemetery	216	-23	-118	-37	-126
Cypress Lawn Memorial Park #3	191	-98	-193	INA	INA
Cypress Lawn Memorial Park #4	330	98	0	INA	INA
Holy Cross Cemetery #1	368	135	31	61	-25
Holy Cross Cemetery #4	420	167	68	34	-47
California Golf Club #7	255	22	-146	-47	-162
California Golf Club #8	320	87	-82	34	-113

Note:

(a) Positive number indicates water level is above top of screen and negative number indicates water level is below top of screen.

INA: Information not available. Information on the existing irrigators' wells that would allow calculation of impacts of the Project on production capacity is not available.

At the Olympic Club and San Francisco Golf Club, the 12-hour pumping capacities are expected to meet or exceed their estimated peak demand even when Project pumping is at a maximum at the end of the design drought (see Table 5.16-13 [Estimated Peak Demand and 12-Hour Production Capacities]). In addition, static and pumping groundwater levels are not estimated to drop below the top of the screen at the Olympic Club and San Francisco Golf Club wells (see Table 5.16-13). Therefore, the Project impact at the Olympic Club and San Francisco Golf Club would be *less than significant*.

At the Home of Peace well, which also serves Salem Cemetery and Hills of Eternity Cemetery, the 12-hour pumping capacity is estimated to meet or exceed its estimated peak demand even when Project pumping is at a maximum at the end of the design drought (see Table 5.16-13 [Estimated Peak Demand and 12-Hour Production Capacities]). The pumping groundwater level at the recently constructed well at the Home of Peace Cemetery is estimated to drop below the top of the screen at the end of the design drought due to the Project, but only by six of the 140 feet of screen (see Table 5.16-14 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought]), which is unlikely to reduce the pumping capacity such that the well would not meet demand given that pumping capacity could be reduced another 40 percent and still meet peak demand. However, pumping groundwater levels dropping below the top of the screen increases the risk of well or pump damage. This risk results in the potential for the well to be unable to meet demand over the long term, if damage should occur. Therefore, the Project would have a *significant* impact relative to well interference at the Salem Cemetery, Hills of Eternity Cemetery, and Home of Peace Cemetery.

At Holy Cross Cemetery and Eternal Home Cemetery, the 12-hour pumping capacities are estimated to meet peak demand even when Project pumping is at a maximum at the end of the design drought (see Table 5.16-13 [Estimated Peak Demand and 12-Hour Production Capacities]). However, static groundwater levels at the end of the design drought are estimated to fall below the top of the screen by a substantial length of the screen at the Eternal Home Cemetery well due to the Project. Pumping groundwater levels at the end of the design drought at the Holy Cross Cemetery wells, in addition to the Eternal Home Cemetery well, are estimated to fall below the top of the screen by a substantial length of the screens due to the Project (see Table 5.16-14 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought]). Additional reductions in pumping capacities due to less of the screens providing water have not been quantified, but it is possible that 12-hour pumping capacities could be reduced more than estimated, such that peak demand would not be met. The Eternal Home site has a 10,000-gallon storage tank (Fugro 2012a), but that equates to only 0.03 af, which may not be enough storage to offset the additional reduction in pumping capacity due to less of the screen providing water. Therefore, the Project would have a *significant* impact relative to well interference at Holy Cross Cemetery and Eternal Home Cemetery.

At Woodlawn Memorial Park, Italian Cemetery, and the California Golf Club, pumping capacities are estimated to decline 41 to 87 percent[23] when Project pumping is at a maximum compared to modeled existing conditions at the end of the design drought (see Table 5.16-12 [Estimated Pump Discharge Rate at

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[23] Greater decreases in pumping capacities were estimated for the Woodlawn Primary Well (87 percent) and California Golf Club Wells (41 and 78 percent) due to the specific characteristics of the pumps installed in these wells.

the End of the Design Drought]). As a result, the 12-hour pumping capacities under the Project are estimated to not meet the peak demand at these sites (see Table 5.16-13 [Estimated Peak Demand and 12-Hour Production Capacities]). In addition, estimates of static groundwater levels at the end of the design drought at the wells at Woodlawn Memorial Park, Italian Cemetery, and California Golf Club drop below the top of the screen due to the Project (see Table 5.16-14 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought]). The reduction in the effective screen length of the well could result in additional reductions in well capacities that have not been quantified and make it more likely that the well would not fully support existing land uses. Impacts relative to well interference would therefore be *significant* at the Woodlawn Memorial Park, Italian Cemetery, and California Golf Club.

The only cemetery or golf club that is estimated to have insufficient existing 12-hour pumping capacity for meeting peak demand at the end of the design drought would be Olivet Memorial Park (see Table 5.16-13 [Estimated Peak Demand and 12-Hour Production Capacities]). As a result, the existing groundwater supply pumped from this well for this land use is only marginally adequate at present and a 40 percent reduction of pumping capacity at this cemetery at the end of the design drought, as shown in Table 5.16-12 (Estimated Pump Discharge Rate at the End of the Design Drought), would prevent the well from fully supporting the existing land use. In addition, estimates of static groundwater levels at the end of the design drought at the Olivet Memorial Park wells show dewatering of a substantial amount of the well screen due to the Project (see Table 5.16-14 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought]). The reduction in the effective screen length of the well could result in additional reductions in well capacities that have not been quantified and make it more likely that the well would not fully support the existing land use. Therefore, the Project would have a *significant* impact at Olivet Memorial Park relative to well interference. However, the Project would result in increased groundwater levels relative to modeled existing conditions at the Olivet Memorial Park during 74 percent of the 47-year modeling period (Fugro 2012a). As a result, pumping capacity at Olivet Memorial Park would increase and make it more likely for the well to meet its estimated peak demand in those years.

Information about the size and type of pump is not available for the Cypress Lawn Memorial Park wells, so Project effects on pumping capacity cannot be quantified. However, groundwater levels due to Project pumping at the end of the design drought are estimated to be approximately 95 to 98 feet lower than under modeled existing conditions (see Table 5.16-11 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought]). This difference is similar to the differences estimated for wells at Woodlawn Memorial Park, Italian Cemetery, and California Golf Club, where reductions in well yield from the lower groundwater levels at the end of the design drought during Project operations are predicted to prevent the wells from fully supporting existing land uses. In addition, the estimated groundwater levels with Project pumping at the end of the design drought would likely dewater a substantial portion of the well screens of Cypress Lawn Memorial Park's well #3 (see Table 5-16-11), which could add to the estimated reductions in well yield. Therefore, the Project would have a *significant* impact relative to well interference at Cypress Lawn Memorial Park.

Information about the size and type of pump is not available for the Lake Merced Golf Club wells, so Project effects on pumping capacity cannot be quantified as precisely as other wells. However, groundwater levels due to Project pumping at the end of the design drought are estimated to be approximately 87 feet lower than under modeled existing conditions (see Table 5.16-11 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought]). It is estimated that this decrease would reduce discharge rates of the Lake Merced Golf Club wells by 10 to 30 percent (Fugro 2012a).

Although it is unknown what discharge rate would result from this decrease, it is likely that the well could meet its estimated peak daily demand[24]. However, the estimated static groundwater levels with Project pumping at the end of the design drought would likely fall below the top of the well screen of the Lake Merced Golf Club well by a substantial length, increasing the risk of well or pump damage. This risk results in the potential for the well to be unable to meet demand if damage should occur. Therefore, the Project would have a *significant* impact relative to well interference at the Lake Merced Golf Club.

Evaluation of Three Alternate Well Sites

To evaluate the well interference impacts of operating the three alternate well sites, the analysis assumed that 16 wells would be operated, including Sites 17 (Alternate), 18 (Alternate), and 19 (Alternate), but not including Sites 1, 4, and 15. Given the locations of wells removed from the modeling scenario (two at the northern end and one at the southern end of the GSR Project area) versus the locations of the alternate wells (generally in the middle of the GSR Project area), the alternate well configuration would reduce drawdowns in the Daly City and San Bruno areas and increase drawdowns in the Colma and South San Francisco area (Fugro 2012a). This configuration would represent only one possible alternate configuration. However, this configuration demonstrates what could be viewed as a worst-case scenario for the Colma and South San Francisco areas, and the configuration with the preferred 16 wells as the worst-case scenario for the Daly City and San Bruno areas.

Therefore, the analyzed alternate configuration includes pumping from Sites 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17 (Alternate), 18 (Alternate), and 19 (Alternate). Under this alternate configuration, more Project pumping would occur in the Colma and South San Francisco areas and less Project pumping would occur in the Daly City and San Bruno areas. As a result, groundwater levels at the Olympic Club and San Francisco Golf Club wells at the end of the design drought are estimated to be higher than shown on Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) (Fugro 2012a). Therefore, under this alternate configuration, the Project would still have a *less than significant* impact relative to well interference at the Olympic Club and San Francisco Golf Club.

Also under this alternate configuration, groundwater levels at the end of the design drought in the wells serving the Colma cemeteries and the California Golf Club are estimated to be lower than shown on Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) (Fugro 2012a). Under the SFPUC's preferred configuration (i.e., wells at Sites 1 through 16), the Project would have a *significant* impact on the California Golf Club and the Colma cemeteries. Therefore, under the alternate configuration, the Project would still have a *significant* impact relative to well interference at the Colma cemeteries and California Golf Club.

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[24] Although it is unknown what discharge rate would result from the projected groundwater level declines, the well would meet its estimated peak daily demand of 0.2 af if the resulting discharge rate is at least 104 gpm. Assuming a 30 percent reduction, the existing discharge rate would have to be 150 gpm or greater to meet demand with the Project. It is reasonable to assume that Lake Merced Golf Club has a pump with a discharge rate greater than 150 gpm, because wells at other golf courses in the Westside Groundwater Basin have existing discharge rates in the range of 200 to 970 gpm. Also, the well at the Lake Merced Golf Club was the sole source of irrigation water prior to recycled water becoming available.

Groundwater levels at Lake Merced Golf Club wells at the end of the design drought are estimated to be 21 to 22 feet higher than shown on Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) under the analyzed alternate configuration (Fugro 2012a). However, static groundwater levels are estimated to still drop below the top of the well screen, and the Project would therefore still have a *significant* well interference impact at the Lake Merced Golf Club.

Mitigation Approach

As provided below, Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation) establishes a performance standard to ensure that well interference impacts caused by the Project would be avoided or reduced to *less-than-significant* levels. The mitigation measure also requires a Monitoring Program at the existing irrigators' wells to provide reliable and timely data to determine if the performance standard is being met and requires the analysis of monitoring data twice a year during Take Years (i.e., when Project Wells are regularly pumping) to determine whether or not reduced pumping capacities at existing irrigation wells are found to occur as a result of the Project.

If the results of the Monitoring Program and biannual analyses during Take Years indicate that well interference impacts of the Project would cause the performance standard to be exceeded, then a list of example mitigation actions are provided that would maintain an uninterrupted supply of groundwater to the affected land use. Mitigation actions that may need to be implemented would vary depending on site-specific conditions at the existing irrigators' wells and a determination of the extent of the decrease in pumping capacity that is occurring due to Project operations and, therefore, the list of mitigation actions includes actions both at the existing irrigators' wells and also at the Project wells. Each action item may be suitable to address impacts on an existing irrigator's well, either alone or in combination with one or more of the other mitigation actions. Each of the mitigation actions, or a combination of mitigation actions, may be feasible and effective in particular circumstances. However, not every one of the mitigation actions alone are anticipated to be feasible and effective at reducing impacts to *less-than-significant* levels in all circumstances, because the irrigation systems, wells, and parcels where the existing irrigators' wells are located are all different and may experience a range of impacts due to Project-caused well interference. Either one or a combination of the mitigation actions identified in Mitigation Measure M-HY-6 is anticipated to reduce impacts to a *less-than-significant* level.

Mitigation actions #1, Improve irrigation efficiency, and #2, Modify irrigation operations, would install measures such as more-efficient sprinkler heads or soil-moisture sensors and would modify operations, for example, through the use of longer irrigation cycles or revised scheduling of irrigation to respond to evapotranspiration data. These actions would tend to mitigate impacts if the irrigation well capacity were only slightly less than the performance standard due to Project pumping. Effectiveness of the actions would vary depending on the design of the existing irrigation system, and would not be expected to be feasible and effective in all cases. (SFPUC 2012c)

Mitigation actions #3, Redistribute GSR pumping, and #4, Reduce GSR pumping, would reduce the rate of groundwater level decline in an affected area by redistributing Project pumping to other areas or by reducing Project pumping. Redistribution of GSR pumping would not be undertaken where the resulting groundwater levels would then decline more than what was originally predicted to be caused by the Project by modeling, therefore, redistribution would be effective at reducing well interference impacts at existing irrigation wells only if some GSR wells are determined to be capable of producing more water with less drawdown than originally predicted (SFPUC 2012a, 2012c). Reduction of GSR pumping would be effective at reducing well interference impacts at existing irrigation wells to *less-than-significant* impacts, but this would be an interim measure, implemented until such time as an alternate measure can be implemented that also mitigates the impact to *less-than-significant* levels.

Mitigation actions #5, Lower pump in irrigation well, and #6, Lower and change pump in irrigation well, would lower the well pump to accommodate groundwater level fluctuations induced by Project pumping that exceed historic levels, or lower and replace the well pump using a more suitable pump for the conditions that are encountered in order to meet demands. These actions would mitigate impacts if the irrigation well capacity were moderately less than the performance standard due to Project pumping. Effectiveness of the actions would vary depending on the design of the existing irrigation well and type of pump used. The actions would also be dependent upon the existing irrigation well being deep enough to accommodate lowering of the pump. For this reason, these actions would not necessarily be feasible and effective in all cases. (SFPUC 2012c)

Mitigation action #7, Add storage capacity for irrigation supply, would add storage; for example, an above-ground tank of 20,000 gallons, which could be up to 20 feet in height. Increased storage capacity may provide the ability to meet peak flow rates that would otherwise be less than the performance standard, in that irrigators could store the additional water in the tank to use during the period of peak demand. It appears likely that each of the existing irrigators could feasibly place a tank on their property, however, increased storage may not be sufficient to meet the performance standard if the reduced well capacity due to the Project is large. (SFPUC 2012c)

Mitigation action #8, Replace irrigation well, would be effective at any of the affected land uses, because the replacement well could be constructed deep enough at each of the cemeteries or golf clubs to operate under the new conditions and thereby meet peak irrigation demand. This mitigation action would be feasible from the standpoint that each of the existing irrigators' well sites has available areas in which a replacement well could be installed, and groundwater resources are deep enough in the area of each irrigator to drill deeper wells (SFPUC2012d). Well permits would need to be obtained from the San Mateo County Department of Environmental Health or City of Daly City, depending on the location of the replacement well. The County's and Daly City's well ordinances provide that granting of a well permit is dependent upon the well meeting the health, safety, and welfare of its citizens. Because wells that would be installed under Mitigation action #6 would replace existing and currently operational irrigation wells, it is expected that the required well permits would be issued by the County and Daly City.

Mitigation action #9, Replace irrigation water source, would provide a new temporary source of water only until another mitigation action could be implemented. Water would be provided via temporary aboveground pipes from Partner Agency or SFPUC supply from distribution or transmission pipelines close to the location where additional irrigation supplies are needed. This action would not be implemented on a permanent basis.

Implementation of Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation) would depend upon the willingness of the well owner to participate in the monitoring program and to allow the SFPUC to install a replacement well or take other corrective action as mutually determined necessary to address the impacts from the Project and meet the performance standard. Therefore, while Mitigation Measure M-HY-6 could reduce the impacts of well interference to a level where existing and planned land uses would continue to be fully supported, its implementation cannot be assured at this time. Nevertheless, with participation in the monitoring program and concurrence to allow implementation of the mitigation actions by all affected existing irrigation well owners, the well interference impacts would be less than significant with mitigation. However, because such assurance cannot be attained prior to Project approval, Impact HY-6 with implementation of Mitigation Measure H-HY-6 is deemed at this time to be *significant and potentially unavoidable with mitigation*.

Mitigation Measure M-HY-6: Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation

This mitigation measure is organized into five sections, as follows:

- Performance standard,
- Mitigation Actions to be Undertaken to Meet the Performance Standard,
- Method for Determining Whether Loss of Pumping Capacity at an Existing Irrigator's Well Is Due to the Project,
- Existing Irrigator Well Monitoring Program, and
- Definitions of terms

Performance Standard: The SFPUC will ensure that the production capacity at existing irrigators' wells is equivalent to the existing production capacity of the wells or is sufficient to meet existing and planned peak irrigation demand at the land use, whichever is less, provided that the loss of capacity at the existing irrigators' wells is reasonably expected to have been caused by the Project.

If the production capacity at an existing irrigator's well is shown to drop below this performance standard due to the Project, measures to avoid or reduce Project contributions to the loss of capacity or measures to meet irrigation needs will be implemented by the SFPUC. The SFPUC will implement these measures, or a combination thereof, so that water supply provided to the land use by the existing irrigators' well(s) is not interrupted. The method for determining whether the loss of pumping capacity is attributable to the Project is described in detail below.

In order to implement one or more of the mitigation actions, it is necessary to, and the SFPUC shall, conduct monitoring at existing irrigators' wells to determine whether the performance standard is being met. The monitoring program is described in detail below.

Mitigation Actions to be Undertaken to Meet the Performance Standard: The SFPUC shall, in cooperation with the existing irrigators, implement actions to meet the performance standard in this mitigation measure when the production capacity of an existing irrigator's well drops below the performance standard. The following mitigation actions are examples of the type of actions that, alone or in combination, will avoid or reduce Project impacts, depending on the circumstance:

1. *Improve irrigation efficiency.* Seek ways to reduce applied water demand through irrigation efficiency measures. For example, sprinkler nozzles can be replaced with more efficient models, sprinklers can be added to achieve more evenly distributed irrigation, and installation of soil-moisture sensors can aid in irrigation scheduling.

2. *Modify irrigation operations.* Seek ways to modify operations to accommodate reduced well capacity. For example, use longer irrigation cycles to meet the same irrigation demand or use evapotranspiration data to modify irrigation scheduling.

3. *Redistribute GSR pumping.* Seek to reduce the rate of groundwater level decline in the affected area by redistributing Project pumping to other areas; however, in no case would redistribution be undertaken where the resulting groundwater levels would then decline more than what was originally predicted to be caused by the Project by modeling. The bi-annual analyses of data from the Monitoring Program would continue while this action is undertaken. The action would cease when the data analysis shows that the performance standard is met without continued redistribution of GSR pumping.

4. *Reduce GSR pumping.* Seek to reduce the rate of groundwater level decline through a reduction in Project pumping (including a cessation in Project pumping at wells in the vicinity of existing irrigation wells). The bi-annual analyses of data from the Monitoring Program would continue while this action is undertaken. The action would cease when the data analysis shows that the performance standard is met without continued reduction of GSR pumping.

5. *Lower pump in irrigation well.* A pump may be lowered to accommodate water level fluctuations induced by Project pumping that exceed historic levels.

6. *Lower and change pump in irrigation well.* A pump may be replaced and set to a lower depth to accommodate new head conditions because of lowered water levels induced by Project pumping.

7. *Add storage capacity for irrigation supply.* Under certain conditions, storage may be added (e.g., an above-ground tank) to offset reduced well capacity caused by Project pumping. The availability of storage capacity (or of increased capacity) can provide an ability to meet peak flow rates that are otherwise reduced by lowered water levels.

8. *Replace irrigation well.* An existing irrigation well may be replaced with a new well which may be designed with different screen intervals or depth. The new irrigation well could therefore access additional groundwater resources at new depths in the aquifer.

9. *Replace irrigation water source.* In the event that the preceding options cannot be implemented without causing an interruption in the irrigation supply, a temporary replacement water supply source would be provided from the regional water system or Partner Agency distribution system via temporary aboveground pipes close to the location where additional irrigation supplies are needed until another mitigation option(s) is implemented.

Method for Determining Whether Loss of Pumping Capacity at an Existing Irrigation Well(s) Is Due to the Project. Any loss in production capacity of an existing irrigation well(s) is assumed to be caused by the Project if: 1) it is temporally correlated with the onset of increased Project pumping; 2) it occurs in an area predicted in this EIR to be affected by well interference; 3) static groundwater levels have dropped; 4) pumping groundwater levels have not dropped more than static groundwater levels (if pumping groundwater levels drop more than static groundwater levels it could indicate the drop in production capacity is due to increased well inefficiency and not due to the Project); or 5) no other obvious reason exists for the drop in production capacity If another reason is identified, it will be based on the written professional opinion of a certified hydrogeologist or professional engineer with expertise in groundwater hydrology that will be submitted to the San Francisco Planning Department's Environmental Review Officer (ERO), or designee, for review and concurrence. The ERO may require the SFPUC to hire an independent expert to advise the ERO.

To support this determination, the SFPUC will develop at least the following information:

- *Item 1. It is temporally correlated with the onset of increased Project pumping.* The SFPUC will develop a graph that shows the pumping of Project and Partner Agency wells within 1.5 miles of the existing irrigator's well over time, compared to the production capacity of the existing irrigator's well over the same period.
- *Item 2. It occurs in an area predicted to be affected by well interference.* The SFPUC will calculate the cone of depression, using the same methodology as used in evaluating the impact in the EIR, at Project and Partner Agency wells within 1.5 miles of the existing irrigator's well, as well as at the existing irrigator's well.
- *Items 3 and 4. Static water levels have dropped and pumping water levels have not dropped more than static water levels*. The SFPUC will develop a graph showing the difference between static and pumping water levels at the existing irrigator's well over time.
- *Item 5. Another reason exists for the drop in production capacity.* If the SFPUC believes that the drop in production capacity of the existing irrigation well(s) is caused by factors other than the Project – and the owner of the existing irrigation well(s) disagrees – then the SFPUC will have a certified hydrogeologist or professional engineer with expertise in groundwater hydrology prepare documentation regarding the reasons for the drop in production capacity and submit this documentation to the San Francisco Planning Department's ERO, or designee, with a copy to the existing well owner. The ERO may require the SFPUC to hire an independent expert to advise the ERO.

In addition, the following Monitoring Program will assist the SFPUC in obtaining the data necessary to support the determination of probable cause for any groundwater level decreases at an existing irrigator's well.

Existing Irrigation Well Monitoring Program. The SFPUC will monitor short- and long-term changes in groundwater conditions and operations at existing irrigators' wells. This Existing Irrigator Well Monitoring Program applies to existing well owners who choose to participate in the program. Participation in this monitoring program is assumed to be necessary for the mitigation actions to be effectively implemented by the SFPUC at the affected well.

At least 18 months prior to the commencement of pumping of Project wells, the SFPUC shall contact existing irrigators with information about the monitoring program. To participate in the program, existing irrigators will complete a registration form and an agreement with the SFPUC. The monitoring program will include the installation of a flow meter to allow for daily well production volumes to be recorded and a groundwater level transducer/data logger (a device for automatically detecting and recording groundwater levels) for measuring groundwater levels. Baseline monitoring of flow meter data and groundwater level data in the existing irrigators' well will occur among willing participants for at least one year prior to pumping the Project wells. In addition to baseline monitoring of well production and groundwater levels, pumping tests will be conducted prior to commencement of pumping Project wells to collect baseline data on pump and well performance. The pumping tests will collect data on well capacity and drawdown, well specific capacity, pump efficiency and head-capacity characteristics, sand content, and selected water quality parameters.

The SFPUC shall also collect any existing information and data available regarding the existing irrigator's well from the well owner, including any estimates or measurements of historical, existing, and planned land and water use (e.g., driller's logs, water level data, pumping records, acres irrigated) to provide information upon which to evaluate the performance of the existing irrigator's well over time and to establish baseline operating conditions. When there is an opportunity to open an existing irrigator's well (such as when a pump is removed by a well owner), the SFPUC may seek to conduct video log surveys in wells to determine the condition of the well structure. The monitoring effort will continue through the life of the Project, unless canceled by the well owner as part of the well owner's decision to remove itself from the monitoring program. Continued participation in this monitoring program is assumed to be necessary for the mitigation actions to be effectively implemented by the SFPUC at the affected well. Periodic re-testing of a well may occur as prompted by the need to evaluate performance throughout the life of the Project. If there is uncertainty or disagreement about whether the Project is responsible for a loss in production capacity at an existing irrigator's well, the SFPUC shall undertake more frequent monitoring and/or testing to help resolve the disagreement.

Data from the water level transducers/data loggers and flow meters shall be recorded daily during the first year. Following the first year of data collection, the frequency may be modified (e.g., as prompted by a need to evaluate pump and/or well performance to determine effects of the Project). The SFPUC shall provide participants with 14-day advance notice for the site visit(s) that would be scheduled within a 48-hour window.

Data shall be analyzed two times each year during Take Periods when Project wells are pumping regularly. The first data analysis period shall end April 30th when production capacity can be compared to peak demand prior to the peak demand period. The second data collection period shall end October 30th when groundwater levels will likely be lowest at the end of the peak irrigation season and production capacity of the well would be at its lowest. The data shall be compiled and analyzed by SFPUC's certified hydrogeologist or professional engineer with expertise in groundwater hydrology by June 30th and January 15th for the two data analysis periods. The data collected from each existing irrigator's well shall also be shared with the well owner upon request. In Project Put and Hold Periods, data shall be analyzed once per year for the data collected through October with analysis completed by January 15th.

Definition of Terms

Existing or planned land use. All existing and planned land uses served by existing irrigators' wells are related to turf irrigation. The only planned known (future) land use is the potential expansion of the Holy Cross Cemetery to include up to an additional 30 acres of irrigated turf.

Existing well capacity. Existing well capacity is the production capacity of the existing irrigator's well during the 12-month monitoring period prior to operation of the Project. The well capacity will be determined by the Monitoring Program described herein.

Peak irrigation demand. Peak irrigation demand is defined either as the actual peak irrigation demand determined from well production records obtained by the Monitoring Program described herein or as identified in Table M-HY-6 (developed from Table 5.16-14 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought] of the EIR), whichever is agreed to by the parties.

TABLE M-HY-6
Existing or Planned Peak Irrigation Demand at Sites with Significant Impacts Due to Project Operation

Irrigation Site	Existing and Planned Peak Demand[(a)] (af per 12-hour period)	
	Existing	Planned
Lake Merced Golf Club	0.2	0.2
Woodlawn Memorial Park	0.7	0.7
Italian Cemetery	0.4	0.4
Eternal Home Cemetery	0.2	0.2
Olivet Memorial Park	0.8	0.8
Salem Cemetery, Hills of Eternity and Home of Peace	0.6	0.6
Cypress Lawn Memorial Park	2.2	2.2
Holy Cross Cemetery	2.2	2.24
California Golf Club	1.8	1.8

Note:
(a) These values are taken from Tables 5.1-2 (Model Input – Pumping Assumptions for Modeling Scenarios), 5.16-9 (Existing Irrigated Acreage and Estimated Peak Demand at Potentially Affected Land Uses), and 5.16-10 (Existing Average Annual Recycled Water and Groundwater Use and Estimated Peak Demand at Potentially Affected Land Uses that Use Recycled Water) in the Draft EIR.
af = acre-feet

Production capacity. Production capacity of a well is the quantity of water that can be produced by a well in a 12-hour period. Production capacity will be calculated based on daily production, as measured by the flow meter, divided by pumping duration, as measured by the flow meter, multiplied by 12 hours.

Existing irrigators' wells. The existing wells that support the following land uses are the only wells that meet the definition of existing irrigators' wells for the purposes of this mitigation measure: Lake Merced Golf Club, Woodlawn Memorial Park, Italian Cemetery, Eternal Home Cemetery, Olivet Memorial Park, Home of Peace Cemetery, Cypress Lawn Memorial Park, Holy Cross Cemetery and the California Golf Club. Existing wells are those wells that are in operation prior to the approval of the Project.

Impact Conclusion: Significant and Unavoidable with Mitigation

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. (Less than Significant)

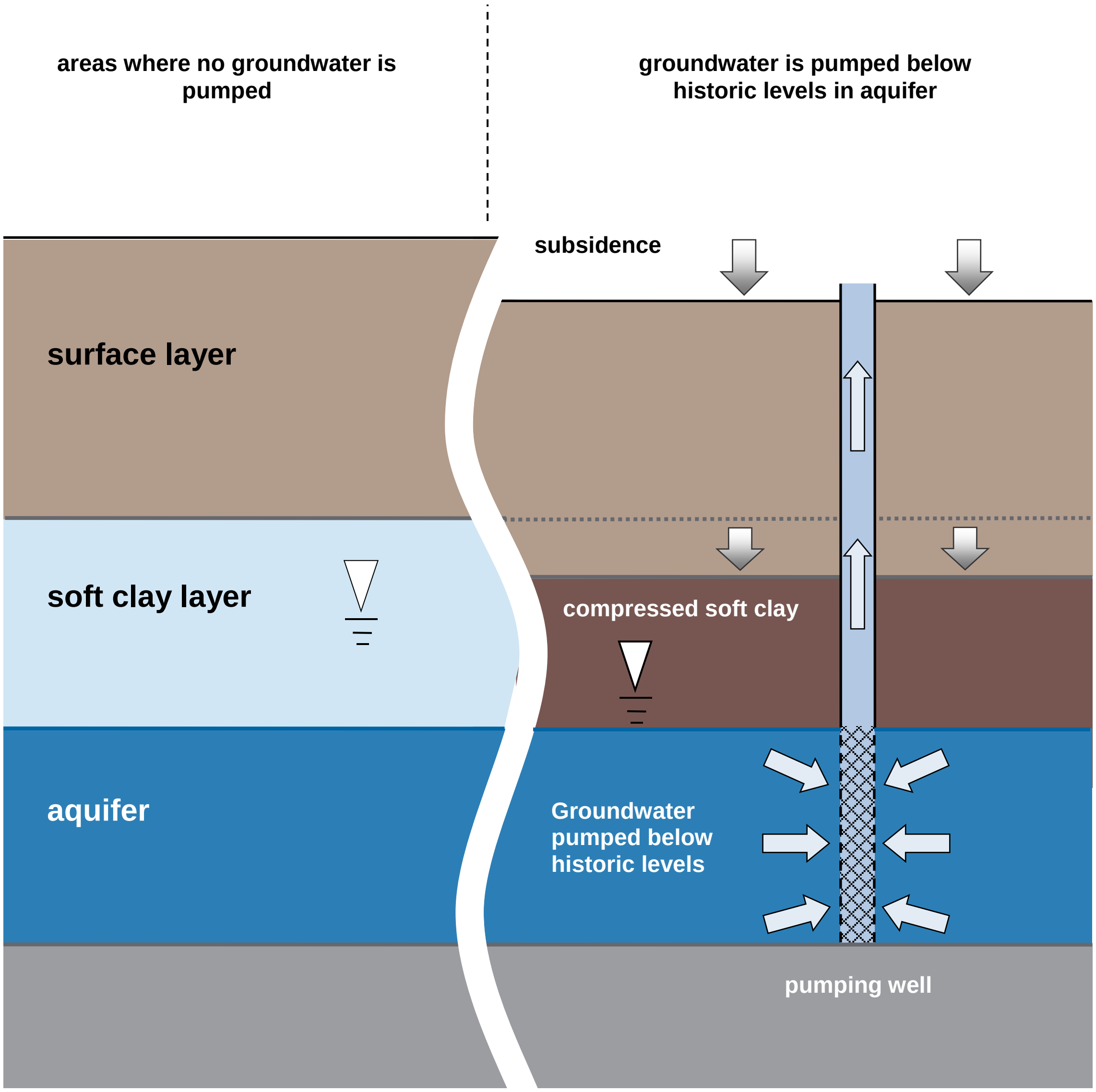
Description of Land Subsidence

Land subsidence is a gradual settling or sudden sinking of the earth's surface due to subsurface movement of earth materials (Galloway et al. 1999). While land subsidence can result from a number of processes, subsidence from groundwater pumping is the focus of the analysis for the Project. Land subsidence due to groundwater pumping can occur when groundwater elevations are lowered, and water drains out of an aquifer or clay layers that are within or between aquifers.

Subsidence in granular materials, such as sand and gravel that typically comprise the water-bearing portion of an aquifer, is generally minor and can be reversed when groundwater levels are raised again. However, as groundwater drains from the clay layers, there is less water supporting the clay particles and the clay layers can compress or compact. This can be a slow process, occurring over several months, or even years. With sufficient time, the magnitude of the compression can be great enough to result in a measurable, permanent lowering or subsidence of the ground surface (see Figure 5.16-8 [Subsidence Schematic]). Clays are far more compressible than sands or gravels; therefore, it is the presence of thick clays, rather than sands or gravels that indicates a potential for subsidence.

Approach to Analysis

Operation of the Project could cause land subsidence if Project-related groundwater pumping were to result in decreased groundwater levels in the Westside Groundwater Basin that are lower than the historic low groundwater levels for an extended period of time. Clay layers that are located above the historic low groundwater levels have already been drained of water and have already compressed, if they were susceptible to compression, as a result of long-term historic pumping in the Basin. This initial compaction of clay layers tends to be permanent (Fugro 2012b). Therefore, future land subsidence that could occur due to the Project would result only if historic low groundwater levels were exceeded. This analysis assumes that if predicted groundwater levels were to drop below historical low levels, they would be maintained at these low levels long enough to induce subsidence.



Subsidence Caused by Groundwater Pumping

LEGEND

Water Levels

Subsidence Schematic

Regional Groundwater Storage and Recovery Project

Figure 5.16-8

This is a conservative assumption that results in reporting the maximum amount of possible subsidence. The relevant factors that influence the expected amount of subsidence due to Project operation include:

- The extent to which groundwater levels are decreased by the Project compared to predicted groundwater levels for modeled existing conditions;
- The presence and thickness of clay layers or clayey sand layers;
- The compressibility of the clay or clayey sand layers; and
- The amount of time low groundwater levels are maintained. This analysis assumes low groundwater levels are maintained long enough to induce the maximum possible subsidence.

Anticipated subsidence from Project operations was estimated using the following methodology (Fugro 2012b; Fugro 2012d):

Four locations within the Westside Groundwater Basin were selected as representative locations to estimate the potential extent of subsidence due to the Project. These locations were selected based on a review of the basin geology. These four sites were considered representative of anticipated subsidence, because subsidence would tend to be greater at these sites due to thicker clay layers and greater drawdown of groundwater levels due to the Project. Selection of these four locations should not be interpreted to mean that potential subsidence would occur only around a specific well site; if subsidence were to occur, the results at these four locations would be representative of the maximum effect that could occur at any of the proposed well locations throughout the Basin.

- Two proposed well locations were selected for subsidence analysis in the North Westside Groundwater Basin: (1) the eastern side of Lake Merced (at the SFPUC's proposed SFGW Project Lake Merced Pump Station well site); and (2) the Sunset area of western San Francisco (at the SFPUC's proposed SFGW Project South Sunset Playground well site) (see Figure 5.1-3 [Location of Projects Considered in the Cumulative Analysis] in Section 5.1, Overview). These two sites were selected over other locations, such as Golden Gate Park, because of the greater prevalence of clay layers in the Sunset and Lake Merced areas compared to Golden Gate Park. This prevalence of clay layers would tend to result in greater estimated subsidence at the selected sites than in Golden Gate Park (Fugro 2012b). No subsidence calculations were performed for the South Sunset Well location relative to the Project, because the South Sunset well site is located too far from the GSR Project's well facility sites for there to be any subsidence effects from Project pumping; however, cumulative impact analyses on subsidence at the South Sunset Well location have been performed (SFPUC 2012b).
- Two proposed well locations were selected in the South Westside Groundwater Basin at Site 8 in the Town of Colma and Site 13 in the City of South San Francisco (see Figure 3-4 [Project Location Map – Central] in Chapter 3, Project Description). Site 8 was chosen for analysis because it appears to have clay layers that are representative of other well locations in the Colma area. Site 13 was selected over other locations due to the presence of multiple clay layers at shallow, intermediate, and deep depths. A very thick, intermediate-depth clay at this location makes this site particularly susceptible to subsidence. (Fugro 2012b)
- Historical low groundwater levels were estimated for each of the four sites, as subsidence is predicted to occur only when groundwater levels fall below historical low groundwater

levels. Historical low water elevations were estimated from historical groundwater level measurements where available. These data were supplemented with groundwater levels as estimated by the Westside Basin Groundwater Model. (Fugro 2012b)

- The difference between groundwater levels for the modeled existing conditions scenario and the Project scenario was obtained from the results of the Westside Basin Groundwater Model (Kennedy/Jenks 2012b). The lowest simulated groundwater levels predicted at each site were used for the subsidence analysis, resulting in the maximum differences that would be caused by the Project. Under the GSR Project, the lowest groundwater levels would occur at the end of the design drought. In the cumulative scenario, the lowest simulated groundwater levels are generally predicted to occur at the end of the 47-year simulation. (Fugro 2012b)
- Historical low groundwater levels, the difference between simulated groundwater levels for existing conditions and the Project, and clay properties were used to calculate subsidence. Subsidence was calculated using equations based on standard and well accepted soil mechanics theories detailed by Terzaghi et al. (Terzaghi et al. 1996). These equations relate the amount of subsidence to a clay's compressibility and thickness, as well as the change in groundwater levels.

The compressibility property of clay particles is one of the parameters required to perform the methodology described above. Knowledge of such values is limited and often imprecise; hence, so are the predictions of the extent of compaction and resulting subsidence. Site-specific laboratory test results of the compressibility of clays in the Westside Groundwater Basin were not available and, therefore, typical soil compressibility values of the Merced Formation (which underlies much of the Westside Groundwater Basin) were used in the estimations of subsidence.

Subsidence can affect surface features such as structures and pipelines, the extent of flooding, and drainage patterns. In general, structures, including pipelines, can withstand subsidence or settlement of six inches or less without damage (Lambe and Whitman 1969; SFPUC 2013d); therefore, projected subsidence of six inches or more is considered a significant impact on structures. Flood zones, as defined by the National Flood Insurance Program Regulations in 44 CFR Part 60.3(c)(10), are subject to revision when the Base Flood Elevation within a 100-year flood zone changes by one foot or more. The calculation and mapping of 100-year flood zones are generally not accurate to more than a one-foot elevation change, and changes to flood elevations of less than one foot should not be interpreted as necessarily causing an increased risk of flooding. Therefore, subsidence impacts on flooding are considered significant if projected subsidence exceeds one foot within a 100-year flood zone. Subsidence impacts on drainage patterns are considered significant if projected subsidence exceeds six inches.

Impact Discussion and Significance Determination

As described in Section 5.16.1.3 (Regional Groundwater Hydrology), historic subsidence in the Westside Groundwater Basin has not been documented. The fact that extensive historic groundwater extraction has resulted in associated declines in groundwater levels, but without any apparent substantial subsidence, suggests that the semi-consolidated Merced Formation sediments in the Westside Groundwater Basin have limited compressibility. Therefore, based on a conceptual understanding of the mechanisms required for land subsidence and the apparent lack of historic subsidence in the area, the potential for future subsidence due to the Project would likely be limited due to low compressibility of semi-consolidated Merced Formation sediments. (Fugro 2012b)

Estimates of land subsidence due to Project pumping were calculated at a Lake Merced site and GSR Sites 8 and 13 because these wells would be located where substantial clay layers occur, as described above under Approach to Analysis. Predicted groundwater levels at the end of the design drought are estimated to be lower than historic low groundwater levels by up to 58 feet at the Lake Merced site, by up to 173 feet at Site 8 in Colma, and by up to 174 feet at Site 13 in South San Francisco during operation of the Project. The difference between modeled existing conditions (i.e., conditions without the Project) and the estimated Project effects at the end of the design drought (i.e., conditions reflecting the lowest groundwater levels that would occur during operation of the Project) would be a decrease in predicted groundwater levels of up to 63 feet at the Lake Merced site, up to 149 feet at Site 8, and up to 151 feet at Site 13. (Fugro 2012b)

Table 5.16-15 (Estimated Subsidence due to Project Operations) shows the estimated subsidence due to the Project at the locations selected for the analysis. The estimated subsidence is based on the difference between groundwater levels for modeled existing conditions and the lowest groundwater levels that are projected to occur with the Project.

TABLE 5.16-15
Estimated Subsidence due to Project Operation (in inches)

Site ID	Estimated Subsidence
San Francisco, eastern Lake Merced	1.0
Colma, Site 8	2.9
South San Francisco, Site 13	3.4

Source: Fugro 2012b

The estimated subsidence due to Project operation ranges between 1.0 and 3.4 inches at the three representative locations where subsidence was calculated. This estimated subsidence due to Project operation is less than the significance threshold of six inches for impacts on structures and drainage patterns. Estimated subsidence due to project operation is also less than the significance threshold of one foot for flooding impacts on land within the 100-year flood zone. Therefore, subsidence due to Project operation would be *less than significant* relative to structures and pipelines, drainage patterns, and flooding.

Impact Conclusion: Less than Significant

Impact HY-8: Project operation would not result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant)

Description of Seawater Intrusion

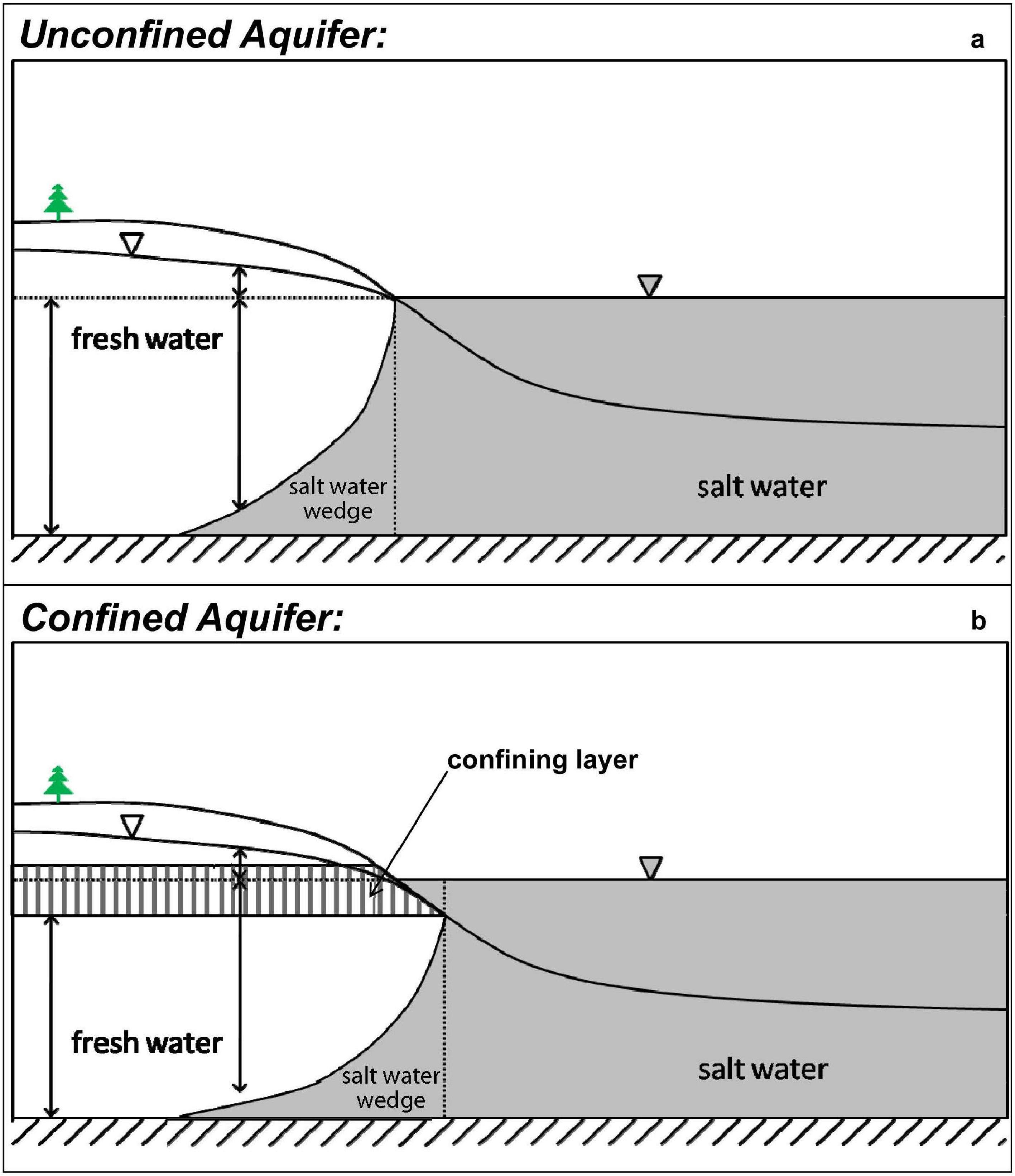
Seawater intrusion refers to the migration of seawater into a freshwater aquifer and can occur when groundwater levels are lowered by pumping. Seawater intrusion becomes an environmental concern when the degradation of groundwater quality would make the groundwater potentially unsuitable for its identified use, or when inland surface water features are affected by the seawater, compromising habitats or uses of the surface water.

Where an aquifer is in direct hydraulic connection with an ocean or bay, the hydrologic zone where fresh groundwater and ocean saltwater meet—referred to as the saltwater/freshwater interface—is comprised of brackish water (a mixture of freshwater and saltwater) to saline water (water with high concentrations of salt). Aquifers that are not actively pumped typically provide freshwater outflow at the coast. Because this ocean outflow exerts seaward hydraulic pressure, it can generally hold seawater at equilibrium offshore from the coast and hinder its onshore advancement.

Seawater intrusion occurs when the freshwater-groundwater gradient declines toward the ocean or bay and the resulting seawater intrusion along the base of the aquifer is termed a "saltwater wedge" (see Figure 5.16-9 [Seawater Intrusion Schematic]). Because of the wedge-shaped boundary, the shallowest portion of the landward side of the saltwater/freshwater interface may remain relatively close to the point where the aquifer is in connection with the ocean or bay, but the deepest portion of the landward side of the saltwater wedge may extend further landward, even when freshwater is flowing to the ocean.

The extent of seawater intrusion into a freshwater aquifer is affected by the relative difference between water levels in the ocean or bay and the freshwater aquifer with which it is in direct hydraulic connection. The theoretical groundwater level necessary to prevent seawater intrusion is termed the "exclusion head." When groundwater levels drop below the exclusion head, the interface between the seawater and freshwater can theoretically move inland under certain conditions. The interface would move back toward the ocean or bay if groundwater levels were raised again. However, some of the salt can remain in the fresh water (even after the interface has moved back toward the ocean or bay), and this remaining saltwater can be difficult to remove (Kennedy/Jenks 2012c). The seawater/freshwater interface is not a sharp interface. Instead, diffusion and dispersion result in a transition zone at the interface where salt concentrations (typically measured as chloride or total dissolved solids [TDS]) range from values typical of freshwater at the leading edge (furthest inland) to those typical of seawater at the following edge (closest to the ocean or bay). The movement of the interface is controlled by changing conditions on the freshwater side of the interface. Seawater contains approximately 35,000 mg/L of TDS, which includes about 19,000 mg/L of chloride (USGS 2003). As discussed in Section 5.16.1.3 (Regional Groundwater Hydrology) under the sub-heading "Coastal Chloride Concentrations," the most recent chloride concentrations in the shallow water bearing zone, Primary Production Aquifer and Deep Aquifer in the North Westside Groundwater Basin are all below 160 mg/L (except at Monitoring Well LMMW-1S, as explained in 5.16.1.3 [Regional Groundwater Hydrology] under the sub-heading "Coastal Chloride Concentrations"). Therefore, there is a large contrast between the chloride concentrations in the seawater and the groundwater. In the North Westside Groundwater Basin, seawater intrusion has not been observed in coastal monitoring wells and the seawater/freshwater interface is assumed to be west of the shoreline.

Movement of the seawater/freshwater interface can be a slow process. The rate of movement depends on aquifer conditions, and seawater intrusion occurs only when the conditions that cause seawater intrusion are sustained for a sufficient period of time given the existing conditions. Fluctuating groundwater elevations can result in a wider transition zone.



Seawater Intrusion Schematic

Regional Groundwater Storage and Recovery Project

Figure 5.16-9

Source: Kennedy/Jenks 2012c

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Approach to Analysis

The Westside Basin Groundwater Model does not simulate seawater and freshwater flows or their interface but instead simulates groundwater-level changes. Therefore, the potential for seawater intrusion to occur in the Westside Groundwater Basin is evaluated using the results of the groundwater model in conjunction with groundwater contours, changes in flux to the ocean or bay, and analytical approaches to evaluate exclusion heads in the aquifer and the estimated rate of seawater intrusion (Kennedy/Jenks 2012c). If the Project were to not cause changes in these groundwater parameters in such a fashion that seawater intrusion would be more likely to occur, then the Project would not cause the chloride concentrations in groundwater to degrade to significant levels above 250 mg/L.

Three methods are used to estimate the potential for seawater intrusion at any location in the Westside Groundwater Basin:

- Comparing simulated groundwater elevations to calculated exclusion heads[25],
- Analyzing the changes in the simulated flux of groundwater flowing to the ocean, and
- Analyzing simulated groundwater contours.

This impact analysis does not discuss groundwater levels and quality at the Thornton Beach and Fort Funston monitoring locations because these monitoring points are located southwest of the Serra Fault, between the San Andreas Fault and Lake Merced, as described in the "Regional Geology" subsection of Section 5.16.1.3 (Regional Groundwater Hydrology). Previous analyses have determined that this area would not be subject to seawater intrusion, because the Serra Fault presents an effective barrier to seawater intrusion (Kennedy/Jenks 2012c).

Groundwater Elevations and Exclusion Heads

Average modeled groundwater levels were compared to the average groundwater levels predicted to occur under modeled existing conditions in order to determine the effect of Project-related pumping on the potential for seawater intrusion to occur. Average groundwater levels were used because short-term movement of the seawater interface towards land during periods of low groundwater can be offset by movement of the seawater interface towards the ocean during periods of high groundwater. Average groundwater elevations are appropriate because they address both the magnitude and duration of short term seawater intrusion.

If predicted average groundwater levels with the Project are lower than predicted average groundwater levels under modeled existing conditions, the groundwater levels are further compared to the exclusion head. Groundwater levels higher than the exclusion head indicate that seawater intrusion would not likely reach that well location. Groundwater levels lower than the exclusion head do not necessarily indicate that seawater intrusion would occur, but rather that the hydrologic potential exists for the

[25] The theoretical groundwater level that must be maintained at a well location to prevent seawater intrusion from reaching the well.

landward migration of the seawater-freshwater interface. Generally, however, seawater intrusion would occur eventually if groundwater levels remain lower than the exclusion head indefinitely, unless there are other factors, such as physical barriers, that control seawater intrusion (Kennedy/Jenks 2012c).

Seawater intrusion is not likely to occur due to seasonal fluctuation of groundwater levels, because seasonal fluctuations are temporary, and seasonal decreases are compensated for by seasonal increases (Kennedy/Jenks 2012c). Seasonal fluctuations may result in a wider seawater/fresh water transition zone, as mentioned above. This wider transition zone may result in elevated chloride concentrations near the coast. However, such a wider transition zone is not an indicator of ongoing seawater intrusion.

Groundwater Flux

The flux of groundwater moving towards the ocean or bay represents the amount of water discharging from the aquifer. The flux values are representative of the groundwater basin as a whole and indicate total discharge along the coast; this means that localized changes in flux that could allow localized seawater intrusion to occur would not be identified in this analysis. However, calculating flux values provides a gross evaluation of the amount of water discharging from the aquifer. A positive flux indicates a lower potential for seawater intrusion to occur, although a positive flux value does not necessarily preclude seawater intrusion from occurring because the seawater wedge could still enter the lowest part of the freshwater aquifer. Rather, the calculated flux is used as an indication of whether seawater intrusion is expected to be a substantial concern.

Groundwater Contours

Groundwater contours were used to evaluate groundwater elevations and flow directions in the shallow water bearing zone and Shallow Aquifer throughout the basin. In general, groundwater levels estimated to be above sea level and groundwater flow directions estimated to be directed toward the ocean or bay indicate that there is a low potential for seawater intrusion to occur.

Significance Threshold

As previously discussed, the recommended secondary MCL for chloride is 250 mg/L and the upper limit is 500 mg/L. An increase in chloride concentrations above these concentrations could render at least part of the groundwater basin unsuitable for use as a drinking water source. Therefore, this analysis considers that impacts related to seawater intrusion would be significant if chloride concentrations exceeded 250 mg/L at one of the monitoring locations along the Pacific Coast or San Francisco Bay.

Impact Discussion and Significance Determination

Potential for Seawater Intrusion in the North Westside Groundwater Basin

Shallow Aquifer

The results from the Westside Basin Groundwater Model predict that, in the North Westside Groundwater Basin, average groundwater levels in the Shallow Aquifer due to the Project would be equal to or higher than the average groundwater levels without the Project, that is, under modeled existing conditions (Kennedy/Jenks 2012c). As a result of the higher future groundwater levels that would accumulate through operation of the Project, seawater intrusion would tend to be impeded or prevented. The average rise in groundwater levels in the Shallow Aquifer, modeled at monitoring well clusters in the Basin, would be between 0 and 1.6 feet. The Model results predict that the Project's average groundwater levels would never be below the exclusion head for the Shallow Aquifer.

The average groundwater flux from the Westside Groundwater Basin to the Pacific Ocean is predicted to be 17 af per month (afm) higher under Project conditions than under modeled existing conditions. This increased flux would tend to either push the seawater wedge further seaward and west of the coast or allow less seawater intrusion into the Westside Groundwater Basin, although a positive flux value does not necessarily preclude seawater intrusion from occurring because the seawater wedge could still enter the lowest part of the freshwater aquifer. Although these increased flux estimates are not specific to the Shallow Aquifer, they do suggest that, generally, more groundwater flows towards the Ocean under Project conditions than under modeled existing conditions.

Groundwater contours for the Shallow Aquifer under Project conditions are predicted to be almost identical to groundwater contours for the Shallow Aquifer under modeled existing conditions (Kennedy/Jenks 2012c), except that during the design drought, groundwater levels south of Lake Merced are predicted to be up to 5 feet lower with the Project than without the Project. These predicted lower groundwater levels, however, represent conditions after the design drought and do not represent average conditions. Any seawater intrusion induced during the design drought would be pushed back out by the average groundwater levels associated with operation of the Project, which are predicted to be higher than those predicted under modeled existing conditions. Therefore, the Project would not cause lower groundwater levels that would induce seawater intrusion in the Shallow Aquifer of the North Westside Groundwater Basin.

<u>Primary Production and Deep Aquifers</u>

The results from the Westside Basin Groundwater Model predict that, in the North Westside Groundwater Basin, average groundwater levels with implementation of the proposed Project in the Primary Production and Deep Aquifers would be equal to or higher than the average groundwater levels without the Project. Average groundwater levels would be higher because they would rise during the Put Years during Project operations, and would remain high during the Hold Years. Only during Take Years would groundwater levels drop below the groundwater levels for the modeled existing conditions. The average rise in groundwater levels in the Primary Production Aquifer, estimated at monitoring well clusters in the North Westside Groundwater Basin, is expected to be between 0.1 and 3.3 feet. The average rise in groundwater levels in the Deep Aquifer, estimated at monitoring well clusters in the North Westside Groundwater Basin, is expected to be between 0.2 and 1.5 feet. These higher groundwater levels would impede seawater intrusion.

The Model results predict that the Project's groundwater levels in the Primary Production Aquifer would be below the exclusion head between 99 and 100 percent of the hydrologic sequence, taking into account the values at different locations. This is identical to the percent of time that groundwater levels in the Primary Production Aquifer are estimated to be below the exclusion head under modeled existing conditions. Therefore, the Project would not be expected to cause groundwater levels to be below the exclusion head more frequently than they would be under the modeled existing conditions.

The Westside Basin Groundwater Model results predict that the Project's groundwater levels in the Deep Aquifer would be below the exclusion head during 100 percent of the hydrologic sequence, which is the same as is expected to occur without the Project (i.e., modeled existing conditions).

Therefore, the Project would not induce seawater intrusion in the Primary Production or Deep Aquifers of the North Westside Groundwater Basin that is not anticipated under modeled existing conditions.

Impact Conclusion: Less than Significant

Potential for Seawater Intrusion in the South Westside Groundwater Basin

<u>Shallow Water-bearing Zone</u>

The results from the Westside Basin Groundwater Model predict that, under the proposed Project, simulated groundwater elevations in the South Westside Groundwater Basin would range between 0.2 feet below and 3.1 feet above modeled existing conditions. The average groundwater levels in the South Westside Groundwater Basin's shallow water bearing zone over the 47-year hydrologic modeling sequence due to the proposed Project are predicted to be equal to or higher than the average groundwater levels without the Project. These higher groundwater levels under the proposed Project would tend to impede seawater intrusion. The average rise in groundwater levels in the shallow water bearing zone groundwater levels, estimated at monitoring well clusters in the South Westside Groundwater Basin, is predicted to be between 0.8 and 2.0 feet over this time period.

The Westside Basin Groundwater Model results predict that the Project's groundwater levels in the shallow water bearing zone would be below the exclusion head during seven to 100 percent of the 47-year hydrologic sequence, taking into account multiple locations throughout the South Westside Groundwater Basin. Groundwater levels in the shallow water bearing zone would be below the exclusion head 10 to 100 percent of the time at those same locations under modeled existing conditions (i.e., without the Project). Therefore, the Project would not cause groundwater levels to be below the exclusion head more frequently than they would be under the modeled existing conditions.

Groundwater flux from the South Westside Groundwater Basin to the San Francisco Bay under Project conditions is predicted to range between 11 afm less to 8 afm more than what is predicted under modeled existing conditions. The average groundwater flux from the Westside Groundwater Basin to the San Francisco Bay is predicted to be 3 afm higher with the Project than without the Project. This increased flux would tend to either push seawater further towards San Francisco Bay or allow less seawater intrusion into the Westside Groundwater Basin. Although these increased flux estimates are not specific to the shallow water bearing zone, they do suggest that, generally, more groundwater would flow towards the Bay under Project conditions than under modeled existing conditions.

Therefore, the Project would not cause lower groundwater levels as compared to modeled existing conditions, such that seawater intrusion would be induced to a greater degree in the shallow water bearing zone of the South Westside Groundwater Basin.

Primary Production and Deep Aquifers

At the Burlingame-D monitoring well (located adjacent to San Francisco Bay in the South Westside Groundwater Basin Primary Production Aquifer), the Westside Basin Groundwater Model results predict that average groundwater levels with the proposed Project would be 1.3 feet higher than the average groundwater levels without the Project (Kennedy/Jenks 2012c). These higher groundwater levels would impede seawater intrusion.

The Westside Basin Groundwater Model results also predict that groundwater levels in the Primary Production Aquifer, measured at Burlingame-D monitoring well, would be below the exclusion head 100 percent of the hydrologic sequence under Project conditions. This is identical to the percent of time that groundwater levels in the Primary Production Aquifer are predicted to be below the exclusion head under modeled existing conditions. Therefore, the Project would not cause groundwater levels to be below the exclusion head more frequently than they would be under the modeled existing conditions.

Simulated groundwater elevations for the South Westside Basin Deep Aquifer are not readily available from the memoranda detailing the results of the Westside Basin Groundwater Model. However, the sediments present in the Deep Aquifer are not continuous to the Bay, being separated from it by deposits of low-permeability Bay Mud that likely stretch from the land surface to the bedrock surface below (Kennedy/Jenks 2012c). Therefore, any Deep Aquifer seawater intrusion would need to pass through the shallow water bearing zone and Primary Production Aquifer before reaching the Deep Aquifer. As discussed above, the Project would not induce seawater intrusion into either the shallow water bearing zone or Primary Production Aquifer. Therefore, given the lack of hydrologic connection between the Deep Aquifer and the bay, the Project would not induce seawater intrusion into the Deep Aquifer.

In summary, the Project would not cause lower groundwater levels that would induce seawater intrusion in either the North or South Westside Groundwater Basin; therefore, the potential impact on groundwater relative to seawater intrusion would be *less than significant*.

Impact Conclusion: Less than Significant

Impact HY-9: Project operation could have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced. (Less than Significant with Mitigation)

Description of Groundwater/Surface Water Interactions

The Project has the potential to affect Lake Merced due to groundwater/surface water interactions. The phrase "groundwater/surface water interactions" refers to the movement of water beneath the land surface (groundwater) to or from water bodies on the ground surface, such as streams, lakes, and wetlands (surface water). Several general conditions are required for groundwater/surface water interactions to occur. First, the depth to groundwater (the water table) has to be sufficiently shallow in relation to the bottom of the surface water body. While the water table does not have to connect with the surface water for interactions to occur, there cannot be a substantial distance between the two, and separations of tens or hundreds of feet would generally preclude groundwater/surface water interactions. There must also be a relatively permeable pathway (such as a sandy lakebed) between the groundwater and surface water for interactions to occur.

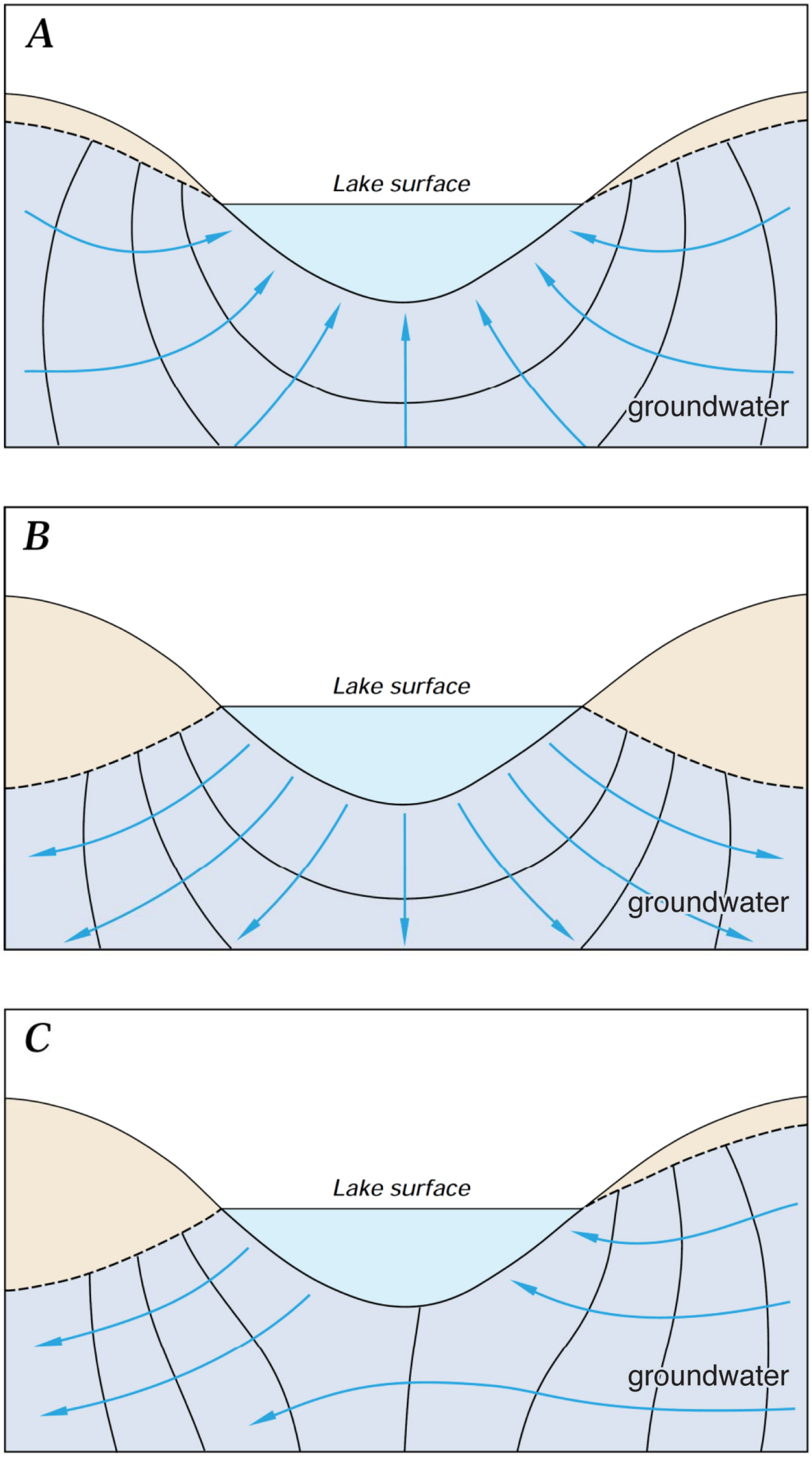
The presence of a clay layer or other low-permeability layer could preclude groundwater/surface water interactions, even if the water table were sufficiently shallow to otherwise allow interactions. Even with a natural sand lakebed, the settling of silt and organic-rich sediments from the lake water could reduce the permeability of the lake bottom, often restricting groundwater/surface water interactions to the areas along the sides of the lake where fine sediments would not have accumulated.

Surface water bodies such as lakes and streams can interact with groundwater in three basic ways (Kennedy/Jenks 2012d). They can gain water from the inflow of groundwater through the lakebed or streambed when the groundwater level is higher than the water level in the surface water body; this is referred to as a gaining system (illustration "A" on Figure 5.16-10 [Interaction of Groundwater and Lakes]). Surface water bodies can also lose water to the groundwater through the lakebed or streambed when the groundwater level is lower than the water level in the surface water body; this is referred to as a losing system (illustration "B" on Figure 5.16-10). In many cases, surface water bodies can both gain and lose water (e.g., during different seasons of the year), depending on the relative elevations of the groundwater table, the water level in the surface water body, as well as the groundwater flow direction in the aquifer (illustration "C" on Figure 5.16-10). The seepage rate between the lakebed or streambed and groundwater system is controlled by the permeability of the subsurface geology and the characteristics of the lakebed or streambed. In both gaining and losing systems, surface water levels can be affected by changes in groundwater elevations. Where the groundwater and surface water systems are disconnected, changes in groundwater elevations would not affect surface water levels.

To evaluate the potential for adverse effects on surface water bodies, it is important to understand changes in groundwater levels and related changes in surface water levels, as well as potential water quality effects related to changes in surface water levels. In general, a decrease in surface water levels would not be substantial unless the beneficial uses of the surface water were adversely affected.

Approach to Analysis

This impact analysis evaluates whether the proposed Project would result in significant changes in water quality due to changes in lake levels, which could in turn affect the beneficial uses of Lake Merced. This analysis is based on understanding the relationship of lake levels to water quality. It describes Lake Merced water levels predicted under the modeled existing conditions and then compares those levels with the projected lake water levels that are predicted to occur with implementation of the Project. Then, based on the magnitude, frequency, and duration of predicted changes in lake levels resulting from the Project, the analysis identifies the potential for water quality impacts that could affect beneficial uses.



Lakes can receive groundwater inflow (A), lose water as seepage to groundwater (B), or both (C). From Winter et al. (1998).

Interaction of Groundwater and Lakes

Regional Groundwater Storage and Recovery Project

Figure 5.16-10

Source: Kennedy/Jenks 2012 TM 10.2

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As discussed above in Section 5.16.1.4 (Groundwater-Surface Water Interactions), under the sub-heading "Lake Merced Water Quality", the relationship between water quality and lake levels varies, with no substantial correlations observed at lake levels between 0 and 7 feet City Datum, which is the range of lake levels observed between 1997 and 2009. Since 2003, Lake Merced has been maintained at a water surface elevation of at least 3 feet City Datum, and this level has increased to at least 5 feet City Datum since early 2006. At approximately 4 feet City Datum, all of the individual lakes are hydraulically connected, which is assumed to allow circulation between the four water bodies that comprise the lake, which would be expected to enhance water quality in the lake, as a result. Based on this, if Lake Merced water levels were to remain at or above 0 feet[26] City Datum (consistent with the water levels observed since 1997) under the Project, it can be expected that the current water quality conditions observed in the lake would continue. Therefore, increases in lake levels are not expected to cause water quality degradation.

Water quality monitoring between 1997 and 2009 indicates that water quality parameters in the lake have generally achieved the water quality objectives specified in the Basin Plan, with the exception of some occurrences of dissolved oxygen levels less than the warmwater habitat criterion of 5 mg/L during the summer and late fall in the deeper portions of the lake (Kennedy/Jenks 2010a). Based on a review of available water quality data, the water quality conditions of Lake Merced remained relatively constant from 1997 to 2009, with a slight improvement in lake clarity (secchi depth) during this period.

No historic data are available to determine whether lake levels below 0 feet would cause water quality degradation. Given this lack of historic data, if Project-related groundwater pumping (rather than hydrologic or other factors) were to result in lake levels below 0 feet City Datum, the potential for water quality impacts is unknown. As a conservative assumption, the approach to this analysis assumes that water quality impacts could occur when lake levels are below 0 feet City Datum, including changes in the pH and dissolved oxygen levels, the parameters that are responsible for the listing of Lake Merced as an impaired water body (see discussion in Section 5.16.1.4 [Groundwater-Surface Water Interactions], under the sub-heading "Lake Merced Water Quality"). For the purposes of this EIR, this would be considered a significant impact.

To evaluate changes in Lake Merced water levels, the Westside Basin Groundwater Model (Kennedy/Jenks 2012a) was used to estimate Project-related groundwater-level changes in the vicinity of Lake Merced and to derive the magnitude and direction of the flux of the groundwater/surface water interactions at Lake Merced. Because this model does not take into account the site-specific geometry of the lakebed, the simulation of Lake Merced surface water levels is not always accurate. Therefore, the output from the groundwater flow model was used as input to the Lake-level Model (a spreadsheet-based mass balance model calibrated to 70 years of historical water levels in Lake Merced) to provide a more accurate estimate of Lake Merced water levels in response to changes in groundwater levels and groundwater flux. Use of the Lake-level Model allows for changes in the surface area of Lake Merced as a function of lake level, a dynamic simulation of changes in lake volume, a more complete evaluation of

[26] At a lake level of 0 feet City Datum, the depth of Lake Merced would range from approximately 6 to 17 feet of water, depending on the location in the lake.

stormwater runoff, and an evaluation of flooding events resulting from overflows of the Vista Grande Drainage Canal.

The modeled groundwater elevations from the following four monitoring well clusters in the vicinity of Lake Merced (see Figure 5.16-11 [Simulated Lake Merced Level Changes]) were used for the analysis of changes in groundwater levels:

- LMMW-1, located along the west shore of South Lake;
- LMMW-2, located between North and South Lakes;
- LMMW-3, located adjacent to the west shore of Impound Lake; and
- LMMW-4, located north of North Lake.

