APPENDIX A

Lake Management Plan

Draft

VISTA GRANDE DRAINAGE BASIN IMPROVEMENT PROJECT

Lake Management Plan

Prepared for
City of Daly City

December 2015

ESA

for: McMILLEN JACOBS ASSOCIATES

Draft

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1. Introduction

The City of Daly City (Daly City) is proposing the Vista Grande Drainage Basin Improvement Project (Project) to address storm-related flooding in the Vista Grande Drainage Basin (Basin) while providing the additional benefit of augmenting the level of Lake Merced. The Vista Grande storm drain system drains the northwestern portion of Daly City and an unincorporated portion of San Mateo County – areas originally within the watershed of Lake Merced. In the 1890s, the Vista Grande Canal and Tunnel were built to divert stormwater away from the lake to an outlet at the Pacific Ocean. The Ocean Outlet and a portion of the Tunnel are located within Fort Funston, part of the Golden Gate National Recreation Area (GGNRA), which is operated under the authority of the National Park Service (NPS). The existing Canal and Tunnel do not have adequate hydraulic capacity to convey storm flows, and this periodically causes backup of Tunnel flows into the Canal and flooding during peak storm events in adjacent low-lying residential areas and along John Muir Drive.

As noted, the proposed Project has two primary, mutually supporting objectives: to address storm-related flooding that periodically occurs as a result of inadequate storm drainage capacity in Daly City's Vista Grande Canal and Tunnel, and to augment water surface levels and manage water quality in San Francisco's Lake Merced. Both Daly City and San Francisco independently are obligated to address these respective issues. The proposed Project represents an approach that would jointly address both jurisdictions obligations while minimizing disturbance, maximizing the beneficial reuse of stormwater, and reconnecting a significant portion of the Lake Merced Watershed to Lake Merced.

Lake Merced is made up of four individual but connected lakes (East, North, South, and Impound Lakes) and is owned by the City and County of San Francisco. The San Francisco Public Utilities Commission (SFPUC) maintains the Lake as a non-potable emergency water supply for the San Francisco and is a responsible agency for this project.

Daly City considered a number of engineering alternatives as a means to alleviate flooding in the Basin by increasing the tunnel capacity. However, in coordination with the SFPUC, the Proposed (known as the Lake Merced Alternative in engineering alternatives consideration process) emerged as the preferred alternative for the project, based on its "green infrastructure" approach of capturing and beneficially reusing stormwater to manage the level of Lake Merced, which declined in the late 1980s and early 1990s and has not fully recovered. Daly City has worked closely with the SFPUC and the San Francisco Bay Regional Water Quality Control Board (RWQCB) in the development of this project. The project would involve partial replacement of the existing Canal, replacement of the existing Tunnel, and replacement of the existing ocean outlet structure. Additionally, operational components of the project would include management of water elevations in Lake Merced by routing some screened wet-weather storm flows from the Canal to Lake Merced, and year-round authorized non-storm flows to a constructed treatment wetland which would subsequently discharge flows to Lake Merced. Daly City and SFPUC are in coordination regarding the proposed design and operation of the proposed project and management of the Lake under a range of potential Lake Merced water surface elevations (WSEs).

Daly City and SFPUC agreed to develop the Lake Management Plan (LMP) as part of the project to demonstrate how Daly City and SFPUC would coordinate to maintain or improve the water quality of Lake Merced. This LMP includes an overview of the initial operational plan for the diversion of stormwater from the Canal to Lake Merced, a Lake monitoring plan to assess trends in hydrology and water quality, and a prioritized suite of best management practices (BMPs) that would be implemented by Daly City and SFPUC, in conjunction with regulatory adjustments to reflect site-specific conditions. The principal diversion routing options are presented in Section 3.2.1. More detailed diversion criteria would be developed further during design of the diversion facilities, and further refined following the first wet season of operation, and as part of the ongoing adaptive management of the project. The operational plan and LMP would then be incorporated into an Operational Agreement executed between Daly City and SFPUC.

The development of the LMP has been conducted in consultation with the RWQCB consistent with the "Proposed Regulatory Approach for Vista Grande Drainage Basin Improvement Project, Lake Merced Alternative" as described in the March 12, 2013 letter from Daly City to the RWCQB, and the May 9, 2013 letter of concurrence from the RWQCB to Daly City (**Appendix A**).

The document is organized as follows:

Lake Management Plan Goals and Objectives: The goals and objectives developed for the LMP focus on the jointly desired endpoints of restoring and maintaining Lake WSEs while maintaining or improving water quality.

Vista Grande Operational Plan: This section describes the monitoring and management of lake levels, operation of the Canal diversions to the Lake, constructed treatment wetlands, and Pacific Ocean, and circulation of non-stormwater flows and Lake water through the constructed treatment wetlands.

Lake Monitoring Plan: This section outlines the monitoring, reporting and assessment plan for hydrology and water quality in the Lake, Canal, and the constructed treatment wetlands.

BMP Implementation Plan: This section describes the list of Watershed and Lake BMPs that could be implemented by Daly City and/or SFPUC to potentially benefit Canal water quality and/or DO and pH levels in the Lake.

2. Lake Management Plan Goals and Objectives

The intent of the LMP is to protect and enhance the beneficial uses of Lake Merced and to monitor for hydrologic and water quality changes, if any, associated with Lake management actions. The following goals and objectives have been collaboratively developed by Daly City and SFPUC for the LMP.

Goal 1. Manage and maintain water surface elevation of Lake Merced

Objective1a: Increase surface water input to the Lake

Objective 1b: Capture and manage stormwater as a resource

Goal 2. Maintain or improve water quality in Lake Merced

Objective 2a: Maintain or improve Dissolved Oxygen (DO) and pH

Objective 2b: Minimize watershed nutrient inputs

Objective 2c: Minimize internal nutrient sources

Objective 2d: Reduce trash input to the Lake

Goal 3. Maintain or improve aquatic habitat quality and availability

This goal will be achieved through attainment of Objectives 1a, 2a, 2b, and 2c.

3. Vista Grande Operational Plan

This section outlines the operational elements of the plan for Lake level management, primarily focusing on potential scenarios for diversion of stormwater from the Canal to Lake Merced. Daly City would have the ability to divert a range of flows from the Canal to South Lake Merced. The water surface elevation would fluctuate depending on seasonal and climatic variations and other influences in addition to Canal diversion operations.

3.1 Project Operation and Lake Level Management Overview

The project would divert stormwater and authorized non-stormwater flows that are currently conveyed to the Pacific Ocean to Lake Merced to aid the SFPUC in operating Lake Merced within desired water levels. More detail about the project's diversion operation is provided below in Section 3.2.

The WSE of Lake Merced has fluctuated historically from Elevation (El.) 13 feet (San Francisco City Datum) in the 1940s to a low of El. -3.2 feet in 1993. Since then, the WSE of Lake Merced has risen due to increases in average rainfall and water additions by the SFPUC (SFPUC, 2011). From 2006 to 2010, the WSE ranged from El. 4.8 feet to El. 6.9 feet with an average of approximately El. 5.8 feet (City Datum). The range of potential WSE scenarios considered initially for the purposes of analysis includes mean WSEs of 6.5 to 8.5 feet, with a maximum high WSE of 9.5 feet. However, the actual proposed operation WSE range would be determined by the SFPUC, following completion of the CEQA/NEPA review process and may be further refined as

part of adaptive management of the project following project implementation should monitoring and operational activities identify the need to adjust the target operational WSE.