Lake Merced Water Levels under Modeled Existing Conditions

Figure 5.16-12 (Simulated Lake Merced Levels Relative to Modeled Existing Conditions) shows the estimated Lake Merced water levels over the 47-year simulation period under modeled existing conditions. The modeled existing conditions respond directly to the assumed hydrologic sequence and existing groundwater practices described in Section 5.1, Overview, Section 5.1.6 (Groundwater Modeling Overview). Lake levels increase during years 1 to 4, which are years of above-average precipitation, followed by a decline in lake levels in years 4 through 16, which are years of a dry period, to a low of 1.5 feet City Datum during a dry period. From years 16 to 36, lake levels fluctuate with climatic conditions, but show an overall increasing trend to over 11 feet City Datum. The model also simulates the hypothetical design drought in years 36 to 44, during which the lake levels decline sharply to -0.8 feet, then recover to about 5 feet City Datum. Over the simulation period, the mean monthly lake level is 6.3 feet City Datum and the estimated mean annual range is 1.6 feet (see Figure 5.16-12). The mean monthly lake levels are below an elevation of 1 foot City Datum for four percent of the simulation period. (Kennedy/Jenks 2012d)

Under modeled existing conditions, estimated Shallow Aquifer groundwater levels in the nearby monitoring wells also indicate a response to climatic conditions, but groundwater levels in the Primary Production Aquifer show less variability than in the Shallow Aquifer. Characteristic of the Westside Groundwater Basin, the estimated groundwater levels are generally higher for locations to the north of Lake Merced and lower for locations to the south. This difference reflects the influence of existing groundwater pumping in the South Westside Groundwater Basin. For Lake Merced, this means that under modeled existing conditions, there could be a higher net outflow of lake water to groundwater from the South and Impound Lakes, while there could be more inflow of groundwater to the North and East Lakes. (Kennedy/Jenks 2012d)

The overall pattern of estimated flux (i.e., groundwater flow into or out of Lake Merced), indicates that under the modeled existing conditions, there is net inflow of groundwater to the lake during periods of higher precipitation and a net outflow of lake water to groundwater during dry periods when groundwater levels decline. (Kennedy/Jenks 2012d)

Effects of Project-related Pumping on Lake Merced Water Levels

Figure 5.16-11 (Simulated Lake Merced Level Changes) shows the estimated Lake Merced water levels over the 47-year simulation period under Project conditions. The effects of Project-related pumping would be observed in groundwater levels in both the Shallow and Primary Production aquifers. In the Shallow Aquifer, groundwater levels during Project operation, at the LMMW-3 location (to the south of Lake Merced), are predicted to be generally higher than is predicted to be the case without the Project, as indicated by the modeled existing conditions. However, following the design drought, groundwater levels at the LMMW-3 location are predicted to be about 2 feet lower with operation of the Project than they are predicted to be under the modeled existing conditions, and at LMMW-4 to the north they are predicted to be about 1 foot lower than they are predicted to be under the modeled existing conditions. Groundwater levels in the Shallow Aquifer, with operation of the Project, are estimated to recover in one to two years following the design drought. (Kennedy/Jenks 2012d)

In the Primary Production Aquifer, groundwater levels are also predicted be higher with operation of the Project than is predicted to be the case under modeled existing conditions throughout most of the 47 years of the modeled simulation. However, at the end of the design drought, the groundwater levels at LMMW-3 are predicted to be about 2 feet lower with operation of the Project than they are predicted to be under the modeled existing conditions. At LMMW-4 to the north, the Primary Production Aquifer groundwater levels are predicted to be about 2 feet lower with operation of the Project than they are predicted to be under the modeled existing conditions. Groundwater levels at this location in the Primary Production Aquifer, with operation of the Project, are estimated to partially recover to pre-design-drought levels in three to four years following the end of the design drought. (Kennedy/Jenks 2012d)

The Lake Merced lake levels under Project conditions are predicted to be similar to the modeled existing conditions for the first two years of the simulation, but are then predicted to rise rapidly from approximately 9 feet to approximately 11 feet by year 10, as a result of higher precipitation and concomitant higher groundwater levels in the Shallow Aquifer. During years 44 to the end of the simulation, after the design drought, lake levels under Project conditions are still predicted to be about 4 feet below what they are predicted to be under the modeled existing conditions at the end of the simulation. (Kennedy/Jenks 2012d)

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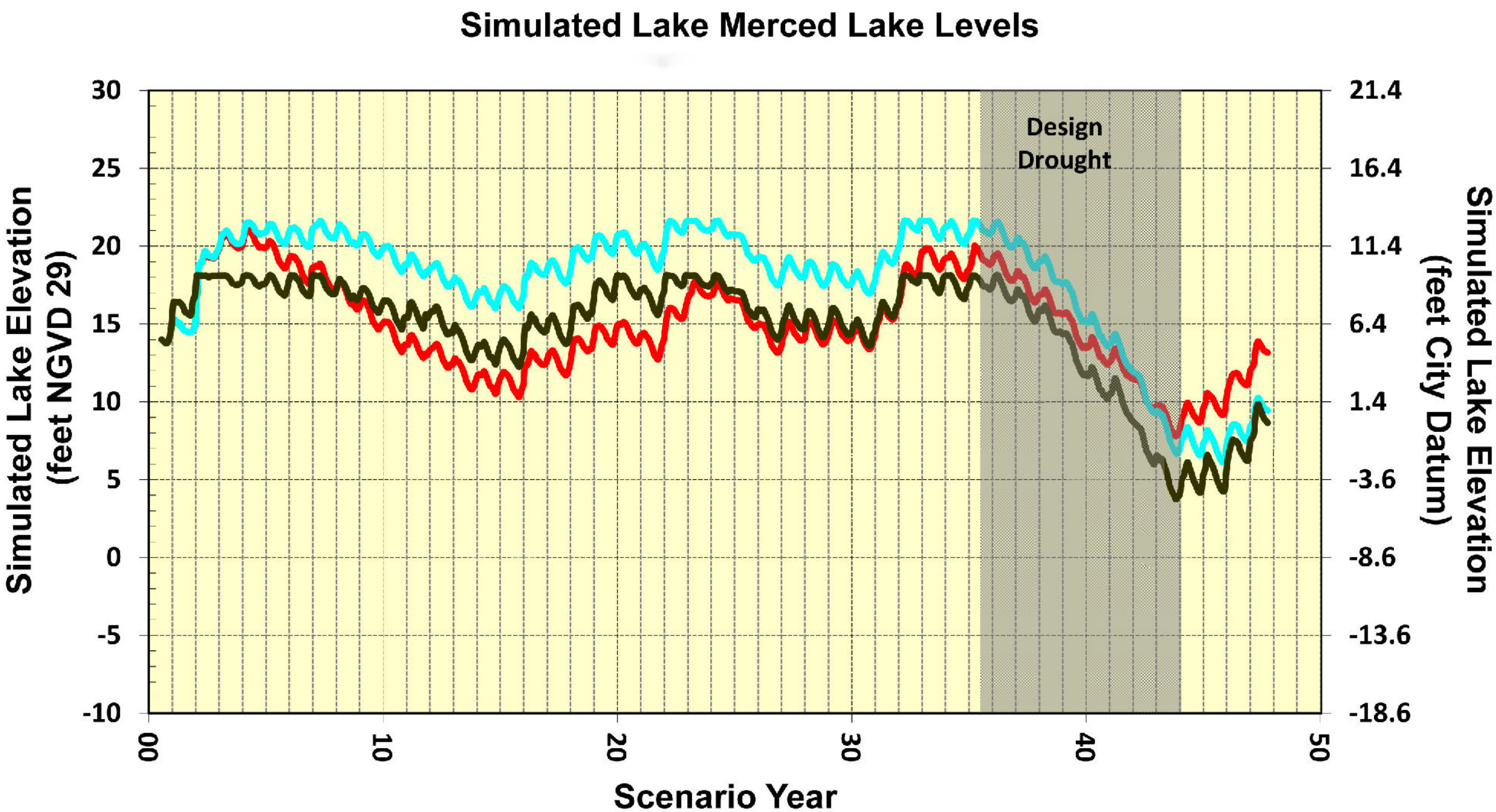
Simulated Lake Merced Lake Levels



Note: Zero elevation NGVD is equivalent to mean sea level. City Datum = NGVD - 8.62 feet.

Lake Levels:

- Modeled Existing Conditions
- GSR Project
- Cumulative Conditions

Simulated Lake Merced Level Changes

Regional Groundwater Storage and Recovery Project

Figure 5.16-11

Source: Kennedy/Jenks 2012d (TM 10.2)

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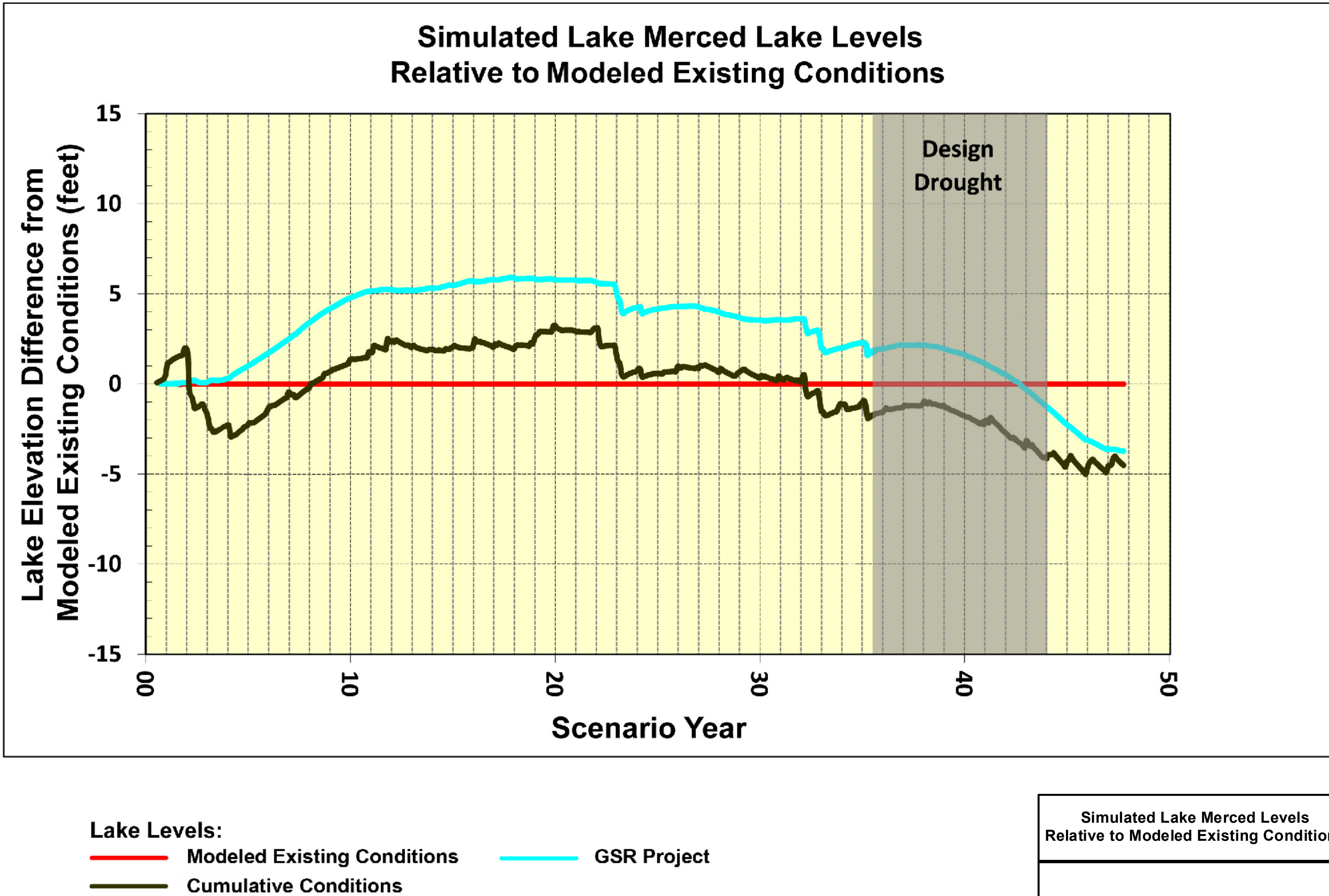

Simulated Lake Merced Levels
Relative to Modeled Existing Conditions

Regional Groundwater Storage
and Recovery Project

Figure 5.16-12

Source: Kennedy/Jenks 2012d (TM 10.2)

The lowest predicted lake level with operation of the Project, which is expected at the end of the design drought, is approximately -2 feet City Datum (compared to approximately -1.5 feet City Datum under modeled existing conditions; i.e., without the Project), which would leave approximately 4 feet of water in Impound Lake and about 9 feet of water in East Lake. (Kennedy/Jenks 2012d)

The predicted mean monthly lake level with operation of the Project is 9.1 feet City Datum (compared to approximately 6.3 feet City Datum under modeled existing conditions). Lake levels with operation of the Project are predicted to be below 5 feet for 14 percent of the simulation period, whereas lake levels are predicted to be below 5 feet for 33 percent of the simulation period under the modeled existing conditions. Lake levels with operation of the Project are predicted to be below 1 foot for 10 percent of the simulation period, whereas lake levels are predicted to be below 1 foot for four percent of the simulation period under the modeled existing conditions. Overall, lake levels are predicted to be higher under the Project conditions than under the modeled existing conditions for approximately 90 percent of the time during the 47-year simulation, but lake levels are predicted to be lower than modeled existing conditions during and after the design drought for approximately 10 percent of the 47-year simulation. (Kennedy/Jenks 2012d)

Relative to the modeled existing conditions, the estimated outflow from Lake Merced to the groundwater under the proposed Project is predicted to be generally lower due to the higher groundwater levels associated with operation of the Project for most of the 47-year simulation period, although groundwater inflows to the lake are predicted to be reduced relative to the modeled existing conditions during and after the design drought. (Kennedy/Jenks 2012d)

Impact Discussion and Significance Determination

Although Lake Merced lake levels are predicted to be higher under the Project than under modeled existing conditions for approximately 90 percent of the time, as shown in Figure 5.16-12 (Simulated Lake Merced Levels Relative to Modeled Existing Conditions), Lake Merced water levels are also predicted to be lower than modeled existing conditions during and after the design drought. Following the design drought, water levels in Lake Merced are predicted to decrease due to the Project by about 4 feet more than under modeled existing conditions for at least three years. If water levels are reduced to this extent during and after the design drought, more of the lake bed would be exposed, making it susceptible to erosion and associated sedimentation of the lake, and the four individual lakes would separate hydraulically. Groundwater inflows to the lake are also predicted to be reduced relative to the modeled existing conditions during and after the design drought.

As described in Section 5.16.1 (Setting), Lake Merced is currently affected by periods of weak stratification and there have been episodes of low dissolved oxygen noted between 1997 and 2009. When the lake stratifies during the summer, dissolved oxygen levels are typically near saturation (approximately 10 mg/L) at the surface, with hypoxic (dissolved oxygen levels of less than 5 mg/L) or anoxic (dissolved oxygen levels of less than 2 mg/L) conditions in the bottom. The lake usually “turns over,” or mixes, in the fall and stays well-mixed throughout the winter. When the lake is mixed, dissolved oxygen levels are typically consistent throughout the entire water column, but these levels tend to be below saturation (approximately 8 mg/L, with a range of 6 to 10 mg/L). The lake is listed by the RWQCB as impaired for pH and dissolved oxygen.

Reduced lake levels and groundwater flows into the lake could also increase eutrophication of the lake because nutrients discharged to the lake would be concentrated in a smaller lake volume. Also, with a smaller volume, the lake would likely mix more frequently, and as a result (based on the patterns described above) this would likely increase dissolved oxygen levels at the bottom while decreasing dissolved oxygen levels at the surface. Therefore, depending on conditions, increased pumping under the proposed Project during Take Periods could increase the episodic occurrences of low dissolved oxygen and could also affect the pH of the lake water, potentially exacerbating the conditions that are responsible for the listing of Lake Merced as an impaired water body. Reduced groundwater inflows during and after Take Periods could affect nitrogen inflow to the lake from groundwater and also result in the increased concentration of suspended solids, metals, hydrogen sulfide, and bacteria already present in the lake, and less dilution of these constituents if they are discharged to the lake from stormwater flows.

As discussed in Section 5.16.2.1 (Federal and State Regulations) under the sub-heading "Regional Water Quality Control Board, Beneficial Uses," the Basin Plan identifies existing beneficial uses of Lake Merced as body contact recreation (e.g., fishing), noncontact recreation (e.g., picnicking, sightseeing, rowing), warm freshwater habitat, cold freshwater habitat, fish spawning, and wildlife habitat. Municipal and domestic supplies are also potential beneficial uses of Lake Merced. Adverse changes in water quality parameters such as dissolved oxygen and pH, as well as increased algal levels, could adversely affect the identified beneficial uses of Lake Merced that are related to warm freshwater habitat, cold freshwater habitat, and fish spawning, which, depending on the magnitude, duration, and frequency of such changes, could be considered a significant impact on water quality.

Because the Project is predicted to result in the lowering of Lake Merced water levels to below 0 feet City Datum somewhat more frequently than is predicted to occur under modeled existing conditions (from four percent of the 47-year simulation to 10 percent of the simulation), there is the potential for the Project to result in water quality changes that would compromise water quality objectives related to warm and cold freshwater habitat (e.g., dissolved oxygen), which in turn could adversely affect associated beneficial uses. Changes in dissolved oxygen levels and pH could also exacerbate conditions responsible for listing Lake Merced as an impaired water body during and after the design drought. This would be a *significant* impact on water quality.

Although municipal and domestic supplies are listed as potential beneficial uses of Lake Merced, the City and County of San Francisco (CCSF) has not used the lake as a municipal supply since the 1930s, as discussed in Section 5.16.1.4 (Groundwater-Surface Water Interactions) under the sub-heading "Existing Uses of Lake Merced." Further, as discussed below, the SFPUC would implement corrective action to ensure that long-term changes in water quality do not occur. Short-term changes in water quality associated with lowered lake levels would not be expected to affect the potential beneficial use of Lake Merced as a municipal supply because the need to rely on Lake Merced for the CCSF's water supply would occur only during a catastrophic emergency, and the City would direct residents to boil tap water prior to its consumption if such an unlikely emergency usage were to occur. (SFPUC 2012d)

Impacts related to water quality and associated beneficial uses of Lake Merced would be reduced to a *less-than-significant* level with 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). These measures require the SFPUC to implement lake level management procedures to maintain Lake Merced water levels above 0 feet City Datum. These procedures include the continuation of lake-level and groundwater monitoring; redistribution of pumping patterns or decreasing the Project pumping rate; or additions of supplemental water (either from the regional system water, treated stormwater, or recycled water), if available. Supplemental water would be supplied from the regional water system, dechlorinated, and introduced to Lake Merced at the existing Lake Merced pumping station, in the same manner that supplemental water has been added to Lake Merced several times in the past. However, in the event that surface water supplies were not available due to maintenance, drought, or a declared emergency resulting from an earthquake or other disaster, the SFPUC could add treated stormwater or recycled water, if available (SFPUC 2012f).

Implementation of these measures would ensure that any lake level declines to below 0 feet City Datum as a result of the Project would be avoided through redistribution of pumping patterns or decreasing the Project pumping rate, or potentially through the addition of supplemental water. Although redistribution of pumping and the addition of supplemental water may or may not be feasible and effective under all circumstances, a decrease in Project pumping would be feasible and effective at mitigating lake level declines below 0 feet City Datum in any case. As a result, the Project would not cause changes in water quality that would adversely affect the potential beneficial uses of Lake Merced and, therefore, would result in a *less-than-significant* impact on the water quality of Lake Merced.

Implementation of redistribution of Project pumping under Mitigation Measure M-HY-9b (Lake Level Management for Lake Merced) would not cause significant seawater intrusion or well interference impacts, because the SFPUC would be able to avoid such impacts through alteration or stopping redistribution of pumping as needed. (SFPUC 2012a)

The Project's effect on Lake Merced water levels could also affect the soil and sediments of Lake Merced near the former Pacific Rod and Gun Club on the western shore of South Lake. Lead and other metals as well as clay target fragments (including associated organic chemicals) have been identified in the soil and sediments in this area. However, the Project would not result in adverse water quality effects related to this site either due to increasing or decreasing Lake Merced lake levels. If the Project were to result in a decrease in Lake Merced water levels, it may expose portions of the lakebed to the air. However, these portions of the Lake Merced lakebed have been exposed in the past and subsequently refilled; water quality sampling of this portion of the lake indicates that no dissolved lead was detected after the lake refilled. Fluctuations of Lake Merced predicted to occur due to Project operations, including increases in lake levels, are similar to historic fluctuations that have occurred in Lake Merced. Even with these historic fluctuations, lead has not been found in the lake water, and, therefore, Project-related lake-level increases or decreases at Lake Merced are expected to have no impact on Lake Merced water quality relative to lead (SFPUC 2012g).

Mitigation Measure M-HY-9a: Lake Level Monitoring and Modeling for Lake Merced

The SFPUC shall implement lake level monitoring and modeling in accordance with the process described below. The SFPUC will conduct monitoring to detect changes in lake level and water quality, as well as groundwater-level elevations. Implementation of this measure shall be coordinated with the SFPUC's ongoing Lake Merced lake-level, water quality, and groundwater monitoring programs to document and maintain the database of these parameters throughout Project operations.

The SFPUC shall continue to maintain the Lake-level Model so as to be able to evaluate what lake levels may have been without implementation of the Project based on the actual hydrology that occurs during Project implementation. As described below, the SFPUC shall use the model to determine the amount of lake-level change that is attributable to the Project rather than to hydrologic or other factors.

Mitigation Measure M-HY-9b: Lake Level Management for Lake Merced

Prior to beginning operation of the Project, the SFPUC shall implement this lake level management program as follows:

- If lake levels are within the range that would occur without the Project based on maintenance of the Lake-level Model, no corrective action shall be required.
- If lake levels are below the range that would have occurred without the Project, corrective action shall be implemented in time to prevent lake levels from declining as a result of Project-related pumping below 0 feet City Datum or the level that would occur without the Project, whichever is lower. One or both of the following corrective actions shall be implemented:
  - Redistribute pumping to decrease Project pumping rates in the vicinity of Lake Merced or decrease the overall Project pumping rate. However, in no case would redistribution be undertaken where groundwater levels would decline more than from the Project as originally predicted by modeling.
  - Augment lake levels through the addition of supplemental water (such as potable water that is dechloraminated at the Lake Merced Pump Station, stormwater from the Vista Grande Drainage Canal, recycled water, or stormwater diverted from other development in the Lake Merced watershed), if available.

Impact Conclusion: Less than Significant with Mitigation

Impact HY-10: Project operation would not have a substantial adverse effect on water quality that could affect the beneficial uses of Pine Lake. (Less than Significant)

As discussed in Section 5.16.1 (Setting) Pine Lake is incised in the Shallow Aquifer and, therefore, lake levels are directly affected by changes in groundwater levels in the Shallow Aquifer. While there are no designated uses for Pine Lake per the Basin Plan, the water quality of the lake could be affected by lake level decreases, similar to what could occur at Lake Merced. Therefore, if the Project causes the lake level to drop below the existing level of 40.1 feet NGVD 29, then water quality in the lake could decline.

The Westside Groundwater Basin Model does not simulate Pine Lake levels, or the shallowest groundwater levels in the Shallow Aquifer. However, lake losses to the groundwater aquifer are directly proportional to changes in groundwater levels. Therefore, changes in Pine Lake water levels can be inferred from changes in groundwater levels in monitoring well LMMW-5S, located near Pine Lake and which monitors groundwater in the deeper portion of the Shallow Aquifer. (Kennedy/Jenks 2012d)

The Westside Basin Groundwater Model for the Project scenario predicts a general increase in groundwater levels at monitoring well LMMW-5S of up to several feet above those expected under modeled existing conditions, until near the very end of the simulation period, when there is a slight reduction after the design drought. The absence of any extended periods of reduced groundwater levels indicates that the Project would have little or no effect on groundwater levels near Pine Lake. Therefore, the lake would be maintained at levels similar to those that are predicted under the modeled existing conditions. As a result, the Project would not cause any significant changes to water quality or to the health of the lake.

In addition, the San Francisco Park and Recreation Department maintains Pine Lake's level by pumping from the Stern Grove well. Further, the Westside Basin Groundwater Model incorporates a sufficient amount of pumping (up to 0.013 mgd [15 afy]) to maintain Pine Lake at the elevation of 40.1 feet NGVD 29; maintenance of the lake at this level would not result in any changes to water quality or the health of the lake. Therefore, water quality impacts related to potential adverse effects on Pine Lake water levels would be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant)

The Westside Basin Groundwater Model predicts that the average annual groundwater outflow to the three creeks together would increase from 94 afy under modeled existing conditions to 122 afy with the Project (Kennedy/Jenks 2012d). Based on these results from the model, which predict little effect on the creeks, and because of the limited hydrogeologic connection between the creeks and groundwater, it is unlikely that groundwater-surface water interaction processes are present to any measureable extent for Colma, San Bruno, or Millbrae creeks. The Lomita Channel is an improved earth channel with a small (0.65 square mile) drainage area. The existing groundwater level in the vicinity of the Lomita Channel is approximately 20 feet below ground surface and is not expected to increase as a result of the Project (Kennedy/Jenks 2012d). As a result, no effect on the exchange between surface water and shallow groundwater at the Lomita Channel is expected. Therefore, the impact of the Project on Colma, San Bruno, and Millbrae creeks, and the Lomita Channel relative to potential groundwater-surface water interactions would be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant)

Description of Water Quality Impacts

Operation of the Project could violate water quality standards or waste discharge requirements in two ways: 1) if the groundwater pumped as part of the Project, after proposed treatment and/or blending as described in Chapter 3, Project Description, would not meet drinking water standards; or 2) if Project operation would change groundwater levels or change groundwater flow patterns such that areas of existing contamination could be mobilized or spread in groundwater, or existing remediation activities could become substantially less effective.

Approach to Analysis

Groundwater Pumped by Project May Violate Drinking Water Standards

To determine whether groundwater pumped by the Project would meet drinking water standards, preliminary Drinking Water Source Assessment and Protection Program (DWSAP) reports have been prepared by the SFPUC for the wells proposed at Sites 1 through 16. Refer to Section 5.16.2 (Regulatory Framework) for a description of the DWSAP Program. Preliminary DWSAP reports have not been prepared for the proposed alternate sites at Site 17 (Alternate), 18 (Alternate), and 19 (Alternate); if wells at these alternate sites were selected for construction, DWSAP reports would be required. For the analysis, the information in the preliminary DWSAP reports for Sites 8, 10, and 12 are used to characterize the vulnerability of Sites 17 (Alternate), 18 (Alternate), and 19 (Alternate), respectively, because the close proximity of the referenced sites means that water quality parameters would likely be substantially similar.

The preliminary DWSAP reports approximate the size of the Groundwater Protection Zones for the wells representing the overlying areas where groundwater may be drawn into the well during two, five, and ten years of pumping. They also report on the degree that the wells would be protected from contamination based on the local hydrogeology and construction features (physical barrier effectiveness) and identify possible contaminating activities (PCAs) within the Groundwater Protection Zones established for the wells. Examples of PCAs are known contaminant plumes, leaking underground storage tanks, dry cleaners, and gas stations. Each PCA is assigned a risk score correlated to the potential for that PCA to contaminate groundwater, with the risk score being based on the land use type of the PCA, which Groundwater Protection Zone the PCA is located in, and the effectiveness of local hydrogeology and well construction methods to prevent potential contamination in groundwater from entering the well. The combined vulnerability score for a PCA can range from 3 to 17 points, and the CDPH considers water supply wells to be vulnerable to PCAs with a score of 8 or higher.

For this analysis, a Groundwater Protection Zone with a radius 2,000 feet was assigned for each SFPUC Project well and each Partner Agency well. This radius is greater than the 1,500 to 1,900 feet approximated by the preliminary DWSAP reports for Groundwater Protection Zones for ten years of pumping. PCAs within 2,000 feet of SFPUC Project wells and Partner Agency wells are identified as potential sources of contamination to the production wells. The likelihood of contamination migrating from the PCAs at or near the surface to the production wells is evaluated based on an assessment of vertical flow from the shallow groundwater zone to the Primary Production Aquifer that supplies the Project and Partner Agency wells.

Groundwater contamination that is not associated with specific PCAs is also identified and the likelihood of this contamination resulting in groundwater from production wells exceeding drinking water standards is evaluated based on modeled changes in groundwater contours due to the Project.

Any violation of drinking water standards at production wells resulting from Project operation would be addressed by proposed treatment and/or blending as described in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types).

Project Operations May Mobilize or Spread Contamination in Groundwater or Cause Remediation Systems to Become Less Effective

To determine whether Project operations could mobilize or spread existing contamination in groundwater or cause remediation systems to become less effective, the analysis examines the extent to which the Project could increase shallow groundwater zone levels and change shallow groundwater zone flow directions. Areas where existing groundwater levels are predicted to be below a depth of 70 feet under modeled existing conditions are evaluated differently from areas where existing groundwater levels are above a depth of 70 feet. A depth of 70 feet is selected because contamination at PCAs is assumed to be limited to the top 50 feet below ground surface; the additional 20 feet serves as a buffer between the shallow groundwater zone level and contamination at the PCA to prevent mobilization of existing contaminants. (Kennedy/Jenks 2012e, SFPUC 2013b)

PCAs do not include nitrate contamination that occurs sporadically in the Westside Groundwater Basin at various depths. A discussion of nitrate contamination is included in the evaluation of Project impacts relative to drinking water standards.

Where existing groundwater levels are below a depth of 70 feet under modeled existing conditions, and groundwater levels are predicted to rise above a depth of 70 feet due to Project operations, PCA contamination could be mobilized or spread in groundwater. These groundwater level rises could potentially mobilize contaminants beyond the downward migration that could occur with recharge under modeled existing conditions. When groundwater levels are not predicted to increase to within 70 feet or are predicted to decrease, it is presumed that shallow contamination would not be mobilized and spread by the Project.

Where existing groundwater levels are above a depth of 70 feet under modeled existing conditions, it is assumed that PCA contamination is already mobilized and could spread in the shallow groundwater zone (unless there is an active remediation system). If groundwater levels increase enough due to the Project to saturate an area of contamination that is undergoing remediation with, for example, a vapor recovery program dependent upon unsaturated soils, then the effectiveness of the remediation efforts could be adversely affected. Likewise, changes in shallow groundwater zone flow directions due to the Project could adversely affect pump-and-treat remediation systems that would have been designed for flow directions assumed under modeled existing conditions. If predicted groundwater levels do not increase enough or predicted groundwater zone flow directions do not change substantially to adversely affect remediation systems under the Project, it is presumed that shallow contamination would not be mobilized by the Project.

Physical Processes Affecting Water Quality in the South Westside Groundwater Basin

South Westside Groundwater Basin geology and the related aquifer system are described in detail in Section 5.16.1.3 (Regional Groundwater Hydrology). The primary physical processes affecting water quality in the South Westside Groundwater Basin consist of 1) groundwater recharge and groundwater gradients, and 2) contaminant fate and transport processes.

Some components of groundwater recharge can transport contaminants from the surface to the underlying regional aquifer system. The primary sources of groundwater recharge are vertical percolation of rainfall, applied irrigation water, subsurface inflow from surrounding areas and leakage from water supply and sewer pipes (HydroFocus 2011). Horizontal and vertical groundwater gradients can transport contaminants laterally between areas and downward to the underlying aquifer systems assuming there is a hydraulic connection. Groundwater gradients are a function of the difference in groundwater elevations within the same groundwater zone (horizontal gradient) or between different groundwater zones or aquifers if there is a direct hydraulic connection (vertical gradient). Larger differences in groundwater elevations result in steeper gradients which in turn can accelerate groundwater flow. On the other hand, smaller differences in groundwater elevations result in shallower gradients which in turn can slow groundwater flow. The ability for contaminants to affect water quality is largely controlled by the chemical properties of the contaminants (e.g., solubility, vapor pressure, soil retardation density, and stability).

The Primary Production Aquifer is generally disconnected hydraulically from most occurrences of shallow groundwater zones in the bulk of the South Westside Groundwater Basin by an unsaturated zone and in most places by the presence of shallow fine-grained materials. The aggregate thickness of the fine-grained materials that make up discontinuous low permeability zones reduces the possibility for vertical migration of contaminants between the shallow groundwater zone and Primary Production Aquifer. These relatively low-permeability shallow sediments in the area from Daly City to South San Francisco are markedly different than the higher-permeability shallow sands found in the North Westside Groundwater Basin. (Kennedy/Jenks 2012e)

Even though permeability is reduced, the shallow water-bearing zone and Primary Production Aquifer have limited hydraulic connectivity, and the GSR Project would therefore affect downward gradients and flow. The downward gradient with the GSR Project would be smaller on average because the time-averaged water levels in the Primary Production Aquifer would be higher (Kennedy/Jenks 2012a). Consequently, the downward movement of contaminated groundwater from the shallow water-bearing zone would generally be less than under existing conditions. The vertical permeability of the sediments between the two zones is low, which means that downward movement of groundwater and contaminants is expected to be relatively slow. This low rate of movement would provide more time to detect and remediate contamination from surface sources before it reaches the Primary Production Aquifer.

At a number of PCA sites, groundwater is encountered at depths more shallow than groundwater levels in the shallow groundwater zones. These groundwater occurrences represent localized perched groundwater that is not hydraulically connected with the shallow groundwater zone. When there is no hydraulic connection, the migration of contaminants from the localized perched groundwater or the soils above the localized perched groundwater to the shallow groundwater zone is limited by recharge rates.

<u>Known Areas of Contamination</u>

An inventory of existing PCAs, such as known contaminant plumes, leaking underground storage tanks, dry cleaners, and gas stations, was compiled and evaluated as part of preliminary DWSAP reports prepared for the proposed wells at Sites 1 through 16. In addition, records of known PCAs within a 2,000-foot radius of wells proposed at Sites 1 through 16 were compiled from the following sources (Kennedy/Jenks 2012e):

- Known contaminating activities from GeoTracker;
- Known historical land disposal sites;
- Records of DTSC sites; and
- Records of SLIC sites (Spills, Leaks, Investigations, and Cleanup).

In addition, environmental cases and spill sites located within 0.25 mile of proposed well facility sites are summarized in Table 5.17-1 (Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area) in Section 5.17, Hazards and Hazardous Materials.

A total of 153 PCAs were identified within the 2,000-foot-radius zones surrounding the proposed well sites. Of the 153 PCAs, 51 were reported to be open, and the remaining 102 were reported closed under regulatory oversight. The PCA sites that are reported to be closed under regulatory oversight are not anticipated to pose a groundwater quality risk given that cleanup at these sites has been completed and residual contamination, if any, is assumed to be low. Among the 51 PCAs reported to be open, several are reported to have affected soil only with no groundwater contamination, and the majority of the remaining sites are related to shallow groundwater contamination underlain by low permeability fine-grained materials. Contaminants at these sites occur at the surface and tend to remain near the surface due to the chemical properties of the contaminants and the geologic conditions that slow the migration of these contaminants into the deeper underlying Primary production Aquifer. Contaminants can occur in soil above shallow groundwater encountered at the site or in the groundwater encountered at the site. The shallow groundwater encountered at the site may be localized perched groundwater or part of a larger shallow groundwater zone. The encountered depth to water at each PCA site is an estimate of the maximum depth of soil contamination or the depth of contamination in perched groundwater, if applicable. The reported depths to water were shallower than 50 feet below ground surface in nearly all the active and inactive regulated sites. The one exception that has been identified is the Arco#465 site where groundwater was encountered 56 feet below ground surface; this site is discussed specifically below. (Kennedy/Jenks May 2012e)

Only two of the 51 open PCAs within the 2,000-foot radius zones surrounding the proposed GSR well sites were characterized in the SWRCB's GeoTracker database system as potentially affecting aquifer media used for drinking water supply (Kennedy/Jenks May 2012b). These two PCAs, discussed below, are located in proximity to Sites 2, 3, and 4. One additional PCA, which was not identified as potentially affecting a drinking water aquifer, is also described below due to its proximity to the proposed well at Site 16. A fourth PCA was identified as having an active remediation system and is within the 2,000-foot radius of the San Bruno #17 production well. The remaining PCAs with contaminated soil and/or shallow water-bearing zones are not summarized in detail below given the shallow nature of the contamination at the sites and the hydraulic separation provided by the aggregate thicknesses of intervening clay and sand layers. For additional information about these sites, refer to Table 5.17-1 (Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area) in Section 5.17, Hazards and Hazardous Materials.

Arco #0465 (T0608100027) – Located within 2,000 feet of Sites 2, 3 and 4

This PCA is listed as an active ARCO gasoline station with underlying soil and shallow groundwater affected with petroleum hydrocarbons. This site is located on the southern corner of the intersection of Southgate Avenue and Lake Merced Boulevard in Daly City, about 700 feet northeast of the existing Daly City Westlake production well and about 1,000 feet northwest of Sites 2, 3, and 4. Based on the 2009 monitoring report available at the GeoTracker website, on-site monitoring wells were screened from 39 to 70 feet below ground surface. Data available at the GeoTracker website indicate a shallow depth to groundwater at approximately 56 feet below ground surface, based on data measured in 2002. (Kennedy/Jenks 2012e)

A deep on-site monitoring well installed to a depth of 220 feet below ground surface (below an approximate 10-foot-thick clayey silt to silt clay zone) observes groundwater levels at much lower depths (approximately 154 feet below ground surface), which may represent the intermediate regional drinking water aquifer (i.e., Primary Production Aquifer). Groundwater sampling conducted in 2009 at the intermediate on-site monitoring well and off-site shallow monitoring well (screened from 39 to 49 feet below ground surface) detected no petroleum hydrocarbons. On-site shallow monitoring wells showed plume concentrations to be either stable or declining over time, with the contaminant plumes being contained on site. (Kennedy/Jenks 2012e)

Gas and Wash Partners (T10000003031) - Located within 2,000 feet of Sites 2, 3 and 4

This PCA is listed as a LUST cleanup site and is located approximately 1,900 feet east of Sites 2, 3, and 4, and about 470 feet north of Daly City Well No. 4. Contamination at this site was discovered in February 2011, when the current property owner conducted sampling beneath three underground storage tanks that were proposed to be converted to use for storage of recycled water. Sampling indicated a historical release of gasoline, benzene, toluene, and xylene from two of the three storage tanks and one of the fuel dispensers. Based on the particular contaminants encountered in the sampling, consultants for the site have speculated that the petroleum hydrocarbon release occurred before the introduction of oxygenated gasoline in the late 1970s to late 1980s; the fuel storage tanks were lined in early 1999. The investigation was limited to soil sampling and did not sample deeper than just below the USTs; groundwater was not encountered or sampled. The detected concentrations of petroleum hydrocarbons were above the Environmental Screening Levels (ESLs) mandated for shallow soil at a commercial property over a potential drinking water source. Consultants for the site noted that a nearby LUST site (approximately 500 feet to the east) had groundwater depths no shallower than 160 feet below the ground surface. Based on the current information available from the site investigation report, there is no supporting data indicating this site has affected the drinking water supply aquifer. (Kennedy/Jenks 2012e)

Olympic Service Station (T0608121993) - Located within 2,000 feet of Site 16

This PCA is listed as an existing service station located about 980 feet upgradient and west of Site 16. During the course of aquifer tests at the Project monitoring well at Site 16, the water level in a shallow monitoring well (Olympian MW-3, located at the Olympic Service Station) about 950 feet west of Site 16 was monitored. This was done to determine whether the pumping at Site 16 would affect any surrounding wells in the shallow groundwater zone. The pumping at Site 16 resulted in no discernible effects on the groundwater levels at the Olympic Service Station monitoring wells. (Kennedy/Jenks 2012e)

Based on the review of the Pangea Environmental Services, Inc., 2008 Groundwater Monitoring Report (Pangea Environmental Services, Inc., 2008) available on the GeoTracker website, concentrations of total petroleum hydrocarbons as gasoline (TPHg) and benzene detected in on-site monitoring wells are on long-term declining trends, while total petroleum hydrocarbons as diesel (TPHd) have been generally stable. No methyl tert-butyl ether (MTBE) was detected in the easternmost downgradient monitoring well (MW-3), which is the closest well, at a distance of 950 feet from Site 16. Soil sampling indicates that MTBE attenuated to a concentration of approximately 0.88 parts per billion (ppb). (Kennedy/Jenks 2012e)

The compounds detected at the Olympic Service Station site appear restricted to the shallow groundwater zones, based on data from the well log for Site 16. This is supported by depth to water data available at the GeoTracker website indicating shallow depth to groundwater conditions at approximately 17.5 feet below ground surface, based on data measured in 2003. The shallow groundwater zone is underlain by clay/Bay Deposits from about 100 feet to 170 feet below ground surface. (Kennedy/Jenks 2012e)

Chevron 9-5584 (T0608179897) – Located within 2,000 feet of San Bruno #17

This was a former Chevron station. Currently, a strip mall and parking lot occupy the site. It is located on the northeastern corner of the intersection of El Camino Real and San Benito Avenue, about 1,700 feet south of the existing San Bruno production well No.17. Site monitoring data indicate shallow depth to water, with water levels ranging from about 20 feet to 60 feet below ground surface. This is consistent with data available at the GeoTracker website indicating a shallow depth to water table at approximately 34 feet below ground surface, based on data measured in 2003, as reported by the GeoTracker records. The site has both soil vapor and groundwater extraction wells. The most recent monitoring event in March 2010 shows a benzene and TPH plume mostly contained on site. (Kennedy/Jenks 2012e)

As discussed under the "Groundwater Quality" sub-heading in Section 5.16.1.3 (Regional Groundwater Hydrology), isolated occurrences of elevated nitrate concentrations in groundwater above the primary drinking water MCL of 45 mg/L occur in portions of Daly City and South San Francisco. These include occurrences in the Primary Production Aquifer. Also discussed is the potential presence of VOCs in the Primary Production and Deep Aquifer monitoring wells at Site 1 in Daly City and Site 11 in South San Francisco.

Impact Discussion and Significance Determination

Groundwater Pumped by Project May Violate Drinking Water Standards

The results of the preliminary DWSAP reports for each proposed Project well identified PCAs within Groundwater Protection Zones resulting in vulnerability scores of 8 and higher (Kennedy/Jenks 2009a through 2009g, 2010a through 2010k). As noted in Section 5.16.3.3 (Approach to Analysis of Operational

Impacts), these scores indicate that groundwater near these wells may be vulnerable to contamination from nearby land use activities. The types of PCAs identified in the Groundwater Protection Zones around the proposed wells are reflective of activities found in most urban settings, such as automobile gas stations, leaking underground tank sites, chemical/petroleum processing, sewer collection systems, and transportation corridors.

The proposed wells would extract water from the Primary Production Aquifer, in general from 340 feet to 700 feet below ground surface, except at Site 16 where the proposed screen would be from 240 feet to 410 feet below ground surface (Kennedy/Jenks 2012e). The Partner Agency production wells also extract water from the Primary Production Aquifer. As described in the Approach to Analysis above, under the sub-heading "Known Areas of Contamination," the PCAs identified within the delineated 2,000-foot radius Groundwater Protection Zones surrounding the SFPUC and Partner Agency well sites have been detected in soil only or in shallow groundwater on the order of 30 to 50 feet below ground surface (Kennedy/Jenks 2012e). As concluded in the preliminary DWSAP reports, because the proposed SFPUC wells would be drawing groundwater from the Primary Production Aquifer, the groundwater to be pumped is not considered to be particularly vulnerable to soil or groundwater contaminant plumes identified in the shallow soil or the uppermost shallow groundwater zones. The same conclusion applies for Partner Agency wells.

There is known contamination in the shallow groundwater zone at PCAs where shallow groundwater zone levels are within 56 feet of the surface or shallower. In addition, there is the potential for contamination in shallow soil or localized perched groundwater to migrate down to the Primary Production Aquifer with groundwater recharge. This potential exists under modeled existing conditions and under the Project. However, the presence of an aggregate thickness of fine-grained materials (which make up discontinuous low permeability zones underlying the shallow and perched groundwater zones with unsaturated zones that overlie the Primary Production Aquifer in most areas of the basin) reduces the possibility for vertical migration of contaminants from the perched or shallow groundwater zone to the underlying Primary Production Aquifer.

The existing and potential shallow groundwater zone contamination would need to migrate down to the Primary Production Aquifer to affect the ability of SFPUC and Partner Agency wells to meet drinking water standards. The shallow groundwater zone and Primary Production Aquifer are generally disconnected hydraulically in most areas; however, in those areas where there may be some level of connection, the Project would affect downward gradients and flow. The downward gradient with the Project would be smaller on average than predicted under modeled existing conditions, because the water levels in the Primary Production Aquifer would be higher (LSCE 2010). Consequently, the downward movement of contaminated groundwater from the shallow water-bearing zone would generally be less than under existing gradients in those areas where there may be some level of hydraulic connection. The vertical permeability of the sediments between the two zones is low, which means that downward movement of groundwater and contaminants is expected to be relatively slow. This low rate of movement would provide more time to detect and remediate contamination from surface sources before it reaches the Primary Production Aquifer.

Finally, each proposed well would be protected against contamination by the construction of an annular seal composed of sand/cement grout (see Chapter 3, Project Description, Section 3.5.1.1 [Construction

Methods for Production Wells]). For the above reasons, potential impacts on groundwater from PCAs would be *less than significant* for all proposed sites.

Elevated nitrate concentrations, especially in the Daly City and South San Francisco area where elevated levels occur in the Primary Production Aquifer, could be affected by Project pumping and in-lieu recharge. Nitrates in soils in the Project area are currently percolating towards the shallow groundwater. The Project would neither increase nor decrease the amount of nitrates that reach the shallow groundwater, because the Project would not change the amount of recharge from rainfall or the percolation rate of the soils. However, the Westside Basin Groundwater Model predicts that Project pumping and in-lieu recharge could result in changes in groundwater flow directions in areas where nitrate concentrations are currently elevated, which could transport nitrate in groundwater to production wells (Kennedy/Jenks May 2012e). If the location of nitrate concentrations changes such that nitrate concentrations in Project wells or Partner Agency wells increases above drinking water standards, this would be addressed through treatment, such as blending, to ensure that all drinking water standards for nitrate are met, as described in Chapter 3, Project Description, Section 3.4.2 (Production Wells and Associated Facilities).

Potential elevated VOC concentrations (i.e., PCE and TCE) in the Primary Production Aquifer and Deep Aquifer at monitoring wells located near Site 1[27] in Daly City and Site 11 in South San Francisco could be affected by Project pumping and in-lieu recharge. The Westside Basin Groundwater Model predicts that Project pumping and in-lieu recharge could result in changes in groundwater flow contours in areas and zones where VOC concentrations may currently be elevated (Kennedy/Jenks 2012e), which could transport VOCs in groundwater to Project or Partner Agency wells. Raw groundwater produced at Sites 1 and 11 would be the most likely to exceed drinking water standards due to the sites' co-location with detected contamination and the increase in groundwater flow to the Sites during Project Take Years. VOCs at these sites could also migrate towards other production wells such as Partner Agency wells in Daly City and South San Francisco as a result of changes in groundwater flow directions during Put and Hold Years. If the location of VOC concentrations were to change due to the Project such that VOC concentrations in Project wells or Partner Agency wells increase above target levels, this would be addressed through treatment, such as blending, to ensure that all drinking water standards for VOCs are met, as described in Chapter 3, Project Description, Section 3.4.2 (Production Wells and Associated Facilities).

Therefore, no violations of water quality standards would occur due to existing PCA contamination, nitrate concentrations, or elevated VOC concentrations, and the impact would be *less than significant*.

With respect to water quality concerns near the cemeteries, refer to Impact HY-14, relative to water quality degradation for constituents for which water quality standards do not exist.

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[27] In October 2012, the monitoring well at Site 1 was resampled, and no VOCs were detected, indicating that the earlier detections may not be representative of the groundwater quality at Site 1 (SFPUC 2013c).

Project Operations May Mobilize or Spread Contamination in Groundwater or Cause Remediation Systems to Become Less Effective

This EIR evaluates the possibility of mobilizing or spreading existing areas of contamination due to increasing groundwater levels from in-lieu recharge of the Project. The in-lieu recharge that would occur during Put Years; i.e., reduced pumping on the part of the Partner Agencies in the Primary Production Aquifer at depths greater than 300 feet below ground surface is expected to indirectly lead to higher groundwater levels in the shallow, regionally continuous, groundwater zone (referred to as Model Layer 1 in the Westside Basin Groundwater Model). The Westside Basin Groundwater Model predicts that the maximum increase in groundwater levels is expected to occur at about Scenario Year 7 after several years of above-normal rainfall and at a time when the SFPUC Storage Account would be full. The Model identifies the Daly City and Colma areas as having shallow groundwater zone (Model Layer 1) levels well below 70 feet under modeled existing conditions. Although the Westside Basin Groundwater Model predicts that Primary Production Aquifer groundwater levels will rise up to 40 to 80 feet in the Daly City area and 5 to 40 feet in the Colma area due to the Project in Scenario Year 7, Primary Production Aquifer groundwater levels are predicted to remain below 70 feet, below where existing PCA contamination is located. Therefore, shallow PCA contamination in this area would not be mobilized or spread by the Project. (Kennedy/Jenks 2012e)

Table 5.16-16 (Predicted Groundwater Levels relative to Depth of Known Contamination) below lists existing municipal and proposed Project wells, together with the Primary Production Aquifer groundwater zone levels under modeled existing conditions (i.e., without operation of the Project) and with the Project, and the depth to water at PCAs within 2,000 feet of the wells. The depth-to-water values listed in the table have been rounded to the nearest 5 feet, to reflect accuracy of the topographic data on which they are based. The existing municipal and proposed Project wells in the Daly City and Colma areas have depths to water of at least 150 feet. The maximum increase in groundwater levels in the Primary Production Aquifer at the wells and PCAs in this area is estimated to be 70 feet or less. The deepest depth to waters at PCAs within 2,000 feet of these wells range from 21-56 feet indicating the presence of localized perched groundwater at these PCAs. The depth to water at the PCAs defines the maximum extent of soil contamination at the PCAs and the depth of any perched groundwater contamination at the sites. However, higher groundwater levels predicted to occur in the Primary Production Aquifer due to the Project would not rise to encountered depth to water at the PCAs and would not mobilize contamination at the PCAs.

This EIR also evaluates the possibility of the Project mobilizing or spreading existing areas of contamination by adversely affecting remediation systems due to changes in shallow groundwater zone levels. This could occur where shallow groundwater zone levels are shallower than 70 feet where remediation systems are assumed to operate. The Model identifies the South San Francisco, San Bruno, and Burlingame areas where this occurs. The Model predicts that shallow groundwater level zones would rise up to 10 feet in these areas with the Project (Kennedy/Jenks 2012e). These groundwater level increases would not substantially change the environment under which remediation is being undertaken and therefore would not be expected to affect the success of the remediation processes. Also, remediation systems typically are designed with some flexibility to accommodate natural fluctuations in groundwater levels. These areas also show no appreciable changes in shallow groundwater zone flow directions caused by the Project at either Scenario Year 7 when groundwater levels are predicted to be most shallow or at the end of the design drought when groundwater levels are predicted to be most deep

(Kennedy/Jenks May 2012e). Therefore, changing groundwater flow directions caused by the Project would not affect remediation processes.

Table 5.16-16 (Predicted Groundwater Levels relative to Depth of Known Contamination) below lists existing municipal and proposed Project wells and information about PCAs within 2,000 feet of the wells in the South San Francisco and San Bruno areas. Table 5.16-16 shows that modeled shallow groundwater zone levels have depths to water of less than 70 feet at a number of wells. The increases in shallow groundwater zone levels at these wells are approximately 5 feet in the South San Francisco area, and approximately 1 to 4 feet in the San Bruno area. Groundwater at PCAs within 2,000 feet of the wells is encountered at depths of 10 to 47 feet. These levels are close enough to modeled levels that groundwater encountered below the PCAs is considered part of the shallow groundwater zone. Therefore, contaminants in the shallow groundwater PCAs are already mobilized in the shallow groundwater zone. The concern is whether changing groundwater levels caused by the Project would adversely affect remediation systems in these areas, such as Chevron 9-8854 near the existing San Bruno well #17. Groundwater levels at this well are predicted to only increase 1 foot due to Project operations, which would not adversely affect remediation at this site.

Based on the above analyses, the potential impact from mobilization or spreading of contaminants in groundwater as a result of increased pumping would be *less than significant*.

TABLE 5.16-16
Predicted Groundwater Levels relative to Depth of Known Contamination

	Predicted Groundwater Levels at Full SFPUC Storage Account				
Nearby Well	**Modeled Existing Conditions Depth to Water (feet)[a]**	**Maximum Increase in Groundwater Level due to Project (feet)**	**Depth to Water with Project (feet) [a]**	**Are known PCAs present within 2,000-foot radius?**	**Deepest depth to water at known PCA within this radius (feet)**
Daly City Wells					
A Street Replacement	420	0	420	No	NA
4 Replacement	250	60	190	Yes	32.7
Vale	285	65	220	Yes	29.3
Jefferson	310	70	240	Yes	22
Junipero Serra	310	70	240	Yes	22
Westlake	190	40	150	Yes	56
Cal Water, South San Francisco District Wells	55-70	5	50-65	Yes	30.6
San Bruno Wells					
15	130	4	125	No	NA
16	65	3	60	Yes	16.2
17	10	1	10	Yes	47.2
18	100	3	95	No	NA

TABLE 5.16-16
Predicted Groundwater Levels relative to Depth of Known Contamination

Nearby Well	Predicted Groundwater Levels at Full SFPUC Storage Account				Deepest depth to water at known PCA within this radius (feet)
	Modeled Existing Conditions Depth to Water (feet)[a]	Maximum Increase in Groundwater Level due to Project (feet)	Depth to Water with Project (feet) [a]	Are known PCAs present within 2,000-foot radius?	
20	10	1	10	Yes	10.4
Proposed GSR Wells					
Site 1	220	47	175	Yes	12.8
Sites 2, 3, 4	200-220	50	150-170	Yes	56
Site 5	270	45	225	Yes	32.7
Site 6	260	37	225	Yes	21.8
Site 7	250	27	225	Yes	21.8
Site 8	200	15	185	No	NA
Site 9	150	5	145	No	NA
Site 10	190	5	185	No	NA
Site 11	95	5	90	Yes	30.6
Site 12	80	5	75	Yes	30.6
Site 13	45	5	40	Yes	45.6
Site 14	120	4	115	No	NA
Site 15	130	4	125	No	NA
Site 16	10	1	10	Yes	17.6

Source: Kennedy/Jenks 2012e

Note:

(a) Depth to water for both modeled existing conditions and the Project is rounded to the nearest five feet because the Westside Basin Groundwater Model is not as accurate for specific groundwater levels at specific sites as when it is used to calculate Project effects (see further explanation in Section 5.1, Overview, Section 5.1.6 [Groundwater Modeling Overview]). Therefore, the values in the columns, "Modeled Existing Conditions Depth to Water" and "Maximum Increase in Groundwater Level due to the Project" may not add up exactly to the "Depth to Water with Project."

Impact Conclusion: Less than Significant

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. (Less than Significant)

Description of Water Quality Degradation

Operation of the Project could substantially degrade water quality if the groundwater pumped by the Project, Partner Agencies, and irrigation pumpers, after proposed treatment and/or blending as described in Chapter 3, Project Description, were degraded by constituents for which water quality standards do not exist.

Approach to Analysis

To determine whether groundwater pumped by the Project, Partner Agencies, and irrigation pumpers would be affected by non-regulated constituents, existing groundwater quality data were reviewed and detected non-regulated constituents were evaluated based on known health effects.

Groundwater quality in the Westside Groundwater Basin is monitored by the SFPUC and Partner Agencies through a network of production and monitoring wells as part of the semi-annual monitoring program that was initiated throughout the Basin in 2000. This network of wells includes existing water quality monitoring wells that have been installed at Sites 1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 15, and 16 (see Chapter 3, Project Description, Section 3.4.3 [Facility Sites]), which were installed and sampled in 2008 and 2009.

The first series of monitoring wells were installed and sampled at Sites 2, 5, 7, 8, 10, 12, and 13 between December 2008 and January 2009. During the initial sampling of these wells, the volatile organic compound (VOC) acetone was detected in the groundwater sampled from each monitoring well at concentrations ranging from 6.5 to 34 micrograms per liter (μg/L). No Primary or Secondary MCL has been established for acetone and it is not included in the CDPH list of contaminants found in Title 22 of the California Code of Regulations. To assess the validity of acetone presence in the native groundwater, the monitoring well at Site 7 was re-sampled in October 2009 at two separate aquifer depths. In addition, groundwater from the monitoring wells at Sites 7, 8, and 10 were analyzed for acetone as part of SFPUC's 2010 Annual Groundwater Monitoring Program for the Westside Groundwater Basin (SFPUC 2011b). Acetone was not detected in any of the subsequent groundwater samples. The second series of monitoring wells were installed and sampled at Sites 9, 15, and 16 between June and September of 2009, and acetone was not detected in any of the wells. To further assess the validity of acetone presence in the native groundwater, the monitoring wells at Sites 2, 5, 7, 8, 10, and 12 were re-sampled in November 2012 at multiple aquifer depths. Acetone was not detected in any of the groundwater samples (SFPUC 2013c).

One other non-regulated VOC detected in groundwater monitoring wells is chloromethane. It is estimated that up to 99 percent of chloromethane that is released to the environment comes from natural sources, including chemical reactions that occur in the oceans or from chemical reactions that occur when materials like grass, wood, charcoal, and coal are burned (Kennedy/Jenks May 2012b, ATSDR 1998). In the past, chloromethane was widely used as a refrigerant, and also as a foam-blowing agent and as a pesticide or fumigant (ATSDR 1998). Chloromethane was detected in one groundwater sample collected from the monitoring well at Site 2 in January 2009. The sample was collected at a depth of 620 feet below ground surface and had a concentration of 0.77 μg/L, which is slightly above the laboratory detection limit of 0.5 μg/L. Chloromethane was not detected in other monitoring wells sampled. To assess the validity of chloromethane presence in the native groundwater, the monitoring well at Site 2 was re-sampled at a depth of 620 feet below ground surface in November 2012. Chloromethane was not detected in the groundwater sample (SFPUC 2013c).

Groundwater monitoring has also been performed to evaluate groundwater quality conditions in the vicinity of cemeteries. The initial samples were taken in September, October, and November 2009 at three different monitoring locations near cemeteries. Locations sampled included a multi-level monitoring well at Site 15 (screened at five depths from 190 to 580 feet below ground surface and each screen depth was sampled) located in the Golden Gate National Cemetery, a multi-level monitoring well at Site 7 (two depths sampled at 230 and 490 feet below ground surface) located near Cypress Lawn Cemetery, and the Site 13 multi-level monitoring wells (screened at four depths from 120 to 530 feet below ground surface and each screen depth was sampled). Samples were analyzed for aldehydes, including acetaldehyde. Acetaldehyde occurs naturally in certain foods, such as ripe fruits and coffee, and green plants produce acetaldehyde as they break down food (U.S. EPA 1994b). Acetaldehyde is also produced industrially for companies that make acetic acid and related chemicals, and is released into air or wastewater from facilities producing or using the chemical, as well as from the combustion and photo-oxidation of hydrocarbons (U.S. EPA 1994b).

Acetaldehyde was detected in two of the groundwater samples at concentrations of 1.0 and 2.0 μg/L, which were slightly above the laboratory detection limit of 1.0 μg/L. There is no established drinking water standard or health advisory for acetaldehyde. The Clean Air Act Amendments of 1990 list acetaldehyde as a hazardous air pollutant. The U.S. EPA has enacted restrictions for certain waste streams containing the chemical, and occupational exposure to acetaldehyde is regulated by the Occupational Safety and Health Administration, with a permissible exposure limit of 200 parts per million of air (U.S. EPA 1994a).

Specific groundwater sampling was undertaken in 2010 by the SFPUC to determine existing formaldehyde concentrations near cemeteries. No MCL has been established for formaldehyde, but a Notification Level of 100 μg/L has been set by the CDPH. Refer to Section 5.16.2.1 (Federal and State Regulations) for an explanation of Notification Levels. Formaldehyde was not detected in samples taken from monitoring wells located at Sites 7, 8, 10, 13, and 15 (all samples were non-detect for formaldehyde, i.e., less than 5 μg/L). The monitoring wells at Sites 7 and 15 are located at or adjacent to cemeteries; the monitoring wells at Sites 8 and 10 are located near cemeteries; and the monitoring well at Site 13 is located about 2,000 feet from the closest cemetery. The results indicate that there is no apparent existing groundwater contamination from cemeteries in the South Westside Groundwater Basin (Kennedy/Jenks 2012e). To assess the validity of acetaldehyde presence in the native groundwater, the monitoring wells at Sites 7 and 15 were re-sampled in November 2012. Acetaldehyde was not detected in either of the groundwater samples (SFPUC 2013c).

Impact Discussion and Significance Determination

As described in the Approach to Analysis above, several non-regulated constituents were initially detected in groundwater samples from monitoring wells at the proposed well sites, including acetone, acetaldehyde, and chloromethane. However, based on subsequent resampling, these detections were not confirmed (SFPUC 2013c).

Research on the possible long-term health ingestion of acetone suggests that the reference dose (the amount at which a daily exposure would likely not have deleterious non-cancer effects over a lifetime) is 0.9 milligrams per kilogram (mg/kg) per day for humans (Kennedy/Jenks May 2012e). This reference dose corresponds to a concentration in water of 31.5 mg/L (or 31,500 μg/L), which is approximately 1,000 times higher than the highest detected acetone concentration (34 μg/L) (Kennedy/Jenks May 2012e). In addition, as described above, the previously detected acetone concentrations have not been repeatable in subsequent groundwater sampling, and they are not considered to be representative of water quality conditions in the Westside Groundwater Basin (Kennedy/Jenks May 2012e). As a result, the potential impact on drinking water quality degradation from acetone in groundwater would be *less than significant*.

For chloromethane, the U.S. EPA has established one-day and 10-day drinking water health advisories for children (U.S. EPA 2012a). Health advisories from the U.S. EPA's Office of Water serve as informal technical guidance to assist federal, State, and local officials responsible for protecting public health, as needed. A 10-day health advisory for children is the concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for up to 10 days of exposure. The one-day health advisory of 9,000 μg/L is approximately 9,000 times higher than the detected concentration of chloromethane (0.77 μg/L), and the 10-day health advisory of 400 μg/L is approximately 400 times higher than the detected concentration of chloromethane. In addition, as described above, the previously detected chloromethane concentration has not been repeatable in subsequent groundwater sampling (SFPUC 2013c). As a result, the potential impact on drinking water quality degradation from chloromethane in groundwater would be *less than significant*.

For acetaldehyde, no established drinking water standards or health advisories have been established. Acetaldehyde was detected in two of the groundwater samples at concentrations of 1.0 and 2.0 μg/L, which are slightly above the reporting limit of 1.0 μg/L. These concentrations are low and at levels normally found in the environment (Kennedy/Jenks 2012e). According to the U.S. EPA, acetaldehyde by itself is not likely to cause environmental harm at levels normally found in the environment (U.S. EPA 1994b). In addition, as described above, the previously detected acetaldehyde concentrations have not been repeatable in subsequent groundwater sampling (SFPUC 2013c). As a result, the potential impact on drinking water quality degradation from acetaldehyde in groundwater would be *less than significant*.

Impact Conclusion: Less than Significant

Impact HY-14: Project operation may have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin over the very long term. (Less than Significant with Mitigation)

Description of Groundwater Depletion

Impacts related to groundwater depletion would be significant if Project operations were to reduce groundwater supplies or interfere with groundwater recharge in a manner that would result in a substantial regional deficit in aquifer storage, and that deficit in aquifer storage would lead to insufficient water supply to support existing or planned land uses.

Approach to Analysis

To assess potential changes in the volume of groundwater stored in the Westside Groundwater Basin, the existing storage volume was estimated and then compared to the storage volume predicted at the end of the 47-year simulation period with Project operations. This analytical approach provides a conservative estimate of the magnitude of impacts from Project operation on overall long-term groundwater storage using the modeled data for the 47-year simulation period. A volumetric calculation was made to estimate the total volume of groundwater in the Westside Groundwater Basin in 2009, based on the volume of the aquifer from the Westside Basin Groundwater Model and an estimate of the available pore space, or porosity, within the aquifer to store water. The volume of the aquifer in the Westside Basin Groundwater Model was based on measured groundwater levels throughout the Basin (Kennedy/Jenks 2012b). The total storage volume calculated by the Westside Groundwater Basin Model is not intended to be the groundwater volume available for recovery, the sustainable yield of the Basin, or other functional definition of storage. Instead, a volumetric estimate of this type is intended to provide context for evaluating the scale of aquifer storage changes that could be caused by the Project. This analysis compares the total groundwater storage changes from the Project to the total groundwater in the Basin. The purpose of this comparison is to provide a sense of the scale of the potential aquifer storage changes relative to the size of the groundwater basin. It should be noted that the Westside Basin Groundwater Model, from which the groundwater storage volumes are derived, has a root mean square error[28] of four percent with respect to basin-wide groundwater levels (Kennedy/Jenks 2012b). Assuming that this root mean square error value also applies directly to modeled groundwater storage then it is possible that any predicted changes in groundwater storage of less than four percent may be attributable to the accuracy of the Model and may not necessarily indicate a change attributable to the modeling scenario being analyzed.

Groundwater depletion may have negative effects on the specific uses of groundwater to support existing or planned land uses; therefore, this EIR evaluates impacts separately on groundwater resources relative to well interference, subsidence, seawater intrusion, groundwater-surface water interactions, and water quality. Refer to Impacts HY-7 through HY-14 for specific evaluations of these other potential impacts.

Previous Analysis

Daly City conducted a model simulation (Version 3.1) consisting of a 51-year continuation of existing or anticipated land and water use conditions and Partner Agency pumping rates consistent with those used in the GSR Project-specific and cumulative model scenarios. The Hydrofocus study concluded that planned groundwater pumping, including the GSR Project, would not result in substantial long-term storage decline in the basin. (HydroFocus 2011)

[28] Root mean square error is a statistical measure that evaluates the average difference (or residual) between modeled and observed parameters and provides a measure of the overall error in the model (Kennedy/Jenks 2012a).

Modeled Existing Conditions

Based on the Westside Basin Groundwater Model, the groundwater storage volume in the Westside Groundwater Basin was calculated based on June 2009 groundwater levels. To facilitate this calculation, the Westside Groundwater Basin was defined as three onshore subareas[29]. The volume of the offshore subareas of the Westside Groundwater Basin underlying the Pacific Ocean and San Francisco Bay were not included in the analysis conducted for this EIR. The results of the volumetric calculations for the three onshore subareas are summarized below (Kennedy/Jenks 2012b):

- The Serra Block subarea was defined as the portion of the Basin east of the Pacific coast and west of the Serra Fault (where it is located onshore). The total estimated groundwater volume in this subarea is 340,000 af.

- The North Westside Basin subarea was defined as the portion of the Basin north of the San Mateo-San Francisco County line and east of either Ocean Beach or the Serra Fault (where it is located onshore). The total estimated groundwater volume in this subarea is 223,000 af.

The South Westside Basin subarea was defined as the portion of the Basin east of the Serra Fault, south of the San Mateo-San Francisco County line and west of SFO. The total estimated groundwater volume in this subarea is 513,000 af. The total estimated groundwater volume in 2009 in the onshore Westside Groundwater Basin using this method is 1,076,000 af (Kennedy/Jenks 2012b).

Over the 47 years of the hydrologic modeling sequence, the predicted 28,000 af decline (which includes the hypothetical design drought) under the modeled existing conditions is 2.6 percent of the estimated total groundwater storage of 1,076,000 af in 2009. It should be noted that the estimated total groundwater storage of 1,076,000 af is not equivalent to the sustainable yield of the basin. Some of the water in the basin has not proven to be a resource, and the accessibility to the total storage amount is not known at this time.

The Westside Basin Groundwater Model predicts that under the modeled existing conditions (i.e., without the Project), groundwater storage in the groundwater basin is declining by approximately 597 afy, or approximately 28,000 af over the 47 years of the hydrologic modeling sequence. The predicted 28,000-af decline in groundwater storage is primarily a result of the assumptions used in the modeling, which conservatively included a design drought consistent with the hydrologic modeling assumptions included in the WSIP PEIR. The design drought used in the Westside Basin Groundwater Model was created for planning purposes and represents drought conditions that are worse than anything indicated in recent historic records, as discussed in Section 5.1, Overview, section 5.1.6 (Groundwater Modeling Overview). Over the 47 years of historic hydrologic records used to develop the model, no drought occurred that was as severe as the design drought. Incorporation of a design drought into the Westside Basin Groundwater Model results in approximately 20 inches of rainfall less in the simulation than

[29] The analysis of groundwater depletion is not intended to address sub-basin or site-specific changes in groundwater storage. Impacts that may potentially result from sub-basin or site-specific changes in groundwater storage are addressed under the other groundwater impact categories, such as well interference and seawater intrusion.

otherwise indicated by historic records, which is nearly equivalent to losing a full year of precipitation and its associated recharge for the entire Basin. The projected 597 af of annual average decline (which would result in 28,000 af of decline in storage over the 47-year hydrologic modeling period) in groundwater storage can largely be attributed to the conservative inclusion of the design drought into the Westside Basin Groundwater Model (Kennedy/Jenks 2012b, HydroFocus 2011). Nonetheless, with the conservative use of a design drought, as included in the Westside Basin Groundwater Model, the Westside Groundwater Basin is predicted under the modeled existing conditions to lose a small amount of storage over the long-term, as further discussed below.

Impact Discussion and Significance Determination

The total decrease in groundwater storage volumes due to Project operation is predicted to result in a decline of approximately 416 afy more than under the modeled existing conditions (that is, without the Project). Over the 47-year simulation period, the total decline in groundwater storage is predicted to be approximately 20,000 af. This decline can be attributed to the fact that the storage efficiency of the Basin is less than 100 percent, that is, the stored groundwater naturally moves to other locations within the basin and/or out of the basin (e.g., water might move from an area of high groundwater levels to an area of low groundwater levels). Such movement of groundwater out of the Basin is known as "leakage." As described by Kennedy/Jenks (2012b), leakage would be highest when groundwater levels are highest (such as would be the case during prolonged Hold Periods) and lowest when groundwater levels are lowest (such as would be the case during the design drought). The effect of these losses would be that not all of the water added into the SFPUC Storage Account during normal and wet periods would be available for pumping during dry periods. As described in Chapter 3, Project Description, Section 3.8.1 (Operating Agreement), this possibility would be accounted for under the proposed Operating Agreement, whereby the Operating Committee would monitor and track the SFPUC Storage Account, including any leakage from the Basin attributable to the Project pumping.

The predicted 20,000 af decline in groundwater storage due to Project operations, as compared to modeled existing conditions over the 47-year simulation, represents about 1.8 percent of the estimated total groundwater volume in the onshore portion of the Westside Groundwater Basin. Even though this decline is small, the Project is predicted to 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 may not fully support existing or planned land uses, given the heavy reliance of local jurisdictions, golf clubs, and cemeteries within the study area on groundwater for their water supply.

Mitigation Measure M-HY-14 (Prevent Groundwater Depletion) requires thorough accounting methods for Basin losses based on actual experience operating the Project, and allows the SFPUC to convert Hold Years to additional Put Years when surplus surface water is available. Such accounting methods would ensure that any Basin losses caused by the Project would be adequately reflected in the SFPUC Storage Account. The provision in the mitigation measure for additional Put Years would at least partially offset the estimated losses from the Basin as a result of the Project by reducing Partner Agency pumping from their existing wells during those years. If, however, the additional in-lieu recharge is not sufficient to offset basin storage losses identified by the Operating Committee, Mitigation Measure M-HY-14 requires that the Project pumping be restricted to extract only the volume of water in the SFPUC Storage Account, which would be adjusted to account for Basin storage losses. Therefore, Mitigation Measure M-HY-14 would reduce impacts of the Project on long-term depletion of groundwater storage to *less-than-significant* levels.

Mitigation Measure M-HY-14 (Prevent Groundwater Depletion) would not cause impacts to groundwater beyond those already identified in this EIR, because additional Put Years would only replace small volumes of overall basin groundwater storage which may be lost and would neither increase nor decrease groundwater levels more than would occur under the Project as defined in Chapter 3, Project Description (SFPUC 2013a).

Mitigation Measure M-HY-14: Prevent Groundwater Depletion

The SFPUC, working in conjunction with the GSR Operating Committee, shall develop and adopt an SFPUC Storage Account monitoring program that will determine the amount of water available for extraction from the SFPUC Storage Account and develop accounting rules that will account for losses from the Basin due to leakage, consistent with the terms of the Operating Agreement between the SFPUC and the Partner Agencies. The SFPUC shall develop the SFPUC Storage Account monitoring program to determine the balance in the SFPUC Storage Account based on actual experience operating in the Westside Groundwater Basin as proposed under the GSR Project. The SFPUC Storage Account monitoring program will use data from metered SFPUC in-lieu water deliveries to the Partner Agencies and regularly measured changes in groundwater elevations during a series of Put and Hold Years to determine the volume of stored water while developing rules to account for losses in groundwater storage, based on generally accepted principles of groundwater management.

To replace water losses in the SFPUC Storage Account due to Basin losses, the SFPUC may deliver additional surface water to the Partner Agencies when surplus surface water is available, creating additional in-lieu recharge to the Westside Basin. This conversion of wet Hold Years to additional Put Years would offset the estimated losses from the Basin as a result of the Project by reducing Partner Agency pumping from their existing wells during those years. Such additional surface water deliveries to the Partner Agencies shall not increase storage in the SFPUC Storage Account above 60,500 af.

The 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. If the additional in-lieu recharge is not sufficient to offset losses identified by the Operating Committee as caused by storage losses from the basin, the GSR wells will only be operated to extract the volume of water in the SFPUC Storage Account.

Impact Conclusion: Less than Significant with Mitigation

5.16.3.8 Cumulative Impacts and Mitigation Measures

Impact C-HY-1: Project construction could result in a cumulatively considerable contribution to cumulative impacts on surface water hydrology and water quality. (Less than Significant with Mitigation)

The geographic scope for the analysis of potential cumulative surface water hydrology and water quality impacts in the study area, due to construction activities, consists of individual facility sites and the surrounding watershed lands. The analysis of potential cumulative impacts on surface water hydrology and water quality considers those cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) and shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis). This analysis focuses on the other past, present, and reasonably foreseeable future projects that could adversely affect water quality during construction of the Project, but especially on activities that involve ground disturbing activities, the placement of fill or structures within the 100-year flood hazard zone, and an increase in impervious surfaces that could be occurring concurrently with construction of the Project.

Degradation of Water Quality

Construction activities associated with the GSR Project could result in the degradation of water quality from increased soil erosion and associated sedimentation of water bodies, as well as an accidental release of hazardous materials, as analyzed above in Impact HY-1. The discharged groundwater from GSR well development, well pumping tests, initial disinfection, and excavation dewatering could also result in increased sources of silt-laden runoff resulting in on- or off site erosion or siltation and/or the violation of water quality standards and degradation of water quality (Impact HY-2). It is assumed that several of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), particularly those projects located in close proximity to the proposed well sites, could adversely affect some of the same water bodies during construction. In particular, the proposed SFPUC Peninsula Pipelines Seismic Upgrade (PPSU) Project (cumulative project D-1 through D-3) includes seismic upgrades to SFPUC existing pipelines that deliver water from the Harry Tracy Water Treatment Plant to the regional water system. Pipeline work for the PPSU Project would occur within the construction boundaries of GSR Sites 8 and 17 (Alternate). Construction of the PPSU Project and the GSR Project would overlap geographically and may use some of the same staging areas during construction. Therefore, cumulative impacts from the proposed SFPUC PPSU Project related to surface water quality and sedimentation, such as potential erosion from vegetation removal, grading, and excavation, could be significant, and the GSR Project's contribution to this cumulative impact could be cumulatively considerable given that its construction has the potential to result in *significant* construction-related water quality impacts.

However, as discussed in Impact HY-1, the GSR Project's potential construction-related water quality impacts related to soil erosion and sedimentation and accidental releases of hazardous materials would be reduced to *less-than-significant* levels 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); this measure requires the preparation and implementation of a SWPPP for sites that would exceed one acre of land disturbance (i.e., Sites 3, 4, 5, 6, 7, 12, 13, and 14) and an erosion and sedimentation control plan for all other sites to protect water quality during construction. The plans would address erosion and sedimentation control measures, waste management, and hazardous materials pollution control, and the necessary inspection and reporting requirements to document compliance. In addition, Project-related water quality impacts related to discharges of dewatering effluent from well development and testing would be *less than significant* with implementation Mitigation Measure M-HY-2 (Management of Well Development and Pump Testing Discharges). This measure requires the preparation of a Project-specific dewatering plan specifying how the water would be collected, contained, treated, monitored, and discharged to the local storm drainage system or sanitary sewer system. Therefore, potential impacts related to discharges of treated water from newly installed wells and pipelines during construction into the storm drain or sanitary sewer system would also be *less than significant as mitigated*.

This analysis assumes that most of the cumulative projects in Table 5.1-3 (Projects Considered for Cumulative Impacts) would be subject to the NPDES construction general construction permit and would be required to implement BMPs to protect water quality during construction, including measures to avoid water quality impacts from dewatering discharges from excavation and from well testing discharges, such as the Daly City "A" Street Well Replacement Project (cumulative project C). Other SFPUC projects that would involve discharges of treated water from the regional water system, such as the San Francisco Groundwater Supply (SFGW) Project (cumulative project A-1 through A-6) and the PPSU Project (cumulative project D-1 through D-3), would be subject to the Waste Discharge Requirements for the SFPUC Drinking Water Transmission System. Because the NPDES construction general permit and the Waste Discharge Requirements for the SFPUC Drinking Water Transmission System were developed in consideration of regional water quality issues, compliance with regulatory requirements would serve to limit the potential for significant cumulative water impacts to result from the construction of these projects. 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 Discharges) and compliance with the Waste Discharge Requirements for the SFPUC Drinking Water Transmission System, the GSR Project's potential contribution to any such cumulative water quality impacts would therefore not be cumulatively considerable (*less than significant with mitigation*).

Increased Flood Hazard

None of the present or probable future projects considered in the cumulative impact analysis and listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would be located in a mapped flood hazard zone according to the FEMA Flood Insurance Rate Mapping (San Francisco 2008; San Mateo County 2012). As such, there would be no cumulative impacts from increased flood hazard. Although a portion of Site 9 would be located in the FEMA mapped 100-year flood hazard zone, the only impacts would be Project specific and would not combine with any potential impacts from the cumulative projects. As discussed in Impact HY-4, Site 9 would not exacerbate flooding as the building would be elevated above the 100-year flood zone and the at-grade parking area would have a negligible effect on impeding or redirecting flood flows (*no impact*).

New Impervious Surfaces

As discussed under Impact HY-4, the GSR Project would result in the creation of new impervious surfaces, which could increase erosion and siltation, or increase the rate or amount of stormwater runoff, or cause flooding on- or off-site. Other cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), including well facilities associated with the SFGW Project (cumulative project A-1 through A-6), residential and commercial facilities associated with the Mission & McLellan Project (cumulative project F) and the Centennial Village Project (cumulative project I), would also create new impervious surfaces and could result in the similar localized effects, resulting in a potentially *significant* cumulative impact on hydrology. However, due to the relatively minor increase in impervious surface areas (e.g., 205 feet to 3,675 square feet) associated with construction of individual GSR facilities, the GSR Project's contribution to this potential impact on hydrology would not be cumulatively considerable (*less than significant*).

Impact C-HY-2: Operation of the proposed Project would result in a cumulatively considerable contribution to cumulative impacts related to well interference. (Significant and Unavoidable with Mitigation)

The geographic scope for the analysis of potential cumulative impacts on well interference in the study area is the area within three miles of each of the GSR wells, because if an existing irrigation well were located within 1.5 miles of a GSR Project well on one side, and a cumulative project well within 1.5 miles on the other side of it, hypothetically, it could be affected by both. Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project (cumulative project A1 to A6) and the Holy Cross Cemetery Expansion Project (cumulative project E) would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project, the Vista Grande Drainage Basin Improvement Project (cumulative Project B) would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater levels near Lake Merced.

Additional drawdowns due to the proposed SFGW Project are estimated using the Westside Basin Groundwater Model. These potential drawdowns are combined with estimated groundwater levels for the GSR Project to estimate the combined effects of both projects (Fugro 2012a). Additional drawdowns due to the Holy Cross Cemetery Expansion Project are estimated to be negligible relative to well interference impacts (Fugro 2012c). The Vista Grande Drainage Improvements Project would not increase well interference, because it would not decrease groundwater levels. Because pumping under cumulative conditions would be at maximum levels during a drought, this analysis focuses on the well interference that could occur at the end of the design drought.

The San Francisco Golf Club, Olympic Club, and Lake Merced Golf Club wells are the only existing irrigation wells where both the SFGW Project wells and the GSR Project wells would result in combined groundwater level effects (Fugro 2012a). Table 5.16-17 (Estimated Static and Pumping Depth to Water at the End of the Design Drought with Cumulative Projects) shows the projected static and pumping depth to water at wells at these three golf clubs at the end of the design drought during pumping by the cumulative projects. When the wells at the three golf clubs are not being pumped (i.e., static condition), groundwater levels are projected to decrease about 4 to 6 feet more from the cumulative pumping than with the GSR Project pumping alone. When the wells are active (i.e., pumping condition), groundwater levels are projected to decrease about 6 feet more from the cumulative pumping than from the GSR Project pumping alone.

TABLE 5.16-17
Estimated Static and Pumping Depth to Water at the End of the Design Drought with Cumulative Projects

Existing Irrigation Well	Estimated Static Depth to Water (feet below ground surface)			Estimated Pumping Depth to Water (feet below ground surface)		
	With GSR Project	With Cumulative Projects	Difference	With GSR Project	With Cumulative Projects	Difference
SF Golf Club #2	196	202	6	228	234	6
Olympic Club #8	136	142	6	195	201	6
Olympic Club #9	136	142	6	164	170	6
Lake Merced Golf Club #3	358	362	4	INA	INA	INA

Source: Fugro 2012a

Note:

INA: Information on this existing irrigation well that would allow calculation of impacts of the Project on production capacity is not available.

Cumulative pumping and the resulting groundwater level decreases identified above in Table 5.16-17 are projected to affect the pump discharge rates of existing irrigation wells, as shown in Table 5.16-18 (Estimated Pump Discharge Rate at the End of the Design Drought with Cumulative Projects). Pump discharge rates at the three golf clubs are projected to decrease due to cumulative pumping approximately one to three percent more than from the GSR Project pumping alone.

TABLE 5.16-18
Estimated Pump Discharge Rate at the End of the Design Drought with Cumulative Projects

Existing Irrigation Well	With GSR Project (gpm)	With Cumulative Projects (gpm)	Percent Reduction Compared to GSR Project
San Francisco Golf Club #2	660	655	1
Olympic Club #8	935	910	3
Olympic Club #9	660	640	3
Lake Merced Golf Club #3	INA	INA	INA

Source: Fugro 2012a

Note:

INA: Information on this existing irrigation well that would allow calculation of impacts of the Project on pump discharge rate is not available.

Table 5.16-19 (Estimated Peak Demands and 12-Hour Production Capacities) compares 12-hour production capacities for each well potentially affected by the cumulative projects. Also included in calculations in Table 5.16-19 is the increased demand resulting from the reasonably foreseeable 30-acre expansion of Holy Cross Cemetery to a future total area of 180 acres. Production capacities of the existing wells at Holy Cross Cemetery are assumed to be the same in the future as they are now. As stated above, this increased demand at Holy Cross Cemetery does not result in additional drawdowns that cause well interference impacts, but the analysis evaluates whether well interference from the Project affects the ability of Holy Cross Cemetery to meet its expansion demand.

TABLE 5.16-19
Estimated Peak Demands and 12-Hour Production Capacities

Land Use	Estimated Peak Demand (af per 12-hour period)	Estimated 12-Hour Production Capacity for Primary, Active, and Secondary Wells (af)		
		Existing Conditions	With GSR Project	With Cumulative Projects
San Francisco Golf Club	0.3	1.5	1.5	1.4
Olympic Club	0.1	3.7	3.5	3.4
Lake Merced Golf Club	0.2	INA	INA	INA
Holy Cross Cemetery	2.6	3.5	2.9	2.9

Note:

INA: Information on the existing irrigation well that would allow calculation of impacts of the Project on production capacity is not available.

The wells at the Olympic Club and San Francisco Golf Club would likely meet their estimated peak demands even with maximum cumulative pumping at the end of the design drought. The pumping groundwater level under the cumulative effects of the projects is estimated to decrease below the top of the screen at Olympic Club Well #8, and dewatering the 400 feet of screen by 1 foot would have a negligible impact on well capacity, because the 1-foot drawdown below the top of well screen would be a small percentage of the screen interval. Nevertheless, there is a risk of well or pump damage from lowering groundwater levels below the top of the screen. However, this risk could be avoided by pumping only from Olympic Club Well #9 when groundwater levels are low during drought conditions. Well #9 has a 12-hour discharge capacity of 1.4 af that can meet peak groundwater demand of the Olympic Club. It is assumed that the entire Olympic Club irrigation system can be supplied by Well #9 alone because Well #8 and #9 are located near each other. Therefore, the cumulative projects would have *less-than-significant* cumulative impacts relative to well interference at the Olympic Club and San Francisco Golf Club.

The impacts of the cumulative projects on the Lake Merced Golf Club wells would be slightly greater than under the proposed Project. The cumulative impact of these projects together would be *significant* at the Lake Merced Golf Club, given that the GSR Project by itself would have *significant* impacts. The contribution of the GSR Project to this significant cumulative impact would, therefore, be considerable (*significant*).

The well interference water level and pump capacity impacts at Holy Cross Cemetery are the same with the GSR project and the cumulative projects. The well at Holy Cross Cemetery would meet peak demand even with its expansion. Therefore, there would be *less-than-significant* cumulative impacts relative to well interference at Holy Cross Cemetery.

With implementation of Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation), the potentially *significant* cumulative impact on well interference would be reduced in a similar manner as described above for the Project-specific impacts. Mitigation Action #6, Replace Irrigation Well, would be effective at reducing the Project's contribution to cumulative impacts to less-than-considerable levels, because the replacement well could be constructed deep enough to access an aquifer with sufficient water to meet peak irrigation demand while simultaneously avoiding any cumulative effects related to well interference (SFPUC 2012c). Therefore, Mitigation Measure M-HY-6 would reduce the impacts of well interference to a level where existing and planned land uses would be supported, except that the feasibility of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property. Because such assurance has not yet been provided, Impact C-HY-2, with implementation of Mitigation Measure H-HY-6, is conservatively deemed to be cumulatively considerable (*significant and potentially unavoidable with mitigation)*.

Impact C-HY-3: Operation of the proposed Project would not result in a cumulatively considerable contribution to cumulative impacts related to subsidence. (Less than Significant)

The geographic scope for the analysis of potential cumulative impacts on subsidence in the study area is the entire Westside Groundwater Basin as shown on Figure 2-1 (Project Vicinity Map). Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project (cumulative project A-1 to A-6) and the Holy Cross Cemetery Expansion Project (cumulative project E) would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project (the Vista Grande Drainage Basin Improvement Project [cumulative project B]) would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater levels near Lake Merced. Each of these cumulative projects, together with the continuation of existing pumping in the Westside Groundwater Basin, have been included in the Westside Basin Groundwater Model (described in Section 5.1, Overview, Section 5.1.6 [Groundwater Modeling Overview]), so predicted groundwater levels for the cumulative conditions scenario include the effects from operation of the cumulative projects.

The difference in predicted groundwater levels between the modeled existing conditions and the cumulative conditions scenario would be up to 61 feet lower at Lake Merced[30], up to 25 feet lower at the Sunset area of San Francisco, up to 146 feet lower at GSR Site 8, and up to 151 feet lower at GSR Site 13.

Table 5.16-20 (Estimated Subsidence Due to Cumulative Projects and the GSR Project) lists estimates of land subsidence due to the cumulative conditions scenario, as well as the portion of the subsidence due to the GSR Project, at the four selected locations. The subsidence estimates are taken from the Westside Basin Groundwater Model results relative to the difference in groundwater levels between the modeled existing conditions scenario and the cumulative conditions scenario.

[30] The lower groundwater levels at Lake Merced are reported from the Primary Production Aquifer, not the Shallow Aquifer. The Primary Production Aquifer at Lake Merced is not in direct hydrologic connection with the lake.

TABLE 5.16-20
Estimated Subsidence Due to Cumulative Projects and the GSR Project (in inches)

Site ID	Estimated Subsidence from Cumulative Projects	Estimated Subsidence from GSR Project
San Francisco, eastern Lake Merced	2.8	1.0
San Francisco, Sunset area	1.6	— [a]
Colma, GSR Site 8	2.7	2.7
South San Francisco, GSR Site 13	3.5	3.4

Source: Fugro 2012b

Note:

(a) The contribution of the GSR Project to subsidence in the Sunset area of San Francisco would be so small that it cannot be reliably estimated.

The estimated subsidence due to the cumulative projects ranges between 1.6 and 3.5 inches. Estimated subsidence due to the cumulative projects at each of the locations is less than the significance threshold of six inches for structures, pipelines, and drainage patterns. Estimated subsidence due to operation of the cumulative conditions scenario (i.e., the cumulative projects plus the GSR Project) at each of the four locations is also less than the significance threshold of 1 foot set for flooding impacts on land within a 100-year flood zone. For these reasons, the potential cumulative impact on subsidence from operation of the cumulative projects would be *less than significant* for structures, changes to drainage patterns, and flooding *(less than significant)*.

Impact C-HY-4: Operation of the proposed Project would not have a cumulatively considerable contribution to seawater intrusion. (Less than Significant)

The geographic scope for the analysis of potential cumulative impacts relative to seawater intrusion in the study area is the entire Westside Groundwater Basin as shown in Figure 2-1 (Project Vicinity Map). Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project and the Holy Cross Cemetery Expansion Project (cumulative project A-1 to A-6 and E, respectively) would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project, the Vista Grande Drainage Improvements Project (cumulative project B) would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater levels near Lake Merced. Each of these cumulative projects, together with the continuation of existing pumping in the Westside Groundwater Basin, have been included in the Westside Basin Groundwater Model, so that groundwater levels are also predicted for the effects from operation of the cumulative projects.

The Westside Basin Groundwater Model cumulative simulation shows that groundwater levels in the South Westside Groundwater Basin are predicted to be similar to those of the GSR Project scenario. Because the SFGW Project would be located in the North Westside Groundwater Basin, the overall effect of the SFGW Project on the South Westside Groundwater Basin is expected to be minimal. However, the SFGW Project includes substantial pumping that would lower groundwater levels in the North Westside Groundwater Basin.

Potential for Cumulative Seawater Intrusion in the North Westside Groundwater Basin

Shallow Aquifer

The Westside Basin Groundwater Model predicts that the cumulative projects would result in average groundwater levels in the Shallow Aquifer that would be generally lower than the average groundwater levels under modeled existing conditions (Kennedy/Jenks 2012c). These lower groundwater levels would tend to promote seawater intrusion. The estimated change in groundwater levels, measured at monitoring well clusters in the North Westside Groundwater Basin, ranges between a rise of 0.3 feet and a drop of 20.3 feet. The average predicted drop in groundwater levels, estimated at monitoring well clusters in the North Westside Groundwater Basin, are groundwater drops of between 1.4 and 10.4 feet.

The Westside Basin Groundwater Model results also show that groundwater levels in the Shallow Aquifer are predicted to be below the exclusion head between 0 and 86 percent of the time for different locations during the hydrologic sequence under the cumulative scenario. Estimated groundwater levels in the Shallow Aquifer would never be below the exclusion head under modeled existing conditions (i.e., without the cumulative projects). Therefore, the cumulative scenario is expected to result in substantially more time when groundwater levels would be below the exclusion head.

Under the cumulative conditions scenario, the average groundwater flux from the Westside Groundwater Basin to the Pacific Ocean is predicted to be 103 afy, which is 153 afm lower than predicted under modeled existing conditions (Kennedy/Jenks 2012c). This decreased flux would tend to reduce the amount of groundwater outflow to the Pacific Ocean or allow incipient or additional seawater intrusion into the Westside Groundwater Basin. Although these decreased flux estimates are not specific to the Shallow Aquifer, they suggest that, generally, less groundwater would flow out to the ocean under the cumulative scenario than under modeled existing conditions.

The Westside Basin Groundwater Model predicts that groundwater level contours for the Shallow Aquifer under the cumulative scenario in western San Francisco (around the SFGW Project's West Sunset Playground well) would likely have an increased potential for seawater intrusion (Kennedy/Jenks 2012c). South of the West Sunset Playground well, the groundwater level contours suggest a smaller, although still measurable, potential for increased seawater intrusion compared to modeled existing conditions.

Primary Production and Deep Aquifers

The Westside Basin Groundwater Model predicts that the cumulative conditions scenario would result in average groundwater levels in the Primary Production and Deep Aquifers lower than the average groundwater levels under modeled existing conditions (Kennedy/Jenks 2012c). These lower groundwater levels could lead to seawater intrusion. The range of groundwater elevation changes in the Primary Production Aquifer, estimated at monitoring wells in the North Westside Groundwater Basin, is between a rise of 2.3 feet and a drop of 16 feet. The average drop in Primary Production Aquifer groundwater levels, estimated at monitoring well clusters in the North Westside Groundwater Basin, would be between 4.0 and 8.5 feet at various locations. The range of groundwater elevation changes in the Deep Aquifer, estimated at monitoring wells in the North Westside Groundwater Basin, is between a rise of 1.1 feet and a drop of 16.9 feet. The average drop in Deep Aquifer groundwater levels is predicted to be between 1.3 and 3.9 feet at the various locations.

The Westside Basin Groundwater Model results predict that the cumulative conditions scenario would cause groundwater levels in the Primary Production Aquifer to be below the exclusion head 100 percent of the hydrologic sequence. This is slightly greater than the 99 to 100 percent of time that groundwater levels in the Primary Production Aquifer are predicted to be below the exclusion head under modeled existing conditions. As a result, the cumulative scenario is expected to cause a small increase in time when groundwater levels would be below the exclusion head.

Groundwater levels in the Deep Aquifer are also predicted to be below the Deep Aquifer exclusion head 100 percent of the hydrologic sequence under cumulative conditions, which would be the same as predicted under modeled existing conditions.

Therefore, in the North Westside Groundwater Basin, the cumulative scenario is predicted to decrease groundwater levels on average, creating an increased risk of seawater intrusion, which would be a *significant* cumulative impact on groundwater quality. However, the GSR Project is not predicted to cause decreased average groundwater levels in the North Westside Groundwater Basin in excess of those predicted under modeled existing conditions. Therefore, the GSR Project would not have a considerable contribution to the cumulative impact relative to seawater intrusion in the North Westside Groundwater Basin (*less than significant*).

Potential for Cumulative Seawater Intrusion in the South Westside Groundwater Basin

Shallow groundwater zone

The Westside Basin Groundwater Model results predict that average groundwater levels in the shallow groundwater zone under the cumulative conditions scenario would be equal to or higher than the average groundwater levels predicted under modeled existing conditions (Kennedy/Jenks 2012c). These higher groundwater levels under the cumulative scenario would better impede seawater intrusion as compared to modeled existing conditions. The change in groundwater levels, estimated at monitoring well clusters in the South Westside Groundwater Basin range between a rise of 3.0 feet and a drop of 0.2 feet. The average rise in groundwater levels is predicted to be between 0.7 and 2.0 feet at various locations.

Groundwater levels in the shallow groundwater zone under the cumulative conditions scenario are predicted to be below the exclusion head seven to 100 percent of the time during the 47-year hydrologic sequence. Simulated groundwater levels in the shallow groundwater zone are predicted to be below the single aquifer exclusion head 10 to 100 percent of the hydrologic sequence under modeled existing conditions. Therefore, the cumulative scenario is not predicted to result in additional time when groundwater levels would be below the exclusion head.

The Westside Basin Groundwater Model also predicts that the average groundwater flux from the Westside Groundwater Basin to the San Francisco Bay would be 13 afm lower under the cumulative scenario than under the modeled existing conditions (i.e., without any of the cumulative projects). The model predicts that outflow to the San Francisco Bay under the cumulative scenario may vary over the hydrologic period from 4 afm greater than modeled existing conditions to 35 afm lower under cumulative conditions than under modeled existing conditions (Kennedy/Jenks 2012c). This decreased average flux would tend to allow incipient or additional seawater intrusion into the Westside Groundwater Basin.

These decreased flux estimates are not specific to the shallow groundwater zone, but suggest that, generally, more groundwater would flow in from the bay under cumulative conditions than under modeled existing conditions.

Primary Production and Deep Aquifers

At the Burlingame-D monitoring well (located adjacent to the San Francisco Bay in the south Westside Groundwater Basin Primary Production Aquifer), the Westside Basin Groundwater Model results predict that the change in groundwater levels due to the cumulative conditions scenario would range between a rise of 2.2 feet and a drop of 0.7 feet during the 47-year hydrologic sequence. Average groundwater levels at the Burlingame-D monitoring well under the cumulative scenario are predicted to be 1.2 feet higher than the average groundwater levels under modeled existing conditions during the 47-year hydrologic sequence. (Kennedy/Jenks 2012c)

Simulated groundwater levels at the Burlingame-D monitoring well are predicted to be below the exclusion head 100 percent of the hydrologic sequence under the cumulative scenario, which is the same as it is predicted to be under the modeled existing conditions.

The Westside Basin Groundwater Model does not provide data for the South Westside Basin Deep Aquifer. However, the sediments present in the Deep Aquifer are not continuous to the Bay, being separated from it by deposits of low-permeability Bay Mud that likely stretch from the land surface to the bedrock surface below (Kennedy/Jenks 2012c). Therefore, any Deep Aquifer seawater intrusion under the cumulative scenario would need to pass through the Shallow and Primary Production Aquifers before reaching the Deep Aquifer. Because the cumulative projects are not expected to induce seawater intrusion greater than that expected under modeled existing conditions in the Shallow or Primary Production Aquifers, there would be no additional seawater intrusion that could reach the Deep Aquifer.

As indicated by the modeled decrease in average groundwater flux from the Westside Groundwater Basin to the San Francisco Bay, the cumulative scenario may induce seawater intrusion. Therefore, in the South Westside Groundwater Basin, the cumulative scenario is predicted to cause an increased risk of seawater intrusion, which would be a *significant* cumulative impact relative to the potential for seawater intrusion. However, the GSR Project is not predicted to cause decreased average groundwater levels in the South Westside Groundwater Basin adjacent to the San Francisco Bay in excess of those under modeled existing conditions and thereby is not predicted to have a substantial adverse effect on average groundwater flux from the Westside Groundwater Basin to the bay (Kennedy/Jenks 2012c). Therefore, the GSR Project would not have a considerable contribution to the cumulative impact relative to seawater intrusion in the South Westside Groundwater Basin (*less than significant*).

Impact C-HY-5: Operation of the proposed Project could have a cumulatively considerable contribution to cumulative impacts on beneficial uses of surface waters. (Less than Significant with Mitigation)

The geographic scope for the analysis of potential cumulative impacts relative to the water quality of surface water bodies in the study area in the study area is the entire Westside Groundwater Basin as shown on Figure 2-1 (Project Vicinity Map). Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project and the Holy Cross Cemetery Expansion Project (cumulative projects A-1 to A-6 and E, respectively) would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project, the Vista Grande Drainage Basin Improvement Project (cumulative project B) would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater levels near Lake Merced. Each of these cumulative projects, together with the continuation of existing pumping in the Westside Groundwater Basin, have been included in the Westside Basin Groundwater Model and the Lake Merced Lake-level Model, so that groundwater levels are also predicted for the effects from operation of the cumulative projects.

Lake Merced

As discussed above, Daly City's proposed Vista Grande Drainage Basin Improvement Project (cumulative project B) would include the addition of stormwater to Lake Merced. For the purposes of the cumulative analysis, the groundwater model assumes that the Vista Grande Drainage Basin Improvement Project would lower the Lake Merced spillway to an elevation of approximately 9.5 feet City Datum from its current elevation of 13 feet City Datum. The cumulative analysis also assumes that Vista Grande Drainage Canal stormwater flows in excess of 75 cubic feet per second (cfs) that meet applicable water quality criteria would be discharged to Lake Merced as a part of that project, and the total resulting annual additions to Lake Merced would range from 19 to 681 af, and the average annual addition would be 209 afy. In addition, the baseflow[31], in the Vista Grande Drainage Canal would likely be diverted to an onsite engineered wetland for treatment and then discharged to Lake Merced on an ongoing basis. The resulting annual additions to Lake Merced would range from 78 to 277 af, with a long-term average of 220 af. Using these assumptions, the mean lake level would be 7.5 feet City Datum as a result of additions to Lake Merced under the Vista Grande Drainage Basin Improvement Project, without influences from the GSR Project or other potentially cumulative projects (Kennedy/Jenks 2012f).

As shown on Figures 5.16-11 (Simulated Lake Merced Level Changes) and 5.16-12 (Simulated Lake Merced Levels Relative to Modeled Existing Conditions), the estimated cumulative Lake Merced water levels are higher than estimated under the modeled existing conditions for much of the 47-year hydrologic modeling period, largely as a result of the GSR Project and Vista Grande Drainage Basin Improvement Project. However, the estimated lake levels are predicted to be below the modeled existing conditions for years two through eight of the simulation period and after year 32 during the modeled design drought conditions. The estimated cumulative lake levels are also consistently lower than are predicted to occur under the GSR Project alone for the entire simulation period, except for a brief period at the beginning of the simulation. Cumulatively, the estimated mean monthly water level in Lake Merced would be 6.1 feet, and the estimated mean annual range would be 1.6 feet. This cumulative estimated mean monthly lake level is 1.4 feet lower than it would likely be under the Vista Grande Drainage Basin Improvement Project alone, and 3 feet lower than it would likely be under the GSR Project alone (Kennedy/Jenks 2012d).

[31] Baseflow is the minimum flow in the Vista Grande Drainage Canal that would be present year-round.

As noted above, the estimated lake levels would be below the modeled existing conditions for years two through eight of the simulation period and after year 32. The estimated cumulative lake levels would be below 1 foot for 13 percent of the simulation period compared to four percent under the modeled existing conditions. The minimum monthly lake level would be -4.9 feet City Datum at the end of the design drought. Therefore, cumulative impacts on Lake Merced water levels could be *significant* because water-level declines below the significance threshold of 0 feet are likely to occur. These water-level declines could cause decreased circulation between lakes and related deterioration of water quality, such as increased eutrophication and decreased dissolved oxygen levels, resulting in *significant* cumulative water quality impacts that could adversely affect the beneficial uses of the lake. The GSR Project's contribution to this impact would be cumulatively considerable, because the lake-level declines due to the Project would likely result in lake levels below 0 feet during, and for a period of time after, the design drought. However, similar to and for the reasons discussed under the analysis for the GSR Project alone, the contribution to this impact would be reduced to a less-than-cumulatively considerable level (*less than significant*) with 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), because, in accordance with these measures, its implementation would ensure that any lake level declines to below 0 feet as a result of the Project would be avoided due to the required reduction in pumping, the alteration of pumping patterns, and/or the addition of supplemental water. Therefore, with implementation of this measure, the Project would not result in long-term changes in water quality that would affect the potential beneficial use of Lake Merced (*less than significant with mitigation*).

As discussed in Section 5.1, Overview, Section 5.1.6 (Groundwater Modeling Overview), the final design of Daly City's proposed Vista Grande Drainage Improvements Project (cumulative project B) has not been determined. Options under consideration include diverting a broad range of stormwater flows to Lake Merced from the Vista Grande Drainage Canal, ranging from diversion of flows above 35 cfs, or 357 afy, to diversion of flows above 170 cfs, or 66 afy (Daly City 2011). Under this range, the baseflow to Lake Merced from the engineered wetland would range from an average of 203 afy to 233 afy, resulting in total diversions to Lake Merced ranging from 299 afy to 560 afy (Kennedy/Jenks 2012f). The values on either end of the range are within 30 percent of the 429-afy volume used in the cumulative analysis. While the specific option selected for the Vista Grande Drainage Basin Improvement Project could result in a different amount of stormwater discharged to Lake Merced than is considered in the cumulative modeling scenario, the resulting mean lake-level range for each of the Vista Grande options is estimated to be 6.7 to 7.9 feet (Kennedy/Jenks 2012f) compared to 6.3 feet City Datum predicted under the modeled existing conditions. Therefore, any additions to Lake Merced would result in an increase in mean lake levels relative to the modeled existing conditions.

Pine Lake

Under cumulative conditions, in addition to the GSR Project, it is assumed that the SFPUC SFGW Project (cumulative project A-1 through A-6), Holy Cross Cemetery Expansion Project (cumulative project E) and Vista Grande Drainage Basin Improvement Project (cumulative project B) would be implemented.

The estimated average modeled groundwater level in monitoring well LMMW-5S, completed in the deeper portion of the Shallow Aquifer, is 26.5 feet NGVD 29 under cumulative conditions, or 13.7 feet lower than the SFRPD lake elevation of 40.1 feet NGVD 29 and 6.7 feet lower than what is estimated under the modeled existing conditions. Based on this potential decrease in groundwater levels, groundwater outflows from the lake would be increased, and an additional 0.0085 mgd (9.5 afy) would be required from the existing Stern Grove well to maintain Pine Lake at the 40.1 feet NGVD 29 lake level. This represents an increase of 0.0042 mgd (5 afy) over the modeled existing conditions.

While additional groundwater would be required to maintain Pine Lake water levels, the estimated amount of additional groundwater pumping is within the 250-gpm (0.36-mgd) capacity of the Stern Grove well. Further, the Westside Basin Groundwater Model incorporates a sufficient amount of pumping (0.013 mgd [15 afy] under cumulative conditions) to maintain Pine Lake at an elevation of 40.1 feet NGVD 29. Therefore, the lake would be maintained at similar levels to those under the modeled existing conditions without adverse effects on the Shallow Aquifer, and maintenance of the lake at this level would not result in any changes to water quality or the health of the lake. Therefore, cumulative water quality impacts on Pine Lake water levels would be *less than significant* (*less than significant*).

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. (Less than Significant)

The geographic scope for the analysis of potential cumulative impacts relative to water quality standards in the study are is the entire Westside Groundwater Basin as shown in Figure 2-1 (Project Vicinity Map). Cumulative projects are listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project (cumulative project A-1 to A-6) and the Holy Cross Cemetery Expansion Project (cumulative project E), would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project, the Vista Grande Drainage Improvements Project (cumulative project B), would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater levels near Lake Merced. Each of these cumulative projects, together with the continuation of existing pumping in the Westside Groundwater Basin, have been included in the Westside Basin Groundwater Model so that estimated future groundwater levels are predicted for the effects from operation of the cumulative projects.

The results of the Westside Basin Groundwater Model cumulative conditions scenario predict that groundwater levels in the South Westside Groundwater Basin would be similar to those of the GSR Project scenario. The Model results also predict that the overall effect of the SFGW Project on the South Westside Groundwater Basin would be minimal.

Model-simulated groundwater levels for the cumulative conditions scenario south of Lake Merced and near Daly City primarily show the effects of the GSR Project, with slightly lower groundwater levels than the GSR Project alone due to the combined pumping effects of the cumulative conditions scenario (including the GSR Project). This difference is attributed to the SFGW Project extracting and intercepting groundwater that would otherwise flow from the North Westside Groundwater Basin south into the Daly City area. Groundwater levels in the cumulative simulation mimic the trends seen in the modeled simulation of the GSR Project in the remainder of the South Westside Groundwater Basin. Near South San Francisco and San Bruno, the effects of the SFGW Project would be minimal due to the intervening distance; the groundwater levels under the cumulative scenario reflect conditions similar to the GSR Project impacts. (Kennedy/Jenks 2012e).

Because groundwater level impacts from the cumulative projects would be similar to the groundwater level impacts for the GSR Project alone, potential cumulative impacts related to water quality standards would be *less than significant* for the same reasons that the GSR Project-specific impacts would be less than significant. As summarized in Impact HY-12 above, contaminants reported at PCA sites in soil or in shallow or perched groundwater zones are not anticipated to be mobilized during well pumping. This conclusion is based on the reported shallow nature of contamination at the PCAs and the aggregate thicknesses of intervening clay and sand layers between the shallower parts of the aquifer and the Primary Production aquifer from which the GSR Project would pump (see analysis of Impact HY-12). Therefore, the potential impact on drinking water standards from mobilization and spreading of contaminants in groundwater, changes in flow direction, or changes to operating conditions for remediation systems as a result of cumulative pumping would be *less than significant*. Consequently, there would be no such significant cumulative impact to which the GSR Project would contribute (*less than significant*).

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. (Less than Significant)

The geographic scope for the analysis of potential cumulative impacts on water quality degradation in the study area is the entire Westside Groundwater Basin as shown in Figure 2-1 (Project Vicinity Map). Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project (cumulative project A-1 to A-6) and the Holy Cross Cemetery Expansion Project (cumulative project E), would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project, the Vista Grande Drainage Basin Improvement Project (cumulative project B), would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater levels near Lake Merced.

Increased pumping in the Westside Groundwater Basin by the SFGW Project and the Holy Cross Cemetery Expansion Project could potentially encounter very low levels of chemicals for which no regulatory standards exist, just as the proposed GSR Project monitoring wells have (see the discussion of Impact HY-14, above). However, groundwater quality monitoring by the SFPUC, Partner Agencies, and the GAMA program throughout the Westside Groundwater Basin indicates that groundwater quality in the Basin is generally very good. The SFPUC's monitoring program has identified VOCs in the Primary Production and Deep Aquifers in the Westside Groundwater Basin (Kennedy/Jenks 2012e). The GAMA groundwater quality monitoring program (described above under Water Quality Standards) sampled 11 wells within the Westside Groundwater Basin. Pesticides, pharmaceutical compounds, and wastewater indicator compounds – including those for which no regulatory standards have been established – were not detected in any of the 11 wells within the Westside Groundwater Basin (Ray et al. 2009).

Therefore, increased pumping in the Westside Groundwater Basin due to the cumulative projects is not likely to encounter chemicals in groundwater that would present substantial health risks.

The Vista Grande Drainage Improvements Project would potentially degrade the water quality in Lake Merced, if untreated stormwater were discharged to the Lake. However, groundwater quality below

Lake Merced would not be substantially affected by such discharges due to percolation of lake water through sediment, soils, and geological formations before reaching the aquifer, which has the effect of filtering the stormwater before it reaches the groundwater. As a result, these cumulative projects would not cause significant degradation of groundwater quality in the Westside Groundwater Basin. Therefore, potential cumulative impacts relative to the degradation of drinking water quality or groundwater quality for constituents for which standards do not exist would be *less than significant*. Consequently, there would be no such significant cumulative impact to which the GSR Project would contribute (*less than significant*).

Impact C-HY-8: Operation of the proposed Project would have a cumulatively considerable contribution to a cumulative impact related to groundwater depletion effect. (Less than Significant with Mitigation)

The geographic scope for the analysis of potential cumulative impacts relative to groundwater depletion in the study area is the entire Westside Groundwater Basin is shown in Figure 2-1 (Project Vicinity Map). Table 5.1-3 (Projects Considered for Cumulative Impacts) and their locations are shown on Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis).

Two cumulative projects, the SFGW Project (cumulative project A-1 to A-6) and the Holy Cross Cemetery Expansion Project (cumulative project E), would increase pumping in the Westside Groundwater Basin and potentially lead to less groundwater storage. One cumulative project, the Vista Grande Drainage Basin Improvement Project (cumulative project B), would discharge treated stormwater to Lake Merced, which could – in turn – potentially increase groundwater storage near Lake Merced. Each of these cumulative projects, together with the continuation of existing pumping in the Westside Groundwater Basin, have been included in the Westside Basin Groundwater Model (described in Kennedy/Jenks 2012a), so that future predicted groundwater volumes for the cumulative conditions scenario include the effects from operation of the cumulative projects.

Groundwater storage under the cumulative scenario is estimated to be less than estimated groundwater storage under the modeled existing conditions; the projected decline is predicted to be approximately 970 afy, which would represent a decline in storage over the 47-year simulation period of approximately 45,000 af more than under the modeled existing conditions. This change in groundwater storage represents about 4.2 percent of the total groundwater volume in the entire onshore portion of the Westside Basin. Even though this decline is small, the results of the Westside Basin Groundwater Model regarding groundwater storage volumes for the cumulative condition indicate an incremental depletion of groundwater storage over the long-term, which is a *significant* cumulative impact. The GSR Project's contribution to this impact would be cumulatively considerable, because the groundwater storage volume would decline due to the Project. However, similar to and for the reasons discussed in the analysis for the GSR Project alone, the contribution to this impact would be reduced to a less-than-cumulatively considerable level (*less than significant*) with implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion), because additional in-lieu recharge would be allowed, and Project pumping would be restricted to extract only the volume of water in the SFPUC Storage Account, which would be adjusted to account for Basin losses. Therefore, with implementation of this measure, the Project would not result in a considerable contribution to any potential long-term cumulative depletion of groundwater storage (*less than significant with mitigation*).

5.16.3.9 Impacts of Mitigation Measures

Well Interference

This section provides an evaluation of whether there would be any significant impacts in addition to those identified for the Project due to implementation of Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation). This mitigation measure lists a number of mitigation actions that may be undertaken by the SFPUC to meet the performance standard established in the mitigation measure. Nine mitigation actions are listed in the mitigation measure as examples of the types of actions that could result in a reduction of impacts from well interference, as follows:

1. Improve irrigation efficiency
2. Modify irrigation operation
3. Redistribute GSR pumping
4. Reduce GSR pumping
5. Lower pump in irrigation well
6. Lower and change pump in irrigation well
7. Add storage capacity for irrigation supply
8. Replace irrigation well
9. Replace irrigation water source

These nine mitigation actions are described below in detail; mitigation actions with similar effects are discussed together.

M-HY-6 Mitigation Action #1: Improve Irrigation Efficiency, and Mitigation Action #2: Modify Irrigation Operations

M-HY-6 Actions #1 and #2 could improve irrigation efficiency and reduce water needs if irrigation pumping is anticipated to decline as a result of Project pumping. Conservation practices would be designed to help control water losses due to evaporation, deep percolation, and runoff. The measures could result in changes to the irrigation schedule (i.e. use of longer irrigation cycles or use of evapotranspiration data to modify irrigation schedules), which may lead to changes to the irrigation timing and amount of water applied to the golf clubs and cemeteries to improve water application efficiency while satisfying turfgrass water needs. Minor physical modifications could include replacing sprinkler nozzles, replacement and/or additional sprinklers to redistribute irrigation more evenly, or installation of soil-moisture sensors to aid irrigation scheduling. (SFPUC 2012c)

M-HY-6 Mitigation Action #3: Redistribute GSR Pumping

M-HY-6 Action #3 would keep the overall Project pumping at up to 7.2 mgd during a Take Year, but redistribute Project pumping so that Project wells that were causing well interference with an existing irrigator's well would be pumped less, and other Project wells that were demonstrating less drawdown than predicted by the groundwater modeling would be pumped more. Pumping would be redistributed only if there are GSR wells where groundwater levels are higher than predicted. This mitigation action would not require any construction, but could temporarily and/or occasionally change the pumping rate at one or more of the Project wells. (SFPUC 2012c)

M-HY-6 Mitigation Action #4: Reduce GSR Pumping

M-HY-6 Action #4 would reduce Project pumping. Reduced pumping would not require any construction or operational changes, and therefore no construction or operational impacts would occur due to reduced pumping.

M-HY-6 Mitigation Action #5: Lower Pump in Irrigation Well and Mitigation Action #6: Lower and Change Pump in Irrigation Well

If needed as a mitigation action, the existing irrigation pump affected by Project pumping would be modified to allow irrigation pumping to continue. The modification would include lowering the pump deeper in the existing well and may include a change in the size and characteristics of the pump to accommodate pumping from deeper water levels. (SFPUC 2012c)

M-HY-6 Mitigation Action #7: Add Storage Capacity for Irrigation Supply

If needed as a mitigation action, storage capacity to meet peak flow rates required for irrigation purposes may be added to offset reduced well capacity caused by Project pumping. Additional storage capacity could be added through installation of an above-ground storage tank with a capacity of 20,000 gallons or less, which could be up to 20 feet in height, and sized according to the peak flow needs. The tank would be painted to blend in with the surrounding area (SFPUC 2012c) (i.e., green for vegetative surroundings). It is assumed, for purposes of this analysis, that the storage would be located adjacent to the existing well that would be impacted by Project pumping and that the storage facility would connect directly to the existing irrigation system infrastructure. To install a typical tank, a site would be cleared and graded as needed to prepare the site. Depending on the size of the tank needed to supply the peak flow water quantities, either a tank may be constructed on the site or a pre-fabricated tank moved to the site. A concrete foundation may be required depending upon the type and size of the tank and the site characteristics. Equipment used for tank construction could include a bulldozer for earthwork and grading, crane, concrete trucks, delivery trucks, and roller compaction equipment. After construction is completed, the area around the new tank disturbed by its installation would be restored to its general pre-construction condition. (SFPUC 2012c)

M-HY-6 Mitigation Action #8: Replace Irrigation Well

If needed as a mitigation action, a replacement well at a cemetery or golf club could be constructed on the cemetery or golf club property. This analysis assumes that the irrigation well would be sited to avoid impacts on: waters of the United States or of the State of California; wetlands; other sensitive habitat; or cultural and historic resources. It also assumes that the new irrigation well would not be sited directly on land currently used for agriculture, or land that has a unique geologic feature, but it could be sited adjacent to such land.

To install a typical replacement well, a site would first be cleared and graded (as needed). A steel conductor casing would be installed to a minimum depth of 50 feet. A large diameter borehole would be drilled to a depth of approximately 550 to 700 feet. The well casing, consisting of a steel well casing and well screen, would be installed in the production borehole. After the well casing has been installed, well development would begin. Various well pumping tests would be performed after final well development. If the pumping test shows that water quality and production would meet the need of the landowner, then a pump, valves, flowmeter, and electrical connection would be installed. Equipment used for replacement well construction would likely include a truck-mounted drill rig, shale shaker, drilling fluid tanks, support trucks, Baker Tanks, forklift, and loader/backhoe. Approximately 45 working days would be required for well construction, development, and testing. After construction, the construction work area would be restored to its general pre-construction condition, including any golf course playing surfaces or other landscaping. (SFPUC 2012c)

M-HY-6 Mitigation Action #9: Replace Irrigation Water Source

In the event that the preceding options cannot be immediately implemented without causing an interruption in the irrigation supply, a temporary replacement water supply source would be provided until another mitigation option(s) is implemented. Water would be trucked to the site or would be provided via aboveground pipes from Partner Agency or SFPUC supply from distribution or transmission pipelines close to the location where additional irrigation supplies are needed. The SFPUC would verify that the water quality of the new irrigation source is acceptable. (SFPUC 2012c)

The effects of these mitigation actions are evaluated together under each environmental resource area. For the following three resource areas, none of the mitigation actions would result in additional impacts:

- **Population and Housing**. Implementation of M-HY-6 Actions #1 through #9 would not result in impacts related to population and housing, because these actions would not increase or displace existing population and do not include the construction of new, or displacement of existing, housing. Therefore, there would be no additional impact on the environment relative to the construction of new housing.
- **Wind and Shadow**. M-HY-6 Actions #1 through #6, and #8 and #9 do not include construction of new structures that could alter wind and shadow patterns. Action #7 includes the placement of a new storage tank, up to 20 feet tall, next to an existing irrigation well. The size of the storage tank would not be substantial enough to alter wind patterns or significantly alter shadow patterns such that enjoyment or use of the golf clubs or cemeteries would be affected. Therefore, there would be no additional impacts related to wind and shadow.
- **Public Services**. Implementation of M-HY-6 Actions #1 through #9 would not result in impacts related to public services because these actions would not increase population in the study area and therefore would not affect the ability of local jurisdictions to maintain service ratios, response times, or other performance objectives. Therefore, there would be no additional impact on the environment relative to public services.

The potential effects of the nine mitigation actions on the remaining resource areas are discussed below.

Land Use

Implementation of M-HY-6 Actions #1 through #4 would not result in impacts on land use, because these actions would not generate construction- or operation-related noise, dust, or exhaust emissions, and would not include construction equipment or permanent structures that would adversely affect the existing character of the land use. *No impact* would occur for M-HY-6 Actions #1 through #4.

While M-HY-6 Actions #5, #6, and #9 would require the use of construction equipment and vehicles, the scope of these construction activities would be similar to ongoing maintenance activities at the golf clubs and cemeteries. Therefore, construction impacts for M-HY-6 Actions #5, #6, and #9 would be *less than significant*. Depending on the placement of the pipelines, operation of M-HY-6 Action #9 may result in minor disruption to recreational uses at the golf clubs. The temporary placement of aboveground pipelines in golf clubs could result in golf carts needing to maneuver around pipelines while traveling within the golf club; however, aboveground pipelines would be placed and operated such that the golf club would remain available and useable to golfers. The temporary operational impacts of M-HY-6 Action #9 would not displace the land use and would therefore be *less than significant*.

M-HY-6 Actions #7 and #8 could result in temporary adverse impacts on land use due to substantial disruption of existing land uses or substantial interference with access to land uses during construction from the combination of temporary increases in noise and dust/exhaust emissions levels, traffic delays, and/or access disruption. Depending on the location of the storage tank or new well (i.e., whether visible from a publicly accessible vantage point), implementation of this mitigation action could temporarily degrade the visual quality of the site or scenic views during construction, and therefore temporarily affect the existing character of surrounding land uses. Therefore, these potential impacts could be *significant*. Implementation of Mitigation Measures M-NO-1 (Noise Control Plan), M-AQ-2a (BAAQMD Basic Construction Measures), M-TR-1 (Traffic Control Plan), and M-AE-1a (Site Maintenance) to reduce Project impacts would also reduce impacts from construction activities related to M-HY-6 Action #7 and #8 to *less-than-significant* levels by requiring measures to reduce construction-related noise, dust, emissions, and traffic access-related issues to *less-than-significant* levels It is unlikely that the wells would displace existing land uses because the new wells could be located at the same site as the existing wells, and no perceptible noise would be generated from the wells; therefore, there would be *no operational impacts* on existing land uses from M-HY-6 Action #8. Given the size of the properties involved and their open-space nature, this analysis assumes that a new storage tank could be sited in an area that would not conflict with existing land use where this mitigation might be required, even though the possible locations for a new tank have not been identified for each irrigator. Therefore, the potential land use impact associated with implementation of M-HY-6 Action #7 is assumed to be *less than significant*.

Aesthetics

Implementation of M-HY-6 Actions #1 through #4 would not result in additional impacts on visual resources, because these actions would not involve construction activities or new aboveground structures that would alter or impact the visual quality of the cemeteries or golf clubs as viewed from publicly accessible vantage points. Additionally, the purpose of these mitigation actions is to ensure continued adequate water for irrigation at the golf clubs or cemeteries, therefore the operation of these facilities would not be impacted by these mitigation actions. As a result, *no construction or operational impacts* related to aesthetics would occur for M-HY-6 Actions #1 through #4.

The implementation of M-HY-6 Actions #5 through #9 could result in minor additional aesthetic impacts during construction due to the presence of construction equipment and vehicles; these impacts could be *significant* if construction sites were visible from publicly accessible viewpoints. Implementation of

Mitigation Measures M-AE-1a (Site Maintenance) would reduce construction impacts to *less-than-significant* levels by keeping the area clean of debris. Construction-related aesthetic impacts from implementation of M-HY-6 Actions #5 through #9 would therefore be *less than significant with mitigation*.

M-HY-6 Actions #5 and #6 would not have operational impacts related to aesthetics, because they would not include any aboveground changes, therefore *no operational impact* would occur for Actions #5 and #6. However, M-HY-6 Actions #7 and #8 could result in additional aesthetic impacts during operation. Placement of a storage tank up to 20 feet tall (M-HY-6 Action #7) could affect the visual quality and character of the golf club or cemetery, however, SFPUC would work with the landowner to site the tank in a location that minimizes visual impacts from publicly accessible viewpoints. Certain factors such as the tank's proximity to other structures or the presence of natural screening (i.e., trees or topography) could limit impacts on the visual character of the site or its surroundings. Additionally, the storage tank would be painted to blend in with its surroundings (SFPUC 2012c) (i.e., green for areas with evergreen turf or vegetation). If significant aesthetic impacts would still result from the installation of a new water tank, per this measure, this analysis assumes that Mitigation Measure M-AE-3a (Implement Landscape Screening) could also be implemented, as necessary, to mitigate such impacts to *less-than-significant* levels. This would be accomplished by requiring the SFPUC to develop and implement a landscape screening plan to screen publicly accessible views of the new water storage tank(s), including the following:

- The landscape plan shall include native trees and shrubs common to the surrounding areas. The landscape plan shall include plant species, planting specifications, and irrigation requirements necessary to screen the new water storage tank(s). The SFPUC shall monitor landscape plantings annually for five years after project completion to ensure that sufficient ground coverage has developed and that the shrubs survive. If necessary, the SFPUC shall implement additional measures (e.g., replanting, temporary irrigation) to address continued survival of the plantings, and shall replant additional shrubs should a significant amount of the plantings do not survive during the monitoring period.

M-HY-6 Action #8 would construct a replacement irrigation well at a golf club or cemetery. However, the aesthetic impact of the well would be minor, because the well would extend approximately three feet above ground, which would not significantly affect viewsheds or the visual quality of the cemetery or golf clubs, as viewed from publicly accessible vantage points. M-HY-6 Action #9 would potentially affect the visual quality of the cemetery or golf club because the pipelines would be located above ground. However, this mitigation action is intended to be temporary in duration. For these reasons, operational impacts on aesthetics from M-HY-6 Actions #8 and #9 would be *less than significant*.

Cultural and Paleontological Resources

Implementation of M-HY-6 Actions #1, #2, #3, #4 #5, #6, and #9, would not result in additional impacts on cultural or paleontological resources, because these actions would not involve additional excavation, grading, or other ground disturbances. Implementation of these mitigation actions would also not involve new structures or changes to historical resources. As a result, *no impacts* would occur.

There are no historical resources identified at the golf clubs that could be affected by the Project, but several cemeteries within the study area include individual historic resources or the cemeteries are eligible for listing on the National Register. If historic resources are present at a golf club or cemetery where a storage tank or replacement well (M-HY-6 Actions #7 and #8) might be needed, the facilities would be sited to avoid impacts on these resources (i.e., sited where the storage tank and well are not visible in proximity to a historic resource), where feasible. Construction of the storage tank or well would be short in duration and impacts on the historic resources during construction would therefore be *less than significant*. Once in place, if a storage tank is within close proximity of a historic resource, the implementation of Mitigation Measures M-AE-3a (Implement Landscape Screening) would reduce impacts on historic resources by providing screening, as also described above to address any potential aesthetics impacts.

It is unknown whether M-HY-6 Action #7 or #8 would be implemented at a site that contains archaeological or paleontological resources. Damage to an archaeological or paleontological resource would be a *significant* impact. However, implementation of Mitigation Measures M-CR-2 (Discovery of Archaeological Resources), M-CR-3 (Suspend Construction Work if a Paleontological Resource is Identified), and M-CR-4 (Accidental Discovery of Human Remains) would adequately address any potential impacts related to the accidental discovery of these resources during construction by requiring adherence to appropriate procedures and protocols. Impacts on cultural and paleontological resources as a result of implementing M-HY-6 Action #7 or #8 would therefore be *less than significant with mitigation*.

Transportation and Circulation

Implementation of M-HY-6 Actions #1 through #4 would not impact transportation and circulation because no construction would be required, and therefore *no construction traffic impacts* would occur. Because these actions would not require additional maintenance vehicle trips, operation would not permanently impact the performance of the transportation circulation system or increase traffic hazards and *no operational impact* would occur.

Implementation of M-HY-6 Actions #5, #6, #7, #8, or #9 could result in additional impacts on transportation and circulation due to additional construction traffic on regional highways and local roadways. However, construction traffic from these mitigation actions would be minor and temporary (i.e., truck deliveries for well pump, storage tank, or piping). Because any storage tanks, replacement wells or irrigation piping would be located on existing golf club or cemetery property and connected to onsite irrigation plumbing (rather than periodically filled by delivery truck), implementation of M-HY-6 Actions #7, #8, or #9 would not permanently impact the performance of the transportation circulation system or increase traffic hazards. Therefore, operational impacts of M-HY-6 Actions #5, #6, #7, #8, or #9 would be *less than significant*.

Noise and Vibration

Implementation of M-HY-6 Actions #1 through #4 would not result in construction or operational noise impacts because these actions would not include construction activities or result in new sources of noise. *No noise or vibration impacts* would therefore occur.

Implementation of M-HY-6 Action #5, #6, and #9 would not generate significant noise impacts during construction. Lowering and/or replacing the pump, or installing aboveground pipelines would be similar in nature to other ongoing maintenance activities and would not substantially increase ambient noise levels at the golf clubs or cemeteries. Any related noise impacts would therefore be *less than significant*. *No* *operational impacts would occur*, because the changed pump and aboveground pipelines would not generate perceptible changes in ambient noise levels.

Implementation of M-HY-6 Action #7 would result in additional noise and vibration impacts during construction due to site grading and clearing, construction of a concrete foundation (if necessary), and the use of construction equipment and vehicles. Implementation of M-HY-6 Action #8 would also result in additional noise and vibration impacts during construction of the replacement irrigation well. If pipelines are required for the irrigation well, pipeline trench compaction during construction could cause ground-borne vibration, which would be potentially significant depending on the proximity to structures and sensitive receptors. While golf clubs are not considered sensitive noise receptors, cemeteries and places of residence, schools, and churches are considered sensitive to noise disturbances. Additionally, Daly City, Colma, and San Bruno have specific noise regulations for cemeteries and/or golf clubs. Construction of M-HY-6 Actions #7 or #8 could exceed local noise standards and temporarily increases ambient noise levels, which would be *significant*.

Mitigation Measures M-NO-1 (Noise Control Plan) would reduce construction-related noise impacts for M-HY-6 Actions #7 and #8. Mitigation Measure M-NO-2 (Reduce Vibration Levels during Construction of Pipelines) would reduce noise and vibration levels generated during well drilling and pipeline trench compaction. Implementation of M-NO-1 (Noise Control Plan) would reduce noise impacts from Action #7 to *less-than-significant* levels. However, Action #8 includes drilling, and as discussed in Section 5.7, Noise and Vibration, depending on the proximity of construction to a sensitive noise receptor (e.g., residences or schools), and depending on the local noise regulations for cemeteries and/or golf clubs, it is possible that even with the implementation of these mitigation measures, noise impacts related to noise standards and ambient noise levels from well drilling could be *significant and unavoidable*.

Operation of the storage tank (M-HY-6 Action #7) would not increase ambient noise levels at the golf clubs or cemeteries. Operation of the irrigation well (M-HY-6 Action #8) would not increase ambient noise levels because the pump would be located underground. *No operational noise impacts* would therefore occur.

Air Quality

Implementation of M-HY-6 Actions #1 through #4 would not require construction, and therefore would not result in the emission of criteria air pollutants or violation of air quality standards. *No impact* would occur. M-HY-6 Actions #5, 6, and #9 would require use of construction equipment and vehicles (but no ground disturbance), and would generate small amounts of exhaust emissions. M-HY-6 Actions # 7 and #8 would generate fugitive dust and other criteria air pollutants from construction activities such as grading and excavation, and the use of construction equipment and vehicles. These emissions could be *significant*. However, implementation of M-AQ-2a (BAAQMD Basic Construction Measures) would reduce impacts to *less-than-significant* levels by requiring measures to control dust and reduce idling. Post-construction, these mitigation actions would not emit criteria air pollutants. *No impact* from operations would therefore occur.

Greenhouse Gas (GHG) Emissions

Implementation of M-HY-6 Actions #1 through #4 would not require construction, and therefore would not generate greenhouse gases. *No impact* would occur. M-HY-6 Actions #5, 6, #7, #8, and #9 would generate a small additional amount of GHG emissions through the combustion of fossil fuels in mobile construction equipment and vehicles, and from the purchase of electricity to operate any electrical equipment for Project construction. However, due to the small scale of these mitigation actions, GHG emissions generated during construction would be *less than significant*. Operation of the Actions #5, #6, #7, and #9 would be similar in scope to existing maintenance activities. Action #8 would replace an existing well, so maintenance activities would be the same as for the existing well, and would not result in additional GHG emissions. Therefore, operational impacts associated with GHG emissions generated from worker trips and energy use would be *less than significant*.

Recreation

Implementation of M-HY-6 Actions #1 through #4 would not require construction. Operation of these mitigation actions would facilitate the continued recreational function of the golf clubs by providing irrigation water. *No impact* would therefore occur.

M-HY-6 Actions #5 and #6 would require the use of construction equipment and vehicles, and construction would be similar to ongoing maintenance activities at the golf clubs, because no ground disturbance would occur and significant noise or dust would not be generated. Therefore, impacts on recreational experience would be *less than significant*. No permanent changes to the recreational facilities would occur, so *no operational impacts* would occur.

Implementation of M-HY-6 Actions #7, #8, and #9 could result in additional impacts on recreation during construction. If M-HY-6 Action #7 is implemented at a golf club, the storage tank would likely be located immediately adjacent to the affected existing irrigation well. If M-HY-6 Action #8 is implemented at a golf club, the replacement irrigation well would likely be sited at the outer fringes of playing surfaces or in other non-playing areas, to minimize damage to playing surfaces. Implementation of M-HY-6 Action #9 could result in temporary impacts at golf clubs. Placement of aboveground pipelines could temporarily affect golf cart access between holes and may require golfers using golf carts to take alternative access routes if pipelines cross internal golf club roadways; otherwise pipeline placement would not prevent golfers from using the golf club or impact playing surfaces. Therefore, it is unlikely that the placement of the storage tank, irrigation well, or aboveground pipelines would substantially damage or displace existing playing surfaces.

Construction of these mitigation actions could temporarily affect the quality of the recreational experience or temporarily affect golf cart access within the golf club; these temporary impacts on recreational experience would be *less than significant* because disruption would be limited and short-term (typically less than one month), and because other recreational resources are available in the area.

Any golf club playing surfaces damaged during construction would be restored to their general pre-construction condition after construction is completed (pursuant to Chapter 3, Project Description, Section 3.5.1.3 [Construction Methods for Water Distribution and Utility Pipeline Installation], which specifies that areas disturbed during construction would be restored to pre-construction conditions). As stated earlier, it is unlikely that the storage tank or irrigation well would substantially displace existing playing surfaces. Depending on the placement of the pipelines, operation of M-HY-6 Action #9 may result in temporary and minor disruption of recreational uses at the golf clubs. Implementation of these actions would not result in population growth, and therefore would not increase the use, or require the expansion of existing parks or recreational facilities. Therefore, operational recreation impacts of M-HY-6 Actions #7, #8, and #9 would be *less than significant*.

Utilities and Service Systems

Implementation of M-HY-6 Action #1, #2, #3, #4, #5, #6, and #9 would not require trenching or other ground disturbances that could disrupt or damage existing utilities. These mitigation actions would not require additional water entitlements; generate additional solid waste or additional discharges to sanitary sewer or stormwater systems. *No such impacts* would therefore occur.

Implementation of M-HY-6 Actions #7 and #8 would result in additional potentially *significant* impacts on utilities and service systems by contributing small additions of solid waste generated during construction and potentially damaging or disrupting utilities during construction. However, as discussed in Section 5.12, Utilities and Service Systems, the Ox Mountain Landfill has a remaining capacity that is sufficient to accommodate the amount of solid waste that would be generated by implementation of M-HY-6 Actions #7 and #8. Additionally, Mitigation Measure M-UT-4 (Waste Management Plan) would require compliance with local solid-waste diversion goals and regulations. Implementation of Mitigation Measures 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), and M-UT-1i (Coordinate Final Construction Plans with Affected Utilities) would adequately address impacts related to the potential disruption and relocation of utility operations or accidental damage to existing utilities by requiring the SFPUC and/or its contractor(s) to identify the potentially affected lines in advance, coordinate with utility service providers to minimize the risk of damage to existing utility lines, protect lines in place to the extent possible or temporarily re-route lines if necessary, and take special precautions when working near high priority utility lines (e.g., gas transmission lines). Construction impacts on utilities and service systems from M-HY-6 Actions #7, and #8 would therefore be *less than significant with mitigation*. Construction of M-HY-6 Action #8 would also discharge to the local sanitary sewer or storm drain system during well development pumping tests. However, as described in Section 5.12, Utilities and Service Systems, the sanitary sewer and storm drain systems in the Project area have sufficient capacity to handle the volume and rate of such discharges during well development.

Operation of M-HY-6 Actions #7 and #8 would not result in impacts on utilities or service systems. A new storage tank would not result in additional discharges to the storm drain or sanitary sewer system. Since Action #8 involves replacing an existing well, no additional discharges to the storm drain or sanitary sewer system would occur.

Biological Resources

Implementation of M-HY-6 Actions #1 through #4, and #9 would occur on existing golf club or cemetery property and would not modify existing habitats or require tree removal. Implementation of M-HY-6 Action #5 or #6 would not impact biological resources, because these actions would not require additional construction activities beyond lowering and/or changing the well pump. No trees would be removed and no surface ground disturbance would occur. Construction equipment and workers would be present, but would avoid any waters of the State or of the United States, wetlands, or sensitive habitat near or adjacent to the construction site, as discussed previously in the mitigation action descriptions. As a result, *no impacts* on biological resources from M-HY-6 Actions #1 through #6, and #9 would occur.

Implementation of M-HY-6 Actions #7 and #8 could result in additional potentially *significant* impacts on biological resources. Storage tanks would likely be located adjacent to existing irrigation wells. Storage tanks and replacement irrigation wells would be sited to avoid jurisdictional waters, wetlands, or other sensitive habitat. However, implementation of this mitigation action could potentially require the removal of trees to accommodate placement of a new tank depending on where the tank was constructed. Implementation of 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), M-HY-1 (Develop and Implement a Stormwater Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan), M-BR-4a (Identify Protected Trees), and M-BR-4b (Protected Tree Replacement) would reduce any such potential impacts to l*ess-than-significant* levels. These measures would require pre-construction surveys to determine whether special-status or migratory birds or bats (including their nests and roosts), or overwintering monarch butterflies are present at or near construction sites. These also include measures to protect nearby habitat from construction-related runoff and sedimentation, and require trees to be protected, avoided, and replaced in accordance with local tree protection ordinances if removed. Therefore, impacts on biological resources from M-HY-6 Actions #7 and #8 would be *less than significant with mitigation*.

Geology and Soils

Implementation of M-HY-6 Actions #1 through #6, and #9 would occur on existing golf club or cemetery property and would not include the construction of new structures that could expose people to seismic ground shaking or landslides. Implementation of Actions #1, #2, #5, #6, and #9 would be similar in nature to existing ongoing maintenance activities; Actions #3 and #4 would not result in physical changes, and therefore would not result in new or increased risk for landslides or other soil or geologic instability risks. As a result, *no impacts* would occur.

M-HY-6 Action #7 could potentially place a storage tank on unstable soil that could be susceptible to landslides, ground shaking, or settlement. The exposure of this structure to potentially adverse seismic effects that could lead to tank failure could be *significant*. However, implementation of Mitigation Measure M-GE-3 (Conduct Site-specific Geotechnical Investigations and Implement Recommendations) would require site-specific geotechnical investigations, and implementation of recommendations to protect against property loss, injury, or death from ground shaking or settlement that could result from the damage of a new water tank and would be reduced to *less-than-significant* levels. Installation and operation of a replacement irrigation well identified in M-HY-6 Action #8 would not include construction of structures intended for human occupancy; therefore, there would be no exposure of people or structures to the effects of landslides, ground shaking, or settlement.

Given that any storage tanks or replacement irrigation wells would be located within existing cemeteries or golf clubs, which are carefully landscaped and highly disturbed, it is unlikely that implementation of these mitigation actions would substantially change existing topography or unique geologic or physical features. If a replacement well were to be sited on the Holy Cross Cemetery property east of Hillside Boulevard, the well would likely be sited to avoid substantial changes to existing topography or unique geologic or physical features. Such potential impacts would be *less than significant*.

Hydrology and Water Quality

Implementation of the M-HY-6 Actions #1, #2, #4 #5, #6 and #9 would not include ground-disturbing construction activities and therefore these mitigation actions would not result in erosion or runoff that would impact water quality. Irrigation (Actions #1, #2, and #9) would follow standards necessary to reduce runoff to surface waters and percolation to groundwater. If a new well is drilled (Action #8), SFPUC would ensure that water quality of the new well is appropriate for irrigation use. Actions #5 and #6 would modify pumping to allow irrigation pumping to continue at existing levels. Action #4 would reduce Project pumping and not require any other construction or operational changes. Therefore, there would be *no impacts* on hydrology or water quality from these mitigation actions.

Implementation of M-HY-6 Actions #7 and #8 could require vegetation removal, grading, excavation, and soil stockpiling, which could result in erosion and sedimentation and impact water quality. This would be a *significant* impact. However, implementation of Mitigation Measure HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan), would reduce such potential impacts to *less-than-significant* levels by requiring stabilization and control measures during ground disturbing activities.