The three representative operational scenarios are identified by the target maximum WSE: El. 7.5, 8.5, and 9.5 feet (see **Figure 1**). This is the elevation at which the Lake Merced overflow structure would be set under each scenario. Accordingly, the operational water levels represent an increase of the annual mean by 0.5, 1.5, and 2.5 feet. After winter rains taper off, about 1.5 feet of water is lost each year, primarily due to evaporation. Thus, for each scenario, there is a corresponding target normal minimum WSE. The term normal is used to refer to normal and wet year conditions. Under dry year and multiple dry year conditions, it is assumed that WSE of Lake Merced would fall below the target normal range. During a storm event, the Lake's WSE may temporarily rise above the target maximum WSE, as the flow of stormwater being diverted into the Lake exceeds the capacity of the overflow outlet, thus providing short-term water storage for flood events. The project includes provisions to extend the duration of elevated WSE conditions to improve Lake water quality. Adaptively managing elevated WSE conditions in conjunction with the overflow structure and a siphon would allow for regular dilution and overflow or displacement of high alkalinity Lake water to the ocean outfall to reduce the background pH of the Lake (discussed in more detail below).

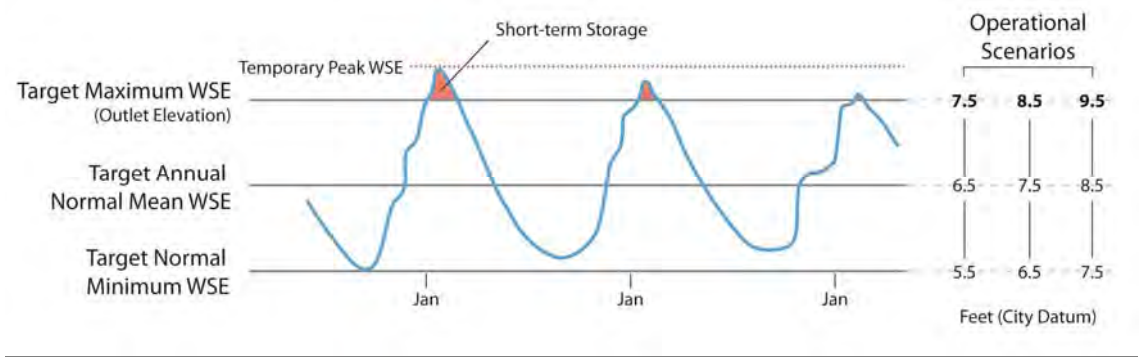

Figure 1
Lake Level Operational Scenarios

3.2 Diversion Operation

The project proposes several measures for balancing the goals of restoring the surface elevation of the Lake while maintaining or improving Lake water quality through the conveyance of flows from the Canal to Lake Merced. This section outlines the initial conceptual thresholds that would be used to determine when to divert flows directly to the Lake, to the constructed treatment wetland, and to the Pacific Ocean.

When the project is operational, stormwater and authorized non-stormwater flows would flow by gravity through a box culvert located beneath one of two constructed treatment wetland cells, flow through a gross solids screening device, then enter a diversion structure where it could be pumped to the proposed constructed treatment wetlands, directed to Lake Merced through a box culvert under John Muir Drive, or allowed to continue through the Canal and Tunnel to the ocean

outlet. Variable control would be available at the diversion structure gates so that all or only portions of the flow may be directed in either direction. Flows that are directed into Lake Merced would be conveyed via the box culvert to an outlet at the northwestern portion of the Impound Lake shoreline.

The box culvert under John Muir Drive to the Lake Merced outlet would be designed to accommodate the peak flows generated by the 4-hour 25-year design storm (1070 cfs); however, since a portion of the total flow could be directed through the Canal to the Tunnel, only approximately 570 cfs of the box culvert's and discharge structure's total 1070 cfs capacity would be needed to accommodate peak flows generated by the design storm.

After passing through the solids screening device, year-round low flow stormwater and authorized non-storm flows would be pumped at rates of up to approximately 400 gallons per minute (gpm) to the start of one of two constructed treatment wetland cells. Water would flow by gravity to the terminus of the constructed treatment wetland, where it would typically drop into a box culvert below and continue to flow into Lake Merced. Treated water from the wetland would also have the capability of dropping into the diversion structure and continuing through the Canal and Tunnel in order to bypass Lake Merced if requested by the SFPUC, such as during maintenance of the treatment wetland system or other related components.

3.2.1 Diversion Criteria

In order to maintain lake levels within target WSEs and to ensure protection of water quality within Lake Merced, the proposed operating model includes provisions for routing stormwater to Lake Merced. To provide the greatest protection to Lake Merced water quality, the initial storm event of the winter season and other storm events with long antecedent dry periods would flow through the Canal to the Tunnel and then to the ocean outlet due to storms with long antecedent dry periods containing increased particulate and associated constituent levels within runoff. The Project also has the capability to continue to route runoff from various types of events to the Pacific Ocean. Stormwater would be routed to Lake Merced dependent on stormwater flow rate, Lake Merced levels, and other diversion criteria, including rainfall frequency, predicted rainfall duration and magnitude, canal flow rates, and other factors. Additional details relating to the diversion criteria would be developed and further refined during detailed design of the diversion facilities and following the first wet season of operation as part of the adaptive management approach (see Section 4.4). However, the principal diversion routing options are:

1. **Summer and Winter Low-Flow Routing, Lake Merced below target WSE.** Screened dry weather flows (authorized non-stormwater) and low-volume stormwater flows would be routed through the treatment wetlands, after which the treated water would drain into the Lake Merced Outlet to Impound Lake. These flows would help to maintain overall lake level and sustain the proposed treatment wetlands throughout the year. There would be no flow through the tunnel or beach discharge.

2. **Summer and Winter Low-Flow Routing, Lake Merced at target WSE.** Screened dry weather flows (authorized non-stormwater) and low-volume stormwater flows would be routed through the treatment wetlands after which the treated water would drain into the

Lake Merced Outlet to Impound Lake. These flows would help to maintain overall lake level and sustain the proposed treatment wetlands throughout the year. Inflows into Impound Lake would increase the WSE above the Lake Merced Overflow elevation, resulting in outflows from South Lake to the Vista Grande Tunnel via the Lake Merced Overflow. Overflows would be conveyed via the Vista Grande Tunnel to the Ocean Outlet.

3. **Winter Storm Routing, Lake Merced below target WSE.** Screened initial stormwater flows would be routed through the canal and discharged via the Vista Grande Tunnel and Ocean Outlet. After initial storm event, if screened storm flows meet diversion criteria, flows exceeding the capacity of the treatment wetlands would be routed directly to Impound Lake, and there may be no flow through the tunnel or beach discharge.

4. **Winter Storm Routing, Lake Merced at target WSE.** Screened initial stormwater flows would be routed through the canal and discharged via the Vista Grande Tunnel and Ocean Outlet. After initial storm event, if screened storm flows meet diversion criteria, flows exceeding the capacity of the treatment wetlands would be routed directly to Impound Lake. Inflows into Impound Lake would increase the WSE above the Lake Merced Overflow elevation, resulting in outflows from South Lake to the Vista Grande Tunnel and Ocean Outlet via the Lake Merced Overflow.

5. **Winter Storm Exceeding 25-year, 4-hour criteria, Lake Merced at target WSE.** Screened initial stormwater flows would be routed through the canal and discharged via the Vista Grande Tunnel and Ocean Outlet. After initial storm event, if screened storm flows meet diversion criteria, flows exceeding the capacity of the treatment wetlands would be routed directly to Impound Lake. In addition, if storm water flows from the Vista Grande watershed exceed the combined capacity of Lake Merced and the Vista Grande Canal and Tunnel, canal flows could overtop the canal and flow across John Muir Drive to Lake Merced. Flows would cross the existing hardscape areas (riprap) between John Muir Drive and South Lake and discharge into Lake Merced via existing riprap Canal overflow discharge structures along the shoreline. Inflows into either Impound Lake or South Lake would result in overflows back to the tunnel as capacity is available and would be discharged via the Ocean Outlet. This option would temporarily raise lake levels above the target WSE, providing short-term storage during major storm events to reduce flooding in the Vista Grande Basin.