Redistribution of pumping under M-HY-6 Action #3 would not have the potential for additional well interference, subsidence, seawater intrusion, or Lake Merced water quality impacts, because Mitigation Measure M-HY-6 specifies that redistribution of pumping would not occur in a manner that would cause groundwater levels to drop below that caused by the Project.

If pumping were redistributed to a different well or wells, the increased pumping during Take Periods would not cause adverse water quality impacts related to drinking water standards, because the wells would still be operated by the SFPUC to meet such standards, as described in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types). If decreased pumping were to occur, groundwater levels in the shallow water-bearing zone could increase slightly, with the potential for interaction with existing contamination. However, such an increase in the shallow water-bearing zone is unlikely and would be very small if it were to occur. Therefore, such potential impacts on groundwater quality would be *less than significant.*

If pumping were redistributed to a different well or wells, the increase in pumping would not cause significant water quality degradation related to constituents for which regulatory standards do not exist, because such constituents occur at very low levels that are not likely to be injurious to health (refer to Impact HY-14). Therefore, *no additional impacts* on groundwater quality would occur.

If pumping were redistributed, the total volume of Project pumping would remain the same, and therefore, *no impact* would occur on overall groundwater storage volumes in the Westside Groundwater Basin, and Project impacts related to groundwater depletion would therefore not change.

Hazards and Hazardous Materials

Implementation of M-HY-6 Actions #1, #2 and #9 would occur on existing golf club or cemetery property and would be similar in scope to ongoing irrigation activities at these facilities. Implementation of these actions would not involve the transport, use, or disposal of hazardous materials. Actions #3 and #4 would not involve construction activities and would also not involve the transport, use, or disposal of hazardous materials. As a result, *no such impacts* would occur for M-HY-6 Actions #1 through #4, and #9.

Implementation of M-HY-6 Actions #5, #6, #7, and #8 could require the use of hazardous materials during construction. Impacts related to accidental releases of chemicals (including within proximity to a school) could be *significant*. However, any activities involving the use or transport of hazardous materials would require compliance with applicable hazardous materials laws and regulations. Implementation of Mitigation Measure M-HY-1 (Develop and Implement a Stormwater Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) would lessen the potential for impacts to *less than significant with mitigation* related to an accidental release of hazardous materials (including within proximity to a school) by requiring specific practices for the safe storage and handling of chemicals.

M-HY-6 Actions #7 and #8 would not include new structures. It is unknown whether implementation of M-HY-6 Actions #7 and #8 would result in the siting of a storage tank or a replacement irrigation well near a hazardous materials site identified on the Cortese List (described in Section 5.17, Hazards and Hazardous Materials). Siting the well near a hazardous materials site could result in the potential to encounter hazardous materials in soil or groundwater, which would be a *significant* hazardous materials impact. However, if these facilities were to be located near a hazardous materials site, implementation of Mitigation Measures M-HZ-2a (Preconstruction Hazardous Materials Assessment), M-HZ-2b (Health and Safety Plan), and M-HZ-2c (Hazardous Materials Management Plan) would reduce the potential hazardous materials impact on the environment to *less-than-significant* levels by requiring a soil investigation to determine the presence of chemical residue, as well as a soil and groundwater management plan to ensure appropriate handling and disposal of excavated material containing hazardous materials. No hazardous materials would be required during operation of M-HY-6 Actions #7 and #8. *No such potential impacts* during operation would therefore occur.

Mineral and Energy Resources

A portion of the Olympic Golf Club is mapped as MRZ-3, which indicates areas that contain mineral deposits, but the significance is unknown (CGS 1987, 1996). All other golf club and cemetery properties within the study area that may be subject to well interference are mapped as MRZ-1, which are areas with no significant mineral deposits or little likelihood for their presence, or MRZ-4, which are areas where information is inadequate for assignment to another zone (CGS 1987, 1996).

Implementation of M-HY-6 Actions #1 through #6, and #9 would not change existing land uses or otherwise change the availability of a known mineral resource. Therefore, no such impacts would occur. Implementation of M-HY-6 Actions #1, #2, #5, #6, and #9 could result in a small change in the energy use required by the irrigation systems or wells at the golf clubs and cemeteries. However, any such changes would be negligible in the context of the overall energy use at these facilities, and may actually reduce energy use. As a result, *no impacts* on minerals or energy resources would occur.

Construction of storage tanks (M-HY-6 Action #7) or replacement irrigation wells (M-HY-6 Action #8) would require the use of fossil fuels. However, given the nature and scale of construction, construction of M-HY-6 Actions #7 or #8 would not require a large amount of fuel or energy usage because of the moderate number of construction vehicles and equipment, worker trips, and truck trips that would be required for a project of this scale. Therefore, construction would not encourage activities that would result in the use of large amounts of fuel and energy. The impact would be *less than significant.* A storage tank or replacement irrigation well could be sited within the Olympic Golf Club area mapped as MRZ-3. However, implementation of these mitigation actions would not result in the loss of a known or locally important mineral resource because the site is not currently mined, and the placement of an aboveground storage tank or small irrigation well would not preclude future access to this resource or result in a change in this site's resource designation. Impacts on mineral and energy resources from M-HY-6 Actions #7 or #8 would therefore be *less than significant with mitigation*.

Agriculture and Forest Resources

A portion of the Holy Cross Cemetery property (areas east and west of Hillside Boulevard) is mapped by the Farmland Mapping and Monitoring Program as Unique Farmland, and a portion of the undeveloped property east of Hillside Boulevard is mapped as Grazing Land (CDC 2011). The area east of Hillside Boulevard also contains a small portion of forest land, as defined in PRC § 12220(g).

M-HY-6 Actions #1 through #6, and #9 do not involve changes to existing zoning, land use, or other construction that would result in the loss of important farmland or forest land. As a result, *no impacts* on agriculture or forest resources from these mitigation actions would occur.

M-HY-6 Actions #7 and #8 would be implemented on existing golf club and/or cemetery property. If a storage tank or replacement irrigation well were constructed in the Holy Cross cemetery area mapped as Unique Farmland, land actively used for agriculture would likely be avoided to the extent feasible, but a small portion of land mapped as Unique Farmland or Grazing Land could be displaced. However, the area of impact would be small and would not result in a conversion of land designated as Unique Farmland or Grazing Land to non-agricultural use, given that the overall land use would not change as a result of these mitigation actions. The land is not under a Williamson Act contract, and the implementation of M-HY-6 Actions #7 or #8 would not preclude continued and future use for agriculture, or involve other changes that could result in the conversion of agriculture land to some other use given that this is an irrigation supply action. Therefore, impacts on agriculture resources would be *less than significant*.

The Holy Cross Cemetery parcel also contains a small portion of forest land, as defined in PRC § 12220(g). However, sufficient non-forested land exists such that storage tanks could easily be sited to avoid the loss of forest land. *No impacts* on forest land would therefore occur.

Adverse Effects on Beneficial Uses of Lake Merced

This section provides an evaluation of whether there would be any significant impacts in addition to those identified for the Project due to implementation of Mitigation Measure M-HY-9b (Lake Level Management for Lake Merced). This mitigation measure lists a number of mitigation actions that may be undertaken by the SFPUC to meet the performance standard established in the mitigation measure. Two corrective actions are listed in the mitigation measure as examples of the types of actions that could result in a reduction of impacts at Lake Merced, as follows:

- Redistribute pumping to decrease Project pumping rates in the vicinity of Lake Merced or decrease the overall Project pumping rate. However, in no case would redistribution be undertaken where groundwater levels would decline more than from the Project as originally predicted by modeling.
- Augment lake levels through the addition of supplemental water (such as potable water that is dechloraminated at the Lake Merced Pump Station, stormwater from the Vista Grande Drainage Canal, recycled water, or stormwater diverted from other development in the Lake Merced watershed), if available.

Impacts related to implementation of this mitigation measure would not include any construction–related impacts, but could include hydrology and water quality impacts as follows:

Well Interference

Redistribution of pumping under Mitigation Measure M-HY-9b (Lake Level Management for Lake Merced) would not have the potential for additional well interference, because Mitigation Measure M-HY-9b specifies that redistribution of pumping would not occur in a manner that would cause groundwater levels to decline more from the Project than originally predicted by modeling. Therefore, impacts related to well interference would be l*ess than significant*.

Subsidence

Increased pumping at a Project well as a result of redistributed pumping could cause increased subsidence. However, the estimated maximum subsidence based on the proposed pumping distribution is less than 60 percent of the significance threshold (3.4 inches at Site 13 as shown in Table 5.16-15 (Estimated Subsidence due to Project Operations) compared to the significance threshold of six inches). Therefore, increased pumping, even at the well where the potential for subsidence is the greatest, would not likely result in subsidence in excess of the significance threshold for subsidence. As a result, impacts related to subsidence would be *less than significant*.

Seawater Intrusion

Increased pumping at a Project well as a result of redistributed pumping could result in an increased potential for seawater intrusion. However, Mitigation Measure M-HY-9b (Lake Level Management for Lake Merced) prohibits redistribution from being undertaken where groundwater levels would decline more than from the Project as originally predicted by modeling. Therefore, Mitigation Measure M-HY-9b would not increase the potential for seawater intrusion as compared to the Project, and Project impacts are less than significant. As a result, impacts related to adverse effects from Mitigation Measure M-HY-9b caused by seawater intrusion would be *less than significant*.

Adverse Effects on Beneficial Uses of Lake Merced

Addition of supplemental water to Lake Merced to maintain lake levels to avoid impacts on water quality, biological resources, and recreational resources could affect water quality, and therefore affect the beneficial uses of the lake. However, the discharge of supplemental water to the lake would be subject to oversight by the RWQCB, which would ensure that the water quality is sufficient to protect the beneficial uses of the lake. Therefore, there would be *less-than-significant* impacts on the beneficial uses of Lake Merced as a result of supplemental water additions.

Water Quality Standards

Increased pumping at a Project well as a result of redistributed pumping under Mitigation Measure M-HY-9b (Lake Level Management for Lake Merced) could increase the size of the groundwater protection zone at that well, potentially introducing new potentially contaminating activities. However, the Primary Production and Deep Aquifers would be protected from surface-level contamination within this large groundwater protection zone in the same manner that they are under the Project groundwater protection zones. Therefore, implementation of Mitigation Measure M-HY-9b would have *less-than-significant* impacts to water quality of the groundwater in the Westside Groundwater Basin.

Groundwater Depletion

Redistribution of pumping would not affect total groundwater storage, and, therefore, impacts related to groundwater depletion would be *less than significant*.

5.16.4 References

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. *Public Health Statement – Chloromethane. CAS#: 74-87-3.* December.

Association of Bay Area Governments (ABAG). 2012. *Interactive GIS Maps Showing Dam Failure Inundation Areas*. Website accessed on June 10, 2012 at: http://quake.abag.ca.gov/dam-failure/.

California Department of Conservation (CDC), Division of Land Resource Protection, Farmland Mapping and Monitoring Program. 2011. *San Mateo County Important Farmland 2010.* October.

California Department of Public Health (CDPH), Division of Drinking Water and Environmental Management. 2000. *Drinking Water Source Assessment and Protection (DSWAP) Program.* January.

CDPH. 2011. *MCLs, DLRs, and PGHs for Regulated Drinking Water Contaminants.* July.

California Emergency Management Agency, Coastal Region (Cal EMA). 2009. *Tsunami Inundation Emergency Planning Map for the San Francisco Bay Region*.

California Geological Survey (CGS). 1987. Mineral Land Classification: Aggregate Materials in the San Francisco-Monterey Bay Area. Special Report 146, Part II.

CGS. 1996. Update of Mineral Land Classification: Aggregate Materials in the South San Francisco Bay Production-Consumption Region. DMG Open-File Report 96-03.

Carollo Engineers. 2008. *Final Recycled Water Feasibility Study.* September.

Clean Water Act. 2012. 33 US Code 1344 Permits for Dredged or Fill Material. January 3.

Daly City, City of. 2011. *Vista Grande Drainage Basin Alternatives Analysis Report Executive Summary.* Prepared by Jacobs Associates. February.

Daly City, City of. 2012. *2011 Daly City Water Quality Report.*

Department of Water Resources (DWR). 2006. *San Francisco Bay Hydrologic Region, Westside Groundwater Basin, California's Groundwater, Bulletin 118*. Updated January 20.

Driscoll, Fletcher G. 1986. *Groundwater and Wells,* 2nd ed. Published by Johnson Screens. St. Paul, Minnesota.

EDAW and Talavera & Richardson. 2003. *Lake Merced Base Map*. March 10.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. 100. January. Website accessed at: http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/pdf/delineation_manual.pdf.

FEMA. 2012. *Flood Insurance Study, San Mateo County, California*. Community-Panels 06081C0030E, 06081C0037E, 06081C0041E, 06081C0043E, and 06081C0132E. Effective on October 16.

Fugro. 2012a. *TM 10-7 (Rev., Final) SFPUC Regional Groundwater Storage and Recovery Project; South Westside Basin Third-party Well Survey and Well Interference Analysis*. April 26.

Fugro. 2012b. *Subsidence Analysis for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. May 7.

Fugro. 2012c. *TM 10-7 Supplement SFPUC Regional Groundwater Storage and Recovery Project; South Westside Basin Third-party Well Survey and Well Interference Analysis*. June 1.

Fugro. 2012d. *Response to Comment on Subsidence TM*. November 19.

Galloway, D., D.R. Jones, and S.E. Ingebritsen. 1999. *Land Subsidence in the United States, U.S. Geological Survey Circular 1182, Reston, VA*.

HydroFocus. 2011. *Technical Memorandum Westside Basin Groundwater-Flow Model: Updated Model and 2008 No Project Simulation Results*. May 6.

Kennedy/Jenks Consultants (Kennedy/Jenks). 2009a. *Proposed Production Well TW-CUP-10A, Serra Bowl Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March.

Kennedy/Jenks. 2009b. *Proposed Production Well TW-CUP-11A, Colma BART Station Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March 26.

Kennedy/Jenks. 2009c. *Proposed Production Well TW-CUP-18, Colma Boulevard Site, Colma, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March.

Kennedy/Jenks. 2009d. *Proposed Production Well TW-CUP-19, Serramonte Boulevard Site, Colma, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March.

Kennedy/Jenks. 2009e. *Proposed Production Well TW-CUP-22A, Hickey Boulevard Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* June 30.

Kennedy/Jenks. 2009f. *Proposed Production Well TW-CUP-41-4, Linear Park Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* June 30.

Kennedy/Jenks. 2009g. *Proposed Production Well TW-CUP-6, Park Plaza Meter Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* September 30.

Kennedy/Jenks. 2010a. *Lake Merced Water Quality Data Organization, Review and Analysis,* January 25.

Kennedy/Jenks. 2010b. *Final Phase 2 Monitoring Well Installation Technical Memorandum, Groundwater Storage and Recovery Project.* March 4.

Kennedy/Jenks. 2010c. *Proposed Production Well TW-CUP-3A, Lake Merced Golf Club Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010d. *Proposed Production Well TW-CUP-5, Benjamin Franklin Intermediate School Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010e. *Proposed Production Well TW-CUP-7, Garden Village Elementary School Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010f. *Proposed Production Well TW-CUP-23, Treasure Island Trailer Court Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010g. *Proposed Production Well TW-CUP-31, SSF Main Area Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010h. *Proposed Production Well TW-CUP-36-1, Funeral Home Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program*. August 25.

Kennedy/Jenks. 2010i. *Proposed Production Well TW-CUP-44-1, Golden Gate National Cemetery – Maintenance Building Site, San Bruno, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010j. *Proposed Production Well TW-CUP-44-2, Golden Gate National Cemetery – North Side Site, San Bruno, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010k. *Proposed Production Well TW-CUP-M-1, Millbrae Corporation Yard Site, San Bruno, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2012a. *Task 10.1 Technical Memorandum, Ground Modeling Analysis for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. April 18.

Kennedy/Jenks. 2012b. *Task 10.4 Technical Memorandum, Changes in Groundwater Levels and Storage for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. April 24.

Kennedy/Jenks. 2012c. *Task 10.3 Technical Memorandum, Assessment of Potential Seawater Intrusion for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. April 24.

Kennedy/Jenks. 2012d. *Task 10.2 Technical Memorandum, Assessment of Groundwater-Surface Water Interactions for the Regional Groundwater Storage and Recovery Project and the San Francisco Groundwater Supply Project*. May 1.

Kennedy/Jenks. 2012e. *Task 10.6 Technical Memorandum, Assessment of Groundwater Quality for the Regional Groundwater Storage and Recovery Project and the San Francisco Groundwater Supply Project*. May 3.

Kennedy/Jenks. 2012f. *Lake Merced Diversions and Lake Levels under Various Scenarios from Stormwater Tunnel Outflow Capacity*. May 29.

Kennedy/Jenks. 2012g. *Phase 3 Monitoring Well Installation Technical Memorandum Groundwater Storage and Recovery Project.* October.

Kirker, Chapman & Associates. 1972. *Daly City Ground Water Investigation*. April.

Lambe, T. William and Whitman, Robert V., Editors. 1969. *Soil Mechanics*. 200.

Luhdorff & Scalmanini Consulting Engineers (LSCE). 2002. *Conceptualization of the Lake-Aquifer System, Westside Ground-Water Basin, San Francisco and San Mateo Counties.* Dated March 2002, Re-released July.

LSCE. 2004. *Update on the Conceptualization of the Lake-Aquifer System Westside Groundwater Basin San Francisco and San Mateo Counties.* April.

LSCE. 2005. *Results of In-Lieu Recharge Demonstration Fall 2002 through Spring 2005.* October.

LSCE. 2006. Hydrogeologic Conditions in the Westside Basin. November.

LSCE. 2010. *TM 1 Hydrologic Setting of the Westside Basin*. May.

MWH with AGS, M. Lee, and Talavera & Richardson. 2008. *Conceptual Engineering Report (CER), Groundwater Conjunctive Use Project* prepared for Water Resources Division. November.

National Flood Insurance Program Regulations. N.d. *44 CFR Part 60.3(c)(10).*

Oakland Museum. N.d. *Upper Peninsula Watershed Finder*. Website accessed February 2, 2013 at: http://museumca.org/creeks/wb-AA-UpperPeninsula.html.

Ray, M.C., Kulongoski, J.T., and Belitz, Kenneth. 2009. *Ground-Water Quality Data in the San Francisco Bay Study Unit, 2007: Results from the California GAMA Program.*

Regional Water Quality Control Board (RWQCB). 2008. *San Francisco Bay Region, Waste Discharge Requirements for the SFPUC Drinking Water Transmission System*. *Order No.R2-2008- 0102, NPDES No. CA0038857*. December 12.

RWQCB. 2009a. *Temporary Discharge of Groundwater to the Municipal Separate Storm Sewer System in San Mateo County*. July 14.

RWQCB. 2009b. *San Francisco Bay Region, Municipal Regional Stormwater NPDES Permit, Order R2-2009-0074*. October 14.

RWQCB. 2011. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*. December 31.

RWQCB. 2012. *Revisions to Condition No. 2 in the Water Board's July 14, 2009 Conditional Approval Letter Regarding Temporary Discharge of Groundwater to the Municipal Separate Storm Sewer System (MS4) in San Mateo County*. March.

San Bruno, City of, California Water Service Company, Daly City, San Francisco Public Utilities Commission. 2012. *Final South Westside Basin Groundwater Management Plan*. July.

San Francisco, City and County of. 2008. *San Francisco Interim Floodplain Map, Citywide, Final Draft*. July.

San Francisco Department of Public Works. 2004. *Water Bodies – Lakes and Reservoirs*. Data accessed June 12, 2012.

SFPUC. 2005. *Final Draft North Westside Groundwater Basin Management Plan*, City and County of San Francisco. Prepared by LSCE. April.

SFPUC. 2010a. *2009 Annual Groundwater Monitoring Report, Westside Basin, San Francisco and San Mateo Counties, California, SFPUC, San Francisco, CA.* May.

SFPUC. 2010b. *Private Well Use*. November 24.

SFPUC. 2011a. *Lake Merced Watershed Report*. January.

SFPUC. 2011b. *2010 Annual Groundwater Monitoring Report, Westside Basin, San Francisco and San Mateo Counties, California, SFPUC, San Francisco, CA*. June.

SFPUC. 2012a. *Framework for Redistribution of Pumping as a Mitigation Measure for the San Francisco Groundwater and Groundwater Storage and Recovery Projects.* March 16.

SFPUC. 2012b. Personal Communication, Robin Cort, May 25, 2012.

SFPUC. 2012c. *Effectiveness of Mitigation Measure for Well Interference*. August 21.

SFPUC. 2012d. Personal Communication, Robin Cort, August 29.

SFPUC. 2012e. *2011 Annual Groundwater Monitoring Report, Westside Basin, San Francisco and San Mateo Counties, California, SFPUC, San Francisco, CA*. September.

SFPUC. 2012f. *Availability of Supplemental Water for Lake Augmentation*, November 16.

SFPUC. 2012g. Personal Communication, Kelley Capone, December 17.

SFPUC. 2013a. *Regional Groundwater Storage and Recovery Project Implementation of Mitigation Measure to Account for System Losses*. January 16.

SFPUC. 2013b. *Clarification of Task 10.6 Technical Memorandum Aquifer Nomenclature and Physical Processes Affecting Water Quality in the South Westside Groundwater Basin*. January 31.

SFPUC. 2013c. Personal Communication, Kelley Capone, March 6.

SFPUC. 2013d. Personal Communication, Kelley Capone, April 2.

San Mateo County. 2005. *Dam Failure Inundation Areas – San Mateo County*. April.

San Mateo County. 2010. *Streams GIS Data*. Data accessed June 15, 2012 at: http://www.co.sanmateo.ca.us/portal/site/SMC/menuitem.e4c29a0f12f966047b830e43917332a0/?vgnextoid=9122f9b53ff3b210VgnVCM1000001937230aRCRD&vgnextrefresh=1&pn=2. San Mateo County. 2012. *FEMA Flood Zone – San Mateo County*. October 1.

State Water Resources Control Board (SWRCB). 2007. *Proposed 2006 CWA Section 303(d) List of Water Quality Limited Segments Being Addressed by U.S. EPA Approved TMDLs*. June 28.

SWRCB. 2010. *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009*. July 1.

SWRCB. 2011. *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2010-0014*. February 14.

Terzaghi, K. Peck, R. B., and Mesri, G. 1996. *Soil Mechanics in Engineering Practice*, 3rd ed. Wiley-Interscience. New York. Todd, David. 1980. *Groundwater Hydrology*, 2nd ed. John Wiley & Sons. New York.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0); Final Report. ERDC/EL TR-08-28*. September.

U.S. Army Engineer Research and Development Center, Vicksburg, MS. N.d. Website accessed at: http://www.usace.army.mil/CECW/Documents/cecwo/reg/trel08-28.pdf.

U.S. Environmental Protection Agency (U.S. EPA). 1994a. *Chemical Summary for Acetaldehyde.* August.

U.S. EPA. 1994b. *Chemical in the Environment: Acetaldehyde (CAS No. 75-07-0).* August.

U.S. EPA. 2012a. *2012 Edition of the Drinking Water Standards and Health Advisories.* April.

U.S. EPA. 2012b. *Drinking Water Contaminants*. Website accessed at: http://water.epa.gov/drink/contaminants/index.cfm#Secondary. June.

USGS. 1997. *Map Showing Principal Debris Source Flow Areas in the San Francisco Bay Region*.

USGS. 2003. *Ground Water in Freshwater-Saltwater Environments of the Atlantic Coast. Circular 1262.*

WRIME. 2007. *San Bruno Groundwater Monitoring Wells: Installation and Monitoring; AB303 Project Report.*

Yates, E.B., S.N. Hamlin, and L.H. McCann. 1990. *Hydrogeology, Water Quality, and Water Budgets for Golden Gate Park and the Lake Merced Area in Western Part of San Francisco, California*. Water Resources Investigations Report 90-4080. U.S. Geological Survey, Reston, VA.

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5.17 HAZARDS AND HAZARDOUS MATERIALS

This section describes hazardous materials and other hazards to public health and safety that could result from implementation of the proposed Project. It presents the potential construction and operational impacts of the Project related to hazards and hazardous materials, as well as mitigation measures as appropriate. This section also evaluates potential impacts from regional hazards including wildfire hazards, public use airports, and geologic units containing naturally occurring asbestos.

5.17.1 Setting

The study area for hazardous materials includes possible contaminating activities (e.g., known contaminant plumes, leaking underground storage tanks, dry cleaners, gas stations) within 0.25 mile of facility sites. The study area for the evaluation of airport and airstrip impacts is within two miles of each facility site and the study area for the evaluation of wildfires and emergency access is the facility site and the nearby areas surrounding the site. This section assesses the potential for hazardous materials to be present in the soil or groundwater as a result of a previously unidentified release of hazardous materials in the study area or a documented release of hazardous materials in or near the facility sites.

5.17.1.1 Definition of Hazardous Materials

The term "hazardous materials"[1] refers to both hazardous substances and hazardous wastes. Under federal and State laws, any material, including wastes, may be considered hazardous if it is specifically listed by statute as such or if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases). The term "hazardous material" is defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

In some cases, past industrial or commercial activities on a site could have resulted in spills or leaks of hazardous materials to the ground, resulting in soil and/or groundwater contamination. Hazardous materials may also be present in building materials and released during building demolition activities. Hazardous materials may also be required as part of the operation of a project, or may be naturally present in soils such as naturally occurring asbestos (NOA) found in serpentine minerals.

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[1] The California Health and Safety Code defines a hazardous material as "any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety, or to the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, radioactive materials and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment" (Health and Safety Code, Section 25501).

If improperly handled, hazardous materials and wastes can cause public health hazards when released to the soil, groundwater, or air. The four basic exposure pathways through which an individual can be exposed to a chemical agent include: inhalation, ingestion, bodily contact, and injection. Exposure can come as a result of an accidental release during transportation, storage, or handling of hazardous materials. Disturbance of subsurface soil during construction can also lead to exposure of workers or the public from stockpiling, handling, or transportation of soils contaminated by hazardous materials from previous spills or leaks.

5.17.1.2 Potential Presence of Hazardous Materials in Soil and Groundwater

This evaluation of the potential to encounter hazardous materials in soil and groundwater is based on federal, State, and local regulatory database reviews conducted by Environmental Data Resources to identify permitted hazardous materials uses[2], environmental cases[3], and spill sites[4] within 0.25 mile of the facility sites (EDR 2008a-l). Additional information regarding identified cases was obtained from Preliminary Drinking Water Source Assessment and Protection[5] reports for facility sites, site investigation reports available from the State Water Resources Control Board (SWRCB) Geotracker database, as well as from the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) Envirostor online database (Kennedy/Jenks 2009a-g, 2010a-i; SWRCB 2012a; DTSC 2012). A list of the specific reports reviewed is provided in Section 5.17.4 (References).

Permitted hazardous material uses, environmental cases and spill sites identified within 0.25 mile of facility sites, including the well facility and associated pipelines, were characterized as to their potential to affect soil and groundwater that would be encountered during excavation for construction (i.e., subsurface conditions) at the facility sites according to the following classifications:

> **Low Potential.** Facilities that are permitted to use or store hazardous waste, but have not had a documented release, would be considered to have a low potential to affect facility sites. In addition, environmental cases that are listed as closed, because remediation or cleanup has been completed and approved by the regulatory agency, would be considered to have a low potential to affect proposed facility sites. The potential to affect subsurface conditions at a site would also be considered to be low if any of the following three factors is known to occur: (1) the direction of groundwater flow is away from the facility site construction area; (2) the lateral extent of contamination from the occurrence is known and is not present within the proposed facility site

[2] Permitted hazardous materials uses are facilities that use hazardous materials or handle hazardous wastes and comply with current hazardous materials and hazardous waste regulations.

[3] Environmental cases are sites suspected of releasing hazardous substances or sites that have required hazardous materials investigations and are identified on regulatory agency lists. These are sites where soil and/or groundwater contamination is known or suspected to have occurred.

[4] Spill sites are locations where a spill has been reported to the State or federal regulatory agencies. Such spills do not always involve a release of hazardous materials.

[5] The potential for groundwater contamination to affect drinking water quality and the potential for pumping of project wells to affect the extent of groundwater contamination is evaluated in Section 5.16, Hydrology and Water Quality.

construction area; or (3) only soil was affected by the occurrence and the potentially contaminated site is not located within the proposed facility site or immediately adjacent to the site (i.e., within 200 feet of the construction area).

Moderate Potential. The potential to affect subsurface conditions within a facility site would be considered to be moderate, and further investigation might be necessary, if the following three factors occur: (1) an off-site occurrence was reported within 0.25 mile of the facility site, but does not occur within the construction area; (2) the extent of contamination and remedial status is not known; and (3) the occurrence has affected groundwater and is located up-gradient from the facility site.

High Potential. The potential to affect subsurface conditions within the facility site would be considered to be high and further investigation would be necessary, if either of the following two factors is known to occur: (1) an active on-site occurrence exists within the proposed facility site construction area; or (2) contamination from an off-site occurrence is known to be present within the proposed facility site construction area.

Environmental cases and spill sites within 0.25 mile of proposed facility sites and their potential to affect soil and groundwater conditions in the project area during excavation are summarized in Table 5.17-1 (Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area). Environmental cases where the reporting agency has determined no further action is necessary (case closed) are not included in the table unless located within the well facility or immediately adjacent (i.e., within 200 feet) of a facility site and associated pipelines. In addition, facilities that are permitted to use or store hazardous waste, but have not had a documented release are not included in the table.

5.17.1.3 Potential Presence of Hazardous Building Materials

Demolition or renovation of older structures that contain hazardous building materials could present a public health risk if such materials were released during construction. Hazardous building materials include asbestos-containing materials[6] in roofing, siding, walls, ceilings, floors, pipes and pipe fittings; certain electrical equipment, such as transformers and fluorescent light ballasts that contain polychlorinated biphenyls (PCBs)[7] or di(2-ethylhexyl) phthalate (DEHP)[8]; fluorescent lights containing

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[6] Asbestos-containing materials were commonly used until the 1970s as a component of numerous building materials. Long-term, chronic inhalation of asbestos can cause lung diseases. Asbestos may be present in numerous building materials, such as materials used to affix floor tiles, insulation materials, shingles, roofing materials, floor tiles and acoustical ceiling materials.

[7] PCBs are known carcinogens. They are mixtures of synthetic organic chemicals with physical properties ranging from oily liquids to waxy solids. Under the Toxic Substances Control Act, the US Environmental Protection Agency (U.S. EPA) began to impose bans on PCB manufacturing and sales on most PCB uses in 1978.

[8] Between 1979 and the early 1990s, DEHP was used in place of PCB as a dielectric fluid in some fluorescent light ballasts and other electrical equipment. DEHP is classified as a probable human carcinogen by the U.S Department of Health and Human Services and as a hazardous substance by the U.S. EPA. Ballasts containing DEHP must be legally disposed of.

mercury vapors[9]; and lead-based paints. If removed during demolition of a building, these materials would require special disposal procedures.

An existing concrete-block restroom building located within the construction area at Site 1 would be demolished as part of the Project. It is conservatively assumed for purposes of this analysis, that the restroom may contain hazardous building materials that could present a public health risk during demolition, such as asbestos and lead-based paint. The concrete block building includes sinks and toilets, plumbing, and electrical lighting materials. Internal and external building materials may contain asbestos in the flooring, roofing, pipes, and pipe fittings and the building may contain lead-based paint.

An existing well, concrete pump enclosure, steel tank, and above ground piping at Site 14 within the Golden Gate National Cemetery would be demolished as part of the Project. It is conservatively assumed for purposes of this analysis, that asbestos-containing materials may be present in the roofing, flooring, ceiling, and piping. The interior and exterior paint may also contain lead.

Building demolitions or renovations would not be needed at the other facility sites; therefore, hazardous building materials at sites other than Sites 1 and 14 would not be encountered.

5.17.1.4 Potential Presence of Naturally Occurring Asbestos

Asbestos is a common name for a group of naturally occurring fibrous silicate minerals that are made up of thin, but strong, durable fibers. Asbestos is a known carcinogen and presents a public health hazard if it is present in the friable (easily crumbled) form. Naturally occurring asbestos would most likely be encountered in Franciscan ultramafic rock (primarily serpentinite) or Franciscan mélange.

As discussed in Section 5.15, Geology and Soils, the underlying geology of the facility sites consists primarily of the Colma formation, with small pockets of alluvium deposits, slope debris/ravine fill and artificial fill. Franciscan ultramafic rock, including serpentinite, is not mapped in the vicinity of the proposed facility sites. In addition, Open File Report 2000-19, entitled *A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally Occurring Asbestos*, was reviewed (CDC 2000). This report shows the areas more likely to contain natural occurrences of asbestos in California. According to this map, no ultramafic rock units occur in the areas of the proposed facility sites; therefore, naturally occurring asbestos is not likely to be encountered.

[9] Spent fluorescent lamps and tubes commonly contain mercury vapors and are considered a hazardous waste in California (California Code of Regulations [CCR], Title 22, Section 66261.50). In 2004, new regulations classified all fluorescent lamps and tubes in California as a hazardous waste, because they contain mercury. All fluorescent lamps and tubes must be recycled or taken to a universal waste handler.

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[a]	Environmental Case Summary	Potential to Affect Facility Site
Site 1	Tosco #3816 101 South Mayfair Avenue Daly City	1,000 feet northwest of Site 1	LUST	As of March 2012, the Tosco facility, located on the southwest corner of South Mayfair Avenue and Poncetta Drive, is undergoing soil investigation and remediation related to a former waste oil tank. Cleanup actions have included over excavation[b] and disposal of contaminated soil during tank removal as well as soil vapor extraction[c] for hydrocarbon removal (SWRCB 2012b). Sampling indicates that soil contamination is limited to the area surrounding the former and current tanks (no off-site migration). Only soil is affected, which, unlike contaminated groundwater, does not spread unless disturbed.	Low
Site 1	Pacific Plaza III 2099-2147 Junipero Serra Boulevard Daly City	1,200 feet southeast of Site 1	LUST	Pacific Plaza III is located on two parcels, one south of the intersection of Junipero Serra Boulevard and Westlake Avenue and another on the north side of the intersection. As of March 2012, the facility is undergoing soil investigation and remediation for arsenic, mercury and cadmium at isolated spots (SWRCB 2012c). Sampling indicates that soil contamination is limited to the area surrounding the release (minimal off-site migration) (Envirometrix 2009). Only soil is affected, which, unlike contaminated groundwater, does not spread unless disturbed.	Low
Site 2, Site 3 and Westlake Pump Station	Arco #0465 151 Southgate Avenue Daly City	1,200 feet northwest of Sites 2 and 3; 500 feet northeast of Westlake Pump Station	LUST	This facility, located at the southwest corner of Lake Merced Boulevard and Southgate Avenue, is an active gas station undergoing soil investigation and remediation as of March 2012. Cleanup actions have included overexcavation and disposal of contaminated soil during tank removal and soil vapor extraction for hydrocarbon removal (SWRCB 2012d). The documented groundwater flow direction at the Arco site varies from the northeast to south-southwest generally away from Sites 2 and 3 and the Westlake Pump Station (Stantec 2012). Sampling indicates that contamination is limited to the area surrounding the release (no off-site migration).	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 2, Site 3 and Westlake Pump Station	Southgate Cleaners 183 Southgate Avenue Daly City	1,200 feet northwest of Sites 2 and 3; 500 feet northeast of Westlake Pump Station	LUST	Southgate Cleaners, located at the southwest corner of Lake Merced Boulevard and Southgate Avenue near the Arco Station described above, is a former dry cleaning site undergoing soil and groundwater investigation for tetrachloroethylene (also known as perchloroethylene or PCE). As of March 2012, ongoing investigation work includes sub-slab soil and groundwater sampling on-site and in the vicinity of North Coronado Boulevard (SWRCB 2012e). The documented groundwater flow direction at the Arco #0465 site, which is adjacent to the Southgate Cleaners site, is toward the northeast to east, away from Sites 2 and 3 and the Westlake Pump Station (Treadwell & Rollo 2010). Sampling indicates that soil contamination is limited to the area surrounding the release (no off-site migration).	Low
Site 5	BP #11202 (Former) 3001 Junipero Serra Boulevard Daly City	450 feet north of Site 5	LUST	As of March 2012, this BP facility, located at the northeast corner of Junipero Serra Boulevard and San Pedro Road, is an active gas station undergoing soil investigation and remediation. Cleanup actions have included overexcavation and disposal of contaminated soil during tank removal as well as pumping and treatment of groundwater from an on-site monitoring well (SWRCB 2012f). The documented groundwater flow direction is to the north-northeast, away from Site 5 (Antea Group 2011). Sampling indicates that the groundwater plume is stable and limited to the area surrounding the release (no off-site migration).	Low
Site 5	Exxon 7-0207 1690 Sullivan Avenue Daly City	850 feet northwest of Site 5	LUST	Exxon 7-0207, located at the northwest corner of Sullivan Avenue and Pierce Street on the west side of I-280, is an active gas station undergoing soil investigation and remediation as of March 2012. Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal and soil vapor extraction for hydrocarbon removal (SWRCB 2012g). The documented groundwater flow direction across the site is east to east-northeast , away from Site 5 (Cardno ERI 2011; SWRCB 2012g). Sampling indicates that soil and groundwater contamination is limited to the area surrounding the release (no off-site migration).	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 6	L. Bocci and Sons 7778 Mission Street Colma	800 feet east of Site 6	LUST	This facility, located near the Colma BART station at the intersection of Mission Street and Albert M. Tegla Boulevard, is a manufacturer of cemetery memorial monuments and is undergoing soil and groundwater investigation as of March 2012. Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal (SWRCB 2012h). The documented groundwater flow direction is to the west-northwest and northwest, toward the Site 6 water connection pipeline. Sampling indicates that soil and groundwater contamination is limited to the area surrounding the release (minimal off-site migration) (TEC Environmental 2010a).	Low
Site 9	Treasure Island Trailer Court 1609 Old Mission Road South San Francisco	At least 50 feet northwest of Site 9; actual location of contaminant release within the trailer court is unknown	LUST	The trailer court, located on the west side of Mission Road, is a former LUST case site that has been closed since 1993, indicating that cleanup has been completed and residual contamination, if any, is low. Cleanup actions included overexcavation and disposal of contaminated soil during tank removal in 1991 (SWRCB 2012i). Database information regarding the environmental case indicates that only soil was affected, which, unlike contaminated groundwater, does not spread unless disturbed.	Low
Site 10 and Site 18 (Alternate)	WESCO Management 117 Hickey Boulevard South San Francisco	150 feet east of Site 10 and 1,200 feet northeast of 18 (Alternate)	LUST	The WESCO facility, located near Hickey Boulevard and Camaritas Avenue, is a former LUST case site that has been closed since 2000, indicating that cleanup has been completed and residual contamination, if any, is low. Cleanup actions included overexcavation and disposal of contaminated soil during tank removal in 1989 (SWRCB 2012j). Database information regarding the environmental case indicates that only soil was affected, which, unlike contaminated groundwater, does not spread unless disturbed.	Low
Site 11	Contreras Painting 1090 Grand Avenue South San Francisco	1,000 feet north of Site 11	Cortese	Contreras Painting, located near Grand Avenue and Mission Road, is a former residence that underwent soil and groundwater investigation for alleged unauthorized discharges of paint and solvent onto the exposed ground surface (SWRCB 2012k). Cleanup actions included excavating a trench alongside a house and in other hot spot areas on the property. The case site has been closed since June 2011, indicating that cleanup has been completed and residual contamination, if any, is low.	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 12 and Site 19 (Alternate)	Chevron, Former Standard Oil 972 El Camino Real South San Francisco	600 feet northeast of Site 12 and Site 19 (Alternate)	LUST	This facility, located on the east side of El Camino Real south of Westborough Boulevard, is a former gas station that underwent soil and groundwater investigation. No cleanup actions have been completed at the facility to date (SWRCB 2012l). The documented groundwater flow direction was to the east, away from Sites 12 and 19 (Alternate). Sampling indicates that soil and groundwater contamination was limited to the area surrounding the release (no off-site migration). The case site has been closed since March 2012, indicating that cleanup has been completed and residual contamination, if any, is low (San Mateo County Health System 2012).	Low
Site 12	Chevron 9-5669 698 El Camino Real South San Francisco	250 feet southeast of water connection pipeline for Site 12	LUST	This facility, located at the southeast corner of El Camino Real and West Orange Avenue, is a former LUST case site that was closed in 2007, indicating that cleanup has been completed and residual contamination, if any, is low. Cleanup actions have included overexcavation and disposal of contaminated soil during tank removal in 1994 (SWRCB 2012m).	Low
Site 12	Chevron 9-0248 687 El Camino Real South San Francisco	150 feet south of water connection pipeline for Site 12	LUST	This facility, located at the southwest corner of El Camino Real and West Orange Avenue, is a former LUST case site that was closed in 2001, indicating that cleanup has been completed and residual contamination, if any, is low. Information on cleanup actions was not documented in available database information (SWRCB 2012n).	Low
Site 13	Pacific Bell 1465 Huntington Avenue South San Francisco	<50 feet east of water connection pipeline along Huntington Avenue for Site 13	LUST	Pacific Bell, located on the east side of Huntington Avenue, is a former LUST case site that has been closed since 2010, indicating that cleanup has been completed and residual contamination, if any, is low. Cleanup actions included overexcavation and disposal of contaminated soil during tank removal in 1985, as well as soil vapor and dual phase extraction[(d)] for removal of hydrocarbons from soil and groundwater (SWRCB 2012o). The documented groundwater flow at the Pacific Bell site is toward the northeast, away from the water connection pipeline along Huntington Avenue for Site 13, as well as away from Site 13 itself (San Mateo County Health System 2010). The westernmost monitoring well at the Pacific Bell site nearest Huntington Avenue was historically non-detect for hydrocarbons. According to the case closure letter for the facility, the shallowest groundwater depth recorded at the site was approximately 21 feet below ground surface (bgs), which is below the depth of the proposed well facility pipeline trench (San Mateo County Health System 2010).	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 13	UNOCAL #6980 192 El Camino Real South San Francisco	1,000 feet west of water connection pipeline along Huntington Avenue for Site 13	LUST	The UNOCAL site, located at the northeast corner of El Camino Real and South Spruce Boulevard, is a former gas station undergoing soil and groundwater investigation and remediation as of March 2012. Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal in 1992 (SWRCB 2012p). The documented groundwater flow direction in 2010 ranged from south to southwest, away from Site 13 (Arcadis 2010). Sampling indicates that soil and groundwater contamination is limited to the area surrounding the release (no off-site migration).	Low
Site 13	Tony's Services 209 El Camino Real South San Francisco	1,200 feet west of water connection pipeline along Huntington Avenue for Site 13	LUST	This facility, located at the northwest corner of El Camino Real and Hazelwood Drive, is a gas station undergoing soil and groundwater investigation and remediation as of March 2012. Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal, soil vapor extraction, and pumping and treatment of groundwater (SWRCB 2012q). The documented groundwater flow direction is toward the west, away from Site 13 (AEI Consultants 2011).	Low
Site 13	Spruce Car Wash 246 South Spruce Avenue South San Francisco	650 feet northeast of Site 13	LUST	Spruce Car Wash, located on the north side of South Spruce Avenue near Myrtle Avenue, is an operating fuel service station and car wash undergoing soil and groundwater investigation and remediation as of March 2012 (SWRCB 2012r). Cleanup actions to date have included free product removal and pilot testing of vacuum enhanced groundwater extraction (GES 2011). Sampling indicates that soil and groundwater contamination is limited to the area surrounding the release with some off-site migration beneath Sneath Lane. The documented groundwater flow direction is toward the southeast away from Site 13 (GES 2010).	Low
Site 13	Coyne Cylinder Company 224 Ryan Way South San Francisco	1,000 feet east of Site 13	LUST	This facility, located on the north side of Ryan Lane near Victory Avenue, is undergoing soil and groundwater investigation related to a former acetone storage tank as of March 2012 (SWRCB 2012s). Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal, as well as pumping and treating groundwater from an on-site well (Treadwell & Rollo 2008). Sampling indicates that soil and groundwater contamination is limited to the area surrounding the release (no off-site migration). The documented groundwater flow direction is toward the south, away from Site 13 (Treadwell & Rollo 2008).	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 13	Former Goss-Jewett Facility 416 Browning Way South San Francisco	650 feet east of water connection pipeline along Huntington Avenue for Site 13; 1,000 feet southeast of Site 13 well facility	CERCLA	This facility, located on the north side of Browning Way, is undergoing soil and groundwater investigation related to PCE contamination from a former dry cleaning business as of March 2012 (SWRCB 2012t). Based on monitoring data collected in October 2012, the groundwater flow direction appears to be to the north-northeast, which is away from Site 13 (KCE Matrix 2012). Recent sampling indicates that soil and groundwater contamination is limited to the area surrounding the release (minimal off-site migration) and appears to be essentially defined (KCE Matrix 2012). The PCE plume is heading to the north and northeast, away from Huntington Avenue and Site 13, in part due to the higher elevation of the existing trail to the west of the facility that prevents off-site flow to the west (RWQCB 2012).	Low
Site 13	290 South Maple Avenue South San Francisco	850 feet east of water connection pipeline along Huntington Avenue for Site 13; 1,200 feet southeast of Site 13 well facility	LUST CERCLIS	This facility, located on the northwest corner of South Maple Avenue and Browning Way, is undergoing soil and groundwater investigation related to PCE contamination from a former dry cleaning business as of March 2012. Cleanup actions to date have included excavation and disposal of contaminated soil (SWRCB 2012u). The documented groundwater flow direction at the site in September 2012 was toward the northeast, away from Huntington Avenue and Site 13 (GEI 2012).	Low
Site 13	Pellegrini Bros Wines Inc. 272 South Maple Avenue South San Francisco	1,000 feet east of water connection pipeline along Huntington Avenue for Site 13	LUST	This facility, located on the west side of South Maple Avenue, is undergoing soil and groundwater investigation and remediation related to hydrocarbons released from a former gasoline tank as of March 2012 (SWRCB 2012v). Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal, as well as installation of an ozone and hydrogen peroxide injection remediation system (TEC Environmental 2011). The documented groundwater flow direction is toward the northeast, away from Site 13. Sampling indicates that soil and groundwater contamination is limited to the area surrounding the release (no off-site migration) (TEC Environmental 2011).	Low
Site 15	Golden Gate National Cemetery 1300 Sneath Lane San Bruno	100 feet north of pipeline connection for Site 15	LUST	This facility, located on the north side of Sneath Lane at the Cemetery Operation and Maintenance Facility, is a former LUST case site that was closed in 2005, indicating that cleanup has been completed and residual contamination, if any, is low. Cleanup actions included overexcavation and disposal of contaminated soil during tank removal in 1989 (San Mateo County Health Department 2005). Database information regarding the environmental case indicates that only soil was affected, which, unlike contaminated groundwater, does not spread unless disturbed (SWRCB 2012w).	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 16	Olympian Service Station 1009 El Camino Real Millbrae	200 feet west of the western end of the alternate water connection pipeline for Site 16	LUST	The Olympian Service Station, located on the northwest corner of El Camino Real and Meadow Glen Avenue, is undergoing soil and groundwater investigation and remediation related to former gasoline and diesel tanks. As of March 2012, cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal, and dual phase water and vapor extraction (SWRCB 2012x). A work plan for enhanced interim remediation using a bio-organic catalyst to enhance contaminant removal rates and accelerate contaminant bioattenuation is currently under review. The documented groundwater flow at the service station primarily is toward the southeast (on the service station property) to the east-northeast off-site, in the general direction of the proposed alternate water connection at Site 16 (Pangea 2011). Sampling indicates that the methyl tert-butyl ether (MTBE) plume in shallow groundwater extends across the intersection of El Camino Real to within approximately 200 feet of the western end of the alternate water connection pipeline for Site 16 (Pangea 2011). During the most recent site investigations, groundwater was encountered across El Camino Real to the west of the alternate water connection at depths ranging from 5.6 to 11.8 feet bgs. The site has moderate potential because the site is located within 0.25 miles of Site 16, the extent of contamination is not known, and the occurrence up gradient of Site 16.	Moderate
Site 16	San Francisco Water Department (SFWD) 1000 El Camino Real Millbrae	500 feet north of pipeline connections for Site 16	LUST	As of March 2012, the SFWD facility, located on the northeast corner of El Camino Real and Meadow Glen Lane, is undergoing soil and groundwater investigation and remediation related to an unintentional release of diesel from a backup generator in September 2010 (SWRCB 2012y). The majority of the spill was contained within the SFWD's corporation yard property, with approximately 10 to 15 gallons of diesel migrating onto the Caltrain right of way (GRI 2011). Cleanup actions to date have included removal and disposal of spilled diesel, storm drain cleaning and soil excavation in the Caltrain right of way. Sampling indicates that soil contamination is limited to a depth of eight feet in the area surrounding the release, approximately 500 feet from the well facility site.	Low
Site 16	Jiffy Cleaners 512 Magnolia Avenue Millbrae	1,200 feet south of alternate water connection pipeline for Site 16	LUST	As of March 2012, the Jiffy Cleaners facility, located at the northeast corner of Magnolia Avenue and Taylor Boulevard, is undergoing soil and groundwater investigation and remediation related to PCE contamination from a former dry cleaning facility (SWRCB 2012z). The documented groundwater flow direction at the cleaners is toward the east, away from Site 16. (TRC 2009).	Low

TABLE 5.17-1
Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area

Site	Environmental Case within 0.25 Mile	Approximate Distance from Facility Site Construction Area	Regulatory List[(a)]	Environmental Case Summary	Potential to Affect Facility Site
Site 16	Jerair Shell Station 491 El Camino Real Millbrae	1,200 feet south-southeast of alternate water connection pipeline for Site 16	LUST	As of March 2012, this facility, located on the southwest corner of EI Camino Real and Taylor Boulevard, is undergoing soil and groundwater investigation and remediation related to hydrocarbons released from former tanks. Cleanup actions to date have included overexcavation and disposal of contaminated soil during tank removal (SWRCB 2012aa). The documented groundwater flow is toward the east-southeast, away from Site 16 (TEC Environmental 2010b).	Low

Notes:

(a) Regulatory Lists: LUST (Leaking Underground Storage Tank List); Cortese (Cal/EPA List); CERCLIS (Comprehensive Environmental Response, Compensation, and Liability Information System). These lists are described in more detail in Section 5.17.2 (Regulatory Framework). Regulatory lists searched in April and May 2011, and again in March 2012.

(b) Overexcavation is a technique for the expedited corrective action of a limited release from an underground storage tank. Specifically, if a release is identified during the removal of a tank, the soil surrounding the tank pit area is often excavated to remove the contaminated materials.

(c) Soil vapor extraction is a remedial technology that reduces concentrations of volatile constituents in petroleum products adsorbed to soils in the unsaturated (vadose) zone.

(d) Dual phase extraction is a remedial technology that uses pumps to remove various combinations of contaminated groundwater, separate-phase petroleum product and hydrocarbon vapor from the subsurface.

5.17.1.5 *Fire Hazards*

The California Department of Forestry and Fire Protection (CAL FIRE) identifies fire hazard areas and fire-threatened communities at the wildland urban interface. The facility sites are located on urban land in non-fire hazard severity zones (CAL FIRE 2008).

The SFPUC maintains Lake Merced as a nonpotable emergency water supply for the City and County of San Francisco (CCSF) to be used for firefighting or sanitation purposes if no other sources of water are available (SFPUC 2011). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the City's drinking water distribution system to maintain firefighting, basic sanitary (e.g., toilet flushing), and other critical needs. In the event of such an emergency, residents would be directed to boil tap water before consuming it.

5.17.1.6 *Airports*

The nearest public airport to the facility sites is San Francisco International Airport (SFO), located approximately 1,600 feet northeast from Site 16 in Millbrae as measured from the proposed well facility to the SFO property boundary. In addition to Site 16, all proposed well facility sites in South San Francisco and San Bruno are within two miles of SFO and are located within an area covered by the San Mateo County Airport Land Use Plan. As a result, the well facility sites in Millbrae, South San Francisco and San Bruno would be subject to airport related height limitations and other airspace protection concerns for SFO. The other facility sites are not located within an area covered by an airport land use plan or within two miles of a public airport. No private airstrips occur in the project vicinity.

5.17.1.7 *Hazardous Chemicals*

Hazardous materials, such as fuels, motor oils, paints, and compressed gases, would be used during construction. While these are commonly used materials, if handled improperly, they could endanger workers and the public. In addition, a variety of commonly used chemicals would be used during operation of the chemical and filtration system for disinfection and water treatment; see Table 3-4 (Maximum Volume of Chemical Storage) in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types).

5.17.2 Regulatory Framework

Hazardous materials and hazardous wastes are subject to numerous federal, State, and local laws and regulations intended to protect public health and safety and the environment. The U.S. Environmental Protection Agency (U.S. EPA), Cal/EPA, DTSC, Regional Water Quality Control Boards (RWQCB), and Bay Area Air Quality Management District (BAAQMD) are the primary agencies that enforce these regulations. The main focus of the federal Occupational Safety and Health Administration (Fed/OSHA) and California Occupational Safety and Health Administration (Cal/OSHA) are to prevent work-related injuries and illnesses, including those from exposures to hazardous materials. CAL FIRE implements fire safety regulations. In accordance with Chapter 6.11 of the California Health and Safety Code (CHSC, Section 25404, et seq.), local regulatory agencies enforce many federal and State regulatory programs through the Certified Unified Program Agency (CUPA) program, including:

- Hazardous Materials Business Plans (HMBPs) (Chapter 6.95 of the Health and Safety Code, Sections 25501 et seq.);
- State Uniform Fire Code requirements (Section 80.103 of the Uniform Fire Code as adopted by the State Fire Marshal pursuant to Health and Safety Code Section 13143.9);
- Underground storage tanks (Chapter 6.7 of the Health and Safety Code, Sections 25280 et seq.);
- Aboveground storage tanks (Health and Safety Code Section 25270.5[c]); and
- Hazardous waste generator requirements (Chapter 6.5 of the Health and Safety Code, Sections 25100 et seq.).

The San Mateo County Health Department, Environmental Health Division, is the CUPA agency for oversight of hazardous materials storage and cleanup of underground fuel leaks in San Mateo County.

5.17.2.1 Use and Storage of Hazardous Materials and Fuels

State and federal laws require detailed planning and management to ensure that hazardous materials are properly handled, used, stored, and disposed of, and, in the event that such materials are accidentally released, to reduce risks to human health and the environment. Businesses that handle specified quantities of chemicals are required to submit a HMBP in accordance with community right-to-know laws. This plan allows local agencies to plan appropriately for a chemical release, fire, or other incidents. Hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; dictate the management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal and transportation; and identify hazardous wastes that cannot be disposed of in landfills.

Chapter 6.95 of the CHSC (§ 25503 et seq.) and Title 19 of the California Code of Regulations (CCR) (§ 2729 et seq.), require any business that handles a hazardous material or mixture containing a hazardous material in reportable quantities to establish and implement a HMBP for emergency response to a release or threatened release of a hazardous material. The minimum reportable quantities are 500 pounds for a solid, 55 gallons for a liquid, and 200 cubic feet for a gas at standard temperature and pressure. Some acutely hazardous materials are reportable at much decreased quantities. Businesses in the Project area submit their plans to the appropriate CUPA. The HMBP must identify the type of business, location, emergency contacts, emergency procedures, mitigation plans, and chemical inventory at each location.

Certain chemicals that could be released to the environment and might affect surrounding communities are regulated by California's Accidental Release Prevention Law (CalARP). This State law and similar federal laws (i.e., the Emergency Preparedness and Community Right-to-Know Act [EPCRA], the Clean Air Act) allow local oversight of both the State and federal programs. The State and federal laws are similar in their requirements; however, the California threshold planning quantities for regulated substances are lower than the federal values. Local agencies may set lower reporting thresholds or add additional chemicals to the program. Beginning in 1997, CalARP has been implemented by the local CUPAs. Any business where the maximum quantity of a regulated substance exceeds the specified threshold quantities must register with the CUPA as a manager of regulated substances.

Ammonia is a regulated substance under State and federal risk management regulations. In accordance with CalARP regulations, preparation of a risk management plan (RMP) is required for the storage of regulated substances above threshold quantities. The listed CalARP threshold value for ammonia is 500 pounds (solid form). The ammonia component of the maximum volume of aqueous ammonia that would be stored at the proposed well facilities is below the CalARP threshold[10]. Therefore, storage of the ammonia at the facility sites would not be regulated under CalARP. Sod.ium hypochlorite, sodium hydroxide, and sodium fluoride are not regulated substances under CalARP.

The Construction General Permit which is issued under State Water Resources Control Board Order No. 2009-0009-DWQ, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities, applies to construction that in total disturbs one or more acres. This permit includes specific requirements for the safe storage and handling of chemicals. The best management practices (BMPs) required by the permit include protection measures for the temporary onsite storage of diesel fuels or other hazardous materials used during construction, including requirements for secondary containment and berming to contain a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system. All equipment and materials storage would need to be routinely inspected for leaks and records maintained for documenting compliance with the storage and handling of hazardous materials. In addition, the Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) for project-related construction activities at construction sites that disturb one or more acre of land.

Aboveground Storage of Petroleum Products

The Aboveground Petroleum Storage Act of 1990 requires facilities storing petroleum products in a single tank greater than 1,320 gallons, or facilities storing petroleum in aboveground tanks or containers with a cumulative storage capacity of greater than 1,320 gallons, to file a storage statement with the SWRCB and prepare a spill prevention, control, and countermeasure plan. The plan must identify appropriate spill containment or equipment for diverting spills from sensitive areas, as well as discuss facility-specific requirements for the storage system, inspections, recordkeeping, security, and personnel training. The SWRCB requires registration of an aboveground fuel storage tank at a construction site only if the tank is 20,000 gallons or larger, or if the aggregate volume of aboveground petroleum storage is over 100,000 gallons, which would not be applicable to the Project, since no fuel storage tanks are proposed as part of the Project. For smaller temporary tanks used during construction, methods to control releases and measures to clean up an accidental release and prevent degradation of water quality are included in

[10] Maximum of 116 gallons aqueous ammonia x 8.35 pounds per gallon (weight of water) x 0.93 (specific gravity of aqueous ammonia solution) x 0.19 (19% ammonia in solution) = 171 pounds of Ammonia.

Mitigation Measure HY-1 (Develop and Implement an Erosion and Sediment Control Plan) as described in Section 5.16, Hydrology and Water Quality.

Underground Storage Tanks

State laws governing underground storage tanks (USTs) specify requirements for permitting, monitoring, closure, and cleanup of these facilities. Regulations set forth construction and monitoring standards for existing tanks, reporting requirements for any releases, and closure requirements. In the Project area, the San Mateo County Environmental Health Division has regulatory authority for permitting, inspection, and removal of USTs. Any entity proposing to remove a UST must submit a closure plan to the County prior to tank removal. Upon approval of the UST closure plan, the County would issue a permit, oversee removal of the UST, require additional subsurface sampling if necessary, and issue a site closure letter when the appropriate removal and/or remediation has been completed. No USTs are proposed as part of the Project; however, these regulations are relevant due to the number of USTs in the vicinity of the Project with the potential to affect subsurface conditions at project sites.

5.17.2.2 Hazardous Materials Transportation

Caltrans regulates hazardous materials transportation on all interstate roads. Within California, the State agencies with primary responsibility for enforcing federal and State regulations and for responding to transportation emergencies are the California Highway Patrol (CHP) and Caltrans. Together, federal and State agencies determine driver-training requirements, load labeling procedures, and container specifications for vehicles transporting hazardous materials.

5.17.2.3 Hazardous Structural and Building Components

Numerous State and federal laws and regulations control exposure to hazardous building components, including asbestos and lead-based paint.

Lead in Construction

Cal/OSHA's Lead in Construction Standard (8 CCR 1532.1) requires project proponents to develop and implement a lead compliance plan when lead-based paint would be disturbed during construction. The plan must describe activities that could emit lead, methods for complying with the standard, safe work practices, and a plan to protect workers from exposure to lead during construction activities. Cal/OSHA requires 24-hour notification if more than 100 square feet of lead-based paint would be disturbed.

Abatement of Asbestos in Buildings and Structures

Regulatory requirements for asbestos abatement are set forth in CHSC Section 19827.5, as well as Title 8 of the CCR, Sections 341.6 through 341.14 and 1529. The BAAQMD also provides requirements for abatement of asbestos-containing materials.

CHSC Section 19827.5, adopted January 1, 1991, requires that local agencies not issue demolition or alteration permits until an applicant has demonstrated compliance with notification requirements under applicable federal regulations regarding hazardous air pollutants in the Bay Area, including asbestos. BAAQMD is vested by the California legislature with authority to regulate airborne pollutants, including asbestos. BAAQMD regulations pertaining to abatement of asbestos-containing materials are specified in Regulation 11, Hazardous Pollutants, Rule 2, Asbestos Demolition, Renovation, and Manufacture.

In accordance with this regulation, BAAQMD must be notified 10 days in advance of any proposed demolition or abatement work. This notification must include the names and addresses of operations and persons responsible; description and location of the structure to be demolished/altered, including size, age and prior use; approximate amount of friable asbestos; scheduled starting and completion dates of demolition or abatement; nature of planned work and methods to be employed; procedures to be employed to meet BAAQMD requirements; and the name and location of the waste disposal site to be used. In accordance with this regulation, a survey must be conducted to identify asbestos-containing materials prior to demolition. Containment must be provided during work that disturbs asbestos-containing materials and there must be no visible emissions to the outside air from demolition operations that involve asbestos-containing materials. The contractor must use methods specified in the regulations for control of emissions, such as wetting of exposed asbestos-containing materials; use of a high-efficiency particulate air (HEPA) filter within an exhaust, ventilation, and control system; or removal in an entirely contained chute. In addition, asbestos-containing materials must be removed prior to demolition and the work site must be cleaned of asbestos materials.

Contractors who conduct asbestos related work activities (including abatement) in buildings and structures must follow State regulations contained in 8 CCR Section 1529 and 8 CCR Sections 341.6 through 341.14 where the work would involve 100 square feet or more of asbestos-containing material. Specifically, under 8 CCR Section 341.6, Cal/OSHA must be notified of asbestos-related work activities to be performed. Contractors must be licensed as an Asbestos Qualified Contractor by the Contractors Licensing Board of the State of California, and registered as such with Cal/OSHA. In addition, a one-time report of the use of carcinogens must be made to Cal/OSHA under 8 CCR Chapter 4, Section 5203. The owner of the property where abatement is to occur must have a Hazardous Waste Generator Number assigned by and registered with the DTSC. The contractor and hauler of the material are required to file a Hazardous Waste Manifest that details the hauling of the material from the site and its disposal. Title 8 CCR Section 1529(b) defines asbestos-containing material as any material that contains more than one percent asbestos.

PCBs and Universal Wastes

Regulatory requirements for disposal of PCB wastes are set forth in 40 CFR Part 761. These requirements include identifying and labeling PCB-contaminated equipment prior to demolition, completion of a Notification of PCB Activity Form, obtaining a PCB disposal identification number, and disposing of waste at an approved PCB waste disposer under hazardous waste manifests. Regulatory requirements for disposal of universal wastes, such as mercury-containing non-incandescent lamps, batteries and other hazardous wastes commonly found in building components and equipment, are set forth in the Department of Toxic Substance Control's Universal Waste Rule (22 CCR Sections 66261.9 and 66273.1

thru 66273.90). These requirements include guidelines for removing and recycling or disposing of such wastes.

5.17.2.4 Soil and Groundwater Contamination

In San Mateo County, remediation of contaminated sites is generally performed under the oversight of the San Mateo County Environmental Health Division, or in some instances, the RWQCB and/or the DTSC. At sites where contamination is suspected or known to have occurred, the site owner is required to perform a site investigation and conduct site remediation, if necessary. Site remediation or development may also be subject to regulation by other agencies. For example, if a project required dewatering near a hazardous waste site, the project sponsor might be required to obtain a permit from the municipal sewer agency before discharging the water to the sewer system, or a National Pollutant Discharge Elimination System (NPDES) permit from the RWQCB before discharging to the storm water collection system.

5.17.2.5 Worker Safety Requirements

Fed/OSHA and Cal/OSHA are the agencies responsible for assuring worker safety in the handling and use of chemicals in the workplace. The federal regulations pertaining to worker safety are contained in Title 29 of the Code of Federal Regulations (CFR), as authorized in the Occupational Safety and Health Act of 1970. They provide standards for safe workplaces and work practices, including standards relating to hazardous materials handling. In California, Cal/OSHA assumes primary responsibility for developing and enforcing workplace safety regulations; Cal/OSHA standards are generally more stringent than federal regulations.

The State regulations concerning the use of hazardous materials in the workplace are included in Title 8 of the CCR, which contain requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal/OSHA also enforces hazard communication program regulations, which contain worker safety training and hazard information requirements, such as procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees.

At sites known or suspected to have soil or groundwater contamination, construction workers must receive training in hazardous materials operations and a site health and safety plan must be prepared. The health and safety plan establishes policies and procedures to protect workers and the public from exposure to potential hazards at the contaminated site.

5.17.2.6 Control of Asbestos during Construction

The California Air Resources Board (CARB) has adopted an asbestos Airborne Toxic Control Measure (ATCM) for construction and grading operations (CARB 2002). The ATCM requires the use of best available dust mitigation measures to prevent offsite migration of asbestos-containing dust from road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas of ultramafic rock, serpentine, or asbestos. The regulation is implemented by the BAAQMD.

For construction projects located in areas where ultramafic rock (primarily serpentinite) is mapped and that would disturb one acre or less of land, the ATCM requires the site operator to implement standard dust mitigation measures before construction begins, and to maintain each measure throughout the duration of the construction project. For construction activities that would disturb more than one acre of asbestos-containing materials, project sponsors are required to prepare an asbestos dust mitigation plan specifying measures that would be taken to ensure that no visible dust crosses the property boundary. The asbestos dust mitigation plan must be submitted to and approved by the BAAQMD prior to the beginning of construction. The site operator must ensure the implementation of all measures throughout the construction project. In addition, the BAAQMD could require air monitoring for offsite migration of asbestos dust during construction activities and might change the plan on the basis of the air monitoring results. As discussed in Section 5.17.1.4 (Potential Presence of Naturally Occurring Asbestos) mapping does not indicate the presence of ultramafic rock units in the areas of the proposed facility sites; therefore, the Asbestos ATCM would not apply to the proposed Project.

5.17.2.7 Risk of Fires

The California Public Resources Code (PRC) sets forth fire safety regulations that include the following:

- Earthmoving and portable equipment with internal combustion engines must be equipped with a spark arrestor to reduce the potential for igniting a wildland fire (PRC Section 4442).
- Appropriate fire suppression equipment must be maintained during the highest fire danger period – from April 1 to December 1 (PRC Section 4428).
- On days when a burning permit is required, flammable materials must be removed to a distance of 10 feet from any equipment that could produce a spark, fire, or flame, and the construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427).
- On days when a burning permit is required, portable tools powered by gasoline-fueled internal combustion engines must not be used within 25 feet of any flammable materials (PRC Section 4431).

As noted in Section 5.17.1.5 (Fire Hazards), the proposed Project would be located on urban land in zones designated as "Non-Fire Hazard" by CAL FIRE (CAL FIRE 2008).

5.17.2.8 Uniform Fire Code

The Uniform Fire Code, Article 80, includes specific requirements for the safe storage and handling of hazardous materials. These requirements are intended to reduce the potential for a release of hazardous materials and for mixing of incompatible chemicals and specify the following specific design features to reduce the potential for a release of hazardous materials that could affect public health or the environment:

- Separation of incompatible materials with a noncombustible partition;
- Spill control in all storage, handling, and dispensing areas; and
- Separate secondary containment for each chemical storage system. The secondary containment must hold the entire contents of the tank, plus the volume of water needed to supply the fire suppression system for a period of 20 minutes in the event of catastrophic spill.

5.17.2.9 Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, State, and local government, and private agencies. Responding to hazardous materials incidents is a part of this plan. The plan is administered by the State Office of Emergency Services (OES), which coordinates the responses of other agencies. The San Mateo County Emergency Response Team (ERT) coordinates response to hazardous materials emergencies within the project area. ERT members respond and work with local fire and police agencies, emergency medical providers, CHP, the California Department of Fish and Wildlife, and Caltrans. San Mateo County, Daly City, Colma, South San Francisco, San Bruno, and Millbrae all have adopted emergency response plans. The emergency response plans do not designate specific evacuation routes within these cities (Colma Fire Department 2012; NCFA 2012; San Mateo County Sherriff's Office of Emergency Services 2012; RWQCB 2012; South San Francisco Fire Department 2012).

5.17.2.10 Airport Operations

The Federal Aviation Administration (FAA) has jurisdiction over airspace in the U.S. FAA requirements as they relate to land uses near SFO are described below.

The Federal Aviation Regulations (FAR) provide criteria for evaluating the potential effects of obstructions on the safe and efficient use of navigable airspace within approximately two to three miles of airport runways and approximately 9.5 miles from the end of high-traffic runways that have a precision instrument approach. FAA requires notification of proposed construction or alteration projects identified by the following airspace obstruction criteria provided in FAR Part 77:

- Any construction or alteration of more than 200 feet in height above the ground level at its site.
- Any construction or alteration of greater height than an imaginary surface extending outward 100 feet and upward one foot for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of an airport with at least one runway more than 3,200 feet in actual length.
- Any construction or alteration of greater height than an imaginary surface extending outward 50 feet and upward one foot for a horizontal distance of 10,000 feet from the nearest point of the nearest runway of an airport with its longest runway no more than 3,200 feet in actual length.

Under the California State Aeronautics Act, local governments have the authority to protect airspace as defined by criteria provided in FAR Part 77. The City/County Association of Governments of San Mateo is the Airport Land Use Commission (ALUC) and has adopted the San Mateo County Comprehensive Airport Land Use Plan, which incorporates and in some cases exceeds the criteria provided in FAR Part 77 (C/CAG 1996). Other airspace protection concerns described in FAR Part 77 include avoiding land uses in the airport vicinity that would create hazards to flight such as electrical interference, lighting, glare, smoke, and bird strikes.

5.17.3 Impacts and Mitigation Measures

5.17.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant impact on hazards and hazardous materials if it were to:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school.
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.
- Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and would result in a safety hazard for people residing or working in the project area.
- Be located within the vicinity of a private airstrip and would result in a safety hazard for people residing or working in the project area.
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
- Expose people or structures to a significant risk of loss, injury, or death involving fires.

5.17.3.2 Approach to Analysis

This impact analysis focuses on the potential to encounter hazardous substances in soil and groundwater during construction and the potential to discharge hazardous materials during Project operations.[11] The evaluation was performed in light of current conditions at the proposed facility sites, information in the environmental database, site investigation reports, applicable regulations and guidelines, and proposed construction activities and operations. The analysis also addresses the potential for the Project to encounter hazardous materials during building demolition activities; result in a release of hazardous materials from construction equipment; interfere with an adopted emergency response plan or emergency evacuation plan; create fire hazards; or result in a release of hazardous materials during operation. Each potential impact is assessed in terms of the applicable regulatory requirements, and mitigation measures are identified as appropriate.

Areas of No Project Impact

As explained below, the Project would not result in impacts related to three of the above-listed significance criteria. These significance criteria are not discussed further in the impact analysis for the following reasons:

Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment. According to the environmental database review, Project facilities are not included on any lists of hazardous materials sites compiled pursuant to Government Code Section 65962.5. Therefore, this criterion is not applicable to the proposed Project and is not discussed further.

Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and would result in a safety hazard for people residing or working in the project area. This significance criterion is intended to address facility siting and design impacts and does not apply to temporary construction impacts. Therefore, this significance criterion is not applicable to Project construction activities and is only discussed below as it relates to long-term operational impacts.

Be located within the vicinity of a private airstrip and would result in a safety hazard for people residing or working in the project area. Proposed well facilities would not be located within the vicinity of a private airstrip. Therefore, this significance criterion is not applicable to construction or operation of the Project.

Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan. San Mateo County, Daly City, Colma, South San Francisco, San Bruno, and

[11] Potential effects of exhaust emission from construction activities in the vicinity of schools and other sensitive receptors is described in Section 5.8, Air Quality, Impact AQ-3.

Millbrae all have adopted emergency response plans. The emergency response plans do not designate specific evacuation routes or sites within the cities (Colma Fire Department 2012; NCFA 2012; San Mateo County Sherriff's Office of Emergency Services 2012; RWQCB 2012; South San Francisco Fire Department 2012). Therefore, neither Project construction nor operation, including pipeline installations that would extend into adjacent roadways, would impair implementation of or physically interfere with any adopted emergency response or evacuation plan. Section 5.6, Transportation and Circulation, further discusses anticipated lane closures that would be required during construction.

5.17.3.3 Summary of Impacts

For the significance criteria that have not already been deemed "not applicable" in the Approach to Analysis section above, the specific impact analyses below are divided into two subsections: (1) construction impacts (short-term) and (2) operational impacts (long-term). Table 5.17-2 (Summary of Impacts – Hazards and Hazardous Materials) provides a summary of potential impacts from the proposed Project.

TABLE 5.17-2
Summary of Impacts – Hazards and Hazardous Materials

	Construction			Operations				Cumulative
Sites	**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.**	**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.**	**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.**	**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.**	**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.**	**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.**	**Impact HZ-7: The Project would not expose people or structures to a significant risk of loss, injury, or death involving fires.**	**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.**
Site 1	LS	LSM	NI	LS	NI	NI	LS	LSM
Site 2	LS	LSM	LSM	NI	NI	NI	LS	LSM
Site 3	LS	LSM	LSM	NI	NI	NI	LS	LSM
Site 4	LS	LSM	LSM	NI	NI	NI	LS	LSM
Westlake Pump Station	LS	LSM	LSM	LS	LS	NI	LS	LSM
Site 5 (Consolidated Treatment at Site 6)	LS	LSM	LS	NI	NI	NI	LS	LSM
Site 5 (On-site Treatment)	LS	LSM	LS	LS	LS	NI	LS	LSM
Site 6	LS	LSM	LS	LS	NI	NI	LS	LSM

TABLE 5.17-2
Summary of Impacts – Hazards and Hazardous Materials

	Construction			Operations				Cumulative
Sites	**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.**	**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.**	**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.**	**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.**	**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.**	**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.**	**Impact HZ-7: The Project would not expose people or structures to a significant risk of loss, injury, or death involving fires.**	**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.**
Site 7 (Consolidated Treatment at Site 6)	LS	LSM	NI	NI	NI	NI	LS	LSM
Site 7 (On-site Treatment)	LS	LSM	NI	LS	NI	NI	LS	LSM
Site 8	LS	LSM	NI	LS	NI	NI	LS	LSM
Site 9	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 10	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 11	LS	LSM	NI	LS	NI	LS	LS	LSM
Site 12	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 13	LS	LSM	LS	LS	LS	LS	LS	LSM

TABLE 5.17-2
Summary of Impacts – Hazards and Hazardous Materials

	Construction			Operations				Cumulative
Sites	**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.**	**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.**	**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.**	**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.**	**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.**	**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.**	**Impact HZ-7: The Project would not expose people or structures to a significant risk of loss, injury, or death involving fires.**	**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.**
Site 14	LS	LSM	NI	NI	NI	LS	LS	LSM
Site 15	LS	LSM	NI	LS	NI	LS	LS	LSM
Site 16	LS	LSM	NI	LS	NI	LS	LS	LSM
Site 17 (Alternate)	LS	LSM	NI	LS	NI	NI	LS	LSM
Site 18 (Alternate)	LS	LSM	LS	LS	LS	LS	LS	LSM
Site 19 (Alternate)	LS	LSM	LSM	NI	NI	LS	LS	LSM

Notes:

NI = No Impact

LS = Less than Significant Impact

LSM = Less than Significant with Mitigation

5.17.3.4 Construction Impacts and Mitigation Measures

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. (Less than Significant)

All Sites

Project construction activities would include the use of hazardous materials such as fuels, lubricants, paints, and solvents. Numerous laws and regulations ensure the safe transportation, use, storage, and disposal of hazardous materials (see Section 5.17.2, Regulatory Framework). Routine transport of hazardous materials to and from proposed facility sites could result in an incremental increase in the potential for accidents; however, Caltrans and CHP regulate the transportation of hazardous materials and wastes, including container types and packaging requirements, as well as licensing and training for truck operators, chemical handlers, and hazardous waste haulers. Worker safety regulations cover hazards related to the prevention of exposure to hazardous materials and a release to the environment from hazardous materials use. Regulations and criteria for the disposal of hazardous materials mandate disposal at an appropriate landfill. Cal-OSHA also enforces hazard communication program regulations, which contain worker safety training and hazard information requirements, such as procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees.

Therefore, because the SFPUC and its contractors would be required to comply with existing and future hazardous materials laws and regulations covering the transport, use, and disposal of hazardous materials, the impacts associated with the potential to create a significant hazard to the public or the environment would be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant with Mitigation)

Accidental Release of Hazardous Chemicals during Construction

All Sites

There are two types of accidental releases that could occur during construction. Hazardous materials are routinely used during construction activities and there is a potential for an accidental release associated with this routine use during construction. In addition, construction involves excavation that could encounter contaminated soil or groundwater that are already present at the construction site. Each type of accidental release is discussed below.

Hazardous materials assumed by this analysis to be used during construction activities include fuels, lubricants, paints, and solvents. Storage and use of hazardous materials at construction sites and staging areas could potentially result in the accidental release of small quantities of hazardous materials, which could pose a risk to construction workers and the environment, such as degradation of soil and groundwater quality and/or surface water quality.

The greatest potential for encountering contaminated soil and groundwater during construction would be in areas where past or current land uses may have resulted in leaking fuel or chemical storage tanks or other releases of hazardous materials. Properties with known soil and/or groundwater contamination are referred to as "environmental cases." As identified in Section 5.17.1 (Setting) and Table 5.17-1 (Hazardous Materials Release Sites Identified within 0.25 Mile of a Facility Site Construction Area), 26 environmental cases included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 are located within 0.25 mile of proposed facility sites and have some potential to affect subsurface conditions at project locations.

No active environmental cases were identified within 0.25 mile of Sites 4, 7, 8, 9, 14, and 17 (Alternate). In addition, no closed environmental cases were located on site or immediately adjacent to these sites. Therefore, the potential to encounter hazardous materials in soil or groundwater at these sites would be low. Although the potential to encounter hazardous materials in soil or groundwater at these sites arising from off-site sources is low, site conditions could change prior to construction if new contaminated sites are identified in the vicinity of these proposed well facilities. If new contamination sites were located at or near these sites, the potential hazardous materials impact would be *significant.*

Several environmental cases included on a list of hazardous materials sites are located within 0.25 mile of Sites 1, 2, 3, 5, 6, 10, 11, 12, 13, 15, 18 (Alternate), 19 (Alternate), and the Westlake Pump Station. The potential to encounter hazardous materials in soil or groundwater at these proposed facility sites is low because hazardous material release sites have not resulted in soil or groundwater contamination in the immediate vicinity of the well facilities. Similar to the findings above, although the potential to encounter hazardous materials in soil or groundwater at these sites arising from off-site sources is low, site conditions could change prior to construction if new contaminated sites are identified in the vicinity of proposed well facilities or if there are substantial changes in the extent of contamination at known release sites. Therefore, the potential hazardous materials impact would be *significant*.

Four environmental cases are located within 0.25 mile of Site 16. The Jiffy Cleaners and Jerair Shell Station cases are at least 1,200 feet (0.23 mile) away from the nearest excavation area associated with Site 16 and have a low potential to affect subsurface excavations at Site 16 because the direction of groundwater flow is away from Site 16 (TRC 2009; TEC Environmental 2010b). Also, the San Francisco Water Department case is at least 500 feet (0.095 mile) away from Site 16 and has a low potential to affect potential subsurface excavations associated with Site 16 because remedial action is underway and sampling indicates that soil contamination is limited to the area surrounding the release (GRI 2011). Off-site contamination from the Olympian Service Station case is located within approximately 200 feet from the alternate water connection for Site 16 and has a moderate potential to affect subsurface excavations in the area. The potential for this impact is considered moderate because the documented occurrence of contamination is in close proximity to the alternate water connection pipeline route and the extent of contamination from the case has not been laterally delineated, the groundwater flow is in the general direction of the construction area, and the most recent data about off-site depth to groundwater in the vicinity of the alternate water connection pipeline indicates groundwater could be encountered during trenching (i.e., less than six feet bgs) (Pangea 2011). Therefore, given that the potential to encounter hazardous materials in soil or groundwater at Site 16 is moderate, and due to the proximity and nature of construction activities, construction of the Project at this location could cause a significant hazardous materials impact on the public or the environment by exposing people to contaminated soil or groundwater or soil vapors during excavation and other ground-disturbing pipeline construction activities. As a result, the potential hazardous materials impact on the environment from constructing the alternate water connection for Site 16 would be *significant*.

The potential impact associated with construction at all the above sites would be reduced to a *less-than-significant* level with implementation of Mitigation Measures M-HZ-2a (Preconstruction Hazardous Materials Assessment), M-HZ-2b (Health and Safety Plan), and M-HZ-2c (Hazardous Materials Management Plan). These measures require: (1) 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; (2) preparation of a site health and safety plan to protect construction worker health and safety; and (3) a hazardous materials management plan to ensure that appropriate procedures are followed in the event that hazardous materials, including unanticipated hazardous materials, are encountered during project construction, and to ensure that hazardous materials are transported and disposed of in a safe and lawful manner.

In addition, the implementation of Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan), which is required to reduce potential impacts on water quality during Project construction (see Impact HY-1 in Section 5.16, Hydrology and Water Quality), would also reduce this potential hazardous materials impact to a *less-than-significant* level. While this mitigation measure is presented in Section 5.16, Hydrology and Water Quality, and primarily addresses potential water quality impacts, it also contains measures for controlling non-stormwater (i.e., excavation dewatering), waste, and potential hazardous materials pollution, which would also reduce the potential for the accidental release of hazardous construction chemicals. The Erosion and Sediment Control Plan requires specific practices for the safe storage and handling of chemicals. The BMPs required to be in the plan include protection measures for the temporary on-site storage of diesel fuels or other hazardous materials used during construction, including requirements for secondary containment to contain a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system. All equipment and materials storage would need to be routinely inspected for leaks and records maintained for documenting compliance with the storage and handling of hazardous materials. With the incorporation of these BMPs, the potential hazardous materials impact on the public or environment from an accidental release of hazardous materials during construction would be *less than significant with mitigation*.

Mitigation Measure M-HZ-2a: Preconstruction Hazardous Materials Assessment (All Sites)
Within three months prior to construction, the SFPUC shall retain a qualified environmental professional to conduct a regulatory agency database review to update and identify hazardous materials sites within 0.25 mile of a well facility site and to review appropriate standard information sources to determine the potential for soil or groundwater contamination at the project sites. Should this review indicate a high likelihood of encountering contamination at the proposed facility sites, follow-up sampling shall be conducted to characterize soil and groundwater quality prior to construction to provide necessary data for the site health and safety plan (Mitigation Measure M-HZ-2b) and hazardous materials management plan (Mitigation Measure M-HZ-2c). If needed, site investigations or remedial activities shall be performed at facility sites in accordance with applicable laws and regulations.

Mitigation Measure M-HZ-2b: Health and Safety Plan (All Sites)
The construction contractor shall, prior to construction, prepare a site-specific health and safety plan in accordance with federal OSHA regulations (29 CFR 1910.120) and Cal-OSHA regulations (8 CCR Title 8, Section 5192) to address worker health and safety issues during construction. The health and safety plan shall identify the potentially present chemicals, health and safety hazards associated with those chemicals, all required measures to protect construction workers and the general public from exposure to harmful levels of any chemicals identified at the site (including engineering controls, monitoring, and security measures to prevent unauthorized entry to the work area), appropriate personal protective equipment, and emergency response procedures. The health and safety plan shall designate qualified individuals responsible for implementing the plan and for directing subsequent procedures in the event that unanticipated contamination is encountered.

Mitigation Measure M-HZ-2c: Hazardous Materials Management Plan (All Sites)
The contractor shall, prior to construction, prepare a hazardous materials management plan that specifies the method for handling and disposal of both chemical products and hazardous materials during construction and contaminated soil and groundwater, should any be encountered during construction. Contract specifications shall mandate full compliance with all applicable local, State, and federal regulations related to identifying, transporting, and disposing of hazardous materials, including hazardous building materials (i.e., asbestos containing materials, lead-based paint, and electrical equipment) and any hazardous wastes encountered in excavated soil or groundwater. The contractor shall provide the SFPUC with copies of hazardous waste manifests documenting that disposal of all hazardous materials has been performed in accordance with the law.

If contaminated soil or groundwater is encountered, the SFPUC shall require the construction contractor to prepare and implement a construction Soil and Groundwater Management Plan. The contractor shall submit the Plan to the SFPUC and the San Mateo County Department of Health Services, Groundwater Protection Program, for review and approval. Elements of the plan shall include:

- Measures to address hazardous materials and other worker health and safety issues during construction, including the specific level of protection required for construction workers.
- Provisions for excavation of soil, stockpiling, dust, and odor control measures.
- Measures to prevent off-site migration of contaminated soil and groundwater.
- Location and final disposition of all soil and groundwater removed from the site.
- All other necessary procedures to ensure that excavated materials are stored, managed, and disposed of in a manner that is protective of human health and in accordance with applicable laws and regulations.

Mitigation Measure M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan (All Sites)
(See Impact HY-1 in Section 5.16, Hydrology and Water Quality, for description.)

Impact Conclusion: Less than Significant with Mitigation

Hazardous Building Materials

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

Sites 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17 (Alternate), 18 (Alternate), 19 (Alternate), and the Westlake Pump Station

Construction at these facility sites would not result in exposure of construction workers or the public to hazardous building materials because building demolition would not occur at any of these sites. Therefore, there would be *no impact* at these sites relative to the potential to create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment from hazardous building materials.

Impact Conclusion: No Impact

Sites 1 and 14

At Site 1, an existing concrete restroom building would be demolished. At Site 14, an existing well, concrete pump enclosure, steel tank, and aboveground piping would be demolished. Lead-based paint may be present on the interior of the restroom building at Site 1, as well as on the exterior and interior of the concrete pump enclosure at Site 14. In addition, asbestos-containing materials could be present in the roofing, flooring, ceiling, and piping (i.e., transit pipe and fittings) at the sites. PCB-containing electrical equipment, fluorescent light ballast containing DEHP, and fluorescent light tubes containing mercury could also be present in electrical equipment at either Site 1 or Site 14.

Cal/OSHA's Lead in Construction Standard, described above in Section 5.17.2.3 (Hazardous Structural and Building Components), addresses the safe handling of lead-based paint during demolition. The SFPUC would sample the lead content in the paint at both demolition sites to determine whether the Standard applies. If lead were detected, the construction contractor would be required to comply with the standard. The standard requires that a contractor develop and implement a lead compliance plan, which must include a description of the activities that could emit lead, methods that will be used to meet the safe work practices, Cal/OSHA notification requirements, and a plan to protect workers from lead exposure during construction activities. Therefore, compliance with the regulations and procedures already established would ensure that potential impacts due to disturbance of lead-based paint during demolition would be *less than significant*.

There are well-established regulatory requirements for asbestos abatement in structures, described above in Section 5.17.2.3 (Hazardous Structural and Building Components). For example, in accordance with BAAQMD Regulation 11, Rule 2 (Asbestos Demolition, Renovation and Manufacture), a survey must be conducted to identify asbestos-containing materials prior to demolition, and the BAAQMD must be notified 10 days in advance of any proposed demolition or abatement work. Containment must be provided during work that disturbs asbestos-containing materials and there must be no visible emissions to the outside air from demolition operations that involve asbestos-containing materials. The contractor must use methods specified in the regulations for control of emissions, such as wetting of exposed asbestos-containing materials; use of a high-efficiency particulate air (HEPA) filter within an exhaust, ventilation and control system; or removal in an entirely contained chute. The contractor and hauler of the material are required to file a Hazardous Waste Manifest that details the hauling of the material from the site and its disposal. Therefore, compliance with the required handling and disposal procedures already established would ensure that potential impacts due to disturbance of asbestos during demolition would be *less than significant*.

The U.S. EPA's PCB regulations (40 CFR Part 761) regulates the disposal of PCB wastes generated or encountered during construction, including PCB-contaminated soils or equipment discovered during demolition. The SFPUC would be required to identify and label PCB-contaminating equipment prior to demolition. The EPA must be notified prior to disposal through completion of a Notification of PCB Activity Form, which would include establishing an ID number for activities involving PCBs. The regulations require that the waste be disposed of at an approved PCB waste disposer under a hazardous materials manifest. In addition, the Department of Toxic Substance Control's Universal Waste Rule (22 CCR Sections 66261.9 and 66273.1 thru 66273.90) provides guidelines for removal and recycling / disposal of universal wastes, such as mercury-containing non-incandescent lamps, batteries and other hazardous wastes commonly found in building components and equipment. Therefore, compliance with the regulations and procedures already established would ensure that potential impacts due disposal of PCB-containing equipment or other universal wastes during demolition would be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant with Mitigation)

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts, and sites with significant impacts.

During construction, potentially hazardous materials could be used or stored near a school. As shown in Table 5.17-3 (Schools within 0.25 Mile of a Proposed Facility Site Construction Area), 10 schools are located within approximately 0.25 mile of a proposed facility site. Potentially hazardous materials typically used for construction would include lubricants, degreasers, paints, solvents, and fuels. The impacts of construction-related truck and vehicle emissions in proximity to schools (and other sensitive receptors) are discussed in Section 5.8, Air Quality, Impact AQ-3.

TABLE 5.17-3
Schools within 0.25 Mile[a] of a Proposed Facility Site Construction Area

Schools	Sites within 0.25 Mile
Ben Franklin Intermediate School	• Site 2 is approximately 60 feet (0.01 mile) east of the school property, across Park Plaza Drive. • Site 3 is located within the school property. • Site 4 is approximately 100 feet (0.02 mile) southeast of the school property. • The Westlake Pump Station is immediately adjacent to a school playing field.
Garden Village Elementary School	• Site 2 is approximately 30 feet (0.006 mile) north of the school property. • Site 3 is approximately 330 feet (0.06 mile) west of the school property. • Site 4 is located immediately adjacent to the school playing field.
Margaret Brown Elementary School	• Site 5 is approximately 1,200 feet (0.23 mile) east of the school, across Interstate Highway 280 (I-280).
Hope Lutheran Elementary School	• Site 5 is approximately 1,200 feet (0.23 mile) northeast of the school, across I-280. • Site 6 is approximately 1,050 feet (0.20 mile).
Holy Angeles Elementary School	• Site 5 is approximately 475 feet (0.09 mile) southwest of the school, across the BART tracks.
El Camino High School	• Site 9 is approximately 1,100 feet (0.21 mile) northwest of the school.
Alta Loma Middle School	• Site 9 is approximately 1,275 feet (0.24 mile) northeast of the school, across El Camino Real. • Site 10 is approximately 950 feet (0.18 mile) northwest of the school. • Site 18 (Alternate) is approximately 170 feet (0.03 mile) northwest of the school.
R.W. Drake Preschool	• Site 12 is 100 feet (0.018 mile) south of the school. • Site 19 (Alternate) is immediately adjacent to the school.
Baden High School	• Site 12 is 920 feet (0.17 mile) northeast of the school. • Site 19 (Alternate) is 900 feet (0.17 mile) northeast of the school.
Los Cerritos Elementary School	• Site 12 is 930 feet (0.17 mile) northwest of the school, across El Camino Real. • Site 19 (Alternate) is 1,250 feet (0.23 mile) northwest of the school, across El Camino Real.
South San Francisco High School	• Site 12 is approximately 1,000 feet (0.19 mile) northwest of the school, across El Camino Real. • Site 13 is approximately 900 feet (0.17 mile) south of the school.

Note:

(a) Measurements are taken from the closest boundary of the construction zone to the closest edge of the land use, including school parking areas.

Sites 1, 7, 8, 11, 14, 15, 16, and 17 (Alternate)

Because no schools are located within a 0.25 mile of these sites, *no impact* would occur related to the emission or use of hazardous materials within 0.25 mile of a school during construction.

Impact Conclusion: No Impact

Sites 5, 6, 9, 10, 12, 13, and 18 (Alternate)

As shown on Table 5.17-3 (Schools within 0.25 Mile of a Proposed Well Facility Site Construction Area), Schools located within 0.25 mile of these sites include: Margaret Brown Elementary School (Site 5); Holy Angels Elementary School (Site 5); Hope Lutheran Elementary School (Sites 5 and 6); El Camino High School (Site 9); Alta Loma Middle School (Sites 9, 10, and 18 [Alternate]); R.W. Drake Preschool, Baden High School, and Los Cerritos Elementary School (Site 12); and South San Francisco High School (Sites 12 and 13).

Project construction activities are assumed by this analysis to include the use of hazardous materials such as fuels, lubricants, degreasers, paints, and solvents. These materials are commonly used during construction, are not acutely hazardous, and would be used in small quantities. Numerous laws and regulations ensure the safe transportation, use, storage, and disposal of hazardous materials (see Section 5.17.1 [Regulatory Framework]). Routine transport of hazardous materials to and from facility sites could result in an incremental increase in the potential for accidents. However, Caltrans and the CHP strictly regulate the transportation of hazardous materials and wastes, including container types and packaging requirements, as well as licensing and training for truck operators, chemical handlers, and hazardous waste haulers. Worker safety regulations cover hazards related to the prevention of exposure to hazardous materials and a release to the environment from hazardous materials use. Regulations and criteria for the disposal of hazardous materials mandate disposal at an appropriate landfill. Cal-OSHA also enforces hazard communication program regulations, which contain worker safety training and hazard information requirements, such as procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees.

These types of hazardous materials are commonly used at facilities such as gasoline stations and dry cleaners, and at construction areas. Although construction activities could result in the inadvertent release of small quantities of hazardous construction chemicals, a spill or release at a well facility construction area is not expected to endanger individuals at nearby schools given the nature of the materials and the small quantities that would be used. Therefore, because the SFPUC and its contractors would be required to comply with existing and future hazardous materials laws and regulations covering the transport, use, and disposal of hazardous materials, and because of the nature and quantity of the hazardous materials, the potential impact on schools related to the use of hazardous materials at these sites that are within 0.25 miles would be *less than significant.* In addition, although the impact is considered less than significant, the standard BMPs that would be implemented under the required erosion and sediment control plan (see Impact HY-1 in Section 5.16, Hydrology and Water Quality) would require specific preventative practices for safe storage and handling of chemicals, as well as secondary containment to contain a potential release. These standard BMPS would further serve to prevent and contain inadvertent releases of hazardous materials at construction sites.

Impact Conclusion: Less than Significant

Sites 2, 3, 4, 19 (Alternate), and the Westlake Pump Station

As shown on Table 5.17-3 (Schools within 0.25 Mile of a Proposed Facility Site Construction Area), Sites 2, 3, 4, and 19 (Alternate) are located within 0.25 miles of several schools, including: Ben Franklin Intermediate School (Sites 2, 3, 4, and Westlake Pump Station); Garden Village Elementary School (Sites 2, 3, 4); and R.W. Drake Preschool, Baden High School, and Los Cerritos Elementary (Site 19 [Alternate]).

Site 19 (Alternate) is located approximately 900 feet away from Baden High School, 1,250 feet away from Los Cerritos Elementary School, and immediately adjacent to R.W. Drake Preschool. As discussed previously, well facility construction activities are assumed by this analysis to include the use of hazardous materials such as fuels, lubricants, degreasers, paints, and solvents, which are commonly used during construction, are not acutely hazardous, and would be used in small quantities. The SFPUC and its contractors would be required to comply with existing and future hazardous materials laws and regulations covering the transport, use, and disposal of hazardous materials. These types of hazardous materials are commonly used at gasoline stations, dry cleaners, and other construction areas. Although construction activities could result in the inadvertent release of small quantities of hazardous construction chemicals, a spill or release at a well facility construction area is not expected to endanger individuals Baden High School or Los Cerritos Elementary School given the nature of the materials and the small quantities that would be used. Therefore, because of anticipated regulatory compliance and the nature and small quantity of the materials used and stored, an accidental spill or release would be unlikely to result in significant hazardous materials impacts on these schools. Therefore, the potential impact related to the use of hazardous materials within 0.25 miles of Baden High School and Los Cerritos Elementary School, would be *less than significant.*

However, several well facility site construction and staging areas would be located on, or immediately adjacent to, several schools. Site 2 is immediately adjacent to Garden Village Elementary School; Site 3 is located on Ben Franklin Intermediate School property; Site 4 is located on Garden Village Elementary School property; Westlake Pump Station is immediately adjacent to Ben Franklin Intermediate School; and Site 19 (Alternate) is immediately adjacent to R.W. Drake Preschool. Because of this close proximity, the potential for an adverse effect at Ben Franklin Intermediate School, Garden Village Elementary School, and R.W. Drake Preschool due to accidental spill or release of hazardous materials at Sites 2, 3, 4, 19 (Alternate), and the Westlake Pump Station could potentially be *significant*, even after considering the nature and quantity of the chemicals to be used and stored and compliance with laws and regulations.

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) and Mitigation Measure M-HZ-2c: (Hazardous Materials Management Plan) would reduce this potential hazardous materials impact to a *less-than-significant* level. While Mitigation Measure M-HY-1 is presented in Section 5.16, Hydrology and Water Quality, and primarily addresses water quality impacts, it also contains measures for controlling non-stormwater (i.e., equipment maintenance and servicing requirements and equipment fueling requirements), waste, and potential hazardous materials pollution, which would also reduce the potential for the accidental release of hazardous construction chemicals. The Erosion and Sediment Control Plan requires specific practices for the safe storage and handling of chemicals. The BMPs required to be in the plan include protection measures for the temporary on-site storage of diesel fuels or other hazardous materials used during construction, including requirements for secondary containment of a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system. All equipment and materials storage would need to be routinely inspected for leaks and records maintained for documenting compliance with the storage and handling of hazardous materials. In addition, Mitigation Measure M-HZ-2c would require that the contractor prepare a Hazards Materials Management Plan to ensure proper handling of all hazardous substances that are used during construction. With the incorporation of these measures, the potential hazardous materials impact on Ben Franklin Intermediate School, Garden Village Elementary School, and R.W. Drake Preschool, due to emission or use of hazardous materials during construction of Sites 2, 3, 4, 19 (Alternate), and the Westlake Pump Station, would be *less than significant with mitigation*.

Mitigation Measure M-HY-1: Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan (All Sites)
(See Impact HY-1 in Section 5.16, Hydrology and Water Quality, for description.)

Mitigation Measure M-HZ-2c: Hazardous Materials Management Plan (All Sites)
(See Impact HZ-2 above for description.)

Impact Conclusion: Less than Significant with Mitigation

5.17.3.5 Operation Impacts and Mitigation Measures

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. (Less than Significant)

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

Sites 2, 3, 4, 5 (Consolidated Treatment at Site 6), 7 (Consolidated Treatment at Site 6), 14, and 19 (Alternate)

Because these well facilities would not store or use chemicals for disinfection or water treatment, accidental releases from stored chemicals would not occur. Therefore, *no impact* would occur relative to transport, use, or disposal of hazardous materials or an accidental release during operation of these sites.

Impact Conclusion: No Impact

Sites 1, 5 (On-site Treatment), 6, 7 (On-site Treatment), 8, 9, 10, 11, 12, 13, 15, 16, 17 (Alternate), 18 (Alternate), and the Westlake Pump Station

Attainment of water quality goals may require disinfection, treatment, or filtration prior to distribution of water into the regional water system or Partner Agency distribution systems. The primary chemicals needed at facility sites are sodium hypochlorite and ammonia for disinfection. Sodium hydroxide would be added if necessary to adjust the pH. Sodium fluoride would be required if the fluoride concentration in the blended water in the local water distribution system is below the respective water agency's identified fluoride levels (see Chapter 3, Project Description, Section 3.4.2.2 [Well Facility Types]).

As discussed in Chapter 3, Project Description, Section 3.4.2.2 (Well Facility Types), the chemical storage tanks would be placed on a pedestal and above a grate-covered chemical containment pit. The depth of the pit would be sized to provide 110 percent of the total storage volume in the event of a spill. A hatch on the grate would allow access for a sump pump to remove any spilled chemicals. Each tank is intended to provide a chemical storage capacity of 14 to 21 days (with an additional 15 percent safety factor). The proposed storage capacity allows for the frequency of chemical delivery to occur every two- to three weeks.

As described above, Project operation would involve regular transportation of hazardous materials. However, Caltrans and the CHP strictly regulate the transportation of hazardous materials and wastes, including container types and packaging requirements, as well as licensing and training for truck operators, chemical handlers, and hazardous waste haulers (see Section 5.17.1, Regulatory Framework). Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are the responsibility of CHP, which conducts regular inspections of licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill identification teams at locations throughout the State that can respond quickly in the event of a spill.

The Uniform Fire Code, Article 80, includes specific requirements for the safe storage and handling of chemicals. These requirements are intended to reduce the potential for an accidental release and for mixing of incompatible chemicals. Design of chemical storage facilities at the well facilities and storage of chemicals for the Project at the Westlake Pump Station would comply with the current Uniform Fire Code requirements and other applicable federal, State, and local regulations, including design features (including noncombustible partitions, spill control features and separate secondary containment, as described above in Section 5.17.2.8 [Uniform Fire Code]) that would reduce the potential for a release of hazardous materials that could affect public health or the environment. The SFPUC would be required by the local CUPA agency (San Mateo County Health Department) to prepare an HMBP for the well facilities that store hazardous chemicals, as well as update the existing HMBP for the Westlake Pump Station facility to reflect the changes in hazardous materials storage.

The SFPUC would also be required to comply with existing and future hazardous materials laws and regulations covering the transport, use, and disposal of hazardous materials. In addition, the SFPUC would be required to incorporate legally mandated design features into the facilities and prepare HMBPs for chemical storage. Therefore, because the SFPUC would be required to comply with these laws and regulations that are designed to protect the public against potential impacts associated with the use of chemicals and accidental chemical releases, potential hazardous materials impacts during operation would be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant)

This impact discussion considers the potential for operational impacts due to the use of chemicals and other hazardous materials. Potential impacts related to operational pollutant emissions are discussed in Section 5.8, Air Quality, Impact AQ-6.

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 1, 2, 3, 4, Site 5 (Consolidated Treatment at Site 6), 6, 7, 8, 11, 14, 15, 16, 17 (Alternate), and 19 (Alternate)</u>

Because no schools would be located within a 0.25 mile of Sites 1, 6, 7, 8, 11, 14, 15, 16, and 17 (Alternate), *no impact* would occur related to emission or use of hazardous materials within 0.25 mile of a school during operation of these sites.

Sites 2, 3, 4, Site 5 (Consolidated Treatment at Site 6), and 19 (Alternate) would be located within a 0.25 mile of schools; however, these well facilities would not store or use chemicals for disinfection or water treatment. As a result, there would be *no impact* related to emission or use of hazardous materials within 0.25 mile of a school during operation of these sites.

Impact Conclusion: No Impact

<u>Sites 5 (On-site Treatment), 9, 10, 12, 13, 18 (Alternate), and Westlake Pump Station</u>

These well facilities, where chemicals would be stored on the site during Project operations, would be located within a 0.25 mile of schools and may store and use sodium hypochlorite, ammonia, sodium hydroxide, and sodium fluoride. The well facility building at Site 5 would be located approximately 475 feet from Holy Angels Elementary School, 1,200 feet from Hope Lutheran Elementary School, and 1,200 feet from Margaret Brown Elementary School. The well facility building at Site 9 would be located approximately 1,100 feet from El Camino High School and 1,275 feet from Alta Loma Middle School. Site 10 would be located approximately 950 feet from Alta Loma Middle School, and Site 18 (Alternate) would be located about 170 feet from the school. Site 12 would be located approximately 920 feet from Baden High School, 1,000 feet from South San Francisco High School, and 930 feet from Los Cerritos Elementary School. Site 13 would be located about 900 feet from South San Francisco High School. The parcel where the Westlake Pump Station is located is immediately adjacent to schoolyard athletic fields at Ben Franklin Intermediate School.

The potential for emissions of chemicals from an accidental release is discussed under Impact HZ-5. As stated there, incorporation of legally required design features and development of HMBPs for chemical storage would maintain the potential impact from increased use of chemicals and potential for accidental release at less-than-significant levels. This includes the potential for emission or use of hazardous materials within 0.25 mile of a school. Therefore, the potential for hazardous materials impacts related to emissions resulting from chemical storage and use to affect schools within 0.25 mile would also be *less than significant*.

Impact Conclusion: Less than Significant

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. (Less than Significant)

The evaluation of impacts that follows discusses sites with no impacts first, followed by sites with less-than-significant impacts.

<u>Sites 1, 2, 3, 4, 5, 6, 7, 8, 17 (Alternate), and the Westlake Pump Station</u>

These sites are not located within an area covered by an airport land use plan or within two miles of a public airport. Therefore, *no impact* per this criterion would occur at these sites.

Impact Conclusion: No Impact

<u>Sites 9, 10, 11, 12, 13, 14, 15, 16, 18 (Alternate), and 19 (Alternate)</u>

These sites are located within an area covered by the San Mateo County Airport Land Use Plan for the SFO. Site 19 (Alternate) would be a well-only facility and surrounded by an 8-foot tall fence. The remaining well facilities would include buildings for treatment and/or filtration that would be a maximum of 15.5 feet above finished grade. As a result, the heights of the well facility buildings would be well below FAR Part 77 airport related height limitations and the land surrounding the well facility sites is almost entirely developed with urban uses that include structures as tall or taller than the proposed well facilities. In addition, the well facilities would not direct lights toward, or cause sunlight to be reflected toward, an aircraft, would not generate smoke or rising columns of air, would not attract large concentrations of birds, and would not cause electrical interference. Therefore, operation of the Project would not result in a safety hazard for people residing or working in the project area. As a result, this potential hazards impact would be *less than significant*.

Impact Conclusion: Less than Significant

Impact HZ-7: The Project would not expose people or structures to a significant risk of loss, injury, or death involving fires. (Less than Significant)

Exposure of people or structures to risk of loss, injury, or death involving fire could occur if the Project sites were located in areas susceptible to risk from fire. As discussed in the setting section, the SFPUC maintains Lake Merced as a nonpotable emergency water supply for the CCSF to be used for firefighting if no other sources of water are available (SFPUC 2011). Impact HY-10 in Section 5.16, Hydrology and Water Quality, discusses the effects of Project operations on Lake Merced lake levels.

<u>All Sites</u>

The facility sites would be located on urban land in zones designated as "Non-Fire Hazard" (CAL FIRE 2008). Therefore, the risk of fires from is considered very low and *no impact* would occur.

As discussed in Impact HY-10 in Section 5.16, Hydrology and Water Quality, water levels in Lake Merced would increase during wet and normal years and decrease during dry years ("Take Periods") (see Impact HY-10 in Section 5.16, Hydrology and Water Quality for an evaluation of the Lake Merced water level and modeled operational scenarios). Despite the increases and decreases in water levels in Lake Merced, water would be present in the lake and available for emergency use during Project operations. Therefore, 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 Conclusion: Less than Significant

5.17.3.6 Cumulative Impacts and Mitigation Measures

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. (Less than Significant with Mitigation)

The geographic scope for the analysis of cumulative impacts relating to hazards and hazardous materials consists of each proposed GSR facility site (including the construction area for the well, the well facility, and the proposed or alternate pipelines) and the area surrounding the sites where an adverse effect could occur.

Construction

Use of Hazardous Materials

All of the cumulative projects listed in Table 5.1-3 (Project Considered for Cumulative Impacts) in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, Section 5.1, Overview, would result in the use, transport, and disposal of hazardous materials during construction within the cumulative impacts study area.

As described in Impact HZ-1, the GSR Project would have less-than-significant impacts associated with the potential to create a significant hazard, because the SFPUC and its contractors would be required to comply with the existing and future laws and regulations governing the use, transport, and disposal of hazardous materials.

Depending on the extent of overlap between the construction schedules for the projects listed in Table 5.1-3 (Project Considered for Cumulative Impacts), implementation of these projects together with the proposed GSR Project could result in a cumulative impact associated with increased hazards; however, each of the cumulative projects would need to comply with existing and future laws and regulations governing the hazardous materials, similar to the GSR Project. For this reason, the potential cumulative impact from the use, transport, and disposal of hazardous materials during construction would be less than significant. As a result, there would be no significant cumulative impact associated with increased hazards relative to the use, transport, or disposal of hazardous materials during construction to which the proposed Project would contribute (*less than significant*).

Accidental Release of Hazardous Chemicals or Building Materials

All of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, Section 5.1 (Overview), are likely to use fuels and other flammable materials during construction within the cumulative impacts study area. The PG&E Transmission Pipeline Replacement Project (cumulative project H) would be located 160 feet south of the pipeline construction area for GSR Site 11 in Chestnut Avenue and adjacent to the pipeline construction area for GSR Sites 12 and 19 (Alternate) along El Camino Real. In addition, a number of the cumulative projects would involve demolition of existing structures (e.g., the Centennial Village Project [cumulative project I], which is adjacent to the pipeline construction area for GSR Site 13, and would demolish the existing commercial businesses on the site), which could release asbestos, lead, or other hazardous building materials into the environment.

As identified above in Impact HZ-2, the GSR Project could cause significant impacts on workers and the environment, if accidental release of hazardous materials were to occur during construction or if contaminated soil or groundwater were encountered during construction. In addition, demolition of existing structures is proposed at GSR Sites 1 and 14, which could release hazardous building materials into the environment. Therefore, cumulative impacts related to accidental release of hazardous chemicals or building materials during construction could be *significant* and the GSR Project's contribution to this cumulative impact could be cumulatively considerable.

However, as discussed in Impact HZ-2, the GSR Project's impacts related to release of hazardous chemicals during construction would be reduced to *a less-than-significant* level with implementation of Mitigation Measure M-HZ-2a (Preconstruction Hazardous Materials Assessment), Mitigation Measure M-HZ-2b (Health and Safety Plan), and Mitigation Measure M-HZ- 2c (Hazardous Materials Management Plan),which require preconstruction hazardous materials assessments, site health and safety plans, and hazardous materials management plans. In addition, Mitigation Measure M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan), would require specific preventive practices for safe storage and handling of chemicals, as well as secondary containment to contain a potential release (see Impact HZ-2, above, for description). With regard to potential release of hazardous building materials from demolition, impacts at GSR Sites 1 and 14 would be *less than significant* due to compliance with applicable laws and regulations that provide procedures for identification and legal disposal of hazardous building materials. Therefore, with implementation of Mitigation Measure M-HZ-2a, Mitigation Measure M-HZ-2b, Mitigation Measure M-HZ-2c, and M-HY-1 at all GSR facility sites, the GSR Project's contribution to cumulative impacts related to compliance with hazards due to accidental release of hazardous chemicals or building materials during construction, would not be cumulatively considerable (*less than significant*).

Exposure of Schools to Hazardous Materials

The following cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would be located within 0.25 mile of a school that could be potentially affected by a proposed GSR facility site, and would be likely to use hazardous chemicals (e.g., fuels, lubricants, and paints) during construction:

- Cumulative project C, the Daly City "A" Street Well Replacement Project, would be within 0.25 mile of Holy Angels Elementary School, which would also be near GSR Site 5.
- Cumulative project D-2, the South San Francisco site for the Peninsula Pipelines Seismic Upgrade Project (PPSU), would be within 0.25 mile of Baden High School, which would also be near GSR Sites 12 and 19 (Alternate).
- Cumulative project E, Holy Cross Cemetery Expansion Project, would be within 0.25 mile of El Camino High School, which would also be near GSR Site 9.
- Cumulative project F, the Mission and McLellan Project, would be within 0.25 mile of El Camino High School and Alta Loma Middle School, both of which would also be near GSR Sites 9 and 10.
- Cumulative project H, the PG&E Transmission Pipeline Replacement Project, would be within 0.25 mile of Los Cerritos Elementary School, which would also be near GSR Sites 12 and 19 (Alternate).
- Cumulative project I, the Centennial Village Project, would be within 0.25 mile of South San Francisco High School, which would also be near GSR Site 13.

As identified in Impact HZ-3, this analysis presumes that some of the proposed GSR facilities would use hazardous materials such as fuels, lubricants, and paints during construction, which could cause a hazard at adjacent schools. Therefore, cumulative impacts related to an increased risk of exposure to hazardous materials to schools from use of hazardous chemicals during construction could be *significant*, and, for GSR Sites 2, 3, 4, 19 (Alternate), and the Westlake Pump Station, the GSR Project's contribution to this cumulative impact could be cumulatively considerable, given the close proximity of construction activities on or immediately adjacent to schools.

However, as discussed in Impact HZ-3, all of the above-listed projects would likely be using similar hazardous materials for the GSR Project (not acutely hazardous) and in non-industrial quantities. The transportation, use, and storage of these hazardous materials would be regulated by numerous laws and regulations, as described in Impact HZ-3. Additionally, for Sites 2, 3, 4, and 19 (Alternate), the GSR Project's impacts related to safety risks to nearby schools during construction would be reduced to *a less-than-significant* level with implementation of M-HY-1 (Develop and Implement a Storm Water Pollution Prevention Plan [SWPPP] or an Erosion and Sediment Control Plan) (see Impact HZ-3, above, for description) and M-HZ-2c (Hazardous Materials Management Plan). Implementation of these mitigation measures would ensure that specific preventive practices for safe storage and handling of chemicals, as well as procedures for secondary containment to contain a potential release, would be implemented during construction of the GSR Project. With implementation of these mitigation measures, the GSR Project's contribution to cumulative impacts related to an increased risk of exposure to hazardous materials to schools from use of hazardous chemicals during construction would not be cumulatively considerable *(less than significant)*.

Operations

Use of Hazardous Materials

Some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) may require the use, transport, and disposal of hazardous materials during operations. For example, the San Francisco Groundwater Supply Project (cumulative projects A-1 to A-6) and the Daly City "A" Street Well Replacement project (cumulative project C) could use, transport, and store common materials for water treatment if they include treatment facilities. The Mission & McLellan and Centennial Village development projects (cumulative projects F and I) could use, transport, and store common hazardous materials such as fuels, paints, and fertilizers for commercial operations, landscaping, and site maintenance.

As described in Impact HZ-4, the GSR sites with treatment facilities would use and store common materials for water treatment, and be required to incorporate legally required design features and HMBPs for chemical storage. These legal requirements are designed to protect the public against potential impacts associated with the use of chemicals and accidental chemical releases. Therefore, the Project would have *less-than-significant* impacts associated with the potential to create a significant hazard, because the SFPUC would be required to comply with the existing and future laws and regulations governing the use, transport, and disposal of hazardous materials.

For the projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), implementation of these projects together with the proposed GSR Project could result in a cumulative impact associated with increased hazards; however, each of the cumulative projects would need to comply with the existing and future laws and regulations governing hazardous materials, similar to the GSR Project. For this reason, the potential cumulative impact from the use, transport, and disposal of hazardous materials during operations would be *less than significant*. As a result, there would be no significant cumulative impact associated with increased hazards relative to the use, transport, or disposal of hazardous materials during operations *(less than significant)*.

Exposure of Schools to Hazardous Materials

Some of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would be likely to use hazardous chemicals (e.g., paints, fertilizers) during operations. For example, the San Francisco Groundwater Supply Project (cumulative projects A-1 to A-6) and the Daly City "A" Street Well Replacement project (cumulative project C) could use, transport, and store common materials for water treatment if they include treatment facilities. The Mission & McLellan and Centennial Village development projects (cumulative projects F and I, respectively) could use, transport and store common hazardous materials such as fuels, paints, and fertilizers for commercial operations, landscaping, and site maintenance. Some of these cumulative projects would also be located within 0.25 mile of a school that could also be potentially affected by a proposed GSR facility site (see list under Exposure of Schools to Hazardous Materials during construction).

As identified in Impact HZ-5, some of the proposed GSR sites where treatment facilities would be built would store hazardous materials such as sodium hydroxide (for pH adjustment) and sodium hypochlorite (for disinfection) for use during operations. Such storage and use of these common water treatment chemicals would have less-than-significant impacts associated with the accidental release of chemicals near schools, because the storage amounts would be minimal (i.e., only enough for two to three weeks' supply would be stored on site when wells are operating), and the SFPUC would be required to comply with the existing and future laws and regulations governing the storage, use, transport, and disposal of such hazardous materials.

For the projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), operation of these projects together with the proposed GSR Project could nevertheless result in a cumulative impact associated with increased risk of accidental release near schools; however, each of the cumulative projects would need to comply with the existing and future laws and regulations governing hazardous materials, similar to the GSR Project. For this reason, the potential cumulative impact from the storage, use, transport, and disposal of these water treatment chemicals during operations would be *less than significant*. As a result, there would be no significant cumulative impact associated with increased hazards relative to the use, transport, or disposal of hazardous materials during operations (*less than significant*).

Safety Hazard near an Airport

Of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), cumulative projects D-1, and E through I would also be located within lands subject to the San Mateo County Airport Land Use Plan (ALUP). The Holy Cross Expansion Project and the California Water Service Company Water Well Replacement Project (cumulative projects E and G, respectively) are cemetery expansion and well replacement projects. The PPSU Colma site (cumulative project D-1) and PG&E Transmission Pipeline Replacement Project (cumulative project H) are infrastructure improvement projects that would not include new aboveground features. The Mission & McLellan Project (cumulative project F) has a maximum height of 50 feet above grade (Allison Knapp Wollam Planning & Environmental Consulting 2010). These cumulative projects would not likely be inconsistent with air space restrictions due to height, although lighting impacts are unknown. It is unknown if the Centennial Village Project (cumulative project I) would have elements that would be inconsistent with air space restrictions contained in the ALUP. As identified in Impact HZ-6, some of the proposed GSR sites (GSR Sites 9 through 16, 18 [Alternate], and 19 [Alternate]) would also be located within lands subject to the San Mateo County ALUP. However, the proposed GSR facilities would have *less-than-significant* impacts on safety hazards near an airport, because the GSR Project would not exceed FAR Part 77 airport-related height limitations. In addition, the well facilities would not direct lights toward, or cause sunlight to be reflected toward, an aircraft, and would not generate smoke or rising columns of steam.

For the projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), operation of these projects together with the proposed GSR Project could result in a cumulative impact associated with increased safety hazards near SFO because they could include new lighting or facilities that may be inconsistent with air space restrictions contained in the ALUP, such as airport-related height limitations, directing lights toward, or cause sunlight to be reflected toward an aircraft, or generate smoke or rising columns of steam. The cumulative impact would, therefore, be *significant*. However, as described in Impact HZ-6, the GSR Project well facility buildings would be well below FAR Part 77 airport-related height limitations, and the land surrounding the facility sites is almost entirely developed with urban uses that include structures as tall or taller than the proposed well facilities. Therefore, the GSR Project's contribution to potentially significant cumulative impacts from increased safety hazards near an airport would not be cumulatively considerable *(less than significant)*.

Exposure of People or Structures to Fire Risk

Some of the cumulative projects may be located on land designated as moderate fire hazard severity zones. None of the cumulative projects would be located on land designated as high to very high fire hazard severity zones. The GSR Project would be located in urban land in zones designated as "Non-Fire Hazard" and the risk from fire is considered very low (CAL FIRE 2008). Therefore, the GSR Project and the cumulative projects would not combine to create a significant cumulative effect related to risk from fire *(less than significant)*.

Additionally, the San Francisco Groundwater Supply Project (cumulative project A-1 through A-6) and the Vista Grande Drainage Basin Improvement Project (cumulative project B) could affect water levels in Lake Merced. Lake Merced water may be used for firefighting purposes in emergency situations, and a reduction of water levels could impact the availability water for firefighting purposes. However, water would still be present in the lake and available for emergency use even with implementation of the cumulative projects. Therefore, the anticipated cumulative impact would be *less than significant.*

5.17.4 References

AEI Consultants. 2011. *Site Monitoring Report (Fourth Quarter, 2010)*. *209 El Camino Real, South San Francisco, CA*. January 31.

Antea Group. 2011. *Quarterly Monitoring Report, Fourth Quarter 2010*. *76 (Former BP) Service Station No*. 11202. January 25.

Arcadis. 2010. *Annual 2010 Groundwater Monitoring and Sampling Report*. *Former Unocal Station No. 6980*. May 14.

City/County Association of Governments of San Mateo County (C/CAG) Airport Land Use Commission. 1996. *San Mateo County Comprehensive Airport Land Use Plan*. December.

California Air Resources Board (CARB). 2002. *Final Regulation Order, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations, California Code of Regulations, Title 17, Section 93105.*

California Department of Conservation (CDC), Division of Mines and Geology. 2000. *Open-File Report 2000-19. A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally Occurring Asbestos*. August.

California Department of Forestry and Fire Protection (CAL FIRE). 2008. *Very High Fire Hazard Severity Zones in LRA – San Mateo County*. November 24.

Cardno ERI. 2011. *Groundwater Monitoring Report, First Quarter 2011*. *Former Exxon Service Station 70207*. March 1.

Colma Fire Department. 2012. Personal Communication, Geoffrey Balton, March 15, 2012.

Department of Toxic Substances Control (DTSC). 2012. *EnviroStor Database.* Database accessed 2012 at: http://www.envirostor.dtsc.ca.gov/public/.

Envirometrix. 2009. *Results of Background Soil Sampling, Statistical Analysis and Request for Closure of Parcel 1 (South Parcel)*. *Pacific Plaza III*. October 3.

Environmental Data Resources, Inc. (EDR). 2008a. Inquiry Number: 2158649.2s. *EDR Radius Map™ Report with GeoCheck, Park Plaza [Sites 2, 3, 4, and West Lake Pump Station]*. March 4.

EDR. 2008b. Inquiry Number: 2158670.2s. *EDR Radius Map™ Report with GeoCheck, Treasure Island Trailer Court [Site 9]*. March 4.

EDR. 2008c. Inquiry Number: 2158677.2s. *EDR Radius Map™ Report with GeoCheck, Alta Loma Drive [Sites 10 and 10a]*. March 4.

EDR. 2008d. Inquiry Number: 2158673.2s. *EDR Radius Map™ Report with GeoCheck, SSF Main Area [Site 11]*. March 4.

EDR. 2008e. Inquiry Number: 2158655.2s. *EDR Radius Map™ Report with GeoCheck, Funeral Home [Site 12]*. March 4.

EDR. 2008f. Inquiry Number: 2158659.2s. *EDR Radius Map™ Report with GeoCheck, Golden Gate National Cemetery [Sites 14 and 15]*. March 4.

EDR. 2008g. Inquiry Number: 2177776.2s. *EDR Radius Map™ Report with GeoCheck, Linear Park [Site 13]*. March 25.

EDR. 2008h. Inquiry Number: 2294834.2s. *EDR Radius Map™ Report with GeoCheck, CUP-10A/11A Serra Bowl and Colma BART [Sites 5 and 6]*. August 18.

EDR. 2008i. Inquiry Number: 2294060.10s. *EDR Radius Map™ Report with GeoCheck, CUP-18, Phase 2, Colma Blvd near Woodlawn Cemetery [Site 7]*. August 18.

EDR. 2008j. Inquiry Number: 2294060.6s. *EDR Radius Map™ Report with GeoCheck, CUP-20A, Phase 1 Serramonte Blvd and El Camino Real [Site 8]*. August 18.

EDR. 2008k. Inquiry Number: 2294060.14s. *EDR Radius Map™ Report with GeoCheck, CUP-3A, [Site 1]*. August 18.

EDR. 2008l. Inquiry Number: 2294060.18s. *EDR Radius Map™ Report with GeoCheck, CUP-M1, Phase 2 Millbrae Corp. Yard [Site 16]*. August 18.

GeoRestoration, Inc. (GRI). 2011. *Site Investigation Report*. *SFPUC Water Supply and Treatment Division Facility*. October 19.

Green Environment, Inc. (GEI). 2012. *Semi-Annual Groundwater Monitoring Report – Second Half 2012*. *290 South Maple Avenue, South San Francisco, CA*. November 12.

Groundwater & Environmental Services, Inc. (GES). 2010. *Groundwater Monitoring Report, Third Quarter 2010. Spruce Car Wash*. October 14.

GES. 2011. *Interim Remedial Action Plan*. *Spruce Car Wash*. August.

KCE Matrix. 2012. *Subsurface Environmental Site Assessment Report. 416 Browning Way, South San Francisco, CA.* December 10.

Kennedy/Jenks Consultants (Kennedy/Jenks). 2009a. *Proposed Production Well TW-CUP-10A, Serra Bowl Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March.

Kennedy/Jenks. 2009b. *Proposed Production Well TW-CUP-11A, Colma BART Station Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March 26.

Kennedy/Jenks. 2009c. *Proposed Production Well TW-CUP-18, Colma Boulevard Site, Colma, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March.

Kennedy/Jenks. 2009d. *Proposed Production Well TW-CUP-19, Serramonte Boulevard Site, Colma, CA, Preliminary Drinking Water Source Assessment and Protection Program.* March.

Kennedy/Jenks. 2009e. *Proposed Production Well TW-CUP-22A, Hickey Boulevard Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* June 30.

Kennedy/Jenks. 2009f. *Proposed Production Well TW-CUP-41-4, Linear Park Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program*. June 30.

Kennedy/Jenks. 2009g. *Proposed Production Well TW-CUP-6, Park Plaza Meter Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* September 30.

Kennedy/Jenks. 2010a. *Proposed Production Well TW-CUP-3A, Lake Merced Golf Club Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010b. *Proposed Production Well TW-CUP-5, Benjamin Franklin Intermediate School Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.*

Kennedy/Jenks. 2010c. *Proposed Production Well TW-CUP-7, Garden Village Elementary School Site, Daly City, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010d. *Proposed Production Well TW-CUP-23, Treasure Island Trailer Court Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010e. *Proposed Production Well TW-CUP-31, SSF Main Area Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010f. *Proposed Production Well TW-CUP-36-1, Funeral Home Site, South San Francisco, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

Kennedy/Jenks. 2010g. *Proposed Production Well TW-CUP-44-1, Golden Gate National Cemetery – Maintenance Building Site, San Bruno, CA, Preliminary Drinking Water Source Assessment and Protection Program.*

Kennedy/Jenks. 2010h. *Proposed Production Well TW-CUP-44-2, Golden Gate National Cemetery – North Side Site, San Bruno, CA, Preliminary Drinking Water Source Assessment and Protection Program.*

Kennedy/Jenks. 2010i. *Proposed Production Well TW-CUP-M-1, Millbrae Corporation Yard Site, San Bruno, CA, Preliminary Drinking Water Source Assessment and Protection Program.* August 25.

North County Fire Authority (NCFA). 2012. Personal Communication, Matt Lucett, March 15, 2012.

Pangea Environmental Services, Inc (Pangea). 2011. *Offsite Well Installation Report*. Olympian Service Station. June 15.

Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2012. Personal Communication, Nancy Katyl, March 14, 2012.

San Francisco Public Utilities Commission (SFPUC). 2011. *Lake Merced Watershed Report*. January.

San Mateo County Health Department. 2005. *Building Department Notification for Case Closure of Site #880017, One (1) 2,000-Gallon Gasoline UST at Golden Gate National Cemetery, 1300 Sneath Lane, San Bruno, California*. April 12.

San Mateo County Health System. 2010. *Case Closure, Pacific Bell Facility, 1465 Huntington Avenue, South San Francisco, CA*. August 12.

San Mateo County Health System. 2012. *Case Closure, Remedial Action Oversight. Former Standard Oil Substation, Chevron, 972 El Camino Real, South San Francisco, CA.* March 30.

San Mateo County Sherriff's Office of Emergency Services. 2012. Personal Communication, Jeff Norris, March 15, 2012.

South San Francisco Fire Department. 2012. Personal Communication, Lewis DeSilva, March 15, 2012.

Stantec. 2012. *Fourth Quarter 2012 Semi-Annual Groundwater Monitoring Report. ARCO Service Station No. 0465*. November 27.

State Water Resources Control Board (SWRCB). 2012a. *GeoTracker Database.* Database accessed in 2012 at: http://geotracker.waterboards.ca.gov/.

SWRCB. 2012b. *GeoTracker Database, Unocal Station #3816.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100912.

SWRCB. 2012c. *GeoTracker Database, Pacific Plaza III.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608131398.

SWRCB. 2012d. *GeoTracker Database, Arco #0465.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100027.

SWRCB. 2012e. *GeoTracker Database, Southgate Cleaners.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608188850.

SWRCB. 2012f. *GeoTracker Database, BP #11202 (Former).* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100077.

SWRCB. 2012g. *GeoTracker Database, Exxon 7-0207.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100204.

SWRCB. 2012h. *GeoTracker Database, L. Bocci & Sons Inc.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608194016.

SWRCB. 2012i. *GeoTracker Database, Treasure Island Trailer Court.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100550.

SWRCB. 2012j. *GeoTracker Database, WESCO Management.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100616.

SWRCB. 2012k. *GeoTracker Database, Contreras Painting.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608106763.

SWRCB. 2012l. *GeoTracker Database, Chevron, Former Standard Oil Substation.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608123509.

SWRCB. 2012m. *GeoTracker Database, Chevron 9-5669.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100145.

SWRCB. 2012n. *GeoTracker Database, Chevron 9-0248.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100144.

SWRCB. 2012o. *GeoTracker Database, Pacific Bell.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100376.

SWRCB. 2012p. *GeoTracker Database, UNOCAL #6980.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100577

SWRCB. 2012q. *GeoTracker Database, Tony's Services.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100545.

SWRCB. 2012r. *GeoTracker Database, Spruce Car Wash.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100512.

SWRCB. 2012s. *GeoTracker Database, Coyne Cylinder Company.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608191592.

SWRCB. 2012t. *GeoTracker Database, 416 Browning (Former Goss-Jewett Facility).* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608101503.

SWRCB. 2012u. *GeoTracker Database, 290 South Maple.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608175553.

SWRCB. 2012v. *GeoTracker Database, Pellegrini Bros Wines, Inc.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100884.

SWRCB. 2012w. *GeoTracker Database, Golden Gate National Cemetery.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608101074.

SWRCB. 2012x. *GeoTracker Database, Rob Baker's Olympic.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608121993.

SWRCB. 2012y. *GeoTracker Database, San Francisco Water Department.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T10000002568.

SWRCB. 2012z. *GeoTracker Database, Jiffy Cleaners.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608147901.

SWRCB. 2012aa. *GeoTracker Database, Jerair Shell.* Database accessed in 2012 at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608100842.

TEC Environmental. 2010a. *Semi-Annual Groundwater Monitoring Report, Spring/Summer 2010*. *L. Bocci and Sons, Inc*. July 26.

TEC Environmental. 2010b. *Additional Site Assessment Workplan*. *Former Jerair Shell*. August 17.

TEC Environmental. 2011. *Vapor Intrusion Workplan*. *Pellegrini Brothers Wines, Inc*. February 1.

TRC. 2009. *Additional Evaluation of Soil Vapor and Groundwater Quality*. *Jiffy Cleaners Site*. August 5.

Treadwell & Rollo. 2008. *Additional Groundwater Characterization Report*. *Former Coyne Cylinder Company*. March 12.

Treadwell & Rollo. 2010. *Work Plan for Sub-slab Soil Gas and Groundwater Sampling*. *Southgate Dry Cleaners*. December 20.

5.18 MINERAL AND ENERGY RESOURCES

This section analyzes the proposed Project's potential impacts on the use of non-renewable mineral and energy resources, as well as on water use, and the potential for Project implementation to adversely affect the availability of these resources. The study area for mineral and energy resources includes the facility sites and the nearby areas.

5.18.1 Setting

5.18.1.1 Mineral Resources

In accordance with the Surface Mining and Reclamation Act of 1975 (SMARA) (discussed below in Section 5.18.2.2 [State Regulations]), the California Department of Conservation, Division of Mines and Geology, currently known as the California Geological Survey (CGS), has mapped nonfuel mineral resources of the State to show where economically significant mineral deposits are either present or likely to occur based on the best available scientific data. These resources have been mapped using the California Mineral Land Classification System, which includes the following four Mineral Resource Zones (MRZs):

- **MRZ-1.** Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- **MRZ-2.** Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.
- **MRZ-3.** Areas containing mineral deposits, the significance of which cannot be evaluated.
- **MRZ-4.** Areas where available information is inadequate for assignment to any other zone.

The study area is mapped as MRZ-1, which indicates that the study area does not, or is unlikely to contain, significant mineral resources (CGS 1987, 1996).

5.18.1.2 California's Electricity Supply

California's electricity is generated by a number of sources, including natural gas (46 percent), coal (18 percent), large hydroelectric plants (11 percent), and nuclear (14 percent) (CEC 2009). The remaining 11 percent is supplied from geothermal, biomass, small hydroelectric, wind, and solar sources (CEC 2009). Established in 2002 under Senate Bill 1078 (SB 1078) and accelerated in 2006 under Senate Bill 107 (SB 107), California's Renewable Portfolio Standard (RPS) requires electric corporations to increase procurement from eligible renewable energy resources by at least one percent of their retail sales annually, until they reached 20 percent by 2010. On September 15, 2009, former Governor Schwarzenegger signed Executive Order S-21-09 directing the California Air Resources Board (CARB) to adopt regulations increasing California's RPS to 33 percent by 2020. In 2010, the three largest investor-owned utilities, including the Pacific Gas and Electric Company (PG&E), had reached 17.9 percent (CPUC 2011).

5.18.1.3 Current Energy Providers

SFPUC Power Enterprise

The San Francisco Public Utilities Commission (SFPUC) Power Enterprise would provide electrical power service for the Project facilities, primarily from power generated by the SFPUC's hydroelectric facilities in the Hetch Hetchy system. The system includes 401 megawatts (MW) of hydroelectric power generation plants on the Tuolumne River and 150 miles of high-voltage transmission lines that carry this power to California's electricity grid at Newark, California, where the Hetch Hetchy power system is linked to California's electricity grid. Energy production varies by season and by year depending on hydrologic conditions. The long-term annual average production is approximately 1.7 billion kilowatt-hours (kWh); historical production has ranged from a low of 1.2 billion kWh per year to a high of 2.2 billion kWh per year (SFPUC 2002). The total energy usage of existing facilities within the Water System Improvement Program (WSIP) regions is nearly 44 million kWh, less than four percent of the historical low production rate of the regional water system and less than three percent of the long-term annual average production rate (incorporated by reference from the WSIP Program EIR, Chapter 4, WSIP Facility Projects – Setting and Impacts, Section 4.15, Energy Resources, Section 4.15.1 Setting [San Francisco Planning Department 2008]).

The SFPUC Power Enterprise provides electricity to all City and County of San Francisco (CCSF) facilities (including tenants), including the San Francisco International Airport and its tenants, and would supply power for the proposed Project. The SFPUC Power Enterprise also sells electricity to Norris Industries (a federal defense contractor), provides electricity for the municipal and agricultural pumping loads of the Modesto and Turlock Irrigation Districts, and sells electricity to other public agency wholesalers. While the quantity of power produced exceeds San Francisco's municipal power needs on an annual basis, the CCSF must supplement its power sources to meet municipal demand and its contractual obligations during the summer and fall months, at which time power generation is reduced so that water can be stored. The SFPUC Power Enterprise load profile is relatively flat (i.e., not dramatically higher in the summer), because it is not driven by air conditioning use.

Pacific Gas and Electric Company

PG&E provides natural gas and electricity to most of Northern California. It provides the SFPUC Power Enterprise with transmission and distribution services from Newark, California, to points west, pursuant to an Interconnection Agreement regulated by the Federal Energy Regulatory Commission (FERC). Under this agreement, PG&E transmits and distributes electricity to the SFPUC Power Enterprise customers and would provide power distribution services for the proposed Project.

5.18.1.4 Existing Energy Use and Distribution

The SFPUC annual energy demand for operation of the regional water system was approximately 35 million kWh in 2009 when the system delivered 219 million gallons per day (mgd); none of this energy demand came from pumping groundwater.

Based on the volume of existing groundwater supply of 6.8 mgd, the Partner Agencies' annual energy demand is estimated to be approximately 16 million kWh[1] to pump, treat and distribute water from their existing groundwater facilities (see Appendix I [Calculations for GSR Energy Use Impacts]).

Because the proposed Project affects energy demand of the regional water system as well as the Partner Agencies' groundwater systems, existing energy use collectively is estimated to be 51 million kWh.[2]

5.18.2 Regulatory Framework

5.18.2.1 Federal Regulations

National Energy Policy Act of 2005

The National Energy Policy Act of 2005 sets equipment energy-efficiency standards and seeks to reduce reliance on nonrenewable energy resources and provide incentives to reduce current demand on these resources. For example, under the Act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, including hybrid vehicles, constructing energy-efficient buildings, and improving the energy efficiency of commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

5.18.2.2 State Regulations

Surface Mining and Reclamation Act of 1975

In accordance with SMARA and as discussed above in Section 5.18.1.1 (Mineral Resources), the State has established the California Mineral Land Classification System to help identify and protect mineral resources in areas that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. Protected mineral resources include construction materials, industrial and chemical mineral materials, metallic and rare minerals, and nonfluid mineral fuels.

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[1] Energy demand for the Partner Agencies' groundwater supply systems was estimated by multiplying the volume of Partner Agency pumping (6.8 mgd) by the projected unit energy demand for the proposed Project's new well facilities (6.4 million kWh per mgd). This calculation is appropriate, because the Partner Agencies are likely using the same general type of equipment and pumping from the same groundwater basin as the proposed new well facilities. However, the calculation is expected to overestimate energy demand somewhat, because some of the Partner Agencies are pumping from shallower aquifers, and the unit energy demand of the proposed new well facilities is based on design loads rather than actual loads (e.g., the new well facilities would not actually operate 24 hours a day in a dry year, but the calculation of the unit energy demand makes this assumption). See Appendix I (Calculations for GSR Energy Use Impacts).

[2] Existing energy use of 51 million kWh is the sum of regional water system 2009 annual energy demand of approximately 35 million kWh, plus the Partner Agencies' 2009 annual energy demand of approximately 16 million kWh.

The Surface Mining and Reclamation Act of 1975 (Chapter 9, Division 2, Section 2710 et seq. of the Public Resources Code) requires the State Mining and Geology Board to adopt State policies for reclaiming mined lands and conserving mineral resources. Title 24 of the California Code of Regulations, Division 2, Chapter 8, Subchapter 1, contains these policies.

2005 California Energy Action Plan II and 2008 Update

The Energy Action Plan II, and subsequent update in 2008, is the State's principal energy planning and policy document (CEC and CPUC 2005, 2008). The plan continues the goals of the original Energy Action Plan, describes a coordinated implementation plan for State energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. In accordance with this plan, the first-priority actions to address California's increasing energy demands are energy efficiency and demand response (i.e., reduction of customer energy usage during peak periods in order to address system reliability and support the best use of energy infrastructure). Additional priorities include the use of renewable sources of power and distributed generation (i.e., the use of relatively small power plants near or at centers of high demand). To the extent that these actions are unable to satisfy the increasing energy and capacity needs, clean and efficient fossil-fired generation is supported. At the beginning of 2008, the California Energy Commission (CEC) and California Public Utilities Commission (CPUC) determined it was not necessary or productive to create a new Energy Action Plan. The State's energy policies have been significantly influenced by the passage of Assembly Bill 32, the California Global Warming Solutions Act of 2006. So rather than produce a new Energy Action Plan, the CEC and CPUC prepared an "update" that examines the State's ongoing actions in the context of global climate change.

The Energy Action Plan II includes the following energy efficiency actions specific to water supply systems: Identify opportunities and support programs to reduce electricity demand related to the water supply system during peak hours, as well as opportunities to reduce the energy needed to operate water conveyance and treatment systems. Because much of electricity demand growth is expected to be met by increases in natural-gas-fired generation, reducing consumption of electricity and diversifying electricity generation resources are significant elements of plans to reduce natural gas demand.

Building Energy Efficiency Standards

The Energy Efficiency Standards for Residential and Nonresidential Buildings, as specified in Title 24, Part 6, of the California Code of Regulations (CCR), were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The CEC adopted the 2008 Standards on April 23, 2008, and the Building Standards Commission approved them for publication on September 11, 2008. The 2008 Non-residential Compliance Manual was adopted January 14, 2009. The new standards went into effect January 1, 2010, and were updated again in 2011.

5.18.2.3 Local

San Francisco Sustainability Plan

The San Francisco Board of Supervisors endorsed the San Francisco Sustainability Plan in 1997, although the Board has not committed the CCSF to perform the actions addressed in the plan. The plan addresses a broad scope of environmental issues such as air quality, human health, biodiversity, and solid waste management to promote sustainability. The major energy goals expressed in the plan are: reduction of overall power use through maximizing energy efficiency; maintaining an energy supply based on renewable, environmentally sound resources; elimination of climate-changing and ozone-depleting emissions, and toxics associated with energy production and use; and basing energy decisions on the goal of creating a sustainable society (San Francisco 1997).