3.2.2 Lake Level Management

Filling Period

Five diversion thresholds were modeled to estimate the potential contribution of stormflows diverted to Lake Merced. These are: > 0 cfs (i.e., all flows would be diverted into the Lake), > 35 cfs (all flows greater than 35 cfs would be diverted into the Lake), > 75 cfs, > 150 cfs, and > 1070 cfs. The maximum predicted runoff reaching the Vista Grande Canal is approximately 1070 cfs,[1] so this threshold does not divert any stormwater from routine rain events to Lake Merced. The amount of time required to fill Lake Merced to the target WSE is dependent upon the diversion threshold. The lower non-zero diversion thresholds (i.e., > 35 and > 75 cfs) require multiple seasons to reach the target WSE, during which time a large volume of water is lost to evaporation and transpiration. Accordingly, the base flows running through the treatment

[1] Maximum predicted runoff based on a design storm event with a 4-hour duration and a 25-year recurrence interval.

wetlands constitute a greater percentage of the Lake Merced contributions than storm water compared to the > 0 cfs threshold. Due to evaporation and transpiration, the highest diversion thresholds (i.e., > 150 and > 1070 cfs) would never achieve the target WSE due to the infrequency of events. **Figure 2** illustrates the annual average contribution patterns under the five diversion thresholds for the 9.5-foot maximum WSE operational target. Because Figure 2 is based on the average year, it does not account for annual variability. The 9.5-foot target maximum WSE could be reached in a minimum of approximately 1.5 years under the > 0 cfs diversion threshold, 3.5 years under the > 35 cfs threshold, and 8.5 years under the > 75 cfs threshold. As shown in Figure 2, the 9.5-foot target maximum WSE would not be achieved under the > 150 cfs and > 1070 cfs diversion thresholds.

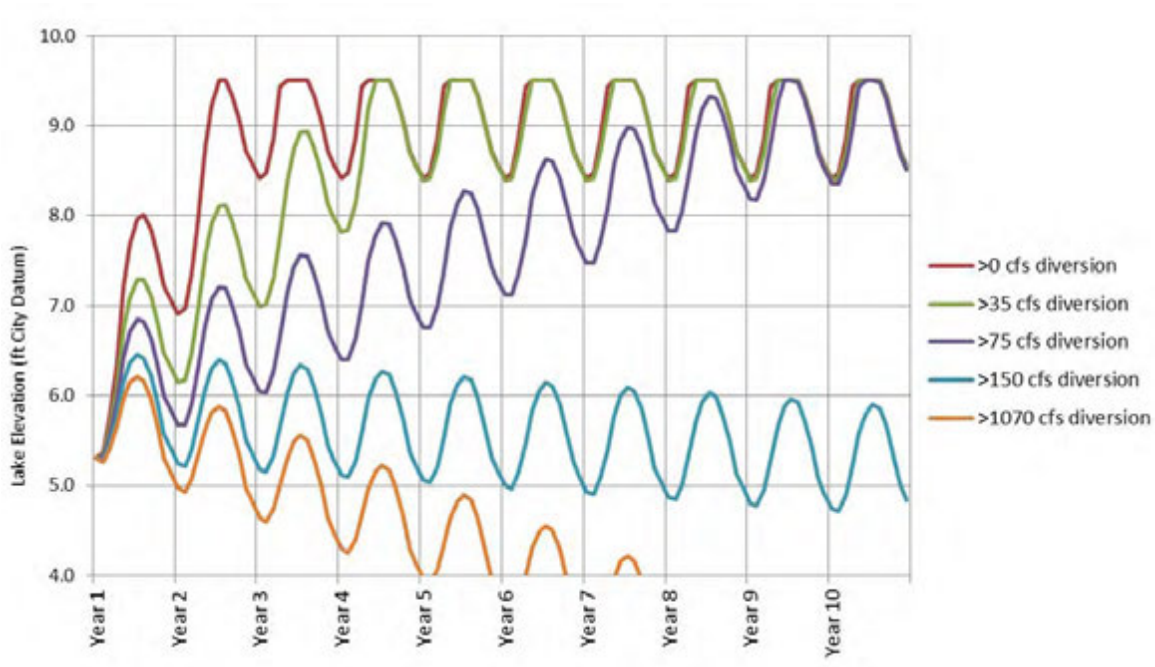

Figure 2
Lake Filling Scenarios, 9.5-Foot Target
Maximum Water Surface Elevation

Steady State

Once the Lake is ultimately raised to the target WSE, smaller annual contributions of flow from the Canal would be required to maintain the Lake within the target WSE range. Because the surface area of the Lake changes only slightly in the El. 6.5 to 8.5 foot range, the maintenance contributions would be approximately the same for all operational scenarios (6.5, 7.5, and 8.5 foot target annual normal mean WSE). Contributions from the constructed treatment wetland and the Canal, ranging from 403 acre-feet (> 75 cfs threshold) to 474 acre-feet (> 0 cfs threshold) would contribute to maintaining the target WSE range, in addition to smaller contributions from precipitation, current stormwater flows entering the Lake from local catch basins, and groundwater inflow. The relative contribution conveyed through the treatment wetlands varies according to the stormwater diversion threshold, but is substantial (45 to 60 percent).

3.2.3 Stormwater and In-Lake Water Quality Management

Collection Box and Debris Screening Device

A collection box would replace the headworks of the existing Canal to collect flows from the contributing storm drains. An approximately 275-foot-long linear radial debris screening device would be installed downstream of the collection box. Stormwater would enter the device through several cylindrical casings and exit through louvers perforated in the casings, trapping all debris larger than 5 mm within the casings. Debris would be removed from the casings with vacuum trucks on a scheduled basis. A schedule for cleaning, monitoring, and maintenance would need to be reviewed and refined during and following the first year of implementation. Depending on how quickly the casings fill up with debris, cleaning could occur as often as after every storm event, with inspections occurring on a bi-weekly basis between storm events. After the first year of implementation, this schedule would be reevaluated for its effectiveness. In the collection box, sediment build-up would also be monitored at the same schedule as the debris screening device. Accumulated sediment would be removed to ensure continued functioning of the debris screening device.

Debris screening is expected to have a minor influence on DO and pH. However, to the extent that there were nutrients and organic oxygen demanding constituents associated with the debris, that would result in less loadings to the Lake and lower the potential for enhanced algal growth.

Constructed Treatment Wetland

A constructed treatment wetland would be developed along John Muir Drive to treat year-round low flows from the watershed in order to reduce sediment, suspended solids, metals, microbiological constituents (bacteria and other organisms), and nutrients. Low volume stormwater flows, authorized non-storm flows, and recirculated Lake water would be treated prior to release to Lake Merced. The wetland would consist of two cells (A and B), with areas totaling approximately 2.75 acres. A portion of Wetland Cell A would overlie the box culvert. Wetland Cell B would be located between the existing Canal and John Muir Drive. The wetland would treat year-round low flows from the watershed (also referred to as base flows), which can consist of authorized non-stormwater flows such as residential irrigation runoff. Low flows would drain to the wetland pump station from the flow diversion structure via a 12-inch drain where two motorized pumps would pump water to one of the wetland cells. Stormwater and authorized non-stormwater flows exceeding the treatment wetland capacity (1.4 cfs) would pass through a solids screening device and then, depending on operational protocols, would either be routed to Lake Merced or be allowed to continue through the Canal and Tunnel to the ocean outlet.