San Francisco Electricity Resource Plan

The 2002 Electricity Resource Plan for San Francisco presented the initial action plan to meet the City's growth in demand for electricity using renewable energy resources. Goals included in this plan were: assure reliable power; maximize energy efficiency; develop renewable power; increase local control; affordable electric bills; improve air quality; support environmental justice; and promote economic opportunities. One of the primary goals of the plan, to facilitate the shutdown of two of the older fossil-fueled power plants located in the City on Hunters Point and in Potrero Hill, was achieved in 2006 and 2011, respectively (SFPUC 2002). The *2011 Update of the San Francisco Electricity Resource Plan* reaffirms the on-going goals of the 2002 Electricity Resource Plan and details the next steps to help San Francisco achieve its goal of generating all of its energy needs from renewable and zero-greenhouse gas (GHG) electric energy sources by 2030. The updated plan is designed to cover all electrical energy needs in San Francisco, not just the electrical energy needs provided by the SFPUC to serve municipal facilities. The updated plan proposes three broad strategies to reduce GHG emissions from electricity:

- Empower San Francisco citizens and businesses to cost-effectively reduce GHG emissions associated with their own electric energy usage;
- Increase the amount of zero-GHG electricity supplied to the City's customers from the wholesale energy market; and
- Continue and expand the SFPUC electric service to guarantee reliable, reasonably-priced and environmentally sensitive service to its customers.

The 2011 Electricity Resource Plan includes recommendations for implementation of each of these strategies (SFPUC 2011).

5.18.3 Impacts and Mitigation Measures

5.18.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on minerals and energy resources if it were to:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State.
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.
- Encourage activities which result in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner.

5.18.3.2 Approach to Analysis

This analysis evaluates the potential Project-related loss of availability of locally or regionally important mineral resources based on mapping conducted under the CGS Mineral Land Classification System. Impacts related to the loss of mineral resources would be considered significant if construction activities would make known mineral resources temporarily unavailable, or if the construction of new facilities would make these resources permanently unavailable.

This analysis also evaluates the use of energy resources (e.g., fuel and electricity) and the use of water associated with the construction and operation of the Project. For construction, the analysis considers whether construction activities would use large amounts of fuels, water, or energy, and whether they would be used in a wasteful manner. For energy, water, and fuel used during operation and maintenance, the analysis identifies the average annual increase in energy and fuel use that would occur with implementation of the Project to determine whether large amounts would be used and whether they would be used in a wasteful manner.

Natural gas would not be required for Project construction or operation and is not discussed further in this section.

With respect to water use, the Project would supply, treat, and distribute groundwater for use during a dry year. The additional water supply would supplant an existing source of water, but it would not increase demand (as, for example, a residential project would). Project construction techniques, such as watering exposed surfaces, would not result in the wasteful use of water or encourage activities using large amounts of water given that a water truck has a limited volume and it is to the benefit of the contractor not to water the site excessively. For these reasons, water usage is not discussed further in this section.

Areas of No Project Impact

The Project would not result in impacts related to the first and second significance criteria. These criteria are not discussed further in this section for the following reasons:

Result in the loss of availability of a known mineral resource of value to the region or State. As noted in Section 5.18.1.1 (Mineral Resources), the study area is mapped as MRZ-1, which means that no known mineral resources pursuant to SMARA were identified within the study area (CGS 1987, 1996). Therefore, the Project would not result in the loss of known mineral resources or make them inaccessible. As a result, this significance criterion would not be applicable to the Project.

Result in the loss of availability of a locally important mineral resource recovery site. As noted in Section 5.18.1.1 (Mineral Resources), the study area is mapped as MRZ-1, which means that no known mineral resources pursuant to SMARA were identified within the study area (CGS 1987, 1996). There are no locally important mineral resource recovery sites identified on a local general plan, specific plan, or other land use plan within the Project area (Colma 1999; Daly City 1987; Millbrae 1998; San Bruno 2009; San Mateo County 1986a, 1986b; South San Francisco 1999). Therefore, the Project would not impact the accessibility of a locally important mineral resource recovery site. As a result, this significance criterion would not be applicable to the Project.

5.18.3.3 Impact Summary

Table 5.18-1 (Summary of Impacts – Mineral and Energy Resources) provides a summary of potential impacts to energy resources and significance determinations.

TABLE 5.18-1
Summary of Impacts – 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.	**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.**	**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 All Sites	LS All Sites	LS All Sites

Notes:

LS = Less than Significant

LSM = Less than Significant with Mitigation

5.18.3.4 Construction Impacts and Mitigation Measures

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. (Less than Significant)

All Sites

Construction of the Project would require the use of fossil fuels (primarily gas, diesel, and motor oil) for a variety of activities, including well drilling, excavation, grading, demolition, generator use, and vehicle travel. The precise amount of construction-related energy consumption is uncertain. However, given the nature and scale of Project construction (i.e., potentially up to 19 wells drilled, with operation of only 16), construction would not require a large amount of fuel or energy usage because of the moderate number of construction vehicles and equipment, worker trips, and truck trips that would be required for a project of this scale (see Table 3-8 [Estimated Daily Worker and Construction Equipment Trips for Well Facilities Construction], in Chapter 3, Project Description, Section 3.5.1.2 [Construction Methods for Well Facilities]). Therefore, Project construction would not encourage activities that would result in the use of large amounts of fuel and energy in a wasteful manner. The impact would be *less than significant.*

Impact Conclusion: Less than Significant

5.18.3.5 Operation Impacts and Mitigation Measures

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. (Less than Significant)

All Sites

The production of groundwater requires electricity to pump the groundwater from the wells, convey it to a water treatment system, treat the groundwater, and convey the treated water to the potable water distribution system. The amount of energy required would depend on the efficiency of the pumping equipment, the depth to groundwater, the distance to the treatment facility, the type of treatment required, and the distance to the distribution system. The proposed Project, during dry years, would increase energy demand associated with the pumping of accumulated water in the southern portion of the Westside Groundwater Basin; dry years are projected to occur in approximately 23 percent of the years (see Appendix I [Calculations for GSR Energy Use Impacts]). The proposed well facilities have been designed and sited so that wells would be close to treatment systems and close to existing distribution systems (the local distribution systems of the Partner Agencies and the regional water system), which would support an efficient use of energy (see Chapter 3, Project Description, Section 3.4.2 [Production Wells and Associated Facilities]). In accordance with the WSIP Greenhouse Gas Reduction Actions, the SFPUC would consult with its Power Enterprise's Energy Efficiency Group to incorporate applicable energy efficiency measures into the Project design, would attempt to maximize efficiency by exceeding Title 24 minimum requirements by at least 20 percent, and would attempt to meet or exceed LEED Silver certification. At a minimum, the proposed well facilities would be designed to meet California's energy efficiency standards outlined in Title 24 of the California Code of Regulations (see Chapter 3, Project Description, Section 3.7 [Greenhouse Gas Reduction Actions] and Section 3.4.2.2 [Well Facility Types]).

The proposed Project's energy demand would be the result of three operational components as discussed in Chapter 3, Project Description, Section 3.8 (Operations and Maintenance) and as shown on Figure 3-2 (Source of Proposed Water Supply for Partner Agencies). This includes operation of the new well facilities and pump station, operation of the Partner Agency wells, and operation of the regional water system. Each of these operational components is discussed below; refer to Appendix I (Calculations for GSR Energy Use Impacts) for additional information and assumptions.

New Well Facilities and Westlake Pump Station Upgrade

Most of the Project's energy demand would be due to pumping at the new wells; however, a small amount of energy would be required to operate the well facility buildings and treatment systems. The energy demand from the new well facilities and the Westlake Pump Station upgrade from pumping 7.2 mgd during a dry year (i.e., Take Year) would be approximately 17 million kWh (see Appendix I [Calculations for GSR Energy Use Impacts]). This would be the maximum annual demand, since the pumping volume would be greatest and the groundwater levels would be lowest during a dry year, thereby requiring more energy to pump the water to the surface (see Appendix I [Calculations for GSR Energy Use Impacts]). In other words, a greater volume of water would be pumped a greater distance.

Energy demand at the proposed well facilities in normal or wet years (i.e., Put or Hold Years) would be negligible, as the well pumps would only be turned on approximately four hours per month to exercise the wells and keep them from fouling (see Chapter 3, Project Description, Section 3.8.3 [Maintenance]).

Taking into account the projected frequency of dry, normal, and wet years, the long-term average annual energy demand of the proposed new well facilities and the Westlake Pump Station upgrade would be approximately four million kWh (see Appendix I [Calculations for GSR Energy Use Impacts]).

Partner Agency Wells

During dry years (i.e., Take Years), and in accordance with the proposed Operating Agreement (see Chapter 3, Project Description, Section 3.8.1 [Operating Agreement]), Partner Agency pumping would be 6.9 mgd, a slight increase over existing pumping, as calculated over a five-year averaging period; the estimated annual energy demand would increase only slightly.

During wet and normal years when the SFPUC Storage Account is full (i.e., Hold Years), the Partner Agencies could pump groundwater at the 6.9 mgd rate, as calculated over a five-year averaging period; the estimated annual energy demand would increase over the existing demand (at the 6.8 mgd pumping rate) only slightly. Under the proposed Operating Agreement, the Partner Agencies would be allowed to increase pumping by 10 percent over the 6.9 mgd, or a total of 7.6 mgd for a short period, but the five-year average pumping rate would still need to be maintained at 6.9 mgd. Therefore, any increased energy demand due to this possibility of short-term increased pumping by the Partner Agencies would be offset by decreased energy demand from reduced pumping required to maintain the 6.9 mgd five-year average pumping rate.

During normal and wet years when the SFPUC Storage Account is not full (i.e., Put Years), pumping by the Partner Agencies would be reduced substantially to 1.4 mgd. Estimated annual energy demand for the Partner Agencies' well facilities would decrease accordingly from 16 to 3 million kWh in normal and wet years (see Appendix I [Calculations for GSR Energy Use Impacts]).

Taking into account the projected frequency of dry, normal, and wet years, the long-term average annual energy demand of the Partner Agency's well facilities would decrease by approximately four million kWh (see Appendix I [Calculations for GSR Energy Use Impacts]).

Regional Water System

Under the proposed Project and in accordance with the proposed Operating Agreement, the SFPUC would decrease surface water deliveries to retail and wholesale customers by 7.2 mgd during dry years (i.e., Take Years), when water supply from groundwater would increase, resulting in energy savings to the regional water system of approximately one million kWh (see Appendix I [Calculations for GSR Energy Use Impacts]).

During normal and wet years when the SFPUC Storage Account is full (i.e., Hold Years), no changes would occur to deliveries from the regional water system due to the Project.

However, during normal and wet years when the SFPUC Storage Account is not full (i.e., Put Years), the SFPUC would increase surface water deliveries to the Partner Agencies by 5.5 mgd, when groundwater pumping would decrease to allow the southern portion of the Westside Groundwater Basin to recharge naturally. This increase in surface water deliveries would result in additional energy use by the regional water system of approximately one million kWh (see Appendix I [Calculations for GSR Energy Use Impacts]).

Taking into account the projected frequency of dry, normal, and wet years, the long-term average annual energy demand for the regional water system would not change substantially from the existing energy demand as a result of the proposed Project (see Appendix I [Calculations for GSR Energy Use Impacts]).

New Well Facilities, Partner Agency Wells, and Regional Water System

Thus, the collective change in energy demand of the new well facilities and Westlake Pump Station (increase of four million kWh), the Partner Agencies' wells (decrease of four million kWh) and the regional water system (no change) would be negligible, and the proposed Project would not cause a substantial increase in energy use on a long-term basis (see Appendix I [Calculations for GSR Energy Use Impacts]).

The Project also would use a small amount of fuel for worker trips to perform routine equipment checks at each well facility site. Each well station would be visited daily when wells are operating. During normal and wet years, the wells normally would be turned off, but regular exercising would be conducted. At these times, the wells would be visited on a weekly basis or at a frequency determined by on-site conditions (see Chapter 3, Project Description, Section 3.8.3 [Maintenance]).

Impact Conclusion

Therefore, because (1) the necessary power for the Project is already produced and distributed through existing infrastructure, (2) the Project is designed to be energy efficient and not waste energy, and (3) the proposed Project would not increase energy demands, the potential impacts associated with energy resources during operation of the Project would be *less than significant*. The energy resources that would be consumed by the Project would be for the public benefit and would not be wasteful, because the Project serves to increase water delivery reliability, meet customer water supply needs, and increase regional operational flexibility.

Impact Conclusion: Less than Significant

5.18.3.6 Cumulative Impacts and Mitigation Measures

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. (Less than Significant)

The geographic scope for the analysis of potential cumulative mineral and energy resources impacts consists of the proposed GSR facility sites, and the general vicinity (for mineral resources), and service area for the SFPUC Power Enterprise (for energy resources), as described in Section 5.18.1.3 (Current Energy Providers).

Construction

Mineral Resources

Because construction of the GSR Project would not result in Project-specific impacts related to mineral resources, implementation of the Project would not result in cumulative impacts to these resources (*no impact*).

Energy Resources

The cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) and the proposed GSR Project (see Impact ME-1) would all use energy during construction, which could result in a *significant* cumulative energy impact. However, the GSR Project's contribution to this cumulative impact would not be cumulatively considerable, given that construction of the Project as proposed would use a small amount of fuel and energy in an efficient manner for the public benefit. Therefore, the GSR Project's contribution to a significant cumulative impact on energy resources would not be cumulatively considerable (*less than significant*).

Operation

Mineral Resources

Because operation of the GSR Project would not result in Project-specific impacts related to mineral resources, implementation of the Project would not result in cumulative impacts to these resources (*no impact*).

Energy Resources

Most of the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts) would result in incremental increases in energy demand during long-term operation. The San Francisco Groundwater Supply Project (cumulative projects A-1 to A-6) would use the SFPUC Power Enterprise electricity to pump up to 4 mgd of groundwater for potable water supply. Expansion of the Holy Cross Cemetery (cumulative project E) would increase energy use to pump an additional 0.04 mgd of groundwater for cemetery operations. The Mission & McLellan Project (cumulative project F) would increase energy demand to supply power to 20 new condominium units. Lastly, the Centennial Village Project (cumulative project I) would increase energy demand with a new shopping center and 132 new apartment units.

As described in Impact ME-2, the GSR Project would have *less-than-significant* impacts on energy demand during operation, because it would not increase the long-term use of energy, it would not use energy in a wasteful manner, and the long-term energy demand for maintenance would be small.

Nevertheless, implementation of the proposed GSR Project, together with the cumulative projects listed in Table 5.1-3 (Projects Considered for Cumulative Impacts), could result in a *significant* cumulative impact on energy use. However, as discussed above, operation of the proposed GSR Project would not increase energy use in the long-term and would not be wasteful of energy resources. As a result, the GSR Project's contribution to a cumulative impact on energy resources would not be cumulatively considerable (*less than significant*).

5.18.4 References

California Energy Commission (CEC). 2009. *2009 Integrated Energy Policy Report*. September.

CEC and California Public Utilities Commission (CPUC). 2005. *Final 2005 Energy Action Plan II Implementation Roadmap for Energy Polices*. October.

CEC and CPUC. 2008. *2008 Update Energy Action Plan*. February.

California Geological Survey (CGS). 1987. *Mineral Land Classification: Aggregate Materials in the San Francisco-Monterey Bay Area.* Special Report 146, Part II.

CGS. 1996. Update of *Mineral Land Classification: Aggregate Materials in the South San Francisco Bay Production-Consumption Region.* DMG Open-File Report 96-03.

CPUC. 2011. *Renewable Portfolio Standard Quarterly Report*.

Colma, Town of. 1999. *Town of Colma General Plan.* June.

Daly City, City of. 1987. *City of Daly City General Plan, Housing, Land Use & Circulation Elements*. November.

Millbrae, City of. 1998. *City of Millbrae General Plan 1998-2015*. November.

San Bruno, City of. 2009. *San Bruno General Plan*. March.

San Francisco, Department of Environment. 1997. *Sustainability Plan for the City of San Francisco*. July.

San Francisco Planning Department. 2008. *Final Program Environmental Impact Report on the San Francisco Public Utilities Commission's Water System Improvement Program (*San Francisco Planning Department File No. 2005.0159E; State Clearinghouse No. 2005092026*).* October.

San Francisco Public Utilities Commission (SFPUC). 2002. *The Electricity Resource Plan, Revised*. December.

SFPUC. 2011. *San Francisco's Updated Electricity Resource Plan.* January.

San Mateo County. 1986a. *General Plan Overview Background & Issues Chapters 1-16)*. November.

San Mateo County. 1986b. *General Plan Policies*. November.

South San Francisco, City of. 1999. *South San Francisco General Plan*.

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5.19 AGRICULTURE AND FOREST RESOURCES

This section describes existing agricultural and forest resources at each facility site and analyzes the potential for Project construction or operation to affect such resources through displacement or conversion of these uses.

5.19.1 Setting

The proposed Project would be located in northern San Mateo County in unincorporated San Mateo County, the Town of Colma, and the cities of Daly City, South San Francisco, San Bruno, and Millbrae. The proposed Project would be located in areas characterized primarily by developed urban/suburban landscapes, and within the Golden Gate National Cemetery and Lake Merced Golf Club. No proposed well facility sites would be located in areas zoned for, or used for, agricultural or forestry purposes. The study area for potential impacts to agriculture and forest resources is the construction area boundary of the individual facility sites.

5.19.1.1 Agricultural Resources

Farmland Classifications

Farmland Mapping and Monitoring Program

The California Natural Resources Agency's Department of Conservation (CDC), Division of Land Resource Protection, maps important farmlands throughout California. Important farmlands are classified into the categories listed below on the basis of soil conditions (their suitability for agriculture) and current land use.

- **Prime Farmland.** This category represents farmland with the best combination of physical and chemical characteristics for long-term agricultural production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed. In addition, the land must have been used for irrigated agricultural production in the last four years to qualify under this category.
- **Farmland of Statewide Importance**. Farmland of Statewide Importance is similar to Prime Farmland in that it has a good combination of physical and chemical characteristics for crop production, but with minor shortcomings, such as greater slopes and less ability to store moisture.
- **Unique Farmland**. This land does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but is land that has been used for the production of the State's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards, as found in some climatic zones of California. Unique Farmland must have been cropped at some time during the four years prior to the mapping date.

- **Farmland of Local Importance**. This category applies to land of importance to the local agricultural economy, as determined by the county. This land is either currently producing crops or has the capability of production, but does not meet the criteria of the preceding categories.
- **Grazing Land.** Grazing Land is land on which the vegetation is suited to the grazing of livestock.
- **Urban and Built-up Land**. This land is occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures on a 10-acre parcel. This land generally provides unfavorable conditions for agricultural production.
- **Other Land**. This is land that is not included in any of the categories above and may include brush, timber, wetlands, confined livestock areas, strip mines, and gravel pits, among other land types.

Farmland Designations in the Project Area

All of the proposed Project facility sites are mapped as Urban and Built-up Land (CDC 2011). No farmland is mapped in the study area (CDC 2011).

Williamson Act Program

As described below in Section 5.19.2.2 (State Regulations), the California Land Conservation Act (commonly referred to as the Williamson Act) is the State's primary program for the conservation of private land for agricultural and open space uses. The CDC prepares countywide maps of lands enrolled in Williamson Act contracts and classifies them into the categories described below.

- **Prime Agricultural Land**. This category represents the State's highest quality agricultural land. Land under this category is typically used for the production of irrigated crops or to support livestock.

- **Non-prime Agricultural Land**. This category represents Open Space Land of Statewide Significance, as defined under the California Open Space Subvention Act. Most land under this category is in agricultural uses such as grazing or non-irrigated crops and may also include other open space uses that are compatible with agriculture and consistent with local general plans.

- **Land in Non-renewal**. This category represents land under contracts that are being terminated at the option of the landowner or local government.

Williamson Act Contracts in the Study Area

No lands in the study area are enrolled in the Williamson Act program (CDC 2007).

5.19.1.2 Forest Resources

Section 12220(g) of the California Public Resources Code defines forest land as "land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation and other public benefits." Timberland is land that is available for and capable of growing a crop of trees of any commercial species used to produce lumber and other forest products (Public Resources Code Section 4526). Under this definition, timberland does not include land owned by the federal government and land designated by the California Board of Forestry and Fire Protection as experimental forest land. There is no forest land within the study area.

5.19.2 Regulatory Framework

5.19.2.1 Federal Regulations

The Farmland Protection and Policy Act (FPPA) requires an evaluation of the relative value of farmland that could be affected by decisions sponsored in whole or part by the federal government. The FPPA is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with State, local units of government, and private programs and policies to protect farmland (USDA 2011). For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements includes forest land, pastureland, cropland, or other land, but not water or urban built-up land. The FPPA does not apply to the proposed Project, because lands in the study area are mapped as Built-up Lands.

5.19.2.2 State Regulations

As noted in Section 5.19.1.1 (Agricultural Resources), the California Land Conservation Act of 1965, commonly referred to as the Williamson Act, is the State's primary program aimed at conserving private land for agricultural and open space use. It is a voluntary, locally-administered program that offers reduced property taxes on lands whose owners place enforceable restrictions on land use through contracts between the individual landowners and local governments. As also indicated in Section 5.19.1.1 (Agricultural Resources), there are no lands in the study area that are enrolled in the Williamson Act program. Therefore, land use restrictions imposed by the Williamson Act are not applicable to the proposed Project.

5.19.2.3 Local Regulations

Local planning agencies regulate land uses, including agricultural uses, through general plan policies and zoning designations, which specify allowable uses within their jurisdictions. The San Francisco Public Utilities Commission (SFPUC) is not subject to local land use policies and zoning ordinances (refer to Chapter 4, Plans and Policies), although it seeks to work cooperatively with local jurisdictions to avoid conflicts. However, none of the facility sites would be located on land designated by a local general plan or zoned for agriculture or forestry (Colma 2009, 2010; Daly City 1987, 2003; Millbrae 1998, 2012; San Bruno 2007, 2009; San Mateo County 1986a, 1986b, 1999, n.d.; South San Francisco 1999, 2010).

5.19.3 Impacts and Mitigation Measures

5.19.3.1 Significance Criteria

For the purposes of this EIR, the Regional Groundwater Storage and Recovery Project would have a significant effect on agriculture and forest resources if it were to:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Natural Resources Agency, to non-agricultural use.
- Conflict with existing zoning for agricultural use or a Williamson Act contract.
- Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220[g]) or timberland (as defined by Public Resources Code Section 4526).
- Result in the loss of forest land or the conversion of forest land to non-forest use.
- Involve other changes in the existing environment, which, due to their location or nature, could result in the conversion of farmland to non-agricultural use or forest land to non-forest use.

5.19.3.2 Approach to Analysis

Due to the location of the Project, no impacts would occur related to the five impact criteria listed above; therefore, no impact discussion is provided for these topics for the reasons presented below:

Convert mapped farmland to non-agricultural use. The proposed Project's facility sites are not located on or in the vicinity of land mapped as farmland. Therefore, the first significance criterion listed above is not applicable to the Project and is not discussed further.

Conflict with zoning for agricultural use or with a Williamson Act contract. The proposed Project's facility sites are not located on land zoned for agricultural uses or subject to a Williamson Act contract. Therefore, the second significance criterion listed above is not applicable to the Project and is not discussed further.

Conflict with existing zoning for, or cause rezoning of, forest land, or result in the loss of forest land or the conversion of forest land to non-forest use. No land in the study area is either zoned for forestry or meets the definition of forest land. Thus, neither construction nor operation of the proposed Project would conflict with zoning regulations for forest land, result in the loss of forest land, or result in the conversion of forest land to non-forest use. Therefore, the third and fourth significance criteria listed above are not applicable to the proposed Project and are not discussed further.

Involve other changes in the existing environment, which, due to their location or nature, could result in the conversion of farmland to non-agricultural use or forest land to non-forest use. The facility sites would be located on land designated as Urban and Built-up Land. The proposed Project would install and operate improvements (well facilities and an upgrade at the Westlake Pump Station) for water supply and, therefore, would not involve changes that would result in conversion of farmland to non-agricultural use or forest land to non-forest use. Thus, the fifth criterion listed above is not applicable to the proposed Project and is not discussed further.

5.19.3.3 Construction and Operational Impacts and Mitigation Measures

As discussed above, the Project would not cause impacts to agriculture or forest resources. Therefore, no mitigation measures related to this resource topic are required.

5.19.3.4 Cumulative Impacts and Mitigation Measures

Because the GSR Project would not result in Project-specific impacts related to agriculture or forest resources, implementation of the Project would not result in cumulative impacts to these resources.

5.19.4 References

California Department of Conservation (CDC), Division of Land Resource Protection. 2007. *San Mateo County Williamson Act 2006, Land Enrolled in Williamson Act and Farmland Security Zone Contracts as of 01-01-2006*. April.

CDC, Division of Land Resource Protection, Farmland Mapping and Monitoring Program. 2011. *San Mateo County Important Farmland 2010.* October.

Colma, Town of. 2009. *Town of Colma General Plan Zoning Map*. July.

Colma, Town of. 2010. Colma *Municipal Code. Chapter Five: Planning, Zoning, Use, and Development of Land and Improvements, Subchapter 5.03: Zoning*. July.

Daly City, City of. 1987. *City of Daly City General Plan, Housing, Land Use & Circulation Elements*. November.

Daly City, City of. 2003. *Daly City Municipal Code Title 17 Zoning. Zoning Regulations (Consolidated).* January.

Millbrae, City of. 1998. *City of Millbrae General Plan 1998-2015*. November.

Millbrae, City of. 2012. *Millbrae Municipal Code. Chapter 10.05 Zoning*. February.

San Bruno, City of. 2007. *Zoning Map*. August.

San Bruno, City of. 2009. *San Bruno General Plan*. March.

San Mateo County. 1986a. *General Plan Overview Background & Issues (Chapters 1-16)*. November.

San Mateo County. 1986b. *General Plan Policies.* November.

San Mateo County. 1999. *Zoning Regulations*. July.

San Mateo County. n.d. *San Mateo County Zoning Map*.

South San Francisco, City of. 1999. *South San Francisco General Plan*.

South San Francisco, City of. 2010. *Zoning Ordinance and Zoning District Map*. Website accessed at: http://www.ssf.net/DocumentCenter/Home/View/1508. July.

U.S. Department of Agriculture (USDA), Natural Resources Conservation Service. 2011. *Farmland Protection Policy Act.* Website accessed April 3, 2012 at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/alphabetical/fppa.

6 OTHER CEQA ISSUES

Sections	Tables
6.1 Growth Inducement 6.2 Summary of Cumulative Impacts 6.3 Significant Environmental Effects that Cannot be Avoided if the Proposed Project is Implemented 6.4 Significant Irreversible Environmental Changes 6.5 References	6-1 Summary of Significant Cumulative Impacts

6.1 GROWTH INDUCEMENT

6.1.1 Introduction and Overview

This chapter analyzes the growth inducement potential and associated secondary effects of growth impacts of the proposed Project, as required by the California Environmental Quality Act (CEQA). CEQA requires that an Environmental Impact Report (EIR) evaluate the growth inducing impacts of a proposed Project. A growth-inducing impact is defined as follows:

> "[T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth… It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment" (CEQA Guidelines Section 15126.2[d]).

As described in Chapter 2 Introduction and Background, Section 2.2 (Project Background), the San Francisco Planning Department prepared a Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP), which was certified in October 2008 (San Francisco Planning Department 2008). The PEIR includes a detailed analysis of the growth inducement potential of the overall WSIP water supply strategy and concluded that "The WSIP would support planned growth in the existing SFPUC service area (WSIP PEIR, Volume. 4, Chapter 7, Impact 7-1)."

The proposed GSR Project, as a dry-year supply project of the WSIP, would be a contributing factor in that growth inducement potential and associated indirect effects of growth. By removing the lack of a reliable water supply and supply system as one potential obstacle to growth within the SFPUC service area, the WSIP, and thus the proposed Project, would have an indirect growth-inducing effect according to the CEQA definition above[1]. This EIR tiers from the WSIP PEIR, and the growth inducement analysis contained in PEIR Chapter 7 and PEIR Appendix E are incorporated by reference into this EIR. All impacts related to the WSIP water supply strategy to which the Project contributes have been examined at a sufficient level of detail in the PEIR and no additional review is necessary in this EIR. The significant environmental effects have been adequately addressed in the PEIR and the SFPUC has adopted the CEQA Findings on the PEIR related to the growth inducing impacts of the WSIP. A summary of the growth inducement analysis in the PEIR is provided below.

6.1.2 Summary of PEIR Growth Inducement Analysis

Implementation of the WSIP would achieve the WSIP goals and objectives, including the water supply goal through the year 2018. It would allow the SFPUC to: (1) meet its customer water needs in non-drought periods through the year 2018 and (2) limit rationing to a maximum of 20 percent reduction in water service system-wide during extended droughts. Achieving the WSIP water supply goal would increase the reliability of water service to existing customers and provide water to serve planned growth of additional residential and business customers in the existing SFPUC service area.

A variety of factors influence new development or population growth in the area served by the SFPUC's water, including economic conditions of the region, adopted growth management policies in the affected communities and the availability of adequate infrastructure (e.g., water service, sewer service, public schools and roadways), with economic factors generally the leading driver. While water service is only one of many factors affecting the growth potential of a community, it is one of the chief public services needed to support urban development, and lack of a reliable water supply as well as a service capacity deficiency could constrain future development.

Pursuant to CEQA, growth per se is not assumed to be necessarily beneficial, detrimental, or of little significance to the environment; it is the secondary, or indirect, effects of growth that can cause adverse changes to the physical environment. The indirect effects of population and/or economic growth and accompanying development can include increased demand on community services and public service infrastructure; increased traffic and noise; degradation of air and water quality; and conversion of agricultural land and open space to urban uses. Local land use plans (e.g., general plans and specific plans) of the jurisdictions served by the SFPUC establish land use development patterns and growth policies that are intended to allow for the orderly expansion of urban development supported by adequate public services, including water supply, roadway infrastructure, sewer service and solid waste service. Local jurisdictions conduct CEQA environmental review on their general and specific plans to assess the secondary effects of their planned growth and to identify feasible mitigation for significant, adverse effects. A project that would induce growth and is inconsistent with local land use plans and policies could indirectly cause adverse environmental impacts, as well as impacts on public services; this

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[1] The WSIP would not *directly* induce growth as it does not involve the development of new housing to attract additional population, nor would it indirectly induce growth by establishing substantial permanent or even short term construction employment opportunities that could stimulate population growth. Construction of the WSIP projects is not expected to involve employment opportunities substantially beyond what would normally be available to construction workers in the area, and workers are expected to be drawn from the local labor pool.

could occur if the local land use jurisdictions have not previously addressed these issues in the CEQA review of their land use plans and development proposals.

By removing the lack of a reliable water supply and water system (as one potential obstacle to growth within the SFPUC service area), providing and assisting in the development of additional water supply sources (such as recycled water and groundwater projects) and promoting of more efficient use of water through conservation measures, the WSIP would have an indirect growth-inducing effect according to the CEQA definition. The WSIP would support growth in the SFPUC service area through 2018; although it appears that some growth would occur irrespective of the WSIP due to increased water delivery efficiencies (e.g., plumbing code changes), conservation and other water supply sources. Growth would in turn result in indirect effects. In most cases, the effects of population and employment growth have been identified and addressed in the EIRs for the general plans and associated area plans and specific plans adopted by the jurisdictions in the service area. Some of the identified indirect effects of growth are significant and unavoidable; others are significant, but can be mitigated.

Potentially significant and unavoidable impacts as a result of growth in the SFPUC service area have been identified by the local jurisdictions in the following areas: traffic congestion, air pollution, traffic noise, construction noise, increased demand for public schools and other public services, loss of recreational opportunities and impacts on visual quality resulting from the loss of open space, cumulative effects on over-utilized parks, loss of wildlife habitat and wetlands and impacts on other biological resources, cumulative impacts on cultural resources, increased flooding potential, increased urban runoff pollutants, seismic hazards, induced population growth, failure to meet housing demand for projected population growth, exposure of new development to contaminated soil or groundwater, insufficient water supply, insufficient wastewater disposal capacity, loss of agricultural resources, land use conflicts, conflicts with existing land use plans or policies, and changes in density, scale and character of an area.

The adopted WSIP would have growth-inducement potential through 2018 because the SFPUC (with the cooperation of the wholesale customers) would provide the additional water supply to meet purchase requests through 2018. The WSIP would support much of the growth through 2018 in the jurisdictions served by the regional water system. In general, development that was planned and approved through the general plan process in the SFPUC service area would have environmental impacts. The environmental consequences of this planned growth have been largely addressed in local plans and the associated CEQA review, as well as in other, project-specific documentation. In a number of jurisdictions, negative declarations or mitigated negative declarations were prepared for general plans and related planning documents that were found not to have significant environmental effects.

The PEIR does not identify any mitigation measures for implementation by the SFPUC that could substantially decrease or eliminate growth-inducing impacts. This is because the SFPUC does not have control over the decisions that each local agency will make with respect to growth in their jurisdictions. Individual agencies' general plans and environmental documents contain actions, limitations and mitigation measures that will be implemented in the individual jurisdictions with local development project or program approvals. These types of mitigation measures were identified in the PEIR (see PEIR Chapter 7 and PEIR Appendix E, which are incorporated by reference into this EIR) (San Francisco Planning Department 2008).

To assess the growth inducement potential of the WSIP and characterize the secondary effects of growth, the PEIR investigates the following questions:

- What assumptions did the SFPUC and its wholesale customers make regarding growth (population and employment) in projecting future (2030) total water demand and customer purchases from the SFPUC?
- Are these assumptions consistent with forecasts prepared and used by local and regional planning agencies (e.g., Association of Bay Area Governments [ABAG], counties, and cities) within the service area? What are the growth trends in the Bay Area region?
- Are there any notable inconsistencies between the population and employment forecasts used by the SFPUC and the wholesale customers, and those of the local and regional planning agencies that suggest that the water supply planning efforts are inconsistent with land use planning efforts?
- Is the level of growth projected for 2030 consistent with that identified and planned for in existing adopted general plans?
- What are the potential environmental impacts (i.e., secondary effects) associated with growth projected to occur in the service area? Have these impacts been evaluated in previous CEQA review documents on existing general and specific plans?
- What mitigation measures and findings have the local jurisdictions adopted as part of approving their future growth plans?

  The issues raised in these questions are summarized below and addressed in detail in PEIR Chapter 7 (Volume 4) and supplemented by PEIR Appendix E (Volume 5).

- **SFPUC Projections (PEIR Section 7.2).** Accurate demand projections are important in ensuring that future water supplies will be adequate while not surpassing the needs of planned growth. The SFPUC and its customers used computer models to forecast future water demand. PEIR Section 7.2 presents an overview of the SFPUC water service area and describes key factors (assumptions, inputs and methodologies) used in estimating future demand that relate to growth and inform comparisons between water demand and land use planning projections. These factors include baseline population, methodology used to determine existing water usage by land use/account type, the current water supply agreement between the SFPUC and its wholesale customers, and assumptions regarding future land use patterns, water conservation and recycling, and water from other (non-SFPUC) sources through 2030. The demand estimates, in conjunction with estimates of savings from conservation and use of other water sources, provide the basis for the 2030 purchase estimates.
- **Growth Inducement Potential (PEIR Section 7.3).** This section analyzes the WSIP's growth inducement potential: whether the demand to be met by the WSIP would be consistent with local plans and policies or could contribute to growth in the service area beyond that called for in the existing general plan. To gauge the consistency of the WSIP with growth planned in the jurisdictions served by the SFPUC, the analysis compares the growth assumed in the SFPUC projections with growth forecasts (a) developed by ABAG and (b) reflected in

adopted land use plans in the service area. With respect to ABAG, this section also describes ABAG's changing expectations about growth as reflected in its updated projections issued in 2002, 2003, and 2005.

- **Indirect Effects of Growth (PEIR Section 7.4).** Growth (whether planned or unplanned) can cause environmental impacts. Section 7.4 of the PEIR describes the potential impacts of growth that could be supported, in part, by implementation of the WSIP. This section also identifies measures adopted to reduce, eliminate or otherwise mitigate the impacts of planned growth.

6.1.3 Summary of Conclusions

A review of historical growth trends of a selection of jurisdictions in the service area, based primarily on information in general plans and Bay Area Water Supply and Conservation Association profiles, shows that:

- Cities in the service area are largely urbanized, most having experienced their most rapid growth in the postwar decades through the 1970s.
- Milpitas and East Palo Alto have experienced high rates of growth more recently.
- San Francisco's population fluctuated somewhat, but on average has been essentially stable over the past 50 years.
- Many jurisdictions cannot grow laterally and their general plans include policies to manage growth. Many general plans identify strategies consistent with "smart growth" principles, such as encouraging infill development and the redevelopment of previously developed areas, as means to accommodate future growth.
- The SFPUC's wholesale customers vary widely, in a variety of ways: by size; overall demand projected for 2030; the change that the 2030 demand represents in absolute terms and as a percentage of 2001 demand; and the degree to which the customers depend on the SFPUC for their water supply. As such, the WSIP would remove growth obstacles to varying degrees within the service area.

As stated above, the complete growth inducement analysis is included in PEIR Chapter 7 and PEIR Appendix E, which are incorporated into this EIR by reference.

6.1.4 Indirect Effects of Growth

The indirect effects of growth expected in the general plans of jurisdictions in the service area have been identified in the EIRs prepared for those plans. Impacts commonly identified as significant and unavoidable and those commonly identified as significant, but mitigable, are presented in PEIR Section 7.4 and summarized briefly.

- The most commonly identified significant and unavoidable impacts of growth are:
    - Increased traffic congestion,
    - Deterioration of air quality, and
    - Cumulative effects of increased air pollutant emissions and noise.
- Mitigation measures have been adopted by local jurisdictions as part of their general plan approval processes to address the secondary effects of planned growth. These measures are summarized in PEIR Appendix E.
- Two cities, Foster City and City of San Mateo, identified increased demand for potable water supply as a significant and unavoidable effect of growth; the WSIP would address this issue in those two cities.
- Overriding considerations commonly adopted by the decision-making bodies in adopting their general plans include the following:
    - Accommodation of growth in an orderly, fiscally sound manner
    - Economic diversification and job generation
    - Creation of housing, furtherance of regional housing share objectives, and provision of affordable housing
    - Improvements of the local jobs/housing balance
    - Increased sales revenue and positive fiscal impact
    - Promotion of alternative modes of travel to reduce reliance on private vehicles
    - Establishment of policies to preserve natural areas and open space lands
- For many cities that receive water from the regional water system, the supply to be provided under the WSIP supports and is consistent with the planned growth reflected in their existing adopted general plans. For other communities, it appears that the WSIP supply (in combination with other supply sources available to those communities), could serve a level of growth beyond that identified in the existing general plans. In those cases, secondary effects of such growth could include impacts related to increased density and impacts related to development of new land areas.
    - Density related impacts could include increased traffic congestion, air pollution, traffic noise, construction noise and demand on public services.
    - Land area related impacts could include loss of open space and agricultural land, as well as loss of and degradation of water quality due to increases in impervious surface area.

The proposed GSR Project would not directly induce population or economic growth, nor would it tax existing community service facilities or encourage other activities that could significantly affect the environment. However, as described above, the GSR Project is one of the groundwater projects that comprise the WSIP and, therefore, its implementation would contribute to the growth inducement potential of the WSIP and the associated indirect effects of growth. Implementation of the GSR Project would thus contribute to an incremental portion of the growth inducement impacts and associated indirect impacts of growth of the WSIP. See Chapter 7 of the PEIR for a detailed analysis of the WSIP's growth inducement effects (San Francisco Planning Department 2008).

6.2 SUMMARY OF CUMULATIVE IMPACTS

As described in Chapter 5 Environmental Setting, Impacts, and Mitigation Measures, Section 5.1.7 (Cumulative Impacts), cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts" (CEQA Guidelines Section 15355). Cumulative impacts can result from individually minor, but collectively significant actions when added to those of other closely related past, present or reasonably foreseeable future projects. The cumulative impacts from several projects are the change in the environment that results from the incremental impact of the project when added to other closely related past, present and reasonably foreseeable future projects. The cumulative analysis in this EIR identifies Project impacts that would be individually limited, but when viewed in connection with the effects of other past, present and reasonably foreseeable future projects, could be "cumulatively considerable" with regard to the Project's contribution to a cumulative impact.

In Chapter 5 Environmental Setting, Impacts, and Mitigation Measures, cumulative impacts are discussed and analyzed under each resource area immediately following the description of the direct impacts of the proposed Project and the identified mitigation measures for that resource area. The analyses of cumulative impacts are based on the same setting, regulatory framework and significance criteria as the direct impacts, and it applies the results of the project-level, direct impact analysis within the context of the identified geographic scope of the area affected by the cumulative effect. Table 5.1-3 (Projects Considered for Cumulative Impacts) lists the relevant past, present and reasonably foreseeable future projects proposed by the SFPUC and other jurisdictions that are considered in the cumulative impact analysis. Figure 5.1-3 (Location of Projects Considered in the Cumulative Analysis), shows the location of the cumulative projects.

Table 6-1 (Summary of Significant Cumulative Impacts), provides a summary of the cumulative impacts associated with the GSR Project that are significant. All significant cumulative impacts could be reduced to less-than-significant levels with implementation of mitigation measures identified in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, except for unavoidable noise, and well interference impacts. See Chapter 5 for a detailed discussion of cumulative impacts by resource topic, and where appropriate, a description of mitigation measures that would avoid or lessen the cumulative impacts.

TABLE 6-1
Summary of Significant Cumulative Impacts

Impact	Significance Determination
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.	SUM
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.	LSM
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
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.	LSM
Impact C-NO-1: Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise.	SUM
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
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
Impact C-BR-1: Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources.	LSM
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 at Lake Merced.	LSM
Impact C-HY-1: Project construction could result in a cumulatively considerable contribution to cumulative impacts on hydrology and water quality.	LSM
Impact C-HY-2: Operation of the proposed Project would result in a cumulative considerable contribution to cumulative impacts related to well interference.	SUM
Impact C-HY-5: The proposed Project, in combination with past, present, and reasonably foreseeable future projects, could have a substantial adverse effect on water quality that could affect the beneficial uses of surface waters.	LSM
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
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

Notes:

LSM = Less than Significant with Mitigation

SUM = Significant and Unavoidable with Mitigation

6.3 SIGNIFICANT ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED IF THE PROPOSED PROJECT IS IMPLEMENTED

In accordance with Section 21100(b)(2)(A) of CEQA and with Sections 15126(b) and 15126.2(b) of the CEQA Guidelines, the purpose of this section is to identify project-related environmental impacts that could not be eliminated or reduced to a less-than-significant level with implementation of mitigation measures identified in Chapter 5 Environmental Setting, Impacts, and Mitigation Measures. The findings in this chapter are subject to final determination by the San Francisco Planning Commission as part of its certification of the EIR.

6.3.1 Significant and Unavoidable Effects of the Proposed Project

This section identifies Project impacts that, even with the implementation of all identified mitigation measures, would remain significant and are, therefore, considered *unavoidable*. All GSR Project impacts would either be less than significant or reduced to less-than-significant levels with implementation of the identified mitigation measures except for unavoidable land use, aesthetics, well interference, and noise impacts. The analysis presented in Chapter 5 Environmental Setting, Impacts, and Mitigation Measures, of this EIR concludes that implementation of the proposed Project would result in four significant and unavoidable impacts:

- Project construction would result in significant and unavoidable impacts associated with construction noise and the temporary increase in ambient noise levels and exceedance of local noise standards. Even with implementation of all feasible noise-reducing mitigation measures, a significant impact would remain with mitigation at Sites 1, 3, 4, 5 (On-site Treatment), 9, 12, 14, 16, 18 (Alternate), and 19 (Alternate) (see Section 5.7, Noise and Vibration, Impacts NO-1, NO-3, and C-NO-1).
- Similarly, Project construction would have a substantial temporary impact on the existing character of the area surrounding well facility sites and could substantially disrupt existing land uses near Sites 1, 3, 4, 5, (On-site Treatment), 9, 12, 14, 16, 18 (Alternate), and 19 (Alternate). These impacts would remain significant and unavoidable after implementation of mitigation measures (see Section 5.2, Land Use, Impacts LU-1 and C-LU-1).
- Project construction would result in a significant and unavoidable impact on the visual character of the area surrounding Site 7, related to the removal of trees. Even with implementation of all feasible mitigation measures, the significant impact would remain at Site 7 (see Section 5.3, Aesthetics, Impact AE-1).
- Operation of the project would decrease the production rate of existing wells due to localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land uses may not be fully supported. Mitigation could reduce impacts to less than significant. However, feasibility of mitigation would vary depending on the willingness of the well owner to allow the SFPUC to implement mitigation, which would have to take place on the property of existing irrigators. Because such assurance has not yet been provided, the

impact is considered significant and potentially unavoidable (see Section 5.16, Hydrology and Water Quality, Impacts HY-7 and C-HY-2).

6.3.2 Significant and Unavoidable Effects of the WSIP

The proposed Project is one of the groundwater projects that comprise the SFPUC's WSIP. Insofar as the proposed Project is a component of the WSIP, it would contribute to the WSIP's significant and unavoidable, and potentially significant and unavoidable water supply and growth-inducement impacts, as identified in the WSIP PEIR (San Francisco Planning Department 2008) and summarized below:

- By providing water to support planned growth in the SFPUC service area, the WSIP will result in significant and unavoidable growth inducement effects that are primarily related to secondary effects such as air quality, traffic congestion and water quality. These impacts were adequately addressed in the PEIR at a sufficient level of detail such that no further analysis is required in this EIR. The analysis contained in the PEIR is incorporated into this EIR by this reference (see PEIR Chapter 7).
- Based on the best available information at that time, the 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). The project-level fisheries analysis in the Lower Crystal Springs Dam Improvements Project EIR modifies certain PEIR impact determinations based upon more detailed site-specific data and analysis. These project-level conclusions supersede any contrary impact conclusions in the PEIR. 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).
- Based on the best available information at that time, the 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). The project-level analysis in the Calaveras Dam Replacement Project EIR modifies this PEIR impact determination to be less than significant based upon more detailed site-specific data and analysis (San Francisco Planning Department 2011). These project-level conclusions supersede the contrary impact conclusions in the PEIR.

6.4 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

In accordance with CEQA Section 21100(b)(2)(B) and CEQA Guidelines Sections 15126(c) and 15126.2(c), the purpose of this section is to identify significant irreversible environmental changes that would be caused by the proposed Project. Construction activities associated with the GSR Project would result in an irretrievable and irreversible commitment of natural resources through the use of power supply and construction materials. In addition, the construction of new facilities (e.g., new wells and water treatment facilities) would result in an irretrievable or irreversible commitment of land to water supply uses. However, these uses would take up limited land area and are compatible with adjacent land uses.

The proposed GSR Project would require the commitment of energy resources to fuel and maintain construction equipment (such as gasoline, diesel and oil) during the construction period. Project construction would commit resources, such as concrete and steel, to be used for the proposed facilities and related improvements.

6.5 REFERENCES

San Francisco Planning Department. 2008. *Final Program Environmental Impact Report for the San Francisco Public Utility Commission's Water System Improvement Program (*File No. 2005.0159E, State Clearinghouse No. 2005092026). Certified October 30, 2008.

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.

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7 ALTERNATIVES

Sections	Tables
7.1 Introduction 7.2 WSIP Alternatives 7.3 GSR Alternatives Analysis 7.4 Comparison of Alternatives 7.5 Environmentally Superior Alternative 7.6 Alternatives Considered but Rejected from Further Analysis 7.7 References	7-1 Selected CEQA Alternatives 7-2 Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

7.1 INTRODUCTION

This chapter presents the California Environmental Quality Act (CEQA) alternatives analysis for the Groundwater Storage and Recovery Project (GSR Project or Project). The CEQA Guidelines, Section 15126.6(a), state that an Environmental Impact Report (EIR) must describe and evaluate a reasonable range of alternatives to a project that would feasibly attain most of the project's basic objectives, but that would avoid or substantially lessen any identified significant adverse environmental effects of the project. Specifically, the CEQA Guidelines (Section 15126.6) set forth the following criteria for selecting and evaluating alternatives:

- **Identifying Alternatives**. The selection of alternatives is limited to those that would avoid or substantially lessen any of the significant effects of the project, are feasible, and would attain most of the basic objectives of the project. Among the factors that may be considered when addressing the feasibility of an alternative are site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the proponent can reasonably acquire, control, or otherwise have access to an alternative site. An EIR need not consider an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative. The specific alternative of "no project" must also be evaluated.
- **Range of Alternatives**. An EIR need not consider every conceivable alternative, but must consider and discuss a reasonable range of feasible alternatives in a manner that will foster informed decision-making and public participation. The "rule of reason" governs the selection and consideration of EIR alternatives, requiring that an EIR set forth only those alternatives necessary to permit a reasoned choice. The lead agency (the City and County of San Francisco [CCSF]) is responsible for selecting a range of project alternatives to be examined and for disclosing its reasons for the selection of the alternatives.

- **Evaluation of Alternatives**. EIRs are required to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. Matrices may be used to display the major characteristics and the environmental effects of each alternative. If an alternative would cause one or more significant effects that would not result from the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project.

This chapter is organized in the following sections, following this introductory section:

Section 7.2, WSIP Alternatives, summarizes the seven alternatives to the San Francisco Public Utilities Commission (SFPUC) Water System Improvement Program (WSIP) that were evaluated in the WSIP Program EIR (PEIR). As required by CEQA, the PEIR evaluated a range of alternatives to the WSIP. The GSR Project is the primary drought supply project under the WSIP.

Section 7.3, GSR Alternatives Analysis, describes the alternatives selection process and the objectives of the Project; summarizes the significant impacts of the Project; describes the alternatives selected for detailed analysis; and compares the environmental impacts of each alternative to those of the proposed Project.

Section 7.4, Comparison of Alternatives, provides a summary comparison of the alternatives, including the No Project Alternative, to the proposed Project. It includes a summary of environmental impacts, a discussion regarding the ability of each alternative to meet project objectives.

Section 7.5, Environmentally Superior Alternative, identifies the environmentally superior alternative.

Section 7.6, Alternatives Considered but Rejected from Further Consideration, includes a description of the alternatives that were considered for evaluation in this Draft EIR and the reasons they were rejected from further consideration. Alternatives were eliminated from detailed consideration in this Draft EIR where they failed to meet most of the basic project objectives, were infeasible, and/or would not avoid any significant environmental effects.

7.2 WSIP ALTERNATIVES

As discussed in Chapter 2, Introduction and Background, the SFPUC approved implementation of the Phased WSIP in October 2008. The WSIP is a comprehensive program to improve the reliability of the regional water system with respect to water quality, seismic response, and water delivery based on a planning horizon through the year 2030, as well as to improve the system with respect to water supply to meet water delivery needs in the service area through the year 2018. To the extent that the GSR Project would contribute to achieving the goals and objectives of the WSIP, the analysis of the WSIP alternatives applies to the alternatives analysis of the GSR Project.

The San Francisco Planning Department, Environmental Planning Division (EP) considered systemwide alternatives to the WSIP in the PEIR, which the San Francisco Planning Commission certified on October 30, 2008. The PEIR evaluated seven alternatives to the WSIP because of their apparent ability to meet most of the WSIP's goals, their ability to reduce one or more of the significant impacts associated with program implementation, their potential feasibility, and their collective ability to provide a reasonable range of alternatives to foster informed decision-making and public participation. Analysis of the No Program Alternative was included in the PEIR as required by CEQA.

The San Francisco Planning Commission certified the PEIR in October 2008 (Planning Commission Motion No. 17734). Thereafter, the SFPUC approved the Phased WSIP and adopted the CEQA Findings on the WSIP (SFPUC Resolution 08-0200). The Phased WSIP incorporates elements of three alternatives analyzed in the PEIR: the No Purchase Request Increase Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative. Chapters 9 and 14 of the PEIR include more detailed descriptions of these WSIP alternatives and also present the associated program-level environmental analysis of these alternatives. Chapter 13 of the PEIR includes additional information about the adopted Phased WSIP. All three of these chapters are incorporated into this EIR by reference. For informational purposes, the WSIP and the alternatives examined in the PEIR are summarized below.

- **WSIP Proposed Program**. The proposed program described and analyzed in the PEIR would establish program goals and system performance objectives in the areas of water quality, seismic reliability, delivery reliability, and water supply. The WSIP would provide for water supplies to serve customer purchase requests during non-drought and drought periods through 2030, including increased average annual diversions from the Tuolumne River, and would implement all key regional facility improvement projects.
- **No Program Alternative**. Under the No Program Alternative, the SFPUC would implement only those facility improvement projects driven by regulatory requirements or existing agreements with regulatory agencies. It would meet only the water quality goals of the WSIP and would fail to meet the other goals and objectives. It would endeavor to meet increasing customer purchase requests through the year 2030 by diverting additional Tuolumne River water only when available under the CCSF's existing water rights.
- **No Purchase Request Increase Alternative**. The No Purchase Request Increase Alternative is designed to serve the wholesale customers the amount of water required under the Master Water Sales Agreement between the CCSF and each of the wholesale customers in effect in 2008. It would thereby limit the ability of the system to meet customer purchase requests through 2030, but would include implementation of all key regional facility improvement projects.
- **Aggressive Conservation/Water Recycling and Local Groundwater Alternative**. Under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC would implement all of the key regional facility improvement projects, but would endeavor to serve the projected increase in customer purchase requests through 2030 only through additional conservation, water recycling, and local groundwater projects.
- **Lower Tuolumne River Diversion Alternative**. Under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the key regional facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River near its confluence with the San Joaquin

River. This alternative would include construction and operation of additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional water system.

- **Year-round Desalination at Oceanside Alternative**. Under the Year-round Desalination at Oceanside Alternative, the SFPUC would implement all of the key regional facility improvement projects and would construct a 25-million-gallons-per-day (mgd) desalination plant in San Francisco to serve the projected increase in customer purchase requests through 2030.
- **Regional Desalination for Drought Alternative**. Under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the key regional facility improvement projects and would partner with other San Francisco Bay Area (Bay Area) water agencies to construct and operate a regional desalination plant that would provide the SFPUC with supplemental supply during drought years.
- **Modified WSIP Alternative**. Under the Modified WSIP Alternative, the SFPUC would implement all of the key regional facility improvement projects, but would modify proposed system operations to minimize environmental effects. This alternative would include the implementation of key mitigation measures identified in the PEIR.

The alternatives analysis in the PEIR identified the Modified WSIP Alternative as the environmentally superior alternative. As described above, the Phased WSIP was ultimately adopted by the SFPUC, which incorporates elements of the No Purchase Request Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative.

7.3 GSR ALTERNATIVES ANALYSIS

7.3.1 Approach to Alternatives Selection

Consistent with CEQA, the approach to alternatives selection for this Project EIR focused on identifying alternatives that: (1) could meet most of the basic objectives of the GSR Project while reducing one or more of its significant impacts, (2) could foster informed decision-making and public participation, and (3) were feasible. The planning effort for the Project entailed consideration of multiple alternatives by the SFPUC and EP. Certain alternatives were eliminated from consideration based on their inability to meet most of the Project's basic objectives, their lack of feasibility, or their inability to reduce the Project's environmental impacts. Those alternatives retained for consideration are presented in Section 7.3.4 (Selected CEQA Alternatives). The alternatives eliminated and the reasons for their elimination are discussed in Section 7.5 (Environmentally Superior Alternative).

The proposed Project would increase the volume of groundwater in storage by allowing the South Westside Groundwater Basin to recharge naturally during normal and wet years. The increased volume of groundwater in storage would occur through a reduction in groundwater pumping by the Partner Agencies; this reduction in groundwater pumping would be made possible by increased surface water deliveries to the Partner Agencies from the regional water system in those years. This "conjunctive," or cooperative, use of the basin would allow recapture of the naturally stored water during dry years.

As discussed in Chapter 3, Section 3.2 (Project Goals and Objectives) the primary goal for the Project is to provide an additional dry-year water supply for the SFPUC and Partner Agencies. Specific objectives of the Project are to:

- Conjunctively manage the South Westside Groundwater Basin through the coordinated use of SFPUC surface water and groundwater pumped by the Partner Agencies;
- Provide supplemental SFPUC surface water to the Partner Agencies in normal and wet years, with a corresponding reduction of groundwater pumping by these agencies, which would then allow for in-lieu recharge of the South Westside Groundwater Basin;
- Increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by 7.2 mgd; and
- Provide a new dry-year groundwater supply for SFPUC customers and increase water supply reliability during the 8.5-year design drought cycle[1].

These objectives support the goals and objectives of the SFPUC's WSIP (SFPUC Resolution No. 08-200). The Project is considered by the SFPUC to be a fundamental component of the WSIP; implementation of the proposed Project is one element of an overall program designed to achieve the established WSIP system performance objectives for delivery reliability and water quality.

7.3.2 Impacts of the Proposed Project

The proposed Project would have potentially significant impacts on land use, aesthetics, cultural and paleontological resources, transportation and circulation, noise, air quality, recreation, utilities and service systems, biological resources, geology and soils, hydrology and water quality, hazards and hazardous materials, and mineral and energy resources. These impacts are associated with construction and operation of the Project as discussed below:

Construction-related Impacts: With the exception of noise, land use, and aesthetics impacts during Project construction, all construction-related Project impacts were determined to have no impact (NI) or be less than significant (LS) or less than significant with mitigation (LSM). The Project's estimated construction-related noise levels at some of the sites were determined to result in significant impacts even with implementation of mitigation (SUM). Significant and unavoidable noise impacts would result from proposed nighttime well drilling that would conflict with local noise standards and/or exceed sleep interference thresholds and daytime construction that would exceed the speech interference thresholds at

[1] The SFPUC measures water supply reliability using an 8.5-year design drought for water supply planning purposes. The design drought is based on the hydrology of the six years of the worst historical drought (1987-1992) plus the 2.5 years of the 1976-1977 drought, for a combined total of an 8.5-year design drought sequence. For additional information on the design drought and its role in the environmental analysis in this EIR, refer to Section 3.2 in the Project Description.

the closest residential receptors (see Impacts NO-1 and NO-3 in Section 5.7, Noise and Vibration). Because of this temporary significant and unavoidable noise impact, temporary construction-related impacts on land use character were also considered to be significant and unavoidable (see Impact LU-1 in Section 5.2, Land Use).

Additionally, the Project would result in the removal of a portion of a locally-designated tree mass in the Town of Colma at Site 7 to accommodate construction of a well facility treatment building, and the impact was determined to be significant and unavoidable (for the preferred option of consolidated treatment at Site 6 and the on-site treatment option). Although a mitigation measure has been identified to potentially reduce the visual impacts associated with tree removal at this site, all trees in the construction area boundary may be removed due to construction safety concerns and trees may not be replanted in the SFPUC right-of-way in sufficient numbers and tree species following construction to reduce the aesthetic impacts to less than significant (see Impact AE-1 in Section 5.3, Aesthetics, Section 5.3.3.4 [Construction Impacts and Mitigation Measures]). All other construction-related significant impacts were determined to be *less than significant with mitigation* (LSM).

Operation-related Impacts: With the exception of hydrology and land use impacts during project operations, all operational-related impacts were determined to be less than significant or less than significant with mitigation. Potential impacts resulting from well interference during Project pumping were determined to be significant and potentially unavoidable because implementation of the identified mitigation would not be totally within the control of the SFPUC, and project operations could adversely impact existing irrigation wells in areas near GSR Project wells. Mitigation measures identified would effectively reduce impacts to existing irrigation wells to a less-than-significant level; however, since the successful implementation of the identified mitigation measure at all affected existing irrigation wells cannot be certain at this time (as it would depend on cooperation from existing irrigation well owners), the mitigation may not reduce all impacts to less-than-significant levels at all locations. Therefore, the potential impacts of well interference were determined to be significant and potentially unavoidable even with all feasible mitigation applied (see Impact HY-6 in Section 5.16, Hydrology and Water Quality). All other significant impacts related to Project operations were determined to be *less than significant with mitigation* (LSM).

All the impacts of the proposed Project, including the significance determination before and after mitigation, are listed in Table 1-1 (Summary of Impacts and Mitigation Measures) at the end of Chapter 1, Executive Summary, in Section 1.5 (Summary of Project Impacts and Mitigation Measures).

7.3.3 GSR Project Development and Site Screening

Prior to the start of the environmental review process, the SFPUC and the Partner Agencies (California Water Service Company [Cal Water], the City of Daly City, and the City of San Bruno) developed an Alternatives Analysis Report (AAR) to evaluate the potential to use the South Westside Groundwater

Basin[2] to store water in normal and wet years and develop in-lieu recharge of the Basin to increase the volume of water in storage that can be pumped in dry years (MWH 2007).

The AAR identifies and evaluates potential sites for the facilities needed to support the Project and achieve all the Project's goals and objectives. The AAR evaluated potential well and treatment facility sites based on evaluation criteria for identification of preferred facility locations.

The following is a list of evaluation criteria utilized in the AAR:

- **Well Site Suitability.** This evaluation included review of access to the site, the footprint of the site, underground obstructions, and horizontal setback distances.
- **Groundwater System Considerations.** This evaluation included review of potential well yield, groundwater quality, well interference, and geologic stability.
- **Distribution System Considerations.** This evaluation included proximity to existing Partner Agency and SFPUC conveyance and treatment facilities.
- **Land Use Considerations.** This evaluation included a review of land ownership, property acquisition, ease of permitting, and local acceptance.

Candidate well sites were identified, screened for suitability, displayed on maps, and evaluated with respect to the evaluation criteria. Preferred well sites were selected and analyzed using a hydraulic model of the water distribution system to evaluate whether the respective water systems would accommodate the estimated additional water at each proposed location.

The SFPUC developed the Project in conjunction with the Partner Agencies and other stakeholders with impact avoidance or reduction in mind. The SFPUC participated in a multi-agency collaborative effort to identify and rank new groundwater well locations; 48 potential well sites were identified and evaluated according to the criteria listed earlier in this section. The 48 potential well sites were reduced to 14 well sites through application of the evaluation criteria (MWH 2007). The SFPUC completed groundwater modeling for the 14 wells identified and found that the pumping rates needed to reach the desired 7.2 mgd could result in well interference and other potential well interference effects at the Partner Agency wells and among the 14 Project wells. As a result, the SFPUC increased the proposed number of wells to 16 wells to redistribute the required pumping over a larger geographic area and thereby reduce the potential for well interference. The SFPUC also has identified three alternate well sites to be implemented in the instance where up to three of the 16 preferred well facilities cannot be constructed due to infeasibility. Some well sites include alternate connections to the SFPUC or Partner Agency distribution systems. Also, the Project includes alternate treatment configurations for wells at Sites 5, 6, and 7; treatment may be located on site for each of these three, or consolidated for all three of these sites at Site 6 (MWH et al. 2008).

[2] The Westside Groundwater Basin has been administratively divided at the San Francisco-San Mateo County line.

7.3.4 Selected CEQA Alternatives

In accordance with CEQA requirements, an alternative must meet the following three criteria: 1) the alternative would attain most of a project's basic objectives; 2) the alternative would avoid or substantially reduce the significant environmental impacts of the proposed project; and 3) the alternative must be feasible. An EIR need not analyze an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative. Furthermore, an EIR need not consider every conceivable alternative, but must consider a reasonable range of alternatives that will foster well-informed decision-making and public participation.

This section describes the project alternatives that were selected and analyzed in accordance with CEQA Guidelines Section 15126.6(a). The five alternatives to the proposed Project selected for detailed analysis in this EIR are:

- **Alternative 1: No Project Alternative.** The SFPUC would not conjunctively manage the South Westside Groundwater Basin with the Partner Agencies and the basin would continue to be operated as it is now. The 16 wells and well facilities would not be constructed or operated, the Westlake Pump Station would not be upgraded, and a new drought water supply would not be developed. The six test wells installed at Sites 2 (Park Plaza Meter), 5 (Right-of-way at Serra Bowl), 6 (Right-of-way at Colma BART), 8 (Right-of-way at Serramonte Boulevard), 10 (Right-of-way at Hickey Boulevard), and 13 (South San Francisco Linear Park) would be abandoned in accordance with regulatory standards or converted to monitoring wells[3].
- **Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield.** This alternative would reduce impacts on Lake Merced associated with declining lake levels by reducing Project pumping near the lake by approximately 54 percent by eliminating construction and operation of Sites 1 (Lake Merced Golf Club) and 4 (Garden Village Elementary School)[4], but redistributing that pumping to wells located away from Lake Merced to maintain Project yield at 7.2 mgd. The Project has the potential to affect Lake Merced by both increasing lake levels during extended Put and Hold Periods and decreasing lake levels during and after a design drought. There is no alternative that can reduce the extent of both lake level increases and lake level declines. Declining lake levels cause a more extensive set of impacts, including impacts to water quality and wetlands, so this alternative was developed to address declining lake levels, as was Alternative 2B, which is described below.
- **Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield.** This alternative would reduce impacts on Lake Merced associated with declining lake levels by reducing Project pumping near the lake by approximately 54 percent (by eliminating construction and operation of Sites 1 and 4), thereby reducing Project yield from 7.2 mgd to approximately 6.2 mgd.

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[3] Sites 2, 5, and 6 are located in Daly City. Site 8 is located in the Town of Colma and Sites 10 and 13 are located in South San Francisco.

[4] Site 1 is located in Daly City and Site 4 is located in Broadmoor, in unincorporated San Mateo County.

- **Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield.** This alternative would reduce impacts on existing irrigation wells in the Colma area by reducing Project pumping near Colma by approximately 32 percent (by eliminating construction and operation of Sites 7 [Right-of-way Colma Boulevard][5] and 8), but also by redistributing that pumping to wells located away from Colma to Daly City, unincorporated Broadmoor, and San Bruno, to maintain Project yield at 7.2 mgd. Alternative 3A represents an alternative that could be developed to decrease well interference for wells in a particular geographic area near proposed well facility sites while maintaining the overall project yield.
- **Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield.** This alternative would reduce impacts on existing irrigation wells in the Colma area by reducing Project pumping near Colma by approximately 32 percent (by eliminating construction and operation of Sites 7 and 8), thereby reducing Project yield from 7.2 mgd to approximately 6.0 mgd. Alternative 3B represents an alternative that could be developed to decrease well interference for wells in a particular geographic area near proposed well facility sites while reducing overall project yield.

Table 7-1 (Selected CEQA Alternatives) provides a brief description of these alternatives and highlights how they differ from the proposed Project. Sections 7.3.4.1 through 7.3.4.5, below, include an evaluation of the impacts of the five selected alternatives relative to those of the proposed Project. Because the alternatives are conceptual, the evaluation is based on the available information and reasonable assumptions about how each alternative would be implemented. Each project alternative presented below has been developed only for the Project's preferred 16 sites and does not include analysis of the proposed alternate sites; the proposed alternate sites are included in the Project Description and have been evaluated as part of the Project. For each project alternative, Sections 7.3.4.1 through 7.3.4.5 present the following:

- A description of the alternative, including the rationale for its selection. Each description discusses feasibility issues as well as assumptions regarding the construction methods likely to be used.
- An evaluation of the alternative's ability to meet project goals and objectives. Evaluation of hydrologic and water quality impacts of the alternatives is, in part, dependent upon the groundwater modeling undertaken for the evaluation of the Project. Refer to Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, Section 5.1.6 (Groundwater Modeling Overview) for an explanation of the groundwater model and its assumptions and limitations.
- Analysis of the environmental impacts of each alternative compared to those of the proposed Project.

[5] Site 7 is located in Colma.

The significant impacts of the proposed Project and the alternatives are presented in Table 7-2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project), which follows discussion of each of the alternatives in Section 7.4 (Comparison of Alternatives).

TABLE 7-1
Selected CEQA Alternatives

Alternative	How Does the Alternative Differ from the Proposed Project?
Alternative 1: No Project. The SFPUC would not conjunctively manage the South Westside Groundwater Basin with the Partner Agencies and the basin would continue to be operated as it is under existing conditions.	• The 16 wells and well facilities would not be constructed or operated. The Westlake Pump Station would not be upgraded. • A new drought water supply may not be developed unless the SFPUC or its wholesale customers pursue other projects.
Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield. The SFPUC would not construct or operate Sites 1 and 4, two of the four wells proposed to be located near Lake Merced. The SFPUC would instead increase Project pumping at Sites 5 through 15 by approximately 20 percent each, to maintain overall yield at 7.2 mgd.	• Pumping near Lake Merced would be reduced by approximately 54 percent compared to the Project. • 14 well facilities would be constructed, rather than 16 wells proposed by the Project. • No well or well facility would be constructed or operated at Sites 1 or 4, and approximately 1.0 mgd of Project pumping proposed at these two wells would not occur. • Approximately 1.0 mgd of Project pumping would be redistributed to wells at Sites 5 through 15. • Pumping at Sites 5 through 15 would increase by approximately 20 percent each compared to the proposed Project. • Well interference impacts on some existing irrigators' wells would be increased.
Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield. The SFPUC would not construct or operate wells at Sites 1 and 4, two of the four sites proposed to be located near Lake Merced. Overall yield would be approximately 6.2 mgd.	• Pumping near Lake Merced would be reduced by approximately 54 percent compared to the Project. • 14 well facilities would be constructed, rather than 16 wells described in the Project. • No well or well facility would be constructed or operated at Sites 1 and 4, and approximately 1.0 mgd of Project pumping proposed at these two wells would not occur. • Overall yield would be reduced from 7.2 mgd to 6.2 mgd, approximately a 14 percent decrease compared to the proposed Project.

TABLE 7-1
Selected CEQA Alternatives

Alternative	How Does the Alternative Differ from the Proposed Project?
Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield. The SFPUC would not construct or operate wells at Sites 7 and 8, two of the seven wells proposed to be located near existing irrigation wells for cemeteries in Colma. The SFPUC would instead increase Project pumping at Sites 1 through 4 and 11 through 15 by approximately 31 percent each, to maintain overall yield at 7.2 mgd.	• Pumping near the existing irrigation wells for cemeteries in Colma would be reduced by approximately 32 percent compared to the Project. • 14 well facilities would be constructed, rather than 16 wells proposed in the Project. • No well or well facility would be constructed or operated at Sites 7 or 8, and approximately 1.2 mgd of Project pumping proposed at these two wells would not occur. • Approximately 1.2 mgd of Project pumping would be redistributed to wells at Sites 1 through 4 and 11 through 15 to maintain yield at 7.2 mgd. • Lake Merced impacts would be increased.
Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield. The SFPUC would not construct or operate wells at Sites 7 and 8, two of the seven sites proposed to be located near existing irrigation wells for cemeteries in Colma. Overall yield would be approximately 6.0 mgd.	• Pumping near the existing irrigation wells for cemeteries in Colma would be reduced by approximately 32 percent compared to the Project. • 14 well facilities would be constructed, rather than 16 wells proposed in the Project. • No well or well facility would be constructed or operated at Sites 7 or 8, and approximately 1.2 mgd of Project pumping proposed at these two wells would not occur. • Overall yield would be reduced from 7.2 mgd to approximately 6.0 mgd, approximately a 16 percent decrease compared to the proposed Project.