Water pumped to the treatment wetlands would flow by gravity through the wetland at a rate of approximately 1.4 cfs. The wetland cells would be planted with emergent reeds such as cattails or bulrush that would provide water quality improvement by intercepting and settling out suspended particulates and providing attachment surfaces for beneficial bacteria. After passing through the wetland, the treated water would flow by gravity through the diversion structure to the Lake Merced Outlet. During periods of very low or no flow (typically during summer months), a recirculating pump would draw water from Lake Merced to maintain the treatment wetlands. Summer

maintenance flows would be adaptively managed to filter algae skimmed directly from the lake surface and pumped to the wetlands. The direct removal of concentrated surface algae by skimming would effectively achieve substantial decreases in chlorophyll, to the extent that concentrated, localized surface scums exist in the lake. The skimmer would have a floating structure with wind protection that draws water from the upper few inches of the lake surface via a piped connection (flexible hose) from the natural algae concentration site(s) within South Lake into the constructed treatment wetlands. Operation of the treatment wetlands to maximize removal of nuisance algal blooms in Lake Merced, when present, would be refined and adjusted as part of the adaptive management approach of the project following implementation to best achieve the LMP goals and objectives.

Controlled Overflow of Lake to Tunnel

The elevated pH level in Lake Merced is likely due to the historical accumulation of alkaline minerals following the permanent closure of the outlet to the Pacific Ocean, which created a terminal lake (i.e., no outflow to other water bodies). As described above, the project would include adaptive management of an adjustable-height overflow structure that would be used to control the lake level and allow water from Lake Merced to be diverted back into the Vista Grande Canal just upstream of the tunnel to flow to the Ocean Outlet. A potential benefit of this control measure is that it would improve some of the original hydrology of the Lake, which once had an outlet to the Pacific Ocean. Further, the project would include a siphon that would be adaptively managed to divert lake water from the hypolimnion to the Canal via the overflow structure to improve lake water quality by flushing higher alkalinity water from near the lake bottom.

When feasible, overfilling and thereby flushing the Lake with low-alkalinity stormwater could reduce the background pH of the Lake by diluting salts in the Lake and displacing higher alkalinity water. Additionally, bottom water would be displaced through the use of the siphon, to the extent that heavier, higher TDS and higher alkalinity water tends to be in the bottom layer when low-salinity stormwater flows into the top layer in winter (Horne, 2012). Adaptive management of the siphon would allow the higher TDS and higher salinity bottom water to be displaced, increasing the benefit of flushing water out of the lake. Operation of the siphon to flush out the highest alkalinity water from Lake Merced to the maximum extent practicable based on available water supply, Lake WSE, and Lake water quality conditions, and without compromising maintenance of target water surface elevations, would be refined and adjusted as part of the adaptive management approach of the project following implementation to best achieve the LMP goals and objectives. Further, the siphon would be adaptively managed and operated, when feasible, to reduce Lake WSE to below or to the lower end of the target elevation range prior to storm events to proactively remove higher TDS and higher salinity bottom water before wind mixing results in the Lake being more fully mixed and reducing the potential benefit of diverting bottom waters as compared to periods of isothermal or chemical stratification.

4. Lake Merced Monitoring Plan

This section describes a hydrology and water quality monitoring plan to evaluate the water quality in Lake Merced (particularly DO and pH), and to provide data to support adaptive management decision making. The monitoring plan has been formulated to provide the information necessary to answer the following questions:

- Have Lake water levels been successfully increased to target mean WSE levels and sustainably maintained as a result of Canal diversion and Lake management actions?
- Has Lake water quality been maintained or improved as a result of Canal flow diversions, use and management of treatment wetlands, and Lake management actions as compared to the historic norms established during the pre-Project period (baseline conditions)?
- If adverse water quality change trends begin to show in the Lake as compared to baseline conditions, can such changes be definitively linked to the addition of treated stormwater or explained by other phenomena (e.g., unusually dry/warm year, reduced fog cover, watershed disturbance, etc.)?
- Are identified initial changes in water quality likely to adversely impact beneficial uses (e.g., fisheries), or contribute to nuisance conditions within Lake Merced if the trend continues?
- If so, what are the most appropriate available BMPs or adaptive management measures that could be implemented to offset or correct these potential adverse water quality changes before substantial effect occurs?
- Are sufficient DO, pH, and ancillary data being collected in Lake Merced to support a request for future removal of the Lake from the Clean Water Act (CWA) Section 303(d) impaired waterbodies list?

4.1 Lake Merced and Canal Water Quality

4.1.1 Summary of Current Conditions

There are two primary data sets describing baseline water quality conditions at Lake Merced: approximately quarterly sampling conducted by SFPUC staff from 1997 through the present, and continuous (hourly) monitoring using data sondes performed by Daly City at four stations in South Lake Merced at multiple depths from August 2011 through January 2013. The SFPUC data set documents long-term trends in water quality and the range in variability of constituents such as nutrients and chlorophyll. The more recent Daly City data document the diurnal, seasonal, and depth related variations in DO, pH, and temperature due to factors such as climatic change, wind induced mixing, phytoplankton photosynthesis and respiration, and sediment oxygen demand induced hypoxia/anoxia in the hypolimnion.

The long-term SFPUC data indicate that water quality in the Lake has been relatively stable since at least 2004. Water quality within Lake Merced represents that of a terminal, eutrophic, shallow stratified lake in a cool, foggy climate. During the rainy, cool winter months, temperatures in the

Lake rarely exceed 15 °C, while summer-fall temperatures can regularly exceed 20 °C. The Lake is only weakly stratified by temperature during the summer and fall due to its moderate depths (less than 30 feet deep) and location at the heart of San Francisco's "fog belt." Monitoring data from Daly City and SFPUC indicate that the typical temperature difference between surface and bottom waters during these seasons is less than 5 °C, often less than 2 °C. As a result of weak temperature stratification, the Lake mixes (in the vertical direction) approximately once every 9 to 11 days (Horne, 2012), making the Lake *polymitcic* (mixes multiple times in one year). When the Lake mixes, it typically mixes throughout its entire water column, a process called *holomixis*.

Though Lake Merced only weakly stratifies with respect to temperature, it is frequently stratified with respect to DO, particularly in the late spring through early fall when a majority of algal blooms occur. This stratification results in periods of low DO (< 5 mg/L) in the bottom waters (hypolimnion) and periods of elevated pH (> 8.5) in the near surface waters (epilimnion). Dissolved oxygen levels in the hypolimnion are frequently hypoxic (DO < 5 mg/L) or functionally anoxic (DO < 2 mg/L) during the summer and fall due to the effect of oxygen demand from the decomposition of dead algae and other organic matter in bottom sediments. Dissolved oxygen levels in the epilimnion (surface waters) can become supersaturated (> 12 mg/L) during daylight hours due to algal photosynthesis. The benthic sediment oxygen demand exerts such a significant influence that the current intermittent (9-11 days) mixing throughout the water column is not adequate to significantly raise DO levels in the hypolimnion. From November through March when cooler air temperatures prevail and the Lake is continually well mixed from top to bottom, DO levels average well above 5 mg/L.

Lake Merced is an alkaline lake with a widely fluctuating and elevated pH range, particularly in the portion of the water column near the Lake surface. Importantly, the Lake's range of pH (approximately 7.5 to 9.3) is always on the alkaline side and never reaches neutrality (pH 7). Due to the elevated alkalinity in this terminal lake, the carbonate chemistry results in an equilibrium pH in the 8 to 8.5 range. The higher pH values in Lake Merced are not typical for a system such as Lake Merced. Although high pH occurrences are common in eutrophic lakes in the later morning and early afternoon, the frequency, duration, and temporal patterns of high pH found in Lake Merced are not consistent with the Lake's eutrophic state and algal abundance (chlorophyll an approximately 28 micrograms per liter [µg/L]). Typically, higher high values would be expected in the day and lower pH values would be expected at night or on cloudy days (Straskraba, 1986). The pH levels appear to be the result of photosynthesis from algal activity, combined with the elevated alkalinity within the Lake due to it being a terminal lake, with no regularly occurring outflow since it lost connection to the Pacific Ocean in the late 1900s (Horne, 2012b). The removal of acidic carbon dioxide on summer afternoons by algal photosynthesis frequently raises the pH of surface water layers above 8.5, typically occurring for about 6 hours, corresponding to peak sunlight periods, and ranging from about 1 to 24 hours in duration. The cycles of high pH in Lake Merced are due to the combination of algal photosynthesis in the day and respiration by algae, zooplankton, and fish at night, on top of a high background pH due to the high concentration of salts like carbonates or alkaline salts.

Monitoring conducted by Daly City in 2011-2012 in the Canal at a range of storm and base flows has documented that Canal stormwater and authorized non-stormwater flows generally have characteristics typical of urban runoff in Bay Area communities for a broad range of constituents (such as nutrients, metals, and bacteria). The water quality of storm flows in the Canal is similar to that of Lake Merced surface waters during corresponding seasonal periods in terms of temperature, DO, and pH.

The levels of water quality constituents in Canal flows (such as metals, nutrients, and bacteria and other organisms) need to be considered in the context of the relative short-term duration and the annual average contribution (volume and loading) of Canal diversions as compared to overall lake volume. Hydrologic monitoring in the Canal conducted by Daly City during the wet and dry seasonal periods between 2011 and 2012 demonstrated that typical storm events in the Basin generate a volume equivalent to a fraction of one percent of the total Lake storage volume. (**Table 1**). The design hydrograph (i.e. peak storm event) for the project is a 25-year recurrence interval, 4-hour event with a peak flow of 1070 cfs. Assuming 100 percent diversion of the design storm flow, the maximum volume contribution from the Canal to Lake Merced during that single storm event would be approximately 190 acre-feet, or approximately 3 percent of the total volume of Lake Merced (5,625 acre-feet).

TABLE 1
STORM MONITORING SUMMARY

	Storm Event Date (2012)					
	1/19	**1/22**	**2/29**	**3/13**	**3/14**	**3/16**
Total Event Precipitation (in)	0.11	0.55	0.36	0.38	1.02	1.09
Antecedent Dry Period (Days)	19	<1	13	11	<1	<1
Peak Flow (cfs)	18	257	184	33	115	193
No. of Aliquots Collected	48	48	36	24	71	48
Storm Event Volume (acre-feet)	3.2	37.9	17.3	21.6	79.7	42.7
Storm Event Capture Volume (acre-feet)	2.8	16.0	16.7	18.8	54.4	38.8
Percent of Hydrograph Sampled[a]	87	42[b]	96	87	68	91
Storm Volume as % of LM Storage[c]	0.06	0.67	0.31	0.38	1.42	0.76

NOTES:

[a] Based on calculation of the volume of the event hydrograph sampled as a percentage of the entire event hydrograph volume above base flow conditions. However, base flow somewhat arbitrarily determined for each storm event due to base flow conditions being under continuous fluctuation. Additionally, not all storms resulted in a return to pre-storm base flow levels following a sample even. In these cases, percent capture derived from base flow during pre-storm condition to the point of lowest flow following sample completion before the subsequent storm event and rising limb of next event hydrograph.

[b] Although total event capture did not meet requirements for storm event monitoring representativeness (percent capture), sample collection successfully captured representative flow-paced samples from base flow to peak flow (and partially beyond) on the event hydrograph. The Event Mean Concentration (EMC) calculated for this event is therefore likely higher (more conservative) than the actual EMC, but is conservatively representative for purposes of characterizing the seasonal mean for various pollutant loads.

[c] Based on Lake volume of 5,625 acre-feet.

4.1.2 Clean Water Act Section 303(d) Support

Lake Merced currently does not meet the generally applicable Basin Plan Water Quality Objectives (WQOs) for DO and pH. There are currently no provisions in the Basin Plan that acknowledge the potential effects of diurnal and/or seasonal stratification nor of the effects of natural conditions, such as eutrophication, on ambient DO and pH. The DO and pH WQOs are also assumed to apply throughout the water column, at all locations within the Lake, and at all times, diurnally and seasonally. As a result, the USEPA in 2003 included Lake Merced on the CWA Section 303(d) list of impaired waterbodies for these constituents, notwithstanding the RWQCB's and State Water Board's recommendation not to include those listings.

Due to the unique conditions that exist in Lake Merced, the RWQCB is pursuing a Basin Plan amendment to incorporate site-specific implementation provisions for the DO and pH WQOs to address the Lake's unique conditions (Appendix A). These unique conditions include that the Lake is polymictic, a terminal lake, subject to marine coastal influences, and has both an artificially maintained coldwater fishery and a self-sustaining warmwater fishery. The additional DO and pH data collected under this LMP could be used in a future water quality assessment, once the revised Basin Plan implementation provisions are fully approved, to support a request to remove Lake Merced from the CWA Section 303(d) list as being impaired for DO and pH. The approach detailed below for long term water quality monitoring in Lake Merced is based, in part, on the early assumption that the Basin Plan Amendment addressing how DO and pH WQOs would be implemented in Lake Merced would involve some type of integrated water column averaging or other statistical approach, similar to that employed by the State of Colorado. The long-term water quality monitoring approach would be subject to change once work begins on the actual Basin Plan Amendment implementation provision language.

4.2 Constituents, Parameters, and Locations to be Monitored

This section describes the hydrologic parameters and water quality constituents that would be monitored to further assess baseline conditions and to track the long-term trends of lake hydrology and water quality, as well as treatment wetland efficacy, including trends associated with introducing treated Canal baseflows and stormwater to Lake Merced. This monitoring would be implemented in parallel with the existing multi-parameter quarterly monitoring program currently conducted by SFPUC in the Lake, which includes sampling of temperature, DO, pH, nutrients, and other constituents at multiple depths plus phytoplankton counts, chlorophyll a and Secchi disc measurements (see example report in **Appendix B**). SFPUC samples at eight stations, two in South Lake (Pump House and Pistol Range) and three each in North Lake and North East Lake. Routine monitoring is not currently conducted in Impound Lake, located south of South Lake and would not be monitored as part of the LMP due to its smaller volume and greater amount of shoreline influences (wetlands), as compared to South Lake, likely resulting in a high degree of water quality variability. Additionally, there are many stormwater inlets to Impound Lake, which would make it problematic to separate out any observed water quality deviations from the adjacent watershed contributions from Canal contributions. For these reasons, it was determined that Impound Lake, as a water quality monitoring location, was not representative of

the main water mass of Lake Merced as compared to the Pump House monitoring station in South Lake. The SFPUC monitoring stations are shown in **Figure 3**.

Figure 3
Lake Merced SFPUC Water Quality Monitoring Sites

This section also describes short-term water quality monitoring that would be conducted during the first year of implementation of Canal diversions to Lake Merced. The project is not expected to be completed until 2017 or soon after, 4 or more years after water quality data was collected concurrently in Canal and Lake Merced between 2011 and 2013. The short-term monitoring would be conducted when the Project is implemented to confirm whether key water quality parameters in Lake Merced are consistent with the current characterization of baseline conditions. This would ensure that baseline conditions at time of Project implementation are accurately incorporated into the monitoring and analysis program and that factors resulting in changes to baseline conditions within the Lake are understood and accounted for.

The proposed monitoring plan is based on a simplified version of the previous wet- and dry-weather monitoring program that was initiated by Daly City in 2011 (**Appendix C**). This approach maintains consistency with previous monitoring efforts and analyses reviewed by the RWQCB and carried out by SFPUC and Daly City, to maximize available data for the assessment of long-term water quality trends. The overall framework of the monitoring plan consists of four components:

1) long-term hydrologic monitoring of Canal flows, diversions, and Lake WSE to understand how Canal diversions are affecting lake depth;

2) long-term continuous monitoring of DO, pH, and temperature at multiple depths at the Lake Merced Pump Station monitoring location, as well as quarterly secchi disk depth, chlorophyll a measurements and a broad suite of key water quality constituents and parameters, in various locations and at a range of depths within Lake Merced to assess long-term trends of key water quality indicator parameters;

3) long-term monitoring of treatment wetlands efficacy at removal of key water quality constituents; and,

4) short-term Lake Merced diversion event based monitoring conducted during the first year of implementation of Canal diversions to confirm that Lake water quality concentrations have remained within the general ranges previously assessed during and immediately following storm runoff contributions to Lake Merced.