7.3.4.1 Alternative 1: No Project Alternative

CEQA Guidelines Section 15126.6(e) requires that EIRs include an evaluation of the No Project Alternative to provide decision-makers the information necessary to compare the relative impacts of approving a project to not approving a project. The No Project Alternative is defined as a continuation of existing conditions, as well as conditions that are reasonably expected to occur in the event that a proposed project is not implemented.

Description of Alternative

In the event that the SFPUC does not implement the GSR Project, no Project facilities would be constructed and the conjunctive use of the South Westside Groundwater Basin, as proposed under the Project, would not occur. Under the No Project Alternative, a GSR dry-year water supply would not be available to the SFPUC, its wholesale customers, or the Partner Agencies, as planned for and approved in the Phased WSIP.

The SFPUC would continue to operate the regional water system, but it would have reduced water supply reliability during dry years under the No Project Alternative compared to the proposed Project. Under the No Project Alternative, regional water system customers would experience water shortages -- and the need to implement water rationing -- more frequently, and water rationing would be more severe; i.e., exceeding 20 percent systemwide rationing, based on hydrologic modeling (San Francisco Planning Department 2008).

In the absence of reliable water service from the SFPUC during dry years, the wholesale customers may pursue other projects, either individually or collectively, to meet their dry-year water needs. However, numerous factors would inhibit the ability of the wholesale customers to address the decreased supply during dry years associated with this alternative, including the following:

- Water demand among all customers is highest when supplies are most constrained, i.e., during dry years, and therefore dry-year water supply is more difficult to secure. Securing water supplies in California is increasingly difficult, particularly in dry years, as overall demand increases and conflicts among competing interests for water supply arise (San Francisco Planning Department 2008).
- A major new water supply project can take as many as 20 to 25 years to complete (Johnson and Loux 2004).
- The SFPUC wholesale customers already have planned for and adopted increased water conservation and recycling initiatives (San Francisco Planning Department 2008).

The ability of the wholesale customers to develop additional dry-year water supplies is uncertain, and further studies would be required to evaluate technical and institutional feasibility. Determining (a) the specific projects that each wholesale customer would pursue, and (b) the likelihood that the wholesale customers could successfully implement the projects is speculative and largely outside the control of the SFPUC.

The basic water management strategies that the wholesale customers could pursue to offset the reduced dry-year water supply under the No Project Alternative involve increasing supply and decreasing demand or increasing rationing during dry years. Potential options associated with these strategies are water purchases or transfers, increased groundwater use, more aggressive water conservation or water recycling, and desalination. However, each of the wholesale customers has already planned for their water supply taking into consideration such programs, and further development of these programs by the wholesale customers may or may not occur for the sake of dry-year supply management.

The WSIP PEIR evaluated water purchases or transfers, increased groundwater use, additional water conservation and water recycling as part of the WSIP and evaluated even further expansion of these programs and local and regional desalination as part of the WSIP alternatives. The WSIP PEIR provides additional detail on supplemental supply options and their associated environmental impacts (San Francisco Planning Department 2008).

Ability of Alternative to Meet Project Objectives

The No Project Alternative would not meet any of the project objectives as it would not result in the coordinated use of SFPUC surface water and groundwater by the Partner Agencies or the in-lieu recharge of the South Westside Groundwater Basin, and it would not provide a new dry-year groundwater supply for SFPUC customers.

Without the Project, the South Westside Groundwater Basin would not be conjunctively managed and the coordinated use of SFPUC surface water and groundwater pumped by the Partner Agencies would not occur. The existing municipal groundwater use by the Partner Agencies would likely continue under the No Project Alternative.

The No Project Alternative would also not support the WSIP goals because it would not provide a dry-year supply to increase water delivery reliability nor would it meet customer water supply needs. The No Project Alternative would not allow the operational flexibility and delivery reliability goals of the WSIP to be met, as fulfillment of the WSIP goals is reliant upon the proposed Project providing 7.2 mgd for up to 7.5 years during a drought.

Environmental Impacts of No Project Alternative Compared to Those of the Proposed Project

The No Project Alternative would avoid all of the construction impacts identified for the GSR Project. The No Project alternative would eliminate the need for construction activities at the GSR facility sites, thereby avoiding all construction impacts identified for the proposed Project, including the significant and unavoidable impacts associated with noise, land use, aesthetics, and hydrology, which, in some instances, may be at least partially reduced by mitigation where feasible (in other instances, feasible mitigations may not exist for reducing some of the impacts identified) (See Section 7.3.2 [Impacts of the Proposed Project]). Other proposed future projects in the GSR Project area may still be implemented. The San Francisco Groundwater Supply (SFGW) Project (cumulative project A-1 through A-6) is one of the projects approved by the SFPUC in 2008 as part of the WSIP, and is currently undergoing project-level environmental review. In addition, the SFPUC Peninsula Pipelines Seismic Upgrade Project (cumulative projects D-1 through D-3), which is also proposed to be implemented under the WSIP and undergoing environmental review, and the PG&E Transmission Pipeline Replacement Project (cumulative project H) could be implemented. While cumulative construction impacts could still occur from these projects, there would be no contribution to the cumulative impacts from the No Project Alternative.

The significant environmental impacts of the No Project Alternative are presented in Table 7-2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project). Because alternatives in general have been selected to reduce groundwater impacts, a more detailed analysis of groundwater impacts is provided than for other impacts.

Indirect or Secondary Impacts. Under the No Project Alternative, the SFPUC could not meet dry-year water supply goals. To meet the dry-year water supply goals, the SFPUC and/or its wholesale customers would likely take action to secure supplemental dry-year supply to make up for drought period supply shortfalls, which could have similar or additional secondary environmental effects. Supplemental dry-year supply options include additional Tuolumne River diversions and water transfers from the Turlock Irrigation District or the Modesto Irrigation District. The WSIP PEIR provides additional detail on supplemental dry-year supply options and their associated environmental impacts (San Francisco Planning Department 2008).

The No Project Alternative could result in secondary effects related to development of drought water supplies. Supplemental water supply options include, for example, water transfers. If the SFPUC and/or its wholesale customers were to pursue supplemental water supplies to compensate for the dry-year shortfall due to the No Project Alternative being selected, the secondary effects could include any or all of the following: construction impacts and operational impacts such as groundwater overdraft, subsidence, seawater intrusion, and water quality effects associated with development of groundwater sources; impacts on fisheries and biological resources, including sensitive species, associated with additional Tuolumne River diversions; and construction impacts and operational impacts on land use, aesthetics, hydrology and water quality, air quality, hazards, and energy associated with development of desalinated water supplies.

7.3.4.2 Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield

Description of Reduce Lake Merced Impacts and Maintain Project Yield Alternative

Alternative 2A was selected for analysis because it would reduce potentially significant biological and water quality impacts associated with declining lake levels at Lake Merced due to Project pumping during dry years, although these impacts have been determined to be less than significant, or less than significant with mitigation (see Impact RE-6 in Section 5.11, Recreation; Impacts BR-6, BR-7, BR-8, BR-9, and C-BR-2 in Section 5.14, Biological Resources; and Impacts HY-9 and C-HY-5 in Section 5.16, Hydrology and Water Quality). Under Alternative 2A, the SFPUC would construct only 14 wells and well facilities (instead of 16 wells under the proposed Project). The 14 wells would be located at the same preferred sites as the Project; however, Alternative 2A would not include a well or well facility at Site 1 in Daly City or Site 4 in unincorporated Broadmoor. Without wells at Sites 1 and 4, pumping would be reduced by approximately 1.0 mgd. To maintain the overall yield at 7.2 mgd, pumping would be redistributed to 11 wells at Sites 5 through 15. Pumping at each of Sites 5 through 15 would increase by approximately 20 percent compared to the proposed Project and production rates of wells at Sites 5 through 15 could support this increased pumping (SFPUC 2012b, 2012c). Pumping at Sites 2 and 3 would not increase under this alternative, because these would become the closest Project wells to Lake Merced and the goal of this alternative is to minimize impacts on Lake Merced, as compared to the proposed Project. Pumping at Site 16 would also not increase under this alternative, as compared to the Project, because groundwater availability is restricted at this location (compared to the other preferred sites). As a result, this alternative would decrease Project pumping near Lake Merced by approximately 54 percent when compared to the Project proposal.

Ability of the Reduce Lake Merced Impacts and Maintain Project Yield Alternative to Meet Project Objectives

Alternative 2A would fully meet the Project objectives. The overall yield would remain at 7.2 mgd, which would meet the Project goal to increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by an average annual 7.2 mgd in the event that the 8.5-year design drought was to happen.

Environmental Impacts of the Reduce Lake Merced Impacts and Maintain Project Yield Alternative (Alternative 2A) Compared to Those of the Proposed Project

Construction-related Impacts. Alternative 2A would result in all of the same construction-related impacts as the proposed Project, except for the construction-related impacts associated with construction at Sites 1 and 4. Elimination of Site 1 would eliminate the SU and SUM impacts relative to noise and the SUM impacts relative to land use, as well as all other LSM and LS impacts at that site (see Impacts NO-1 and NO-3 in Section 5.7, Noise and Vibration, and Impact LU-1 in Section 5.2, Land Use). Elimination of Site 4 would eliminate SUM impacts relative to noise and land use (see Impacts NO-1 and NO-3 in Section 5.7, Noise and Vibration, and Impact LU-1 in Section 5.2, Land Use), as well as all other LSM and LS impacts at the site. All other SU and SUM impacts related to noise, land use, and aesthetics would remain as described for the proposed Project. These impacts are described in Chapter 5, Environmental Setting, Impacts and Mitigation Measures. Construction impacts at the remainder of the sites related to cultural resources, transportation and circulation, recreation, utilities and service systems, geology and soils, water quality, and hazards and hazardous materials would be the same as those of the proposed Project, and the same mitigation measures would be required to reduce these impacts to less-than-significant levels.

Operational Impacts. The significant environmental impacts of Alternative 2A are presented in Table 7-2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project). However, because Alternative 2A was selected to reduce groundwater impacts, a more detailed analysis of operational groundwater impacts is provided than for other impacts as compared to the proposed Project. The operational groundwater impacts of the alternatives as compared to the proposed Project are presented below. The information provided comes from the groundwater modeling analysis and other technical studies, as identified below (Kennedy/Jenks 2012b, 2012c).

Production rate of preexisting wells. A 54 percent reduction in pumping near Lake Merced would reduce well interference impacts on the irrigation wells at the Lake Merced Golf Club. This reduced interference, however, would be partially offset by increased pumping at Sites 5, 6, and 7. The 54 percent pumping reduction near Lake Merced attributable to the elimination of Sites 1 and 4, however, would not provide enough change to maintain water levels above the well screens at the Lake Merced Golf Club. As a result, static water levels at the Lake Merced Golf Club wells would still decrease to below the top of the well screen, increasing the risk of well or pump damage. Therefore, the well interference impact on the Lake Merced Golf Club wells would be significant under Alternative 2A, as it would be for the proposed Project. The elimination of pumping at Sites 1 and 4 would have a beneficial effect on the Olympic Club wells and the San Francisco Golf Club wells, compared to the proposed Project because, similar to the proposed Project, both static and pumping groundwater levels would remain above the top of the well screen at these wells under Alternative 2A. Furthermore, these wells have the capacities to meet their peak demand (Fugro 2012b). Therefore, the well interference impact on the Olympic Club wells and the San Francisco Golf Club wells would be less than significant under Alternative 2A, as it would be for the proposed Project.

Increasing pumping at Sites 5 through 15 by 20 percent would increase well interference impacts on the wells at the Colma cemeteries and at the California Golf Club. Under the proposed Project, all irrigation wells at the nine Colma area cemeteries and the California Golf Club would be subject to significant well interference impacts. The increased pumping at Sites 5 through 15 would increase such impacts at these wells by approximately 20 percent. Therefore, the well interference impacts on the Colma cemetery wells and on the California Golf Club wells would be significant and slightly greater under Alternative 2A, than they would be for the proposed Project. Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation) would reduce the impacts of well interference to *less-than–significant* levels, except that the implementation of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property, thereby potentially resulting in a *significant and unavoidable impact with mitigation*. Refer to the discussion of Impact HY-6 in Section 5.16, Hydrology and Water Quality, Section 5.16.3.7 (Operation Impacts and Mitigation Measures – Groundwater) where this impact analysis is presented in greater detail.

Land Subsidence. A 54 percent reduction in pumping near Lake Merced would reduce the risk of subsidence near Daly City and the unincorporated community of Broadmoor. A 20 percent increase in pumping at Sites 5 through 15 would increase the risk of subsidence slightly, but would not result in significant impacts, because estimated subsidence would remain below the established thresholds of six inches for structures and drainage patterns, and one foot for floodplains. The maximum expected subsidence under the proposed Project would be 3.4 inches; approximately half of the six-inch threshold. The 20 increase in pumping at Sites 5 through 15 would result in a 20 percent increase in groundwater elevation decline compared to the proposed Project. The method for calculating subsidence indicates that subsidence changes would be proportionately smaller than groundwater elevation changes and, therefore, a 20 percent increase in groundwater level decline would not be expected to increase subsidence to significant levels, because to do so would require almost doubling the amount of subsidence anticipated for the proposed Project (Fugro 2012a). Therefore, subsidence impacts would be slightly greater for Alternative 2A when compared to the proposed Project; however, the impacts would be *less than significant* for both Alternative 2A and the proposed Project.

Seawater Intrusion. Decreasing pumping in the Lake Merced area by 54 percent may reduce the risk of seawater intrusion from the Pacific Ocean slightly. Increasing pumping at Sites 5 through 15 by 20 percent would increase the risk of seawater intrusion from San Francisco Bay. Seawater intrusion has been observed in sediments adjacent to the Bay and is expected to continue into the future. The proposed Project would reduce the risk of seawater intrusion a small amount. Over a long-term average, estimated groundwater elevations at the Bay rise slightly and approximately three acre-feet (af) per year more groundwater is predicted to flow out to the Bay, as compared to modeled existing conditions. (Kennedy/Jenks 2012c)

While there would be an incremental increase in the potential for seawater intrusion due to the 20 percent increase in pumping in Colma, South San Francisco, and San Bruno areas, the magnitude of the increase would be relatively small based on two lines of evidence. First, in general, the San Francisco Bay coast is not particularly susceptible to seawater intrusion due to the presence of the Bay Mud and a subsurface bedrock ridge, both of which provide some protection to the southern portion of the South Westside Basin from potential seawater intrusion from San Francisco Bay (Kennedy/Jenks 2012c). Second, the proposed Project is estimated to increase groundwater flows to the Bay (due to the increase of in-lieu recharge) on the order of two to three af per month at the end of the design drought. For this alternative, the increase in pumping from GSR wells south of Daly City would slightly increase the potential for seawater intrusion from San Francisco Bay as compared to the proposed Project. This is not expected to result in a seawater intrusion impact because it would be similar to the amount of seawater intrusion predicted under modeled existing conditions (SFPUC 2012a). Therefore, potential seawater intrusion impacts would be slightly greater under Alternative 2A; however, the potential impact for both Alternative 2A and the proposed Project would be *less than significant.*

Adverse Effects on Beneficial Uses at Lake Merced. A 54 percent reduction in pumping in the Lake Merced area would result in a 54 percent decrease in the decline of Lake Merced lake levels at the end of the design drought. The proposed Project is expected to result in lake levels that are one foot lower than is predicted to occur under modeled existing conditions at the end of the design drought; under Alternative 2A, this impact would be reduced to approximately 0.5 feet instead of one foot, due to the reduced pumping under this alternative. Because the lake levels under the proposed Project recover more slowly than under modeled existing conditions, the difference between the proposed Project and modeled existing conditions is actually greater several years after the drought than at the end of the drought. Thus, the proposed Project is expected to result in lake levels about four feet lower than under modeled existing conditions after the end of the design drought. With the proposed Project, the lake is expected to recover to a lake level of 0 feet City Datum within 37 months after the drought. Under Alternative 2A, the decline in lake levels (as compared to modeled existing conditions) would be reduced to approximately 2 feet City Datum (instead of 4 feet City Datum under the proposed Project), due to the reduced pumping under this alternative, and the recovery period is expected to be shorter (SFPUC 2012b). During the period following the design drought, when Lake Merced lake levels are recovering, the impact of Alternative 2A on water quality would be *significant*, as it would be for the proposed Project, because, monthly lake level averages would decline below 0 feet City Datum under both the proposed Project (a minimum of -2.5 feet) and this alternative (a minimum of -0.5 feet). 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 develop and implement a lake level monitoring and management program to maintain Lake Merced at water levels similar to conditions that would occur without the Project. The mitigation measures would be effective at reducing impacts of the alternative to less than significant, as it would be for the Project, because it requires the SFPUC to implement lake level management procedures to maintain Lake Merced water levels above 0 feet City Datum. These procedures include continuation of lake-level and groundwater monitoring, additions of supplemental water, if available, or alteration of pumping patterns. Implementation of this measure would ensure that any lake level declines to below 0 feet City Datum as a result of this alternative are short-term and, with the addition of supplemental water or alteration of pumping patterns, this alternative would not result in long-term changes in water quality that would adversely affect the potential beneficial uses of Lake Merced.

Water Quality Standards. A reduction in pumping in the Lake Merced area and an increase in pumping away from Lake Merced would not affect the ability of the SFPUC to provide drinking water that meets drinking water quality standards, because the SFPUC would treat or blend groundwater as necessary to meet primary and secondary water quality standards and because the groundwater to be pumped is not considered vulnerable to soil or groundwater contamination due to the depth of pumping proposed. Therefore, the potential impact of Alternative 2A on drinking water quality would be the same as the proposed Project, which would be *less than significant.*

Under either the Project or Alternative 2A, the SFPUC would supply supplemental surface water to Daly City, and Daly City would decrease groundwater pumping during put years. However, with the reduction in pumping during take years under this alternative, in-lieu recharge could increase compared to the proposed Project, potentially resulting in increased groundwater elevations in the Daly City area after a drought (i.e., Take Years). Such increased groundwater levels would not be expected to rise to the level where existing contaminated plumes are located, because the existing groundwater levels in the Daly City area are very low and would stay very low even with the increased in-lieu recharge. Therefore, the impact of Alternative 2A relative to the potential to mobilize existing areas of contamination due to increasing groundwater levels from in-lieu recharge would be the same as the proposed Project, which would be *less than significant.*

Water Quality Degradation. Decreasing pumping in the Lake Merced area and increasing pumping to the south would not degrade water quality in relation to constituents not currently regulated, because the existing concentration of such non-regulated constituents in the groundwater is lower than what would be likely to cause environmental harm and decreased pumping would not increase or decrease these concentrations. Therefore, potential impacts of Alternative 2A relative to this type of water quality degradation would be *less than significant*, as they would be for the proposed Project.

Groundwater Depletion. Because the overall yield from the Westside Groundwater Basin would be maintained at 7.2 mgd under Alternative 2A, potential impacts on groundwater depletion would be the same as they would be for the proposed Project, which would be *less than significant with mitigation.* Both the proposed Project and Alternative 2A would have the potential to result in depletion of the basin if losses from the SFPUC Storage Account were not considered in the management of pumping. With implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion), pumping would be managed to ensure that GSR wells would only be pumped when there is a positive balance in the SFPUC Storage Account, which would be adjusted for losses from the basin due to leakage.

Reduce Lake Merced Impacts and Maintain Project Yield Alternative Conclusions

Alternative 2A would fully meet the Project objectives and meet the Project goal to increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by 7.2 mgd. This alternative would have the same construction-related impacts as the proposed Project, except impacts associated with construction at Sites 1 and 4 would not occur. Operational impacts would be nearly the same as those expected for the proposed Project. A 54 percent reduction in pumping near Lake Merced would reduce well interference on the irrigation wells at the Lake Merced Golf Club; however the reduced well interference at the golf club would be partially offset by increased pumping at Sites 5, 6, and 7, which are within the vicinity of the Lake Merced Golf Club. Increasing pumping at Sites 5 through 15 by 20 percent would increase the potential well interference impacts on the wells at the Colma cemeteries and at the California Golf Club. As a result, well interference impacts would be *significant and potentially unavoidable with mitigation* for both the alternative and the Project, although well interference impacts at some existing wells would be greater under Alternative 2A than the Project. The potential for subsidence impacts and for seawater intrusion would be slightly greater for Alternative 2A when compared to the proposed Project; however impacts would be less than significant for both the alternative and the proposed Project. Declines in water levels in Lake Merced would be slightly less under this alternative; however impacts for both this alternative and the proposed Project would be less than significant with mitigation. Eliminating other wells would not further reduce impacts on Lake Merced water levels because other wells are too far from the lake to have a substantial influence on the lake. Potential impacts on groundwater quality and groundwater depletion would be the same for the proposed Project and this alternative. In any case, this alternative would support the WSIP goals and objectives to provide dry-year and emergency water pumping capacity.

7.3.4.3 Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield

Alternative 2B was selected for analysis because it would reduce significant biological and water quality impacts associated with declining lake levels at Lake Merced due to Project pumping during dry years, but would not include any redistribution of pumping as Alternative 2A does. Under Alternative 2B, the SFPUC would construct only 14 wells and well facilities (instead of 16 wells under the proposed Project). The 14 wells would be located at the same preferred sites as the Project; however, Alternative 2B would not include a well or well facility at Site 1 in Daly City or at Site 4 in unincorporated Broadmoor. Without wells at Sites 1 and 4, Project pumping would be reduced by approximately 1.0 mgd and the overall Project yield would be 6.2 mgd. The alternative would also decrease pumping near Lake Merced by approximately 54 percent (as would Alternative 2A).

Ability of Alternative to Meet Project Objectives Compared to the Proposed Project

Alternative 2B would reduce pumping by 1.0 mgd; therefore, the alternative would meet most, but not all, of the Project objectives. This alternative would allow for the conjunctive use of the South Westside Groundwater Basin, and it would provide supplemental SFPUC surface water to Partner Agencies during normal and wet years to allow for in-lieu recharge of the Basin, albeit reduced by 1 mgd, as compared to the proposed Project. The alternative would not meet the objective of increasing the SFPUC's dry-year and emergency pumping capacity by 7.2 mgd; it would provide a new dry-year groundwater supply though not at the same volume as described in Section 7.3.1 (Approach to Alternatives Selection) or in the adopted WSIP goals. Therefore, in order to meet the WSIP goal of limiting rationing to a systemwide maximum of 20 percent during an 8.5-year drought, if this alternative were implemented, the SFPUC or its wholesale customers could decide to pursue additional projects such as water transfers to increase dry-year and emergency pumping capacity by 7.2 mgd.

The alternative would also not meet the project objective of providing an emergency supply, to be used in the event of a catastrophic emergency that would affect the other sources of supply for the regional water system. Therefore, the reduction in yield with Alternative 3B would limit the regional water system's ability to meet the WSIP goal of seismic and delivery reliability, adopted as part of approval of the WSIP under SFPUC Resolution 08-0200. Per the adopted resolution, the SFPUC will reevaluate 2030 demand projections, regional water system purchase requests, and water supply options by 2018. If this alternative were adopted, the up to 1.2-mgd reduction in drought-year water supply would be included as part of the reevaluation and taken into consideration as a part of the separate SFPUC decision regarding water deliveries after 2018. With the reduction in yield from this alternative, the SFPUC may need to revise the WSIP goals and objectives or develop additional water supply projects depending on demand projections.

Environmental Impacts of Alternative 2B

The significant environmental impacts of Alternative 2B are presented in Table 7-2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project). However, because Alternative 2B was evaluated for its ability to reduce groundwater impacts, a more detailed analysis of operational groundwater impacts is provided than for other impacts, as compared to the proposed Project. The operational groundwater impacts of this alternative, as compared to the proposed Project, are presented below. The information provided comes from the groundwater modeling analysis and other technical studies, as identified below (Kennedy/Jenks 2012a, 2012b).

Production rate of preexisting wells. A 54 percent reduction in pumping near Lake Merced would reduce well interference impacts on the irrigation wells at the Lake Merced Golf Club. The Project is predicted to lower static water levels in the Lake Merced Golf Club Well #3 by 85 feet at the end of the design drought, from 271 feet below ground surface (bgs) to 356 feet bgs (see Table 5.16-11 [Estimated Static and Pumping Depth to Water Level at the End of the Design Drought] in Section 5.16, Hydrology and Water Quality). Assuming a linear relationship between pumping and water level, a 54 percent reduction in nearby pumping would lower static water levels by 46 percent of 85 feet (i.e., by 39 feet). The static water level in the Lake Merced Golf Club Well #3 at the end of the design drought is therefore estimated to be 310 feet bgs, which would be below the top of the screen at 294 feet bgs. Therefore, even with the 54 percent pumping reduction at Sites 1 and 4, static water levels at the Lake Merced wells would decrease to below the top of the well screen (albeit approximately 39 feet higher than is predicted to result with the proposed Project), which would reduce but not eliminate the risk of well or pump damage. Therefore, the well interference impact on the Lake Merced Golf Club wells would also be *significant* under Alternative 2B, as it would be for the proposed Project.

The elimination of pumping at Sites 1 and 4 would reduce the Project's potential well interference impacts on the Olympic Club wells and the San Francisco Golf Club wells. The Project would lower static water levels in both Olympic Club Well #8 and Olympic Club Well #9 by 14 feet, from 122 feet bgs to 136 feet bgs at the end of the design drought (see Table 5.16-11 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought] in Section 5.16, Hydrology and Water Quality). Assuming a linear relationship between pumping and water level, a 54 percent reduction in nearby pumping would lower static water levels by 46 percent of 14 feet (i.e., by 6 feet). The static water level in both of the Olympic Club Wells at the end of the design drought is therefore estimated to be 128.4 feet bgs, which would be above the top of the screen at 260 feet bgs. Table 5.16-12 (Estimated Pump Discharge Rate at the End of the Design Drought) shows that the Project is expected to lower static water levels in the San Francisco Golf Club Well #2 by 14 feet, from 182 feet bgs to 196 feet bgs. Assuming a linear relationship between pumping and water level, a 54 percent reduction in nearby pumping would lower static water levels by 46 percent of 14 feet (i.e., by 6 feet). The static water level in both of the Olympic Club Wells at the end of the design drought is therefore estimated to be 188 feet bgs, which would be above the top of the screen at 360 feet bgs. Therefore, similar to the proposed Project, both static and pumping groundwater levels would remain above the top of the well screen at these wells under Alternative 2B. Furthermore, these wells have the capacities to meet peak their demand (see Impact HY-6 in Section 5.16, Hydrology and Water Quality). Therefore, the potential well interference impact on the Olympic Club wells and the San Francisco Golf Club wells would also be *less than significant* under Alternative 2B, as it would be for the proposed Project.

Land Subsidence. A 54 percent reduction in pumping near Lake Merced would reduce the risk of subsidence near Daly City and the unincorporated community of Broadmoor, as compared to the proposed Project. Because pumping would not be increased in Colma, South San Francisco and San Bruno, this alternative would not change subsidence impacts in these areas. Therefore, subsidence impacts would also be *less than significant* under Alternative 2B, as they would be for the proposed Project.

Seawater Intrusion. Decreasing pumping in the Lake Merced area by 54 percent would correspondingly reduce the risk of seawater intrusion from the Pacific Ocean, as compared to the Project. Therefore, seawater intrusion impacts would also be *less than significant* under Alternative 2B, as they would be for the proposed Project.

Adverse Effects on Beneficial Uses at Lake Merced. A 54 percent reduction in pumping in the Lake Merced area would result in a 54 percent decrease in the decline of Lake Merced lake levels at the end of the design drought. The proposed Project is expected to result in lake levels that are 1 foot lower than predicted under modeled existing conditions at the end of the design drought; under Alternative 2B, this impact would be reduced by 54 percent to approximately 0.5 feet instead of 1 foot, given that the pumping from Sites 1, 2, 3, and 4 would be within 1.3 miles of Lake Merced, whereas the next closest Project well would be over 2 miles from the lake, and Sites 1 and 4 constitute 54 percent of the proposed pumping at Sites 1, 2, 3, and 4 (SFPUC 2012b, 2012c). Because the lake levels under the proposed Project recover more slowly than under modeled existing conditions, the difference between the proposed Project and modeled existing conditions is actually greater several years after the drought than at the end of the drought. Thus, the proposed Project is also expected to result in lake levels about 4 feet lower than predicted under modeled existing conditions after the design drought, with lake levels gradually increasing over the 37-month period during which the lake is recovering from the drought; under Alternative 2B, the decline in lake levels (as compared to modeled existing conditions) would be reduced to approximately 2 feet instead of 4 feet (SFPUC 2012b, 2012c). Minimum monthly average lake levels are predicted to be -2.5 feet City Datum due to the Project, and approximately -0.5 feet for the alternative, both of which are below 0 feet, which is the threshold used by this EIR for determining significant water quality impacts on Lake Merced. Therefore, during the period following the design drought, until Lake Merced lake levels recover to a level of 0 feet City Datum, the impact of Alternative 2B on water quality would be *significant*, as it would be for the proposed Project. 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 reduce the water quality impact of this alternative on Lake Merced to *less-than-significant* levels, as it would for the Project, through development and implementation of lake level monitoring and management procedures to maintain Lake Merced at water levels similar to conditions that are predicted to occur without the Project.

Water Quality Standards. A reduction in pumping in the Lake Merced area would not affect the ability of the SFPUC to provide drinking water that meets drinking water quality standards, because the SFPUC would treat or blend groundwater as necessary to meet primary and secondary water quality standards and because the groundwater to be pumped is not considered vulnerable to soil or groundwater contamination due to the depth of pumping proposed. Therefore, the impact of Alternative 2B on drinking water quality would be *less than significant*, as it would be for the proposed Project.

Because groundwater levels that would result from this alternative would not be expected to rise more than they would from the proposed Project, due to the reduced pumping, the impact of Alternative 2B on the potential to mobilize existing areas of contamination would be *less than significant*, as it would be for the proposed Project.

Water Quality Degradation. Decreasing pumping in the Lake Merced area would not affect water quality degradation from constituents not currently regulated because the existing concentration of such non-regulated constituents in the groundwater is lower than what would be likely to cause environmental harm and decreased pumping would not increase or decrease these concentrations. Therefore, potential impacts of Alternative 2B relative to water quality degradation would be *less than significant*, as they would be for the proposed Project (Kennedy/Jenks 2012d).

Groundwater Depletion. Because the overall yield from the Westside Groundwater Basin would be reduced to 6.2 mgd, potential impacts on groundwater depletion resulting from Alternative 2B would be less than expected for the proposed Project. However, impacts on groundwater depletion under both the alternative and the proposed Project would be *less than significant with mitigation.* Both the proposed Project and Alternative 2B would have the potential to result in depletion of the basin if losses from the SFPUC Storage Account were not considered in the management of pumping. With implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion), pumping would be managed to ensure that GSR wells would only be pumped when there is a positive balance in the SFPUC Storage Account, which would be adjusted for losses from the basin due to leakage.

Reduce Lake Merced Impacts and Reduce Project Yield Alternative Conclusions

Alternative 2B would meet most, but not all, of the Project goals and objectives. It would provide for the conjunctive management of the South Westside Groundwater Basin, and it would provide supplemental SFPUC surface water to Partner Agencies in normal and wet years, albeit reduced by 1 mgd, as compared to the proposed Project. Alternative 2B would also provide a new dry-year groundwater supply though not at the same volume as described in Section 7.3.1 (Approach to Alternatives Selection) or in the adopted WSIP goals. Therefore, in order to meet the WSIP goal of limiting rationing to a systemwide maximum of 20 percent during an 8.5-year drought, the SFPUC or its wholesale customers could decide to pursue additional projects such as water transfers so that, combined with this alternative, it could increase its dry-year and emergency pumping capacity by 7.2 mgd.

This alternative would have the same construction-related impacts as the proposed Project, except impacts associated with construction at Sites 1 and 4 would not occur.

The alternative would decrease pumping near Lake Merced by approximately 54 percent; however the operational impacts would be similar to those expected for the proposed Project. A 54 percent decrease in pumping near Lake Merced would result in groundwater levels that would have similar or slightly less well interference impacts on existing irrigation wells as compared to the Project. However, this alternative would have *significant and potentially unavoidable* well interference impacts, which would be the same level of significance for this impact as with the proposed Project. Alternative 2B would reduce the potential for subsidence and seawater intrusion as compared to the proposed Project; however both the proposed Project and Alternative 2B would result in less than significant impacts relative to subsidence and seawater intrusion. Water levels in Lake Merced would decrease slightly less under the alternative; however such impacts resulting from this alternative and the proposed Project would be less than significant following implementation of mitigation. Eliminating other wells would not further reduce impacts on Lake Merced water levels because other wells are too far from the lake to have a substantial influence on the lake. Potential impacts on groundwater quality and groundwater depletion would be the same for the proposed Project and the alternative (less than significant and less than significant with mitigation, respectively).

7.3.4.4 Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield

Alternative 3A was selected for analysis because it would reduce the significant well interference impacts of the Project during dry years at existing irrigation wells that are located at the Colma-area cemeteries. Under Alternative 3A, the SFPUC would construct only 14 wells and well facilities (instead of 16 wells under the proposed Project). The 14 wells would be located at the same preferred sites as the Project; however, Alternative 3A would not include a well or well facility at Sites 7 or 8 in Colma. Without wells at Sites 7 and 8, Project pumping would be reduced by approximately 1.2 mgd. To maintain the overall yield at 7.2 mgd, pumping would be redistributed to nine wells at Sites 1 through 4 and Sites 11 through 15. Project pumping at each of these sites would increase by approximately 31 percent compared to the proposed Project. Pumping at Sites 5, 6, 9, and 10 would be the same as the Project, because they are near Colma; pumping at Site 16 would also not increase under this alternative, as compared to the Project, because groundwater availability is restricted at this location (compared to the other preferred sites). The alternative would decrease pumping in the Colma area by approximately 32 percent.

Ability of Alternative to Meet Project Objectives Compared to the Proposed Project

Alternative 3A would fully meet the Project objectives. The overall yield would be at 7.2 mgd, which would meet the Project goal to increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by 7.2 mgd.

Environmental Impacts of Alternative 3A

The significant environmental impacts of Alternative 3A are presented in Table 7-2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project). However, because Alternative 3A was evaluated for its ability to reduce groundwater impacts, a more detailed analysis of operational groundwater impacts is provided than for other impacts, as compared to the proposed Project. The operational groundwater impacts of the alternatives as compared to the proposed Project are presented below. The information provided comes from the groundwater modeling analysis and other technical studies, as identified below (Kennedy/Jenks 2012a, 2012b).

Production rate of preexisting nearby wells. A 32 percent reduction in pumping near Colma-area existing irrigation wells would reduce well interference impacts on these wells.

The Project is predicted to lower static water levels in the Eternal Home Cemetery well by 105 feet, reducing static water levels to below the top of the well screen at the end of the design drought (see Table 5.16-11 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought] in Section 5.16, Hydrology and Water Quality). Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower static water levels by 68 percent of 105 feet (i.e., by 71 feet). This same table shows that, at the end of the design drought, the Project is predicted to lower static water levels in the Woodlawn Cemetery Well by 116 feet; and lower static water levels in the Italian Cemetery Well by 110 feet. Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower static water levels by 68 percent of 116 feet (i.e., by 79 feet in the Woodlawn Cemetery Well); and by 68 percent of 110 feet (i.e., by 75 feet in the Italian Cemetery Well). With these estimated lowered static groundwater levels at the end of the design drought, the static water levels at the Eternal Home Cemetery well, Woodlawn Cemetery well, and Italian Cemetery well would fall below the top of the well screens under Alternative 3A. As a result, the well interference impact on these wells would also be *significant* under Alternative 3A, as it would be for the proposed Project.

Table 5.16-12 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Holy Cross Cemetery Well #4 by 81 feet. The same table shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Hills of Eternity Cemetery Well by 89 feet. Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower pumping water levels by 68 percent of 81 feet (i.e., by 55 feet in the Holy

Cross Cemetery Well #4); and by 68 percent of 89 feet (i.e., by 61 feet in the Hills of Eternity Cemetery Well). With these estimated lowered groundwater levels at the end of the design drought, the static water levels at the Holy Cross Cemetery well #4 and at the Hills of Eternity Cemetery well would fall below the top of the well screen under Alternative 3A; As a result, the well interference impact on these wells would be *significant* under Alternative 3A, as it would be for the proposed Project.

The Olivet Memorial Park well is expected to have just enough capacity to meet its expected demands, as predicted under modeled existing conditions (see Impact HY-6 in Section 5.16, Hydrology and Water Quality). Consequently, any lowering of groundwater levels at this well would likely result in this well having insufficient capacity to meet its expected demands. Therefore, even with the reduced pumping at Sites 7 and 8, the well interference impact on the Olivet Memorial Park well under Alternative 3A would be *significant*, as it would be for the proposed Project.

The Project is predicted to lower pumping water levels in the Holy Cross Cemetery Well #1 by 86 feet, at the end of the design drought (see Table 5.16-11 [Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought] in Section 5.16, Hydrology and Water Quality). Assuming a linear relationship between pumping and water level, a 32 percent reduction in pumping by eliminating pumping at GSR Sites 7 and 8 would lower pumping water levels by 68 percent of 86 feet (i.e., by 58 feet). If pumping were not increased at any other wells in the vicinity, the pumping water level in the Holy Cross Cemetery Well #1 at the end of the design drought is predicted to be slightly above the top of the well screen. However, because the pumping groundwater level would be very close to the top of the well screen, the additional drawdown from the increased pumping at Sites 11 and 12, as per Alternative 3A, is projected to drop the pumping water level below the top of the well screen. Therefore, the well interference impact on this well would be *significant* under Alternative 3A, as it would be for the proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Home of Peace Well by 81 feet. Therefore, under the Project, the pumping water level is predicted to be below the top of the screen at the end of the design drought. Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower pumping water levels by 68 percent of 81 feet (i.e., by 55 feet). The pumping water level in the Home of Peace Well at the end of the design drought is predicted to be sufficiently above the top of the well screen. Accordingly, the reduced pumping at Sites 7 and 8 is estimated to result in both pumping and static groundwater levels above the top of the well screen at the Home of Peace Cemetery well. The pumping capacities of this well under Alternative 3A are therefore estimated to meet peak demand even when Project pumping is at a maximum (see Impact HY-6 in Section 5.16, Hydrology and Water Quality). As a result, the well interference impact on the Home of Peace Cemetery well would be *less than significant* under Alternative 3A, while the impact of the proposed Project at this well would be *significant*.

Increasing pumping at Sites 1 through 4 by 31 percent would increase well interference impacts at the San Francisco Golf Club, Olympic Club, and Lake Merced Golf Club, as compared to the Project. The Project is predicted to lower pumping water levels in the San Francisco Golf Club Well #2 by 11 feet at the end of the design drought. Assuming a linear relationship between pumping and water level, a 31 percent increase in nearby pumping would lower pumping water levels by an additional 31 percent over the 11 feet of anticipated drawdown (i.e., by an additional 3 feet). The pumping water level in the San Francisco Golf Club Well #2 at the end of the design drought is predicted to be sufficiently above the top of the screen. Therefore, at the end of the design drought both static and pumping groundwater levels would remain above the top of the well screens in the San Francisco Golf Club Well #2 under Alternative 3A. Furthermore, as shown above, the drop in groundwater levels estimated to be caused by the 31 percent increased pumping (as compared to the Project) would be less than 3.5 feet, and therefore would cause a negligible change in the capacity of the existing irrigation wells in this region. As a result, the well interference impact on the San Francisco Golf Club Well #2 would be *less than significant* under Alternative 3A, as it would be for the Proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that at the end of the design drought the Project is predicted to lower pumping water levels in the Olympic Club Well #8 by 10 feet; and lower pumping water levels in the Olympic Club Well #9 by 4 feet. Assuming a linear relationship between pumping and water level, a 31 percent increase in pumping at Sites 1 through 4 would lower pumping water levels by an additional 31 percent over the 10 feet of anticipated drawdown (i.e., by an additional 3 feet) at Olympic Club Well #8; and lower pumping water levels by an additional 31 percent of the 4 feet of anticipated drawdown (i.e., by an additional 1 foot) at Olympic Club Well #9. The pumping water level in the Olympic Club Well #8 at the end of the design drought is predicted to be just above the top of the screen; and the pumping water level in the Olympic Club Well #9 at the end of the design drought is predicted to be above the top of the screen. Neither well would be influenced by pumping from any other GSR wells. Therefore, both static and pumping groundwater levels at the end of the design drought are estimated to remain above the top of the well screens in the Olympic Club Wells #8 and #9 under Alternative 3A. Furthermore, as shown above, the drop in groundwater levels that estimated to be caused by the 31 percent increased pumping (as compared to the Project) is less than 3.5 feet, which would therefore cause a negligible change in the capacity of the existing irrigation wells in this area. As a result, the well interference impact on the Olympic Club Wells #8 and #9 would be *less than significant* under Alternative 3A, as it would be for the Proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that at the end of the design drought the Project is predicted to lower static water levels in the Lake Merced Golf Club Well #3 by 85 feet. Assuming a linear relationship between pumping and water level, a 31 percent increase in nearby pumping would lower static water levels by an additional 31 percent of the 85 feet of anticipated drawdown (i.e., by an additional 26 feet). The static water level in the Lake Merced Golf Club Well #3 at the end of the design drought is predicted to be below the top of the screen. As a result, the well interference impact on the Lake Merced Golf Club well would be *significant*, as it would be for the proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water at the End of the Design Drought) also shows that at the end of the design drought the Project is predicted to lower static water levels in the California Golf Club Well #7 by 168 feet, and to lower static water levels in the California Golf Club Well #8 by 169 feet. Assuming a linear relationship between pumping and water level, a 31 percent increase in pumping at Sites 11 through 15 would lower static water levels by an additional 31 percent of the 168 feet of anticipated drawdown at the California Golf Club Well #7 (i.e., by an additional 52 feet); and would lower static water levels by an additional 31 percent of the 169 feet of anticipated drawdown at the California Golf Club Well #8 (i.e., by an additional 52 feet). The static water level in the California Golf Club Well #7 at the end of the design drought is predicted to be below the top of screen; and the static water level in the California Golf Club Well #8 at the end of the design drought is predicted to be below the top of screen. As a result, the well interference impact on these wells would be *significant* under Alternative 3A, as it would be for the proposed Project.

However, implementation of Mitigation Measure M-HY-6 would reduce these impacts of well interference to *less-than-significant* levels, by either increasing irrigation efficiency, modifying irrigation operations, or undertaking other actions detailed in Mitigation Measure M-HY-6 (Ensure Existing Irrigators' Wells Are Not Prevented from Supporting Existing or Planned Land Use Due to Project Operation). Nevertheless, the implementation of this mitigation measure cannot be assured at this time, until the existing irrigation well owners have agreed to allow the mitigation to take place on their property and, therefore, the impact is determined to be *significant and potentially unavoidable with mitigation*.

Land Subsidence. A 32 percent reduction in pumping near Colma would reduce the risk of subsidence in that area, as compared to the Project. A 31 percent increase in pumping at Sites 1 through 4 and 11 through 15 would increase the risk of subsidence slightly, but would not result in significant impacts, because estimated subsidence would remain below the established thresholds of 6 inches for structures and drainage patterns; and one foot for floodplain. The maximum expected subsidence under the proposed Project would be 3.4 inches; approximately half of the 6-inch threshold. The 31 percent increase in pumping at Sites 1 through 4 and 11 through 15 would result in a 31 percent increase in groundwater elevation decline compared to the proposed Project. The method for calculating subsidence indicates that subsidence changes would be proportionately smaller than groundwater elevation changes and, therefore, a 31 percent increase in groundwater level decline would not be expected to increase subsidence to significant levels, because to do so would require almost doubling the amount of subsidence anticipated for the proposed Project (Fugro 2012a). Therefore, subsidence impacts would be *less than significant* under Alternative 3A, as they would be for the proposed Project.

Seawater Intrusion. Decreasing pumping in the Colma area by 32 percent and increasing pumping at Sites 11 through 15 in South San Francisco and San Bruno by 31 percent would accordingly increase the risk of seawater intrusion from the San Francisco Bay, as compared to the Project. Seawater intrusion has been observed in sediments adjacent to the Bay and is expected to continue into the future. The proposed Project would reduce the risk of seawater intrusion a small amount. Over the 47 years simulated by the West Basin Model, estimated groundwater elevations at the Bay under Project conditions rise slightly (Table 10.3-2 in Kennedy/Jenks 2012c), and approximately 3 af per year more groundwater is predicted to flow out to the Bay than under modeled existing conditions (Table 10.3-5 in Kennedy/Jenks 2012c).

While there would be an incremental increase in the potential for seawater intrusion due to the 31 percent increase in pumping in the South San Francisco and San Bruno areas, the magnitude of the increase would be relatively small based on two lines of evidence. First, in general, the San Francisco Bay coast has physical controls that limit the rate of seawater intrusion, including the presence of the Bay Mud and a subsurface bedrock ridge, both of which provide some protection to the southern portion of the South Westside Basin (Kennedy/Jenks 2012c). Second, the proposed Project is estimated to increase groundwater flows to the Bay (due to the increase of in-lieu recharge) by about 2 to 3 af per month at the end of the design drought. For Alternative 3A, the increase in pumping from GSR wells at Sites 11 through 15 would slightly increase the potential for seawater intrusion from San Francisco Bay as compared to the proposed Project. This is not expected to result in a seawater intrusion impact because it would be similar to the amount of seawater intrusion predicted under modeled existing conditions (SFPUC 2012a). Therefore, seawater intrusion impacts would be *less than significant* under Alternative 3A, as they would be for the proposed Project.

Adverse Effects on Beneficial Uses at Lake Merced. A 31 percent increase in pumping in the Lake Merced area would result in a 31 percent increase in the decline of Lake Merced lake levels at the end of the design drought, because GSR Sites 1, 2, 3, and 4 would be within 1.3 miles of Lake Merced whereas the next closest GSR sites would be over 2 miles from the lake, and this alternative proposes to increase pumping at GSR Sites 1, 2, 3, and 4 by 31 percent. The proposed Project is expected to result in lake levels that are 1 foot lower than is predicted to occur under modeled existing conditions at the end of the design drought (SFPUC 2012b); under Alternative 3A, this impact would be increased to approximately 1.3 feet (instead of 1 foot under the proposed Project), due to the 31 percent increase in pumping in the Lake Merced area. Because recovery in lake levels is slower with the Project than under modeled existing conditions, the proposed Project is expected to result in lake levels about 4 feet lower than what is expected under modeled existing conditions after recovery from the design drought. With the proposed Project, the lake is expected to recover to a lake level of 0 feet City Datum within 37 months after the drought. Under Alternative 3A, this impact would be increased to approximately 5.2 feet (instead of 4 feet under the proposed Project), due to the increased pumping in this area during the drought, and the recovery period is expected to be longer. Monthly lake level averages are predicted to decline below 0 feet City Datum under both the proposed Project (a minimum of -2.5 feet) and this alternative (a minimum of -3.7 feet). Therefore, during the period following the design drought, when Lake Merced lake levels are recovering, the impact of Alternative 3A on water quality would be *significant*, which would be a greater impact under this alternative than for the proposed Project. 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 reduce the water quality impacts of this alternative to *less-than-significant* levels, because it requires the SFPUC to implement lake level management procedures to maintain Lake Merced water levels above 0.0 feet. Nevertheless, the impact would be greater under Alternative 3A, requiring more supplemental water, redistribution of pumping, or discontinued pumping than under the proposed Project.

Water Quality Standards. A reduction in pumping in the Colma area and an increase in pumping away from Colma would not affect the ability of the SFPUC to provide drinking water that meets drinking water quality standards, because the SFPUC would treat or blend groundwater as necessary to meet primary and secondary water quality standards and because the groundwater to be pumped is not considered vulnerable to soil or groundwater contamination due to the depth of pumping proposed. Therefore, the potential impact of Alternative 3A on drinking water quality would be *less than significant*, as it would be for the proposed Project.

Because in-lieu recharge does not occur in the Colma area (because none of the Partner Agencies have wells in Colma) where pumping would decrease, Alternative 3A is not expected to result in higher groundwater levels than those expected under modeled existing conditions. Therefore, the impact of Alternative 3A on the potential to mobilize existing areas of contamination due to increasing groundwater levels from in-lieu recharge would be *less than significant*, as it would be for the proposed Project.

Water Quality Degradation. Decreasing pumping in the Colma area and increasing pumping to the north and south would not affect water quality degradation from constituents not currently regulated because the existing concentration of such non-regulated constituents in the groundwater is lower than what would be likely to cause environmental harm, and decreased pumping would not increase or decrease these concentrations. Therefore, potential impacts of Alternative 3A relative to water quality degradation would be the same as the proposed Project, which would be *less than significant*.

Groundwater Depletion. Because the overall yield from the Westside Groundwater Basin would be maintained at 7.2 mgd under Alternative 3A, potential impacts on groundwater depletion would be *less than significant with mitigation*, as they would be for the proposed Project. Both the proposed Project and Alternative 2A would have the potential to result in depletion of the basin if losses from the SFPUC Storage Account were not considered in the management of pumping. With implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion), pumping would be managed to ensure that GSR wells would only be pumped when there is a positive balance in the SFPUC Storage Account, which would be adjusted for losses from the basin due to leakage.

Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield Conclusions

Alternative 3A would fully meet the Project objectives and meet the Project goal to increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by 7.2 mgd. This alternative would have the same construction-related impacts as the proposed Project except impacts associated with construction at Sites 7 and 8, including the significant and unavoidable aesthetic impact at Site 7, would not occur. Operational impacts would be nearly the same as those expected for the proposed Project. A 32 percent reduction in pumping near the Colma-area existing irrigation wells from this alternative as compared to the proposed Project would reduce well interference on the existing wells; however, well interference would still be significant for Alternative 3A as it would for the proposed Project. The potential for subsidence impacts and for seawater intrusion would be slightly greater for Alternative 3A when compared to the proposed Project; however impacts would be *less than significant* for both the alternative and the proposed Project. Potential impacts on Lake Merced water levels would be slightly greater for Alternative 3A than for the proposed Project, prior to mitigation, but as mitigated, both would result in less-than-significant impacts on the water quality of Lake Merced (even though, under Alternative 3A, more supplemental water, redistribution of pumping, or discontinued pumping would be required to mitigate such impacts, as compared to the proposed Project). Potential impacts on groundwater quality and groundwater depletion would be the same for the proposed Project and this alternative.

7.3.4.5 *Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield*

Alternative 3B was selected for analysis because it would reduce the significant well interference impacts of the Project at existing irrigation wells for cemeteries in the Colma area due to Project pumping during dry years, but it would not include any redistribution of pumping as Alternative 3A does (in order to provide the SFPUC with a dry-year and emergency pumping capacity of 7.2 mgd). Under Alternative 3B, the SFPUC would construct only 14 wells and well facilities (instead of 16 wells under the proposed Project). The 14 wells would be located at the same preferred sites as the Project; however, Alternative 3B would not include a well or well facility at Sites 7 or 8 in Colma. Without wells at Sites 7 and 8, pumping would be reduced by approximately 1.2 mgd, and the overall yield would be 6.0 mgd. The alternative would also decrease pumping near Colma by approximately 32 percent (as would Alternative 3A).

Ability of Alternative to Meet Project Objectives Compared to Proposed Project

Alternative 3B would reduce pumping by 1.2 mgd; therefore, the alternative would meet most, but not all, of the Project objectives. This alternative would allow for the conjunctive use of the South Westside Groundwater Basin, and it would provide supplemental SFPUC surface water to Partner Agencies during normal and wet years to allow for in-lieu recharge of the Basin, albeit reduced by 1.2 mgd, as compared to the proposed Project. The alternative would not meet the objective of increasing the SFPUC's dry-year and emergency pumping capacity by 7.2 mgd; it would also provide a new dry-year groundwater supply though not at the same volume as under the proposed Project. Therefore, in order to meet the WSIP goal of limiting rationing to a systemwide maximum of 20 percent during an 8.5 year drought, if this alternative were implemented, the SFPUC or its wholesale customers could decide to pursue additional projects (e.g., water transfers) to increase dry-year and emergency pumping capacity up to 7.2 mgd.

The alternative would also not meet the project objective of providing an emergency supply, to be used in the event of a catastrophic emergency that would affect the other sources of supply for the regional water system. Therefore, the reduction in yield with Alternative 3B would limit the regional water system's ability to meet the WSIP goal of seismic and delivery reliability, adopted as part of approval of the WSIP under SFPUC Resolution 08-0200. Per the adopted resolution, the SFPUC will reevaluate 2030 demand projections, regional water system purchase requests, and water supply options by 2018. If this alternative were adopted, the up to 1.2-mgd reduction in drought-year water supply would be included as part of the reevaluation and taken into consideration as a part of the separate SFPUC decision regarding water deliveries after 2018. With the reduction in yield from this alternative, the SFPUC may need to revise the WSIP goals and objectives or develop additional water supply projects depending on demand projections.

Environmental Impacts of Alternative 3B

The significant environmental impacts of Alternative 3B are presented in Table 7-2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project). However, because Alternative 3B was selected for analysis to reduce groundwater impacts, a more detailed analysis of operational groundwater impacts is provided than for other impacts as compared to the proposed Project. The operational groundwater impacts of the alternatives as compared to the proposed Project are presented below. The information provided comes from the groundwater modeling analysis and other technical studies, as identified below (Kennedy/Jenks 2012a, 2012b).

Production rate of preexisting nearby wells. A 32 percent reduction in pumping near Colma-area existing irrigation wells, as associated with this alternative, would reduce well interference impacts on those wells.

At the end of the design drought, the Project is predicted to lower static water levels by 105 feet in the Eternal Home Cemetery well; by 116 feet in the Woodlawn Cemetery Well; and by 110 feet in the Italian Cemetery Well (see Table 5.16-11 [Estimated Static and Pumping Depth Levels to Water at the End of the Design Drought] in Section 5.16, Hydrology and Water Quality). Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower static water levels by 68 percent of 105 feet (i.e., by 71 feet), in the Eternal Home Cemetery well; by 68 percent of 116 feet (i.e., by 79 feet) in the Woodlawn Cemetery Well; and by 68 percent of 110 feet (i.e., by 75 feet) in the Italian Cemetery Well. The static water levels in the Eternal Home Cemetery Well, Woodlawn Cemetery Well and Italian Cemetery Well at the end of the design drought are predicted to be below the top of the well screens. Therefore, the reduced pumping is expected to result in static groundwater levels at these three cemetery wells falling to below the top of the well screens under Alternative 3B. As a result, the well interference impact on these wells would be *significant* under Alternative 3B, as it would be for the proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Holy Cross Cemetery Well #4 by 81 feet. The same table shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Hills of Eternity Cemetery Well by 89 feet. Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower pumping water levels by 68 percent of 81 feet (i.e., by 55 feet) in the Holy Cross Cemetery Well #4; and by 68 percent of 89 feet (i.e., by 61 feet) in the Hills of Eternity Cemetery Well. The pumping water levels in the Holy Cross Cemetery Well #4 and in the Hills of Eternity Cemetery Well at the end of the design drought are predicted to be below the top of the well screens. As a result, pumping groundwater levels at these wells is expected to fall below the top of the well screen under Alternative 3B; and the well interference impact on these wells would be *significant* under Alternative 3B, as it would be for the proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Holy Cross Cemetery Well #1 by 86 feet. Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower pumping water levels by 68 percent of 86 feet (i.e., by 58 feet). The pumping water level in the Holy Cross Cemetery Well #1 at the end of the design drought is predicted to be slightly above the top of the well screen. Because pumping would not be redistributed to any other well sites under Alternative 3B, unlike Alternative 3A, no further reductions in water level would be expected. Furthermore, the pumping capacity of the Holy Cross Cemetery Well #1 is estimated to meet its peak demand when Project pumping is at a maximum, and a 32 percent reduction in nearby pumping, as per this alternative, would therefore not reduce the well's pumping capacity. As a result, the potential well interference impacts on the Holy Cross Cemetery well #1 would be *less than significant* under Alternative 3B, while the proposed Project impacts would be *significant*.

The Olivet Memorial Park well is expected to have just enough capacity to meet its expected demands, as predicted modeled existing conditions (see Impact H-6 in Section 5.16, Hydrology and Water Quality). Consequently, any lowering of groundwater levels at this well would likely result in this well having insufficient capacity to meet its expected demands. Therefore, even with the reduced pumping at Sites 7 and 8, the well interference impact on the Olivet Memorial Park well under Alternative 3B would be *significant*, as it would be for the proposed Project.

Table 5.16-11 (Estimated Static and Pumping Depth to Water Levels at the End of the Design Drought) also shows that, at the end of the design drought, the Project is predicted to lower pumping water levels in the Home of Peace Well by 81 feet. Under these Project conditions, this pumping water level would be below the top of the screen. Assuming a linear relationship between pumping and water level, a 32 percent reduction in nearby pumping would lower pumping water levels by 68 percent of 81 feet (i.e., by 55 feet). The pumping water level in the Home of Peace Well at the end of the design drought under Alternative 3B is predicted to be sufficiently above the top of the screen. Therefore, the reduced pumping at Sites 7 and 8 is expected to result in both pumping and static groundwater levels above the top of the well screen at the Home of Peace Cemetery Well at the end of the design drought. The pumping capacity of this well is estimated to meet its peak demand even when Project pumping would be at a maximum (Tables 5.16-13 [Estimated Peak Demand and 12-Hour Production Capacities]), and pumping capacity under Alternative 3B would be slightly greater as a result of eliminating pumping at Sites 7 and 8. As a result, the well interference impact on the Home of Peace Cemetery well would be *less than significant* under Alternative 3B, while the impact of the proposed Project on this well would be *significant* because the water levels due to Project pumping would be below the well screen, even though the pump discharge rate would be adequate to meet peak demand.

Under Alternative 3B, there would be no increase in pumping at other well sites, so potential well interference impacts under Alternative 3B at the San Francisco Golf Club, Olympic Club, and Lake Merced Golf Club would be essentially the same as for the proposed Project. The elimination of Sites 7 and 8 would not change the groundwater levels in the vicinity of these irrigation wells because they are too far from those GSR well sites to be affected by Sites 7 and 8. Therefore, the potential well interference impacts on the San Francisco Golf Club, Olympic Club, and Lake Merced Golf Club wells under Alternative 3B would be *less than significant*, as they would be for the proposed Project.

Land Subsidence. A 32 percent reduction in pumping near Colma would reduce the risk of subsidence in that area as compared to the Project. Therefore, potential subsidence impacts would be *less than significant* under Alternative 3B, as they would be for the proposed Project.

Seawater intrusion. Decreasing pumping in the Colma area by 32 percent would decrease the risk of seawater intrusion from the San Francisco Bay. Therefore, potential seawater intrusion impacts would be *less than significant* under Alternative 3B, as they would be for the proposed Project.

Adverse Effects on Beneficial Uses at Lake Merced. Pumping under Alternative 3B would not change near Lake Merced, as compared to the Project. Therefore, impacts on Lake Merced under Alternative 3B would be *less than significant with mitigation* relative to biological resources and to water quality, as they would be for the proposed Project. 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 that includes monitoring to detect changes in lake levels, water quality, and groundwater, and the development and implementation of a strategy to augment lake levels or alter pumping to avoid adverse effects on Lake Merced. This mitigation measure would reduce the impacts of Alternative 3B to *less-than-significant* levels, as it would for the Project.

Water Quality Standards. A reduction in pumping in the Colma area would not affect the ability of the SFPUC to provide drinking water that meets drinking water quality standards, because the SFPUC would treat or blend groundwater as necessary to meet primary and secondary water quality standards and because the groundwater to be pumped is not considered vulnerable to soil or groundwater contamination due to the depth of pumping proposed. Therefore, the potential impact of Alternative 3B on drinking water quality would be *less than significant*, as it would be for the proposed Project.

Water Quality Degradation. Decreasing pumping in the Colma area would not affect water quality degradation from constituents not currently regulated because the existing concentration of such non-regulated constituents in the groundwater is lower than what would be likely to cause environmental harm, and decreased pumping would not increase or decrease these concentrations. Therefore, potential impacts of Alternative 3B relative to water quality degradation would be *less than significant*, as they would be for the proposed Project.

Groundwater Depletion. Because the overall yield from the Westside Groundwater Basin would be reduced to 6.0 mgd under this alternative, potential impacts on groundwater depletion would be less than those of the proposed Project and would remain *less than significant with mitigation*. Both the proposed Project and Alternative 3B would have the potential to result in depletion of the basin if losses from the SFPUC Storage Account were not considered in the management of pumping. With implementation of Mitigation Measure M-HY-14 (Prevent Groundwater Depletion), pumping would be managed to ensure that GSR wells would only be pumped when there is a positive balance in the SFPUC Storage Account, which would be adjusted for losses from the basin due to leakage.

Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield Conclusions

Alternative 3B would meet most, but not all, of the Project goals and objectives. It would provide for the conjunctive management of the South Westside Groundwater Basin, and it would provide supplemental SFPUC surface water to Partner Agencies in normal and wet years to allow for in-lieu recharge of the Basin. However, Alternative 3B would not fully meet the Project goal to provide 7.2 mgd of water for a new dry-year water supply for the SFPUC and Partner Agencies because Alternative 3B would reduce the number of wells and reduce the dry-year and emergency pumping capacity to 6.0 mgd.

The alternative would decrease pumping near Colma-area cemeteries by approximately 32 percent. This alternative would have the same construction-related impacts as the proposed Project except impacts associated with construction at Sites 7 and 8 would not occur. Operational impacts would be nearly the same as those expected for the proposed Project. This alternative would partially support the WSIP goals and objectives to provide dry-year and emergency water pumping capacity. However, additional measures may be necessary to fully provide the dry-year and emergency water pumping volume required in order to meet the WSIP goal of limiting rationing to a systemwide maximum of 20 percent during an 8.5 year drought.

Although this alternative would decrease pumping near the Colma-area by approximately 32 percent, the operational impacts would be similar to those expected for the proposed Project. The expected groundwater levels would still result in the potential for well interference impacts as would the proposed Project and these impacts, in most cases, are similar to those that would occur with the proposed Project. Alternative 3B would reduce the potential for subsidence and seawater intrusion; however, both the proposed Project and Alternative 3B would result in less than significant impacts. Potential impacts on groundwater quality would be the same for the proposed Project and the alternative. Potential impacts related to groundwater depletion would be similar for both the Project and this alternative.