4.2.1 Hydrologic Monitoring

Hydrologic monitoring is necessary to relate water quality dynamics in Lake Merced to hydrological drivers such as rainfall, lake depth, and stormflow contributions. Additionally, hydrologic monitoring provides data critical for assessing whether lake management is achieving success in regards to Goal 1 and supporting objectives 1a and 1b, as detailed in Section 2. Hydrologic monitoring to help assess successful water surface elevation management and long-term trends of Lake Merced water quality include:

- **Water surface elevation (WSE) monitoring.** Water levels should continue to be monitored daily year round in Lake Merced using the existing SFPUC pressure transducers installed at the Lake Merced Pump Station.
- **Meteorology.** Rainfall, wind speed and direction, temperature, and solar radiation should continue to be monitored at the meteorological station installed in 2011 at the North San Mateo County Sanitation District wastewater treatment plant to help confirm estimated relationships between rainfall, runoff, and Canal flows.
- **Total Canal flow.** Total Canal flow should be monitored and quantified to confirm estimated relationships between rainfall, runoff, and Canal flows. Canal flow data would also be needed to provide information for operation of the diversion structure control system, such as the stage-discharge relationship.
- **Canal flow into Lake Merced.** Canal volumes diverted directly into Lake Merced should be monitored and recorded on an event basis.
- **Canal flow through Treatment Wetlands.** Diversions of low volume stormwater runoff and authorized non-stormwater flows passing through the treatment wetlands should be continuously monitored and recorded so that event-based (low-volume stormwater), seasonal, and annual contributions of treated Canal flows to Lake Merced can be quantified.
- **Canal Flow to Pacific Ocean.** Diversions of Canal flow into the Pacific Ocean should be monitored and recorded to quantify the proportion of annual and seasonal Canal flows that do not meet diversion criteria.

- **Lake Merced Overflow to Pacific Ocean.** Outlet structure overflows of Lake Merced water to the Pacific Ocean should be monitored and recorded to quantify annually the volume of Lake water displaced through temporary storage of peak storm flows that aid in flushing the Lake and re-establishing historic hydrologic connection to the Pacific Ocean.
- **Lake Merced Evaporation.** Continue to calculate estimated evaporation from Lake Merced.

4.2.2 Long Term Water Quality Monitoring

Continuous Water Quality Monitoring

Readings of various water quality parameters collected on an hourly basis, as was done for the 2011-2012 dry and wet season Lake Merced monitoring (see Appendix C for more details) should be implemented to capture diurnal and seasonal variations. Continuous monitoring refers to measurements captured by automatically recording water quality data sondes. The frequency of monitoring (such as hourly) is adjustable. Continuous water quality monitoring would include the following key parameters: temperature, pH, and DO. The focus of the 2011-2012 monitoring was on collecting sufficient DO and pH data to document in part, the extent, by depth and seasonal duration, that DO levels were below the Basin Plan water quality objective (WQO) of 5.0 mg/L and above the upper pH WQO of 8.5. Temperature data were used to help track the location of the thermocline, the onset and duration of mixing events, and to calculate DO percent saturation (another Basin Plan WQO). The proposed long-term LMP monitoring would continue that same focus with the intent to provide additional baseline information on the extent and duration of DO and pH conditions based on a longer term historical record to better understand ongoing interannual variability. The long-term monitoring would also provide information to help evaluate the extent to which, if at all, the addition of Canal flows can be shown to significantly improve ambient DO and pH conditions outside the range of normal seasonal and interannual variability.

It is recommended that the initial long-term data sonde deployment be conducted at the historic South Lake Pump Station site (Figure 3), which would ensure long-term water quality data collection is consistent with historic data collection. Continuous monitoring data was previously collected at the SFPUC Pump Station site in South Lake for the 2011-2012 dry and wet season (identified as Station LM-4 in Appendix C). Two sondes would be deployed at the South Lake Pump Station water quality monitoring location; one near the mid-point of the epilimnion and one near the mid-point of the hypolimnion. The intent would be for these locations to capture values approximating the average of the DO and pH conditions at the approximate mid-point of the epilimnion and the hypolimnion. Since the surface elevation of Lake Merced varies as does the location of the thermocline, the sondes would have to be deployed in a way that allows their elevation to change with lake levels (e.g., attached to a float or buoy).

Data from the sondes would be downloaded on a monthly basis to examine for errors related to sensors, to conduct calibrations, and address other issues such as the need for potential depth changes relative to the current locations of the epilimnion and hypolimnion. During each monthly download and maintenance visit, chlorophyll a and Secchi disk readings and a manual depth profile for DO, pH and temperature would be taken to inform the need for depth adjustments (discussed in more detail below).

Grab Sample Water Quality Monitoring

As part of the Lake Merced long-term water quality monitoring under the LMP, SFPUC would continue to conduct approximately quarterly monitoring within Lake Merced for the suite of parameters and at the multiple depths from which they have historically been collected (Appendix B). This long-term dataset (quarterly monitoring has occurred since 1997) provides a reasonable framework from which to identify and track potential changes in trends of constituents of concern (e.g., nutrients) as Lake management actions are implemented and Lake levels increase. Additionally, the continuation and expansion of this monitoring will document the degree to which measured water quality ranges during start-up, projected to occur in 2017 or later, are consistent with the values measured in 2011-2012 which were used for the characterization of baseline conditions, supported project design elements (such as operational criteria), and will be used in the CEQA/NEPA environmental analysis. This investigation would also ensure any new or existing sources of stormwater that are independent of the project that could cause Lake Merced water quality to substantially deviate from baseline conditions are accounted for as part of operational planning, monitoring and analysis, and adaptive management.

However, in addition to the quarterly monitoring conducted by SFPUC, monthly chlorophyll a and Secchi disk readings could more accurately identify trends of increasing frequency of occurrence and magnitude of algal blooms. Therefore, the monitoring frequency at the SFPUC South Lake Pump Station and Pistol Range locations could be increased to monthly for chlorophyll a, Secchi disk depth, and for a depth profile analysis of DO, pH, and temperature. Monthly depth profiles could more accurately track the onset, breakup, and degree of stratification occurring in the Lake. Previous monitoring of Lake water quality and analysis demonstrates the importance of conducting monthly combined chlorophyll a and Secchi disk monitoring. Modeling was conducted by Dr. Alex Horne to estimate changes to annual average Lake nutrient (total inorganic nitrogen) and algal (chlorophyll a) concentrations at various target WSEs with and without the Canal flow first passing through a basic or advanced design treatment wetlands. As shown in **Table 2** (ESA, 2013), after the Lake reaches the target WSE at the end of the filling period and is at steady state, without the proposed treatment wetland, it is estimated that the Lake would see an increase of about 5.9 µg/L algal chlorophyll (19 percent increase). With a base or advanced treatment wetland, there could be a slight decrease in algae of 1.8 to 3.0 µg/L (6 to 10 percent decrease), respectively, as compared to baseline. Final in-lake concentrations of algal chlorophyll could be approximately 27 to 35.9 µg/L, depending on the wetland design versus the current level of approximately 30 µg/L.

This range of changes in chlorophyll is shown graphically in **Figure 4** (ESA, 2013). Figure 4 also shows that there would be no visibly discernible change in Secchi disk depth over the entire predicted range of changes. Dr. Horne noted that an average 32 percent increase in algae is about that which would be analytically detectable from background over a few years. Smaller increases or declines would be obscured by seasonal and other variations. The low predicted changes in chlorophyll would therefore be difficult to detect through Secchi disk depth monitoring.

TABLE 2
ESTIMATED NET EFFECTS ON WINTER, SUMMER, AND YEAR-ROUND TIN AND ON ALGAL CONCENTRATION AT STEADY STATE

TIN (µg N/L)									Algae (µg Chl/L)	
Winter Inflow	Winter Increase	Winter Depth Reduc tion Effect	Winter Net Increase	Summer Net Increase	Summer Depth Reduc-tion Effect	Summer Usable Over Back-ground	Mean Sum Over Back-ground for 5 Blooms	All Year Increase	All Year Net Increase	All Year Value In Lake
No wetland										
158	68	-40	28	74	0	74	15	43	5.9	35.9
Base wetland										
121	31	-40	-9	20	-40	-20	-4	-13	-1.8	28.2
Advanced wetland										
114	24	-40	-16	9	-40	-31	-6	-22	-3.0	27.0

SOURCE: Horne, 2012c

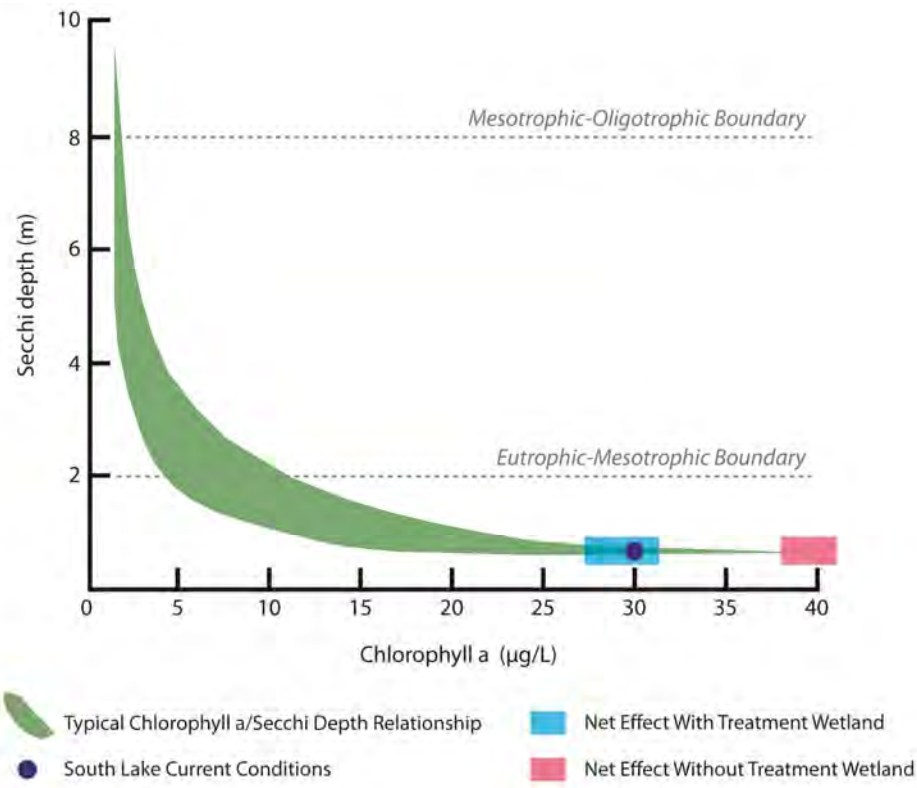

Figure 4
Potential Effects on Chlorophyll A and Secchi Depth

Treatment Wetlands Water Quality Monitoring

To assess the efficacy and performance of the treatment wetlands, samples would be collected to characterize the water quality of flows diverted into the proposed treatment wetlands (influent) as well as flows from the treatment wetlands into Lake Merced (effluent). Monthly samples would be collected for comparison and to assess the efficacy of constituent removal, such as metals, nutrients, and microorganisms, over time as wetland vegetation becomes established, with influent and effluent collected at times offset by the estimated retention time in the wetlands. Representative samples would be collected to assess the treatment wetlands performance when treating 1) Canal wet and dry season baseflows, 2) recirculating Lake water, and 3) stormwater directed to the wetlands. **Table 3** details the preliminary list of water quality constituents targeted for assessment of the treatment wetland performance pending further development of the wetlands design and review and input from the wetlands designers. All samples would be collected using standard accepted field methods and delivered to a commercial lab for analysis of the water quality constituents summarized in Table 3.

TABLE 3
PROPOSED MONITORING PROTOCOL FOR WET WEATHER SEASON
(SAMPLING AND LABORATORY ANALYSIS)

Constituent	South Lake Merced Sampling Frequency	Wetlands Sampling Frequency	Units	Laboratory Test Method	Method Detection Limits	Reporting Limits
Total phosphorus	A target of 3 storm events with 2 samples per event: within 24 hrs of a diversion event and a follow up sample 48-72 hrs following diversions.	Initially monthly influent and effluent for 12 months during differing operational modes; to be reassessed when wetlands design completed	mg/L	EPA 365.1	0.03 mg/L	0.04mg/L
Nitrate as N			mg/L	EPA 300.0	0.019 mg/L	0.1 mg/L
Total Kjeldahl Nitrogen			mg/L	EPA 351.2	0.04 mg/L	0.15 mg/L
Total Ammonia [as N]			mg/L	EPA 350.1	0.05 mg/L	0.05 mg/L
Dissolved Copper			µg/L	E200.8 (filtered)	0.1 µg/L	0.5 µg/L
Total suspended solids			µg/L	SM 2540D	N/A	1 µg/L
E. coli			cfu/ml	SM 9222	1 cfu/ 100 ml	1 cfu/ 100 ml

4.2.3 Short-Term Lake Merced Water Quality Monitoring

During the first year of diversion of Canal flows to Lake Merced, detailed water quality monitoring would be conducted at the background station in South Lake (Lake Merced Pump Station) to assess the change, if any, to conditions in the main Lake water mass potentially attributable to diversion events. Most constituents in Canal flows are associated with particulates (sediments), subject to settling and removal from the water column once entering the Lake. The constructed treatment wetlands system would provide additional particle removal via settling and adsorption onto organic plants and sediments for baseflows and for initial low-level storm flows.

Canal storm flows would be introduced near-shore at the mid-westerly side of Impound Lake typically over a period of a few to several hours. During and following wet season storm events, the Lake is likely to be well mixed, due to the lack of stratification and the presence of storm induced winds. Hydraulically, it is expected that upon entering the Lake, Canal flows would be rapidly dispersed throughout the water column and out into the main water mass of South Lake.

Water quality monitoring in South Lake would be conducted at the Lake Merced Pump Station water quality monitoring location in a manner that generally follows the monitoring plan design described in Daly City's 2011-2012 Wet Season Monitoring Plan (Appendix C), but modified based on the results of the previous monitoring and analysis to target fewer storm events (minimum of three storm events) and key water quality indicator constituents. Sampling would be conducted within 24 hours after the majority of a stormflow diversion event and again 24 to 48 hours after that initial post-diversion sampling. Table 3 details the constituents proposed for wet season water quality characterization of South Lake. All samples would be collected using standard accepted field methods and delivered to a commercial lab for analysis of the constituents listed in Table 3 using NPDES compliant methodologies and detection limits.

4.3 Analysis and Reporting

The monitoring plan would require summarization of monitoring data and submission of annual reports to RWQCB staff. Additionally, as part of adaptive management and long-term trend analysis, a more comprehensive summary and analysis of data would be included in a five-year report. The Daly City, SFPUC, and RWQCB staff would jointly determine how long and/or to what extent routine monitoring and reporting would continue after the initial five-year report. They would also determine compliance assessment procedures to be incorporated into sampling and reporting requirements. Reports would include summary graphs of all quality assured/quality controlled data as well as statistical analyses of the data relative to historic baselines. Reports would assess lake data within the context of the Lake's conceptual and numeric models. The reports would describe any measured trends in beneficial or adverse water quality related changes, such as changes in observed algal blooms/scums, lake aesthetics/odors, and in fisheries habitat quality. The reports would include assessment of the extent to which any such measured changes were attributable to controllable factors, including inputs of Canal flows. Finally, the reports would describe the need for adaptive management measures (discussed under Section 4.4) or BMPs (discussed under Section 5) and would propose a schedule for implementation. The following sections provide details regarding the schedule, content, and framework for detailed analysis and reporting of monitoring data.