7.4 COMPARISON OF ALTERNATIVES

Table 7.2 (Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project) provides a comparison of the environmental impacts of the alternatives as compared to the impacts of the proposed Project. The table does not include those impact categories for which the proposed Project would result in No Impact or a Less than Significant Impact at all sites. A comparison of the alternatives follows the table along with a discussion of the environmentally superior alternative.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
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.	**Significant and Unavoidable with Mitigation (SUM)** Construction-related noise, traffic, air quality and recreation impacts could temporarily substantially disrupt or displace existing land uses. Mitigation Measures M-NO-1, M-NO-3, M-LU-1a, AQ-2a, AQ-3, and M-TR-1 would reduce impacts to less-than-significant levels at some sites; however the impact would remain SUM at 10 sites.	**Same as existing condition (NI)** There would be no construction activities, and therefore no land use impacts.	**Similar to but less than the proposed Project (SUM)** Under the Project, Sites 1 and 4 contribute to the significant impact. With removal of these well facilities, construction impacts to land use would be slightly less than the proposed Project, however, eight sites would continue to have significant and unavoidable impacts.	**Similar to but less than the proposed Project (SUM)** Under the Project, Sites 1 and 4 contribute to the significant impact. With removal of these well facilities, construction impacts to land use would be slightly less than the proposed Project, however, eight sites would continue to have significant and unavoidable impacts.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Site 7 contributes to the significant impact though the impact would be mitigable. Omission of Site 7 would slightly reduce overall land use impacts, although 10 sites would continue to have significant and unavoidable impacts.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Site 7 contributes to the significant impact though the impact would be mitigable. Omission of Site 7 would slightly reduce overall land use impacts, although 10 sites would continue to have significant and unavoidable impacts.
Impact LU-2. Project operations would result in substantial long-term or permanent impacts on the existing character or disrupt or displace land uses.	**Less than Significant with Mitigation (LSM)** Nighttime noise from operations could potentially disrupt land uses at five sites. Mitigation Measure M-NO-5 would reduce the impact to a less-than-significant level.	**Same as existing condition (NI)** There would be no changes to existing operations at the Westlake Pump Station, and no new GSR well facilities would be constructed.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 1 would have a mitigable impact on its surrounding land use. This alternative would reduce the land use impact slightly by eliminating Site 4 where impacts are LSM. Impacts at four sites would remain LSM.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 1 would have a mitigable impact on its surrounding land use. This alternative would reduce the land use impact slightly by eliminating Site 1 where impacts are LSM. Impacts at four sites would remain LSM.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.
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.	**Significant and Unavoidable with Mitigation (SUM)** Construction could result in a cumulatively considerable contribution to cumulative land use impacts at Sites 9, 12, and 19. Even with implementation of Mitigation Measures M-NO-1 and M-NO-3, the impact could remain SUM.	**Same as existing condition (NI)** There would be no construction activities. No new GSR well facilities would be constructed so no noise caused land use impacts would be generated.	**Same as the proposed Project (SUM)** Under the Project, Sites 1 and 4 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (SUM)** Under the Project, Sites 1 and 4 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (SUM)** Under the Project, Sites 7 (On-site) and Site 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (SUM)** Under the Project, Sites 7 (On-site) and Site 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
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.	**Significant and Unavoidable with Mitigation (SUM)** Project construction at seven sites would be visible from areas with moderate to high visual sensitivity and significant viewer concern, and construction of Site 15 would be visible from a locally designated scenic route, which would be a significant impact. Mitigation Measures M-AE-1a, M-AE-1b, M-AE-1c, M-AE-1d, M-AE-1e, and M-CR-1a would reduce the impact at most sites; however, construction would result in a significant and unavoidable impact at Site 7, even with the implementation of the mitigations.	**Same as existing condition (NI)** There would be no construction activities; and therefore no visual impacts.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Site 4 contributes to the significant impact. Omission of this site would reduce construction-related aesthetic impacts at residences, Ben Franklin Intermediate School athletic field and Garden Village Elementary School. However, visual impacts would still occur at seven other sites, and a significant and unavoidable impact would remain at Site 7.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Site 4 contributes to the significant impact. Omission of the site would reduce construction-related aesthetic impacts at residences, Ben Franklin Intermediate School athletic field and Garden Village Elementary School. However, visual impacts would still occur at seven sites, and a significant and unavoidable impact would remain at Site 7.	**Similar to but less than the proposed Project (LSM)** Under the Project, Site 7 (under both Consolidated Treatment at Site 6 and On-Site Treatment) contributes to the significant impact. Omission of this site would reduce aesthetic impacts at several cemeteries, the Colma Bay Area Rapid Transit (BART) Station and Metro Shopping Center. Visual impacts would still occur at six sites, but impacts can be reduced to less-than-significant levels.	**Similar to but less than the proposed Project (LSM)** Under the Project, Site 7 (Consolidated and On-Site) contributes to the significant impact. Omission of this site would reduce aesthetic impacts at several cemeteries, the Colma BART Station and Metro Shopping Center. Visual impacts would still occur at six sites, but impacts can be reduced to less-than-significant levels.
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.	**Less than Significant with Mitigation (LSM)** Project facilities would be visible and may have an adverse impact on the visual character at five sites. Mitigation Measures M-AE-3a, M-CR-5a, and M-CR-5b would reduce impacts.	**Same as existing conditions (NI)** No new GSR well facilities would be constructed, and therefore no visual impacts would occur.	**Same as the proposed Project Less than Significant with Mitigation (LSM)** Under the Project, Site 4 contributes to the significant impact. Omission of the site under this alternative would reduce the impact; however, impacts on the visual character of the surrounding areas would remain at four other sites.	**Same as the proposed Project Less than Significant with Mitigation (LSM)** Under the Project, Site 4 contributes to the significant impact. Omission of the site under this alternative would reduce the impact; however, impacts on the visual character of the surrounding areas would remain at four other sites.	**Similar to but less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the significant impact. Omission of Site 7 would eliminate the visual impact at the site. Significant, but mitigable impacts would remain at four sites.	**Similar to but less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the significant impact. Omission of Site 7 would eliminate the visual impact at the site. Significant, but mitigable impacts would remain at foursites.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
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.	**Less than Significant with Mitigation (LSM)** Project construction and operations in addition to other projects may result in a cumulative impact to visual character of the area at Sites 12 and 13 Mitigation Measure M-AE-1a, M-AE-1b, and M-AE-3a would reduce impacts to less-than-significant levels.	**Same as the existing conditions (NI)** No new GSR well facilities would be constructed, and therefore there would be no cumulative visual impacts.	**Same as the proposed Project (LSM)** Sites, 12 and13 would have a cumulatively considerable contribution to cumulative impacts on the visual character of the surrounding area. This alternative includes facilities at these sites.	**Same as the proposed Project (LSM)** Sites, 12 and 13 would have a cumulatively considerable contribution to cumulative impacts on the visual character of the surrounding area. This alternative includes facilities at these sites.	**Similar to but slightly less than the proposed Project (LSM)** Sites 12 and 13 would have a cumulatively considerable contribution to cumulative impacts on the visual character of the surrounding area. The alternative would not reduce the impact.	**Similar to but slightly less than the proposed Project (LSM)** Sites 12 and 13 would have a cumulatively considerable contribution to cumulative impacts on the visual character of the surrounding area. The alternative would not reduce the impact.
Cultural and Paleontological Resources						
Impact CR-1. Project construction could cause an adverse change in the significance of a historical resource.	**Less than Significant with Mitigation (LSM)** Construction of the Project could affect the significance of historical resources at Sites 14 and 15. Mitigation measures M-CR-1a, M-CR-1b, and M-NO-2 would reduce the potential impacts to less-than-significant levels.	**Same as the existing conditions (NI)** No new GSR well facilities would be constructed, and therefore, there would be impacts on historical resources.	**Same as the proposed Project (LSM)** Construction of well facilities at Sites 14 and 15 would be included as part of this alternative; therefore the impacts would be the same as the proposed Project.	**Same as the proposed Project (LSM)** Construction of well facilities at Sites 14 and 15 would be included as part of this alternative; therefore the impacts would be the same as the proposed Project.	**Same as the proposed Project (LSM)** Construction of well facilities at Sites 14 and 15 would be included as part of this alternative; therefore the impacts would be the same as the proposed Project.	**Same as the proposed Project (LSM)** Construction of well facilities at Sites 14 and 15 would be included as part of this alternative; therefore the impacts would be the same as the proposed Project.
Impact CR-2. Project construction could cause an adverse change in the significance of an archaeological resource.	**Less than Significant with Mitigation (LSM)** Construction of the Project could affect a previously undiscovered archaeological resource at all sites, except for the Westlake Pump Station. Mitigation Measure M-CR-2 would reduce impacts to less-than-significant levels.	**Same as the existing conditions (NI)** There would be no construction activities, and therefore no impacts on cultural resources.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to adversely affect archaeological resources would be slightly decreased by eliminating Sites 1 and 4.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to adversely affect archaeological resources would be slightly decreased by eliminating Sites 1 and 4.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to adversely affect archaeological resources would be slightly decreased by eliminating Sites 7 and 8.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to adversely affect archaeological resources would be slightly decreased by eliminating Sites 7 and 8.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact CR-3. Project construction could result in a substantial adverse effect by destroying a unique paleontological resource or site.	**Less than Significant with Mitigation (LSM)** Construction could destroy a paleontological resource except at the Westlake Pump Station and Site 9. Mitigation Measure M-CR-3 would reduce the impacts to less-than-significant levels.	**Same as the existing conditions (NI)** There would be no construction activities, and therefore there would be no impacts on unique paleontological resources.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact because they are located on surface deposits considered to have a high paleontological sensitivity for significant paleontological resources. Therefore, without these two sites, the potential for adverse effects related to unique paleontological resources is slightly decreased.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact because they are located on surface deposits considered to have a high paleontological sensitivity for significant paleontological resources. Therefore, without these two sites, the potential for adverse effects related to unique paleontological resources is slightly decreased.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact because they are located on surface deposits considered to have a high paleontological sensitivity for significant paleontological resources. Therefore, without these two sites, the potential for adverse effects related to unique paleontological resources is slightly decreased.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact because they are located on surface deposits considered to have a high paleontological sensitivity for significant paleontological resources. Therefore, without these two sites, the potential for adverse effects related to unique paleontological resources is slightly decreased.
Impact CR-4. Project construction could result in a substantial adverse effect related to the disturbance of human remains.	**Less than Significant with Mitigation (LSM)** Construction could result in an impact on human remains at all sites except for the Westlake Pump Station. Mitigation Measure M-CR-4 would reduce the impacts to less-than-significant levels for all sites.	**Same as the existing conditions (NI)** There would be no construction activities. No impacts on human remains would occur.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to encounter human remains would be slightly decreased by eliminating Sites 1 and 4.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to encounter human remains would be slightly decreased by eliminating Sites 1 and 4.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to encounter human remains would be slightly decreased by eliminating Sites 7 and 8.	**Similar to but slightly less than the proposed Project (LSM)** Because this alternative would involve less ground disturbance, the potential to encounter human remains would be slightly decreased by eliminating Sites 7 and 8.
Impact CR-5. Project facilities could cause an adverse change in the significance of a historical resource.	**Less than Significant with Mitigation (LSM)** Construction of the Project facilities could result in an impact on the historical resources at or near Sites 14 and 15 in the Golden Gate National Cemetery. Mitigation Measures M-CR-5a and M-CR-5b would reduce the impacts to less-than-significant levels for both well facility sites.	**Same as the existing conditions (NI)** There would be no construction activities, and therefore no impacts on historical resources would occur.	**Same as the proposed Project (LSM)** Construction of the Project facilities at Sites 14 and 15 would occur under this alternative, and therefore the potential impacts on historical resources are the same as the proposed Project.	**Same as the proposed Project (LSM)** Construction of the Project facilities at Sites 14 and 15 would occur under this alternative, and therefore the potential impacts on historical resources are the same as the proposed Project.	**Same as the proposed Project (LSM)** Construction of the Project facilities at Sites 14 and 15 would occur under this alternative, and therefore the potential impacts on historical resources are the same as the proposed Project.	**Same as the proposed Project (LSM)** Construction of the Project facilities at Sites 14 and 15 would occur under this alternative, and therefore the potential impacts on historical resources are the same as the proposed Project.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
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.	**Less than Significant with Mitigation (LSM)** Construction could result in a cumulatively considerable contribution to cumulative impacts except at the Westlake Pump Station. Mitigation Measures M-CR-2, M-CR-3 and M-CR-4 would reduce impacts to less than significant levels.	**Same as existing conditions (NI)** There would be no construction activities, and no cumulative impacts on cultural, historical, or paleontological resources would occur.	**Similar to but slightly less than the proposed Project (LSM)** Under this alternative, cumulative impacts on paleontological resources, archaeological resources or human remains would be slightly reduced because there would be no ground disturbance in the locations of Sites 1 and 4.	**Similar to but slightly less than the proposed Project (LSM)** Under this alternative, cumulative impacts on paleontological resources, archaeological resources or human remains would be slightly reduced because there would be no ground disturbance in the locations of Sites 1 and 4.	**Similar to but slightly less than the proposed Project (LSM)** Under this alternative, cumulative impacts on paleontological resources, archaeological resources or human remains would be slightly reduced because there would be no ground disturbance in the locations of Sites 7 and 8.	**Similar to but slightly less than the proposed Project (LSM)** Under this alternative, cumulative impacts on paleontological resources, archaeological resources or human remains would be slightly reduced because there would be no ground disturbance in the locations of Sites 7 and 8.
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.	**Less than Significant with Mitigation (LSM)** Construction traffic could affect the performance of the circulation system at 12 sites. Mitigation Measure M-TR-1 would reduce the impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities and no impacts on the performance of the circulation system would occur.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 1 would not contribute to the significant impact related to travel lane closures. In this alternative, impacts to Park Plaza Drive would be slightly reduced by elimination of Site 4. A less-than-significant impact would remain at 11 sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 1 would not contribute to the significant impact related to travel lane closures. In this alternative, impacts to Park Plaza Drive would be slightly reduced by elimination of Site 4. A less-than-significant impact would remain at 11 sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the significant impact related to travel lane closures. In this alternative, impacts to Colma Blvd. would be eliminated; therefore the impact would be slightly reduced. A less-than-significant impact would remain at 11 sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the significant impact related to travel lane closures. In this alternative, impacts to Colma Blvd. would be eliminated; therefore the impact would be slightly reduced. A less-than-significant impact would remain at 11 sites.
Impact TR-2. The Project would temporarily impair emergency access to adjacent roadways and land uses during construction.	**Less than Significant with Mitigation (LSM)** Temporary impacts on emergency access could occur during construction at three sites. Mitigation Measure M-TR-1 would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities and no temporary access impacts would occur.	**Same as the proposed Project (LSM)** Under the Project, Sites 1 and 4 would not contribute to the significant impact; therefore the impacts would the same as the proposed Project.	**Same as the proposed Project (LSM)** Under the Project, Sites 1 and 4 would not contribute to the significant impact; therefore the impacts would be the same as the proposed Project.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.
Impact TR-3. The Project would temporarily decrease the performance and safety of public transit, bicycle, and pedestrian facilities during construction.	**Less than Significant with Mitigation (LSM)** Project construction could temporarily impact the performance and safety of bicycle, pedestrian, and public transit systems during construction at five sites. Mitigation Measure M-TR-1 would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities, and therefore no transit systems would be affected.	**Same as the proposed Project (LSM)** Under the Project, Sites 1 and 4 would not contribute to the significant impact on transit systems; therefore the impacts would be the same as the proposed Project.	**Same as the proposed Project (LSM)** Under the Project, Sites 1 and 4 would not contribute to the significant impact on transit systems; therefore the impacts would be the same as the proposed Project.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
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.	**Less than Significant with Mitigation (LSM)** The Project could result in a cumulatively considerable contribution to impaired emergency access and create traffic hazards for alternative modes of transportation at 13 sites. Mitigation Measures M-TR-1 and M-C-TR-1 would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities. No new GSR well facilities would be constructed and, therefore, no related traffic impacts would result.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 4 contributes to the cumulative significant impact related to impairing emergency access and the safety of pedestrians and bicyclists. In this alternative, impacts related to pedestrian, bicycle and emergency access to Park Plaza Drive would be eliminated, and therefore the impact would be slightly less than the proposed Project.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 4 contributes to the cumulative significant impact related to impairing emergency access and the safety of pedestrians. Under this alternative, impacts related to pedestrian, bicycle and emergency access to Park Plaza Drive would be eliminated, and therefore the impact would be slightly less than the proposed Project.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the cumulative significant impact related to impairing emergency access and the safety of pedestrians and bicyclists; however, Site 8 does not contribute to the significant impact. Therefore, the elimination of Site 7 would reduce the impact slightly.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the cumulative significant impact related to impairing emergency access and the safety of pedestrians and bicyclists; however, Site 8 does not contribute to the significant impact. Therefore, the elimination of Site 7 would reduce the impact slightly.
Noise and Vibration						
Impact NO-1. Project construction would result in noise levels in excess of local standards.	**Significant and Unavoidable with Mitigation (SUM)** Project construction would result in noise levels that exceed local noise standards at 14 sites. Mitigation Measure M-NO-1 would reduce this impact at seven of the sites, but the impact would remain significant at the other sites. At Sites 1, 4, 9, 12, 16, 18 (Alternate), and 19 (Alternate), there is no mitigation to avoid nighttime drilling, which is not allowed in the relevant jurisdictions, so the impact is significant and unavoidable at those sites.	**Same as existing conditions (NI)** There would be no construction activities, and no related noise impacts would occur.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 1 and 4 contribute to the significant and unavoidable impact. Under this alternative, significant and unavoidable noise impacts would be reduced because of the omission of facilities at these sites; however the significant and unavoidable impact would still occur at five sites.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 1 and 4 contribute to the significant and unavoidable impact. Under this alternative, significant and unavoidable noise impacts would be reduced because of the omission of facilities at these sites; however the significant and unavoidable impact would still occur at five sites.	**Same as the proposed Project (SUM)** Under the Project, Sites 7 and 8 do not contribute to the significant and unavoidable impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (SUM)** Under the Project, Sites 7 and 8 do not contribute to the significant and unavoidable impact, so the omission of these well facilities would not change the significance of this impact.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact NO-2. Project construction would result in excessive groundborne vibration.	**Less than Significant with Mitigation (LSM)** Project construction could result in excessive groundborne vibration at five sites. Mitigation Measures M-NO-2 would reduce this impact to less-than significant levels.	**Same as existing conditions (NI)** There would be no construction activities so groundborne vibration would not occur.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 4 contributes to the significant impact. Under this alternative, groundborne vibration impacts would be slightly reduced due to the omission of Site 4. However, excessive groundborne vibration would still occur at four sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 4 contributes to the significant impact. Under this alternative, groundborne vibration impacts would be slightly reduced due to the omission of Site 4. However, excessive groundborne vibration would still occur at four sites.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.
Impact NO-3. Project construction would result in a substantial temporary increase in ambient noise levels.	**Significant and Unavoidable with Mitigation (SUM)** Project construction would result in a substantial temporary increase in ambient noise levels at 15 sites, ten of which would have significant and unavoidable impacts. Mitigation Measures M-NO-1 and M-NO-3 would reduce this impact, but the impact would remain significant.	**Same as existing conditions (NI)** There would be no construction activities and no related temporary increases in ambient noise levels would occur.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 1 and 4 contribute to the significant and unavoidable impact. Under this alternative, the number of sites with significant and unavoidable impacts would be reduced to eight because of the omission of Sites 1 and 4.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 1 and 4 contribute to the significant and unavoidable impact. Under this alternative, the number of sites with significant and unavoidable impacts would be reduced to eight because of the omission of Sites 1 and 4.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 7 and 8 do not contribute to the significant and unavoidable impact. Under this alternative, significant and unavoidable impacts would remain at 10 sites.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 7 and 8 do not contribute to the significant and unavoidable impact. Under this alternative, significant and unavoidable impacts would remain at 10 sites.
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.	**Less than Significant with Mitigation (LSM)** Project operations would result in exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance at seven sites. Mitigation Measure M-NO-5 would reduce this impact to less-than significant levels.	**Same as existing conditions (NI)** No new GSR well facilities would be constructed, so no related noise would be generated.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 1 contributes to the significant impact. Under this alternative, operational noise impacts would be slightly reduced because of the omission of this site. Noise impacts would occur at six sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 1 contributes to the significant impact. Under this alternative, operational noise impacts would be slightly reduced because of the omission of this site. Noise impacts would occur at six sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 7 (On-site Treatment) contributes to the significant impact. Under this alternative, operational noise impacts would be slightly reduced because of the omission of this site. Noise impacts would occur at six sites.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Site 7 (On-site Treatment) contributes to the significant impact. Under this alternative, operational noise impacts would be slightly reduced because of the omission of this site. Noise impacts would occur at six sites.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact C-NO-1. Construction and operation of the proposed Project could result in a cumulatively considerable contribution to cumulative impacts related to noise.	**Significant and Unavoidable with Mitigation (SUM)** The Project could result in a cumulatively considerable contribution to cumulative impacts related to construction noise at Sites 12 and 19 (Alternate) even with the implementation of Mitigation Measures M-NO-1, M-NO-3, and M-NO-5.	**Same as existing conditions (NI)** There would be no construction activities. No new GSR well facilities would be constructed, so no related noise would be generated.	**Same as the proposed Project (SUM)** Under the Project, Sites 1 and 4 do not contribute to the significant and unavoidable impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (SUM)** Under the Project, Sites 1 and 4 do not contribute to the significant and unavoidable impact, so the omission of these well facilities would not change the significance of this impact.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 7 (On-site Treatment) and 8 contribute to the significant cumulative impact. Under this alternative, cumulative construction noise impacts would be slightly reduced because of the omission of these two sites.	**Similar to but slightly less than the proposed Project (SUM)** Under the Project, Sites 7 (On-site Treatment) and 8 contribute to the significant cumulative impact. Under this alternative, cumulative construction noise impacts would be slightly reduced because of the omission of these two sites.
Air Quality						
Impact AQ-2: Emissions generated during construction activities would violate air quality standards and would contribute substantially to an existing air quality violation.	**Less than Significant with Mitigations (LSM)** Construction of the Project may result in violations of air quality standards and contribute substantially to existing air quality violations at all sites. Mitigation Measures M-AQ-2a and M-AQ-2b would reduce impacts at all sites to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities. Related construction emissions would therefore not occur.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction. Emissions would occur at 14 sites and at the Westlake Pump Station.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction. Emissions would occur at 14 sites and at the Westlake Pump Station.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction. Emissions would occur at 14 sites and at the Westlake Pump Station.	**Similar to but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction. Emissions would occur at 14 sites and at the Westlake Pump Station.
Impact AQ-3: Project construction would expose sensitive receptors to substantial pollutant concentrations.	**Less than Significant with Mitigations (LSM)** Project construction would expose sensitive receptors to pollutant concentrations at Site 5. Mitigation Measure M-AQ-3 would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities. Sensitive receptors would not be exposed to related pollutant concentrations.	**Same as the proposed Project (LSM)** This alternative includes construction at Site 5; therefore the impact would be the same as the proposed Project.	**Same as the proposed Project (LSM)** This alternative includes construction at Site 5; therefore the impact would be the same as the proposed Project.	**Same as the proposed Project (LSM)** This alternative includes construction at Site 5; therefore the impact would be the same as the proposed Project.	**Same as the proposed Project (LSM)** This alternative includes construction at Site 5; therefore the impact would be the same as the proposed Project.
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.	**Less than Significant with Mitigation (LSM)** Project construction could result in a cumulatively considerable contribution to cumulative impacts related to air quality at all sites. Mitigation Measure M-AQ-2b would reduce impacts to less-than significant levels.	**Same as existing conditions (NI)** There would be no construction activities. Cumulative air quality impacts would not occur.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, air quality impacts would be slightly reduced because of the overall decrease in construction.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Recreation						
Impact RE-2. The Project would deteriorate the quality of the recreational experience during construction.	**Less than Significant with Mitigation (LSM)** The Project would deteriorate the quality of the recreational experience during construction at Sites 1, 2, and 4. Mitigation Measure M-AQ-2a would reduce the impact at this site.	**Same as existing conditions (NI)** There would be no construction activities, and impacts to recreational resources would not occur.	**Similar but less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, because Sites 1 and 4 are omitted, the less-than-significant-with-mitigation impact is only associated with construction at Site 2.	**Similar but less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. In this alternative, because Sites 1 and 4 are omitted, the less-than-significant-with-mitigation impact is only associated with construction at Site 2.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.
Utilities and Service Systems						
Impact UT-1. Project construction could result in potential damage to or temporary disruption of existing utilities during construction.	**Less than Significant with Mitigation (LSM)** Construction of the Project could result in damage to or disruption of existing utilities at all sites. Mitigation Measures M-UT-1a through M-UT-1i would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities and utility service would not be temporarily disrupted.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts on existing utilities impacts would be slightly reduced because of the overall decrease in construction. Utility impacts could occur at 17 sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts on existing utilities impacts would be slightly reduced because of the overall decrease in construction. Utility impacts could occur at 17 sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts on existing utilities impacts would be slightly reduced because of the overall decrease in construction. Utility impacts could occur at 17 sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts on existing utilities impacts would be slightly reduced because of the overall decrease in construction. Utility impacts could occur at 17 sites.
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.	**Less than Significant with Mitigation (LSM)** Project construction may not comply with federal, State, and local (Daly City, Colma, South San Francisco, San Bruno, Millbrae and San Mateo County) regulations pertaining to solid waste disposal at all sites. Mitigation Measure M-UT-4 would reduce impacts at all sites.	**Same as existing conditions (NI)** There would be no construction activities.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts related to solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still need to comply with the applicable waste management ordinance.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts related to solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still need to comply with the applicable waste management ordinance.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts related to solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still need to comply with the applicable waste management ordinance.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts related to solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still need to comply with the applicable waste management ordinance.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	**Proposed Project**	**Alternative 1: No Project**	**Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield**	**Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield**	**Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield**	**Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield**
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.	**Less than Significant with Mitigation (LSM)** The Project could result in a cumulatively considerable contribution to cumulative impacts related to utilities and service systems at all sites. Mitigation Measures M-UT-1a through M-UT-1i and M-UT-4 would reduce impacts to less-than significant levels.	**Same as existing conditions (NI)** There would be no construction activities and, therefore, no related impacts on utilities.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant cumulative impact. Under this alternative, impacts related to existing utilities and solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still have the potential to contribute to cumulative impacts on existing utilities and solid waste disposal.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant cumulative impact. Under this alternative, impacts related to existing utilities and solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still have the potential to contribute to cumulative impacts on existing utilities and solid waste disposal.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant cumulative impact. Under this alternative, impacts related to existing utilities and solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still have the potential to contribute to cumulative impacts on existing utilities and solid waste disposal.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant cumulative impact. Under this alternative, impacts related to existing utilities and solid waste would be slightly reduced because of the overall decrease in construction. However, other sites would still have the potential to contribute to cumulative impacts on existing utilities and solid waste disposal.
Biological Resources						
Impact BR-1. Project construction would adversely affect candidate, sensitive, or special-status species.	**Less than Significant with Mitigation (LSM)** Project construction could adversely impact special-status species at all sites. Mitigation Measures M-BR-1a through M-BR-1d would reduce impacts to less-than–significant levels.	**Same as existing conditions (NI)** There would be no construction or operational activities and, therefore, no related construction or operational impacts on specials-status species.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact related to birds and bats. Site 1 contributes to significant impacts related to overwintering monarch butterfly habitat. Under this alternative, these impacts would be slightly reduced because of the omission of these sites. However, significant impacts on these special-status species could still occur at other sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact related to birds and bats. Site 1 contributes to significant impacts related to overwintering monarch butterfly habitat. Under this alternative, these impacts would be slightly reduced because of the omission of these sites. However, significant impacts on these special-status species could still occur at other sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact related to birds. Site 7 contributes to significant impacts related to bats and overwintering monarch butterfly habitat. Under this alternative, these impacts would be slightly reduced because of the omission of these sites. However, significant impacts on these special-status species could still occur at other sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact related to birds. Site 7 contributes to significant impacts related to bats and overwintering monarch butterfly habitat. Under this alternative, these impacts would be slightly reduced because of the omission of these sites. However, significant impacts on these special-status species could still occur at other sites.
Impact BR-2. Project construction could adversely affect riparian habitat or other sensitive natural communities.	**Less than Significant with Mitigation (LSM)** Project construction at Site 1 could adversely affect Central Coast riparian scrub habitat. Mitigation Measures M-BR-2 and M-HY-1 would reduce impacts at Site 1 to less-than–significant levels.	**Same as existing conditions (NI)** There would be no construction activities, and no sensitive natural communities would be affected as a result.	**Less than the proposed Project (NI)** Construction would not occur at Site 1; therefore there would be no impacts on riparian habitat or other sensitive natural communities at that site under this alternative.	**Less than the proposed Project (NI)** Construction would not occur at Site 1; therefore there would be no impacts on riparian habitat or other sensitive natural communities at that site under this alternative.	**Same as the proposed Project (LSM)** Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact under this alternative.	**Same as the proposed Project (LSM)** Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact under this alternative.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact BR-3. The Project would impact jurisdictional wetlands or waters of the United States.	**Less than Significant with Mitigation (LSM)** Project construction could impact jurisdictional wetlands and waters at Sites 8, 9, and 11. Mitigation Measure M-HY-1 would reduce the impacts at these sites to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities and no wetlands or waters would be impacted as a result.	**Same as the proposed Project (LSM)** Under the Project, Sites 1 and 4 do not contribute to the significant impact, so the omission of these well facilities per this alternative would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 1 and 4 do not contribute to the significant impact, so the omission of these well facilities per this alternative would not change the significance of this impact.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 8 contributes to the significant impact. While the omission of this site would reduce overall impacts on jurisdictional waters, the impact level would be reduced but the impact would remain at LSM.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 8 contributes to the significant impact. While the omission of this site would reduce overall impacts on jurisdictional waters, the impact level would be reduced but the impact would remain at LSM.
Impact BR-4. Project construction would conflict with local tree preservation ordinances.	**Less than Significant with Mitigation (LSM)** Project construction would result in tree removal at 12 sites. Mitigation Measures M-BR-4a, M-AE-1b, and M-BR-4b would reduce impact to less-than-significant levels.	**Same as existing condition (NI)** There would be no construction activities and no trees would be removed.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 4 contributes to the significant impact. While the omission of this site would reduce the extent of tree removal in San Mateo County jurisdiction, trees would be removed at 11 other sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 4 contributes to the significant impact. While the omission of this site would reduce the extent of tree removal in San Mateo County jurisdiction, trees would be removed at 11 other sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the significant impact. While the omission of this site would reduce the extent of tree removal in the Town of Colma's jurisdiction, trees would be removed at 11 other sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 7 contributes to the significant impact. While the omission of this site would reduce the extent of tree removal in the Town of Colma's jurisdiction, trees would be removed at 11 other sites.
Impact BR-5. Project operations could adversely affect candidate or sensitive special-status species.	**Less than Significant with Mitigation (LSM)** Project construction could result in adverse impacts to special-status species at five sites. Mitigation Measure M-NO-5 would reduce impact to less-than-significant levels.	**Same as existing condition (NI)** There would be no project operations and no special-status species would be affected.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 1 contributes to the significant impact. While the omission of the site would reduce the extent of operational impacts, special-status species could still be affected at four sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 1 contributes to the significant impact. While the omission of the site would reduce the extent of operational impacts, special-status species could still be affected at four sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 7 (On-site Treatment) contributes to the significant impact. While the omission of the site would reduce the extent of operational impacts, special-status species could still be affected at four sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 7 (On-site Treatment) contributes to the significant impact. While the omission of the site would reduce the extent of operational impacts, special-status species could still be affected at four sites.
Impact BR-7. Operation of the Project could adversely affect sensitive habitat types associated with Lake Merced.	**Less than Significant with Mitigation (LSM)** Project operation could increase water levels at Lake Merced, which could inundate sensitive habitats along the shores of Lake Merced. Mitigation Measures M-BR-7, M-HY-9a, and M-HY-9b would reduce impacts to less-than-significant levels.	**Same as existing condition (NI)** Water levels in Lake Merced would continue to fluctuate with varying hydrologic conditions, as they do now.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2A pumping near Lake Merced would be reduced, so lake levels would be expected to increase to higher levels than under the Project, potentially increasing the likelihood of inundating sensitive habitat.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2B pumping near Lake Merced would be reduced, so lake levels would be expected to increase to higher levels than under the Project, potentially increasing the likelihood of inundating sensitive habitat.	**Similar but slightly less than the proposed Project (LSM)** The Alternative would have slightly less impact on Lake Merced sensitive habitats because pumping would be redistributed to wells near Lake Merced, and water levels would not increase as much as they would with the Project.	**Same as the proposed Project (LSM)** Pumping would not be redistributed to wells near Lake Merced, so the impact would be the same as the Project.

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Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact BR-8: Operation of the Project could adversely affect wetland habitats and other waters of the United States associated with Lake Merced.	**Less than Significant with Mitigation (LSM)** Project operation could decrease water levels at Lake Merced at the end of the design drought and could also increase water levels during wet and normal years such that a net loss of wetland habitat would occur. Mitigation Measures M-BR-8, M-HY-9a, and M-HY-9b would reduce impacts to less-than-significant levels.	**Same as existing condition (NI)** Water levels in Lake Merced would continue to fluctuate with varying hydrologic conditions, as they do now.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2A pumping near Lake Merced would be reduced, so the decline in lake levels at the end of the design drought would be 54 percent less than with the Project. This would reduce the impact on decreasing lake levels at the end of the design drought, but would increase the impact on rising lake levels during wet and normal years, thus increasing impacts on wetland habitat.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2B pumping near Lake Merced would be reduced, so the decline in lake levels at the end of the design drought would be 54 percent less than with the Project. This would reduce the impact on decreasing lake levels at the end of the design drought, but would increase the impact on rising lake levels during wet and normal years, thus increasing impacts on wetland habitat.	**Similar but slightly greater than the proposed Project (LSM)** The Alternative would increase pumping in wells near the lake. This would reduce the impact on rising lake levels during wet and normal years, but would increase the impact on decreasing lake levels at the end of the design drought, thus increasing impacts on wetland habitat.	**Same as the proposed Project (LSM)** Because pumping would not be redistributed to wells near Lake Merced, this alternative would have the same impact as the Project.
Impact BR-9: Operation of the Project could adversely affect native wildlife nursery sites associated with Lake Merced.	**Less than Significant with Mitigation (LSM)** Project operation could affect water levels at Lake Merced which would inundate eucalyptus trees that support cormorant and heron rookeries. Mitigation Measures M-BR-7 and M-HY-9a would reduce impacts to less-than significant levels.	**Same as existing condition (NI)** Water levels in Lake Merced would continue to fluctuate with varying hydrologic conditions, as they do now.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2A pumping near Lake Merced would be reduced, so lake levels would be expected to increase to higher levels than under the Project, potentially increasing the likelihood of inundating eucalyptus trees.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2B pumping near Lake Merced would be reduced, so lake levels would be expected to increase to higher levels than under the Project, potentially increasing the likelihood of inundating eucalyptus trees.	**Similar but slightly less than the proposed Project (LSM)** The Alternative would have slightly less impact on Lake Merced eucalyptus trees because pumping would be redistributed to wells near Lake Merced, and water levels would not increase as much as they would with the Project.	**Same as the proposed Project (LSM)** Pumping would not be redistributed to wells near Lake Merced, so the impact would be the same as the Project.
Impact C-BR-1. Construction and operation of the proposed Project could result in significant cumulative impacts related to biological resources.	**Less than Significant with Mitigation (LSM)** The Project could result in significant cumulative impacts related to biological resources at all sites associated with effects on nesting birds, disturbance of riparian habitat and wetlands, and tree removal. Mitigation Measures M-BR-1a, M-BR-1b, M-BR-1c, M-BR-1d, M-BR-2, M-HY-1, M-BR-4a, M-AE-1b, and M-BR-4b would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities. No new GSR well facilities would be constructed.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant cumulative impact related to special-status species. Site 1 contributes to impacts related to Coastal Riparian Scrub habitat, and Site 4 contributes to impacts related to local tree ordinances. The omission of these two sites would reduce cumulative impacts on these biological resources.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant cumulative impact related to special-status species. Site 1 contributes to impacts related to Coastal Riparian Scrub habitat, and Site 4 contributes to impacts related to local tree ordinances. The omission of these two sites would reduce cumulative impacts on these biological resources.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant cumulative impact related to special-status species. Site 8 contributes indirectly to impacts related to jurisdictional waters, and Site 7 contributes to impacts related to local tree ordinances. The omission of these two sites would reduce cumulative impacts on these biological resources.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant cumulative impact related to special-status species. Site 8 contributes indirectly to impacts related to jurisdictional waters, and Site 7 contributes to impacts related to local tree ordinances. The omission of these two sites would reduce cumulative impacts on these biological resources.

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Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact C-BR-2. The Project would not result in cumulative construction or operational impacts related to special-status species, riparian habitats, sensitive communities, wetlands, or water of the United States, or compliance with local policies and ordinances protecting biological resources at Lake Merced.	**Less than Significant with Mitigation (LSM)** Under cumulative conditions, the Project is expected to result in less dramatic water level fluctuations in most years than those for the Project alone, resulting in fewer impacts related to changes in water levels. Mitigation Measures M-BR-7, M-HY-9a, and M-HY-9b would reduce impacts to less-than-significant levels.	**Same as existing condition (NI)** Water levels in Lake Merced would continue to fluctuate with varying hydrologic conditions, as they do now.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2A pumping near Lake Merced would be reduced, so the decline in lake levels at the end of the design drought would be less than with the Project, but lake levels would increase more than with the Project in wet and normal years. This would increase the impact on sensitive habitat, wetlands, and eucalyptus trees around the lake.	**Similar but slightly greater than the proposed Project (LSM)** Under Alternative 2B pumping near Lake Merced would be reduced, so the decline in lake levels at the end of the design drought would be less than with the Project, but lake levels would increase more than with the Project in wet and normal years. This would increase the impact on sensitive habitat, wetlands, and eucalyptus trees around the lake.	**Similar but slightly greater than the proposed Project (LSM)** The Alternative would have slightly greater impacts on Lake Merced because there would be more pumping in wells near the lake at the end of the design drought, so water levels would be reduced further, resulting in loss of wetland habitat.	**Same as the proposed Project (LSM)** Because pumping would not be redistributed to wells near Lake Merced, this alternative would have the same impacts as the Project.
Geology and Soils						
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 ground shaking, or landslides.	**Less than Significant with Mitigation (LSM)** Project operations would expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to fault rupture, seismic ground shaking, or landslides at all sites. Mitigation Measure M-GE-3 would reduce impacts to less-than significant levels.	**Same as existing conditions (NI)** No new GSR well facilities would be constructed.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact related to ground shaking. The omission of these sites would reduce the number of new GSR facilities susceptible to ground shaking.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact related to ground shaking. The omission of these sites would reduce the number of new GSR facilities susceptible to ground shaking.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact related to ground shaking. The omission of these sites would reduce the number of new GSR facilities susceptible to ground shaking.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact related to ground shaking. The omission of these sites would reduce the number of new GSR facilities susceptible to ground shaking.
Impact GE-4. The Project would be located on a geologic unit or soil that is unstable, or that would become unstable.	**Less than Significant with Mitigation (LSM)** Project facilities would be located on unstable soils or soils that may become unstable at 10 sites. Mitigation Measure M-GE-3 would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** No new GSR well facilities would be constructed.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 1 would contribute to the significant impact related to settlement. The omission of this site would reduce the number of new GSR facilities susceptible to settlement to nine sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 1 would contribute to the significant impact related to settlement. The omission of this site would reduce the number of new GSR facilities susceptible to settlement to nine sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 8 would contribute to the significant impact related to settlement. The omission of this site would reduce the number of new GSR facilities susceptible to settlement to nine sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 8 would contribute to the significant impact related to settlement. The omission of this site would reduce the number of new GSR facilities susceptible to settlement to nine sites.

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Hydrology and 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.	**Less than Significant with Mitigation (LSM)** Construction would result in earthmoving that if not properly managed could increase sediment loads in receiving water bodies, thereby adversely affecting water quality and designated beneficial uses for all sites. Mitigation Measure M-HY-1 would reduce impacts to less-than-significant levels for all sites.	**Same as existing conditions (NI)** There would be no construction activities that would degrade water quality.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in construction. However, the potential for surface water quality impacts would still occur at the remaining sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in construction. However, the potential for surface water quality impacts would still occur at the remaining sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in construction. However, the potential for surface water quality impacts would still occur at the remaining sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in construction. However, the potential for surface water quality impacts would still occur at the remaining sites.
Impact HY-2. Discharge of groundwater could result in minor localized flooding, violate water quality standards and/or otherwise degrade water quality.	**Less than Significant with Mitigation (LSM)** Well development, well pumping tests, initial well disinfection and excavation dewatering could result in increased sources of polluted runoff and may lead to degraded water quality at all sites except for the Westlake Pump Station. Mitigation Measure M-HY-2 would reduce impacts to less-than-significant levels.	**Same as existing conditions (NI)** There would be no wells constructed, and therefore no impacts from well testing or disinfection would occur.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in the total number of wells. However, the potential for water quality impacts resulting from groundwater discharge would still occur at the remaining sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in the total number of wells. However, the potential for water quality impacts resulting from groundwater discharge would still occur at the remaining sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in the total number of wells. However, the potential for water quality impacts resulting from groundwater discharge would still occur at the remaining sites.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 contribute to the significant impact. Under this alternative, impacts on surface water quality would be slightly reduced because of the overall decrease in the total number of wells. However, the potential for water quality impacts resulting from groundwater discharge would still occur at the remaining sites.

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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.	**Significant and Potentially Unavoidable with Mitigation (SUM)** Operation of the Project would cause significant well interference at 13 existing irrigation wells. Mitigation Measure M-HY-6 would reduce impacts to less-than–significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SU)** During a drought equivalent to the design drought, groundwater levels would decline to a point such that the production rate of existing wells may not fully support existing or planned land uses.	**Similar but slightly greater than the proposed Project (SUM)** Alternative 2A would decrease well interference at five existing irrigation wells and increase well interference at 12 existing irrigation wells. The level of significance for well interference at existing irrigation wells would not change compared to the Project. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SUM)** Alternative 2B would decrease well interference at five existing irrigation wells, but the level of significance for well interference at existing irrigation wells would not change compared to the Project. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SUM)** Alternative 3A would decrease well interference at 10 existing irrigation wells and increase well interference at seven existing irrigation wells. The level of significance for well interference at existing irrigation wells would not change compared to the Project, except that significant impacts would not occur at the Home of Peace Cemetery well. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SUM)** Alternative 3B would decrease well interference at five existing irrigation wells. The level of significance for well interference at existing irrigation wells would not change compared to the Project, except that significant impacts would not occur at the Home of Peace Cemetery well and the Holy Cross Cemetery well #1. Mitigation Measure M-HY-6 would reduce impacts to less-than–significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.

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Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact HY-9. Project operation could have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced.	**Less than Significant with Mitigation (LSM)** Operation of the Project is predicted to cause lake levels at Lake Merced to decline by approximately 4 feet more than modeled existing conditions to a minimum monthly average of -2.5 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measure M-HY-9a and M-HY-9b would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (SU)** During a drought equivalent to the design drought, lake levels at Lake Merced are predicted to decline to -0.8 feet City Datum, a level at which substantial adverse effects on water quality and the beneficial uses of Lake Merced could occur.	**Similar but slightly less than the proposed Project (LSM)** Operation of the Project under this alternative is predicted to cause lake levels at Lake Merced to decline by approximately 2 feet more than under modeled existing conditions, to a minimum monthly average of -0.5 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (LSM)** Operation of the Project under this alternative is predicted to cause lake levels at Lake Merced to decline by approximately 2 feet more than modeled existing conditions, to a minimum monthly average of -0.5 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than–significant levels.	**Similar but slightly greater than the proposed Project (LSM)** Operation of the Project under this alternative is predicted to cause lake levels at Lake Merced to decline by approximately 5.2 feet more than modeled existing conditions, to a minimum monthly average of -3.7 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that could have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than–significant levels.	**Similar to the proposed Project (LSM)** Operation of the Project under this alternative would not change effects on Lake Merced because pumping near the lake would be the same as under the Project. As with the Project, lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than-significant levels.
Impact HY-14. Project operation may have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin over the very long term.	**Less than Significant with Mitigation (LSM)** Operation of the Project is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 20,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Similar but slightly more than the proposed Project (SU)** Groundwater storage volumes in the Westside Groundwater Basin are predicted to decline by approximately 28,000 af over the 47-year hydrologic modeling period.	**Same as the proposed Project (LSM)** Because this alternative maintains the Project yield, operation of the Project under this alternative is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 20,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period, the same as the Project. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (LSM)** Because this alternative reduces Project yield by 14 percent, operation of the Project under this alternative is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 13,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period, or 7,000 af less than the Project over the same time span. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Same as the proposed Project (LSM)** Because this alternative maintains the Project yield, operation of the Project under this alternative is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 20,000 af more than under existing conditions over the 47-year hydrologic modeling period, the same as the Project. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (LSM)** Because this alternative reduces Project yield by 16 percent, operation of the Project under this alternative is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 12,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period, or 8,000 af less than the Project over the same time span. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact C-HY-2. Operation of the proposed Project would result in a cumulatively considerable contribution to cumulative impacts related to well interference.	**Significant and Unavoidable with Mitigation (SUM)** Operation of the Project under the cumulative scenario would cause significant well interference at 13 existing irrigation wells. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SU)** During a drought equivalent to the design drought, groundwater levels would decline to a point such that the production rate of existing wells may not fully support existing or planned land uses.	**Similar but slightly greater than the proposed Project (SUM)** Under the cumulative scenario, alternative 2A would decrease well interference at five existing irrigation wells and increase well interference at 12 existing irrigation wells. The level of significance for well interference at existing irrigation wells would not change compared to the Project. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SUM)** Under the cumulative scenario, alternative 2B would decrease well interference at five existing irrigation wells, but the level of significance for well interference at existing irrigation wells would not change compared to the Project. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SUM)** Under the cumulative scenario, alternative 3A would decrease well interference at 10 existing irrigation wells and increase well interference at seven existing irrigation wells. The level of significance for well interference at existing irrigation wells would not change compared to the Project, except that significant impacts would not occur at the Home of Peace Cemetery well. Mitigation Measure M-HY-6 would reduce impacts to less-than-significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.	**Similar but slightly less than the proposed Project (SUM)** Under the cumulative scenario, alternative 3B would decrease well interference at five existing irrigation wells. The level of significance for well interference at existing irrigation wells would not change compared to the Project, except that significant impacts would not occur at the Home of Peace Cemetery well and the Holy Cross Cemetery well #1. Mitigation Measure M-HY-6 would reduce impacts to less-than–significant levels, except that the certainty of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; thus, this impact is conservatively deemed significant and potentially unavoidable with mitigation.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Impact C-HY-5. Operation of the proposed Project could have a cumulatively considerably contribution to cumulative impacts on beneficial uses of surface waters.	**Less than Significant with Mitigation (LSM)** Under the cumulative scenario, during a drought equivalent to the design drought, lake levels at Lake Merced are predicted to decline to -4.9 feet City Datum, a level at which substantial adverse effects on water quality and the beneficial uses of Lake Merced could occur. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (SU)** During a drought equivalent to the design drought, lake levels at Lake Merced are predicted to decline to -0.8 feet City Datum, a level at which substantial adverse effects on water quality and the beneficial uses of Lake Merced could occur.	**Similar but slightly less than the proposed Project (LSM)** Under the cumulative scenario, operation of the Project under this alternative is predicted to cause lake levels at Lake Merced to decline to a minimum monthly average of -2.3 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (LSM)** Under the cumulative scenario, operation of the Project under this alternative is predicted to cause lake levels at Lake Merced to a minimum monthly average of -2.3 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than–significant levels.	**Similar but slightly greater than the proposed Project (LSM)** Under the cumulative scenario, operation of the Project under this alternative is predicted to cause lake levels at Lake Merced to decline to a minimum monthly average of -6.5 feet City Datum, after the end of the design drought during recovery of the lake levels. These lake level impacts could cause significant water quality impacts that could have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than–significant levels.	**Similar to the proposed Project (LSM)** Under the cumulative scenario, operation of the Project under this alternative would not change effects on Lake Merced because pumping near the lake would be the same as under the Project. As with the Project, lake level impacts could cause significant water quality impacts that would have substantial adverse effects on the beneficial uses of Lake Merced. Mitigation Measures M-HY-9a and M-HY-9b would reduce impacts to less-than-significant levels.
Impact C-HY-8. Operation of the proposed Project would have a cumulatively considerably contribution to a cumulative impact related to groundwater depletion effect.	**Less than Significant with Mitigation (LSM)** Under the cumulative scenario, groundwater storage volumes in the Westside Groundwater Basin are predicted to decline by an approximately 45,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Similar but slightly more than the proposed Project (SU)** Groundwater storage volumes in the Westside Groundwater Basin are predicted to decline by approximately 28,000 af over the 47-year hydrologic modeling period.	**Same as the proposed Project (LSM)** Because this alternative maintains the Project yield, operation of this Project alternative under the cumulative scenario is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 45,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period, the same as the Project. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (LSM)** Because this alternative reduces Project yield by 14 percent, operation of this Project alternative under the cumulative scenario is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 35,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period, or 10,000 af less than the Project over the same time span. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Same as the proposed Project (LSM)** Because this alternative maintains the Project yield, operation of this Project alternative under the cumulative scenario is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 45,000 af more than under existing conditions over the 47-year hydrologic modeling period, the same as the Project. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.	**Similar but slightly less than the proposed Project (LSM)** Because this alternative reduces Project yield by 16 percent, operation of this Project alternative under the cumulative scenario is predicted to cause groundwater storage in the Westside Groundwater Basin to decline by approximately 33,000 af more than under modeled existing conditions over the 47-year hydrologic modeling period, or 12,000 af less than the Project over the same time span. Mitigation Measure M-HY-14 would reduce impacts to less-than-significant levels.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
Hazards and Hazardous Materials						
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.	**Less than Significant with Mitigation (LSM)** Construction of the Project could result in the accidental release of chemicals used during construction at all sites. Mitigation Measures M-HZ-2a, M-HZ-2b, M-HZ-2c, and, M-HY-1 would reduce impacts at all sites to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities and so no related hazardous material would be released.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 would contribute to the significant impact related to accidental release of hazardous construction chemicals. Site 1 would contribute to significant impacts related to hazardous building materials. Under this alternative, there would be no demolition of the existing restroom building at Site 1. The overall potential for these impacts would be reduced due to the omission of Sites 1 and 4.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 would contribute to the significant impact related to accidental release of hazardous construction chemicals. Site 1 would contribute to significant impacts related to hazardous building materials. Under this alternative, there would be no demolition of the existing restroom building at Site 1. The overall potential for these impacts would be reduced due to the omission of Sites 1 and 4.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 would contribute to the significant impact. Under this alternative, the overall potential for accidental release of hazardous construction chemicals would be reduced due to the omission of Sites 7 and 8.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 would contribute to the significant impact. Under this alternative, the overall potential for accidental release of hazardous construction chemicals would be reduced due to the omission of Sites 7 and 8.
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.	**Less than Significant with Mitigation (LSM)** Project construction would occur within 0.25 mile of a school at seven sites and adjacent to four well facility sites and the Westlake Pump Station. Mitigation Measure M-HY-1 and M-HZ-2c would reduce impacts at Sites 2, 3, 4, WLPS, and 19 (Alternate) to less-than-significant levels.	**Same as existing conditions (NI)** There would be no construction activities.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 4 would contribute to the significant impact related to use of hazardous materials near schools. Under this alternative, the overall potential for this impact would be reduced due to the omission of Site 4.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Site 4 would contribute to the significant impact related to use of hazardous materials near schools. Under this alternative, the overall potential for this impact would be reduced due to the omission of Site 4.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.	**Same as the proposed Project (LSM)** Under the Project, Sites 7 and 8 do not contribute to the significant impact, so the omission of these well facilities would not change the significance of this impact.

TABLE 7-2
Environmental Impacts of the CEQA Alternatives as Compared to the Proposed Project

Impact	Proposed Project	Alternative 1: No Project	Alternative 2A: Reduce Lake Merced Impacts and Maintain Project Yield	Alternative 2B: Reduce Lake Merced Impacts and Reduce Project Yield	Alternative 3A: Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield	Alternative 3B: Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield
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.	**Less than Significant with Mitigation (LSM)** The Project could result in a cumulatively considerable contribution to cumulative impacts related to hazards and hazardous materials at all sites. Mitigation Measures M-HZ-2a, M-HZ-2b, M-HZ-2c, and M-HY-1 would reduce impacts to less-than-significant levels.	**Same as existing condition (NI)** There would be no construction activities. No new GSR well facilities would be constructed.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 would contribute to the significant cumulative impact related to accidental release of hazardous construction chemicals. Site 1 would contribute to significant cumulative impacts related to hazardous building materials. Site 4 would contribute to significant cumulative impacts related to use of hazardous materials near schools. Under this alternative, the overall potential for these impacts would be reduced due to the omission of Sites 1 and 4.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 1 and 4 would contribute to the significant cumulative impact related to accidental release of hazardous construction chemicals. Site 1 would contribute to significant cumulative impacts related to hazardous building materials. Site 4 would contribute to significant cumulative impacts related to use of hazardous materials near schools. Under this alternative, the overall potential for these impacts would be reduced due to the omission of Sites 1 and 4.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 would contribute to the significant cumulative impact related to accidental release of hazardous construction chemicals. Under this alternative, the overall potential for these impacts would be reduced due to the omission of Sites 7 and 8.	**Similar but slightly less than the proposed Project (LSM)** Under the Project, Sites 7 and 8 would contribute to the significant cumulative impact related to accidental release of hazardous construction chemicals. Under this alternative, the overall potential for these impacts would be reduced due to the omission of Sites 7 and 8.

7.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The CEQA Guidelines require the identification of an environmentally superior alternative to the proposed project (Section 15126.6[e]). If it is determined that the No Project Alternative would be the environmentally superior alternative, then the EIR shall also identify an environmentally superior alternative among the other Project alternatives (Section 15126.6[e][2]).

Construction of the proposed Project would cause significant and unavoidable noise and land use impacts (Impacts LU-1, NO-1, and NO-3) (see Section 5.2, Land Use, and Section 5.7, Noise and Vibration) from well drilling at nighttime and well facility construction during the daytime. Impacts LU-1 and NO-3 would be significant, even with mitigation, and there is no mitigation available to reduce the impact of nighttime construction conflicting with local noise standards (NO-1). In addition, aesthetic impacts of construction (Impact AE-1) (see Section 5.3, Aesthetics) would be significant and unavoidable at Site 7. All other construction impacts would have no impact, would be less than significant, or would be less than significant with implementation of mitigation measures. Operation of the proposed Project would cause significant and potentially unavoidable well interference impacts from pumping during take years at up to 13 existing irrigation wells. Mitigation would reduce these impacts to less than significant, except that the implementation of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; for this reason, the impact is deemed to be significant and potentially unavoidable with mitigation (see Impact HY-6 in Section 5.16, Hydrology and Water Quality). All other operational impacts would either have no impact, would be less than significant, or would be less than significant with implementation of mitigation measures. The proposed Project would achieve all of the Project objectives.

The No Project Alternative would avoid the construction-related environmental impacts of the proposed Project, except for potential actions taken by the SFPUC or wholesale water customers to develop other dry-year water supplies. The No Project Alternative would avoid the significant and unavoidable land use and noise impacts (Impacts LU-1, NO-1, and NO-3) (see Section 5.2, Land Use, and Section 5.7, Noise and Vibration) and the significant and unavoidable visual impact (Impact AE-1) associated with the proposed Project (see Section 5.3, Aesthetics). This alternative would not achieve any of the Project objectives, and it would not fulfill the SFPUC's basic mission of providing a reliable water supply for its customers, because a new source of dry-year and/or emergency water supply would be unavailable for SFPUC customers. The No Project Alternative would not support conjunctive use of the South Westside Groundwater Basin, nor would it allow for in-lieu recharge of the Basin.

Both Alternative 2A and Alternative 2B were selected for consideration to allow evaluation of the effects of a project that would reduce impacts to Lake Merced by eliminating two wells near the lake. Alternative 2A maintains project yield by redistributing pumping, and Alternative 2A reduces project yield.

Alternative 2A (Reduce Lake Merced Impacts and Maintain Project Yield) would eliminate construction impacts at Sites 1 and 4, including significant and unavoidable land use and noise impacts (Impacts LU-1, NO-1, and NO-3) at both sites that would occur under the proposed Project (see Section 5.2, Land Use, and Section 5.7, Noise and Vibration). Construction impacts at the other sites would be the same as those of the proposed Project. During operations, this alternative would reduce the severity of water quality impacts (Impact HY-9) at Lake Merced through a 54 percent reduction in pumping in the Daly City area, but impacts of pumping would be significant while the lake is recovering from the design drought, similar to the proposed Project (see Section 5.16, Hydrology and Water Quality). This alternative would decrease the severity of well interference impacts at five existing irrigation wells, but increase the severity of well interference impacts (Impact HY-6) at 12 existing irrigation wells compared to the Project, due to a redistribution of pumping at GSR wells away from the Lake Merced area and an approximately 20 percent increase in pumping at Sites 5 through 15. Mitigation would reduce the well interference impacts to less-than-significant levels in all cases, except that the implementation of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; for this reason, the impact is deemed to be significant and potentially unavoidable with mitigation. All other operational impacts would be less than significant with implementation of mitigation measures, which would be the same as the Project. Alternative 2A would have significant impacts at fewer sites than the Project during construction; however, impacts during operations would be approximately the same as the impacts of the Project, because mitigation measures would be equally effective at reducing impacts in either case. Because construction-period significant and unavoidable impacts of the proposed Project would be eliminated at two sites, impacts of Alternative 2A would be less severe than those of the proposed Project. In addition, Alternative 2A would achieve the Project objectives and would support the SFPUC's goal of providing a reliable dry-year groundwater supply during the 8.5-year design drought cycle.

Alternative 2B (Reduce Lake Merced Impacts and Reduce Project Yield), would eliminate construction impacts at Sites 1 and 4, including significant and unavoidable land use and noise impacts (Impacts LU-1, NO-1, and NO-3) at both sites that would occur under the proposed Project (see Section 5.2, Land Use, and Section 5.7, Noise and Vibration). Construction impacts at the other sites would be the same as those of the proposed Project. During operations, the alternative would reduce the severity of water quality impacts on beneficial uses (Impact HY-9) at Lake Merced through a 54 percent reduction in pumping in the Daly City area compared to the Project, but impacts of pumping would be significant while the lake is recovering from the design drought, similar to the proposed Project (see Section 5.16, Hydrology and Water Quality). This alternative would decrease the severity of well interference impacts (Impact HY-6) at five existing irrigation wells. All other operational impacts would be less than significant with implementation of mitigation measures, the same as the Project. Alternative 2B would have significant impacts at fewer sites than the Project during construction; impacts during operations would initially be less than the Project, but would become approximately the same as the impacts of the Project with implementation of mitigation, because mitigation measures would be equally effective at reducing impacts in either case. Therefore, because construction-period significant and unavoidable impacts of the proposed Project would be eliminated at two sites, the impacts of Alternative 2B would be less severe than those of the proposed Project; and because pumping would not be redistributed as it would be in Alternative 2A, operational impacts of Alternative 2B would be less severe than those of Alternative 2A and the proposed Project. Alternative 2B would not fully achieve the Project objectives, although it would meet most of them. Specifically, it would not fully support the SFPUC's goal to supply water reliably to customers in the event of emergencies and drought, because with the reduced yield associated with Alternative 2B, the SFPUC may not be able to limit systemwide rationing to 20 percent. The alternative would allow for the conjunctive use of the South Westside Groundwater Basin through coordinated use of SFPUC surface water and groundwater pumped by Partner Agencies and it would allow for in-lieu recharge of the Basin. However, the alternative would not provide the full 7.2-mgd dry-year and emergency pumping capacity needed to limit systemwide rationing to 20 percent during the 8.5-year design drought. The alternative would result in an approximately 1.0-mgd shortfall during each year of a severe drought. As a result, water rationing could increase to greater than 20 percent systemwide, which would be greater than currently included in the WSIP and thus under the proposed Project (SFPUC Resolution 08-200). In addition, the SFPUC and wholesale water customers may undertake other actions (e.g., groundwater development, water transfers) to meet their dry-year water supply needs, and each of these potential actions would likely have environmental impacts.

Alternative 3A (Reduce Impacts on Colma-area Existing Irrigation Wells and Maintain Project Yield) would eliminate construction impacts at Sites 7 and 8, including significant and unavoidable aesthetic impacts from tree removal at Site 7 that would occur under the proposed Project. Construction impacts at the other sites would be the same as those of the proposed Project. During operations, this alternative would reduce the severity of well interference impacts (Impact HY-6) on 10 existing irrigation wells at cemeteries in Colma, but would increase well interference impacts at seven existing irrigation wells compared to the Project, due to redistribution of pumping to GSR wells away from the Colma area (see Section 5.16, Hydrology and Water Quality). As a result, one existing irrigation well in Colma (Home of Peace Cemetery well) would not experience significant impacts, as it otherwise would under the proposed Project. Mitigation would reduce the significant well interference impacts to less-than-significant levels, except that the implementation of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; for this reason, the impact has been deemed significant and potentially unavoidable with mitigation. All other operational impacts would be less than significant with implementation of mitigation measures, which would be the same as for the Project; however, impacts on Lake Merced water levels (prior to mitigation) would be slightly greater under this alternative. In addition, Alternative 3A would have significant impacts at fewer sites than the Project during construction, because this alternative eliminates significant construction aesthetic impacts at Site 7. No impacts would be more severe under this alternative than those of the Project with implementation of mitigation. However, the greater impact to Lake Merced water levels under Alternative 3A requires greater mitigation of impacts to Lake Merced water levels and would require additional supplemental water, redistribution of pumping, or discontinued pumping than under the proposed Project. Therefore, the operational impacts of Alternative 3A would be less severe than those of the Project or of Alternatives 2A or 2B, with the exception of slightly greater impacts associated with Lake Merced. Alternative 3A would fully achieve the Project objectives and support the SFPUC's basic goal of providing a reliable dry-year and emergency groundwater supply during the 8.5-year design drought cycle.

Alternative 3B (Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Project Yield) would eliminate construction impacts at Sites 7 and 8, including significant and unavoidable aesthetic tree removal impacts at Site 7 that would occur under the proposed Project (see Impact AE-1 in Section 5.3, Aesthetics). Construction impacts at the other sites would be the same as those of the proposed Project. During operations, the alternative would reduce the severity of well interference impacts (Impact HY-6) on 10 existing irrigation wells at cemeteries in Colma as compared to the Project (see Section 5.16, Hydrology and Water Quality). As a result, two existing irrigation wells in Colma (Home of Peace

Cemetery well and Holy Cross Cemetery well #1) would not experience significant impacts, as they otherwise would under the proposed Project. Mitigation would reduce the significant well interference impacts to less-than-significant levels, except that the implementation of the mitigation measure cannot be assured until the existing irrigation well owners have agreed to allow the mitigation to take place on their property; for this reason, the impact has been deemed significant and potentially unavoidable with mitigation. All other operational impacts would be less than significant with implementation of mitigation measures, which would be the same as for the Project. Alternative 3B would have significant impacts at fewer sites than the Project during construction, because this alternative eliminates significant construction aesthetic impacts at Site 7. In addition, Alternative 3B reduces well interference at two existing irrigation wells to less than significant. No impacts would be more severe under this alternative than the Project with implementation of mitigation. Therefore, the operational impacts of Alternative 3B would be less severe than those of the Project or of Alternatives 2A, 2B, or 3A. Alternative 3B would not fully achieve the Project objectives, although it would achieve most of them. Specifically, it would not fully support the SFPUC's goal to supply water reliably to customers in the event of emergencies and an 8.5-year drought. This alternative would allow for the conjunctive use of the South Westside Groundwater Basin through coordinated use of SFPUC surface water and groundwater pumped by Partner Agencies and it would allow for in-lieu recharge of the Basin. However, the alternative would not provide the full 7.2-mgd dry-year and emergency pumping capacity needed during the 8.5-year design drought. The alternative would result in an approximately 1.2-mgd shortfall during each year of a severe drought. As a result, water rationing could increase to greater than 20 percent systemwide, which would be greater than currently included in the WSIP and under the proposed Project. In addition, the SFPUC and wholesale water customers may need to undertake other actions (e.g., groundwater development, water transfers) to meet their dry-year water supply needs, and each of these potential actions would likely have environmental impacts.

Conclusion

As described above, none of the alternatives would reduce all the significant and unavoidable impacts of the proposed Project. Alternatives 2A, 2B, 3A, and 3B would cause significant and unavoidable impacts related to construction at one or two fewer sites than the Project; however, significant and unavoidable construction-related impacts would still occur at nine or 10 other facility sites, as they would under the proposed Project. Such impacts, although significant and unavoidable, would be temporary and would only occur for portions of the 16-month construction period. Alternatives 2A and 2B avoid the significant construction-period noise and land use impacts at Sites 1 and 4. Alternatives 3A and 3B avoid the significant and unavoidable aesthetic impact during construction associated with tree removal at Site 7.

Alternatives 3A and 3B would cause significant and potentially unavoidable well interference impacts during operation at one or two fewer existing irrigation wells than the Project; however, significant and potentially unavoidable well interference impacts would still occur at 11 or 12 existing irrigation wells, as they would under the proposed Project. The No Project Alternative would not cause significant and unavoidable construction impacts (since no construction would occur), but water levels at Lake Merced would continue to fluctuate as they do now under varying hydrologic conditions, and during a drought as severe as the design drought, lake levels would decline to a level that could have adverse water quality effects at Lake Merced. Because permanent operational impacts are considered more severe than temporary construction-period impacts, Alternative 3B (Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Yield) is the environmentally superior alternative, in that it would have significant and potentially unavoidable well interference impacts at fewer sites than the proposed Project or Alternatives 2A, 2B, or 3A. Alternative 3B (Reduce Impacts on Colma-area Existing Irrigation Wells and Reduce Yield) is therefore identified as the environmentally superior alternative, although, while it would meet most, it would not fully meet all of the Project objectives or WSIP goals.

7.6 ALTERNATIVES CONSIDERED BUT REJECTED FROM FURTHER ANALYSIS

As described under Section 7.3, GSR Alternatives Analysis, there is no alternative that would reduce all significant and unavoidable environmental impacts to a less than significant level and also meet most of the project objectives. The alternatives that were considered and then eliminated from further consideration are discussed below.

7.6.1 Eliminate Facility Sites with Significant and Unavoidable Construction-related Noise Impacts

Under this alternative, all sites with significant and unavoidable impacts for construction-related noise would be eliminated (see Section 7.3.2 [Impacts of the Proposed Project]). The following sites would be eliminated under this alternative: Sites 1, 3, 4, 5 (On-site Treatment), 9, 12, 14, 16, 18 (Alternate), and 19 (Alternate). It would allow the SFPUC to conjunctively manage the South Westside Groundwater Basin; however, it would not allow the SFPUC to increase the dry-year and emergency capacity of the Basin by 7.2 mgd during the 8.5-year design drought cycle.

This alternative is rejected from further consideration in this Draft EIR because the elimination of nine GSR sites would severely reduce the SFPUC's ability to provide sufficient water during the 8.5-year design drought. Operation of only 10 GSR wells would require nearly double the pumping rates proposed under the Project, which would be infeasible due to the lack of sufficient groundwater availability, in addition to the increased well interference effects at existing irrigation wells and Partner Agency municipal wells (MWH et al. 2008).

7.6.2 Construct and Operate 19 or More Well Facilities

Under this alternative, 19 or more new well facilities would be constructed and operated instead of the 16 sites proposed for the Project. The alternative would meet all the Project objectives. Specifically, it would provide for the conjunctive use of the South Westside Groundwater Basin, would increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by an annual average 7.2 mgd, and would provide a new dry-year groundwater supply for SFPUC customers and increase water supply reliability during the 8.5-year design drought cycle.

However, the alternative is rejected from further consideration in the Draft EIR because of increased construction-related and operations-related environmental impacts and possible infeasibility. The alternative would construct more well facilities than the Project and, therefore, increase the environmental impacts from construction. The SFPUC, in cooperation with the Partner Agencies, completed an Alternatives Analysis Report (AAR) that identified and evaluated potential well facility sites to support the Project (MWH 2007). The analysis used evaluation criteria for selection of preferred facility sites. The AAR identified nine preferred sites with 14 wells. Following completion of the AAR, the SFPUC developed the Conceptual Engineering Report (CER) (MWH et al. 2008). Based on Project reviews during development of the CER, the SFPUC conducted analyses to determine potential effects of pumping the original 14 well locations on groundwater levels near the wells and potential impacts to existing irrigation wells in the Basin. Results of the analysis indicated that a more distributed network of wells than the original nine sites should be developed to reduce potential well interference impacts. The analysis determined that 16 wells distributed across the Basin would be the optimal number to reduce well interference effects at existing irrigation wells, Partner Agency municipal wells, and proposed GSR well sites. Further, expansion of the number of well facility sites would require that wells be located further out toward the edges of the Groundwater Basin where groundwater availability would be more limited, or closer to existing wells or proposed GSR well sites where well interference effects would be greater (MWH et al. 2008).

7.6.3 Construct Well Facilities at Different Locations within the South Westside Groundwater Basin

Under this alternative, a total of 16 well facilities, some of which would be constructed at locations different than those identified and evaluated for the proposed Project, would be constructed. The alternative would meet all the project objectives. Specifically, it would provide for the conjunctive use of the South Westside Groundwater Basin, would increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by an average annual 7.2 mgd, and would provide a new dry-year groundwater supply for SFPUC customers and increase water supply reliability during the 8.5-year design drought cycle.

However, the alternative is rejected from further consideration in the Draft EIR because the selection of different sites, rather than the 19 sites (16 preferred sites and three alternate sites) evaluated for the proposed Project, would not reduce environmental impacts and may increase impacts beyond those identified for the proposed Project. The SFPUC and Partner Agencies completed an Alternatives Analysis Report (AAR) to evaluate potential well sites (MWH 2007). The AAR compared 48 potential well sites within the South Westside Groundwater Basin. The analysis evaluated potential well sites based on four evaluation criteria including the following:

- **Well Site Suitability** – including access to the site, the footprint of the site, underground obstructions and horizontal setback distances.
- **Groundwater System Considerations** – including potential well yield, groundwater quality, well interference potential, and geologic stability.

- **Distribution System Considerations** – including proximity to existing Partner Agency and SFPUC conveyance and treatment facilities.
- **Land Use Considerations** – including land ownership, property acquisition, ease of permitting, and local acceptance.

The evaluation criteria were applied to the preliminary well locations and a prioritized list of well locations was developed to meet the goal 7.2 mgd. The AAR identified nine preferred sites with 14 wells, and the nine sites were evaluated more fully to refine assumptions of the Basin properties at each preferred well site. Following completion of the AAR, two additional well sites were added to reduce well interference. The analysis performed by the SFPUC to identify the preferred well locations indicates that the remaining 32 well locations evaluated in the AAR would not reduce environmental impacts compared to the well sites in the proposed Project (MWH 2007; MWH et al. 2008).

7.6.4 Decreased Yield for all Proposed Wells

Under this alternative, a total of 16 well facilities would be constructed at the locations identified in the proposed Project (this could include a combination of any 16 of the 19 sites evaluated in this EIR, including Alternate location). However, the yield from each of these wells would be reduced to reduce significant groundwater impacts, such as well interference and water quality impacts at Lake Merced. The alternative would meet two of the four Project objectives. Specifically, it would provide for the conjunctive use of the South Westside Groundwater Basin and it would provide supplemental SFPUC surface water to Partner Agencies in normal and wet years and allow for in-lieu recharge through reduced groundwater pumping by Partner Agencies. The alternative would not create a dry-year and emergency pumping capacity of 7.2 mgd in the South Westside Groundwater Basin, and it would not provide a new dry-year groundwater supply for SFPUC customers and increase water supply reliability during the 8.5-year design drought cycle.

The alternative is rejected from further consideration in the Draft EIR because it would not meet most of the Project’s basic objectives and therefore would not be a reasonable project alternative. Alternatives 2B and 3B would reduce the Project yield in a targeted manner so that significant groundwater impacts affecting water quality at Lake Merced (Impact HY-9) or well interference at existing irrigation wells in Colma (Impact HY-6) are reduced as much as feasible (see Section 5.16, Hydrology and Water Quality). An alternative that reduces yield equally at all of the well facilities would be less effective at reducing significant impacts, and therefore is not needed to provide decision-makers and the public with a reasonable range of alternatives for study.

7.6.5 Provide Water to Serve Less than an 8.5-year Design Drought Cycle

Under this alternative, a total of 16 well facilities would be constructed at the locations identified in the proposed Project. These wells would operate to meet the dry-year and emergency pumping capacity of the South Westside Groundwater Basin by 7.2 mgd in the event of an 8.5-year drought; however, pumping would cease before significant groundwater impacts would occur, resulting in water supplied for less than the full 8.5-year design drought cycle (should such an event ever occur). The alternative would meet three of the four Project objectives. Specifically, it would provide for the conjunctive use of the South Westside Groundwater Basin, it would provide supplemental SFPUC surface water to Partner Agencies in normal and wet years and allow for in-lieu recharge through reduced groundwater pumping by the Partner Agencies, and it would increase the dry-year and emergency pumping capacity of the South Westside Groundwater Basin to 7.2 mgd. However, the alternative would not provide a new dry-year groundwater supply for SFPUC customers nor increase water supply reliability during the entire 8.5-year design drought cycle.

The alternative is rejected from further consideration in the Draft EIR because the alternative would not meet the Project's most important objective, which is providing additional water for the entire 8.5-year design drought cycle and because it would not decrease significant impacts compared to the proposed Project. It is likely that significant well interference impacts would occur during the early years of a drought, because some of the existing irrigation wells have production capacity only slightly in excess of that needed to meet peak demand (see Table 5.6-13 [Estimated Peak Demand and 12-Hour Production Capacities] in Section 5.16, Hydrology and Water Quality). Therefore, pumping would need to be reduced early in the design drought cycle, and no additional environmental benefit would occur.

7.6.6 Construct a Year-round Desalination Plant for Drought

Under this alternative, the SFPUC would construct a desalination plant to provide water during drought years. The PEIR evaluated construction and operation of a 25-mgd year-round desalination plant as a means to provide supplemental water during all hydrological year types to blend with the regional system water, including supplemental water during drought years (San Francisco Planning Department 2008). The alternative would involve the construction of the Oceanside Seawater Desalination Plant on the west side of San Francisco near the existing Oceanside Water Pollution Plant. Under this alternative, 25 mgd of potable water supplies produced by reverse-osmosis technologies would be provided year-round to retail customers. The desalinated water would be introduced into the regional water system at Sunset Reservoir; this reservoir serves only customers in San Francisco and these customers would primarily receive desalinated water.

The San Francisco Public Utilities Commission rejected the alternative as infeasible at the time of approval of the WSIP in 2008 because construction and operation of a desalination facility raised unresolved environmental issues, including questions about protection of aquatic resources, water quality and brine disposal issues (SFPUC 2008). The desalination plant would require a significant amount of long-term energy use, which would increase emissions of greenhouse gases (unless powered by 100 percent non-GHG-generating energy sources). The Commission also rejected the alternative because the feasibility of a desalination plant was uncertain at that time, because it would require numerous additional permits and approvals and, therefore, would be unlikely that the facility could be approved within the ten years following approval of the WSIP. Moreover, the SFPUC determined that the alternative would be quite costly for the SFPUC, as set forth in Resolution 08-200.

This alternative is rejected from further consideration in the Draft EIR because, although the alternative would meet the Project's objective to provide a new dry-year water supply, it may not be cost effective to construct a year-round desalination plant for a dry-year water supply that would likely be needed less than 25 percent of the time on average. The unresolved environmental and regulatory compliance issues currently remain as they were when the Commission rejected this alternative during approval of the PEIR. Moreover, while the Commission rejected this alternative at the time of the 2008 WSIP approval (SFPUC Resolution 08-200), it continues to examine the feasibility of a year-round desalination plant in addition to a regional desalination plant, along with other opportunities and options to increase water supply to meet future demand and dry year needs. This ongoing evaluation was contemplated at the time of adoption of the WSIP and is part of the comprehensive assessment of water supply beyond 2018 and is appropriate for review in that context.

7.7 REFERENCES

Fugro. 2012a. *TM 10.5 Subsidence Analysis for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. May.

Fugro. 2012b. *TM 10-7(Rev., Final) Supplemental SFPUC Regional Groundwater Storage and Recovery Project; South Westside Basin Third-party Well Survey and Well Interference Analysis*. June.

Johnson, Karen E. and Jeff Loux. 2004. *Water and Land Use*.

Kennedy/Jenks Consultants (Kennedy/Jenks). 2012a. *Task 10.1 Technical Memorandum, Ground Modeling Analysis for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. April 18.

Kennedy/Jenks. 2012b. *Task 10.4 Technical Memorandum, Changes in Groundwater Levels and Storage for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project.* April 24.

Kennedy/Jenks. 2012c. *Task 10.3 Technical Memorandum, Assessment of Potential Seawater Intrusion for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project*. April 24.

Kennedy/Jenks. 2012d. *Task 10.6 Technical Memorandum, Assessment of Groundwater Quality for the Regional Groundwater Storage and Recovery Project and the San Francisco Groundwater Supply Project.* May 3.

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

MWH with AGS, M. Lee, and Talavera & Richardson. 2008. *Conceptual Engineering Report (CER), Groundwater Conjunctive Use Project*. Prepared for Water Resources Division. November.

San Francisco Planning Department. 2008. *Program Environmental Impact Report on the San Francisco Public Utilities Commission's Water System Improvement Program* (San Francisco Planning Department File No. 2005.0159E; State Clearinghouse No. 2005092026). October.

San Francisco Public Utilities Commission (SFPUC) 2008. *SFPUC Resolution adopting the WSIP, Attachment A: Water System Improvement Program California Environmental Quality Act Findings: Findings of Fact, Evaluation of Mitigation Measures and Alternatives, and Statement of Overriding Considerations*. October.

SFPUC. 2012a. Personal Communication, Greg Bartow, August 7, 2012.

SFPUC. 2012b. *Summary of CEQA Alternatives*. August 13.

SFPUC. 2012c. *Effectiveness of Mitigation Measures for Well Interference*. August 21.

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