4.3.1 Baseline Analysis

Baseline WSE and water quality conditions would be re-established for comparison against the monitoring data and trend analyses compiled for each subsequent annual report following project implementation. Pertinent additional pre-project monitoring data collected since the completion of monitoring and analysis conducted by Daly City (Appendix C) in 2013 would be included to establish re-baseline Lake water quality conditions prior to implementation of diversions.

4.3.2 Annual Reporting

Annual reports summarizing all monitoring data would be prepared and submitted to RWQCB staff for review. Annual data reports would include, at a minimum, the following information:

- Summary of baseline WSE and water quality conditions in Lake Merced against which trends are measured, as established under Baseline Analysis (4.3.1, above);
- Analysis and discussion of WSE and water quality trends as compared to the baseline conditions;
- Hydrologic analysis and discussion to include tables/graphs summarizing monthly dry and wet season flow volumes to Lake Merced directly, to Lake Merced via the constructed treatment wetlands, and to the Pacific Ocean via the Canal and Tunnel and via the Lake Merced overflow structure;
- Water quality analysis and discussion to include tables/graphs summarizing monthly WSE measurements and water quality results for all monitoring locations/depths;
- Summary of project developments potentially affecting WSE or water quality, such as changes to Canal diversion operational protocols;
- Discussion of other watershed factors potentially affecting WSE and water quality, such as groundwater pumping, local development, annual rainfall trends (wet/dry year);
- Preliminary discussion of water quality trends and the potential for available BMPs to address water quality trends attributable to addition of Canal flows or other identified watershed or Lake management factors, as well as additional discussion of other response strategies, such as modifications to operational protocols.

4.3.3 Five-Year Reporting

The fifth annual report would be submitted to the RWQCB staff in the form of a revised LMP. The fifth annual report would focus on analysis, interpretation, and discussion of hydrologic and water quality data collected the five years prior. The objective of the five-year report would be to assess trends in Lake hydrology and water quality within the context of identified beneficial uses and to determine if significant sustained adverse water quality trends attributable to the addition of Canal flows or other Lake management actions are beginning to be observed. This could include trends of increased nuisance conditions (e.g., excessive algal blooms) and/or adverse impacts on fisheries. Declining water quality trends could serve as a potential trigger for additional lake management actions (BMPs) to be implemented, or the need for investigation of any sources of inflow/outflow to the lake that may be affecting water quality.

Along with the components of the annual reports, the five-year report would also include a re-evaluation of Lake Merced WSE and water quality conditions based upon the monitoring data and other applicable information available. The five-year report would be submitted by Daly City and SFPUC to the RWQCB staff for review, and would include, at a minimum, the following information:

- Summary analysis of total contributions to Lake Merced from the Canal along with analysis and discussion of any trends in WSE from the monitoring data within the context of meeting project goals and objectives for lake levels;

- Discussion of any revised estimates of target WSE filling periods as well as maintenance of target WSE as a result of hydrologic monitoring as well as consideration of changes or alterations resulting from operational scenarios, as appropriate;

- Analysis and summary of water quality parameters and constituents monitored during the five year reporting period, including recommendations for any identified changes to the parameters, frequencies, and locations monitored;

- Evaluation of the need to update the modeled predications of the effects of Canal flows on Lake Merced water quality (chlorophyll a, DO, pH, temperature) based on monitoring data collected during the prior five-year reporting period.

- Analysis and discussion of significant trends beginning, such as sustained improvement or declines in Lake Merced water quality over the five-year reporting period as compared against pre-project baseline conditions;

- Recommendations for collection of additional information, such as investigation regarding the quality and quantity of inflow/outflow to the lake to determine if water quality effects are attributable to the Canal, watershed inflow, or other Lake management actions; and,

- If negative trends in water quality attributable to inputs of Canal flows or other Lake management actions are conclusively identified, discussion of operational and watershed management adjustments (such as changes in timing or amount of Canal flow to the lake) or BMPs selected for implementation and description of the associated implementation schedule including a rationale for how BMPs were selected and expected results following implementation.

4.4 Monitoring Plan Adaptive Management

An adaptive management approach to the monitoring plan is incorporated in recognition of the complexity of determining effects to Lake Merced water quality in response to inputs of Canal flows and to management actions undertaken as part of the LMP. Adaptive management provides a practical approach for assessing and responding to uncertainty inherent in complex systems (Eberhard et al., 2009). The cycle of adaptive management refers to the process that typically involves significant review of the experimental design of a monitoring plan and operates over a longer time cycle than annual monitoring and reporting (i.e., 5 to 10 years).

Adaptive management would also allow refinement of and alterations to various operational protocols and would also inform the operation and management of specific project components towards achieving the goals and objectives (Section 2). Adaptive management and evidence based decision making, informed by the results of the monitoring program analysis and reporting, would allow operational protocols to be established and further refined and adjusted over time for the following project components:

- Impound Lake outlet structure: operational protocols for operation of the outlet structure relating to project diversion criteria may be further refined following baseline studies and

final design. Further adjustments to diversion criteria may be made as monitoring analyses provide seasonal and annual hydrologic and water quality trend feedback.

- Recirculation of lake water through treatment wetlands: the location of the skimmer/intake as well as the rate and volume of lake water recirculated to maintain treatment wetlands would be adjusted by monitoring and adaptive management to maximize removal of nuisance algae blooms.

- Siphon and overflow weir: The timing of diversions made to the Canal via the siphon and/or weir as well as hydrologic decisions relating to diversion volumes would be informed by monitoring and adaptive management to improve Lake water quality to the maximum extent practicable and provide temporary storage and management of flood flows.

- Treatment wetlands: alterations/adjustments to wetland hydrologic management and/or treatment wetland vegetation communities would be informed by monitoring and adaptive management to maximize treatment efficacy.

- Monitoring and reporting framework: changes to the monitoring and reporting plan may be made in response to contextual changes within the basin or system, such as anticipated or unanticipated alterations to operational parameters, watershed changes (such as development), changes in available technology, efficacy of system operations, or extreme climatic variation (e.g., extended drought conditions).

Further, as part of each five-year monitoring report, the hydrologic and water quality monitoring program design would be re-assessed in response to feedback on progress towards achieving water quality and WSE goals and objectives. Following such an assessment, alterations to the monitoring network may be made, such as revisions to the number, location, and frequency of monitoring parameters (e.g., additional sondes may be added to existing monitoring locations to cover a wider portion of the water column and additional monitoring stations may be added to cover a wider area of the Lake).

5. BMP Implementation

This section of the LMP provides a description of actions that Daly City is implementing as part of the Municipal Regional Stormwater Permit (MRP), those that SFPUC is implementing as part of their Phase II permit, and BMPs in addition to those required by the permits that could be implemented to further help maintain or improve water quality in the Canal and in the Lake. Daly City and SFPUC developed a preliminary list of 33 potential actions (including BMPs) intended to help improve water quality in South Lake. Dr. Alex Horne provided the evaluation of each action's influence on DO and pH levels. The preliminary list was transmitted to RWQCB staff (May 11, 2012) for review and comment. Based on the comments received, the preliminary list of 33 potential actions was reduced to 24.

These potential actions were screened for compliance with the LMP's goals and objectives (see Section 2.0) and then ranked according to a series of criteria that assessed their feasibility for implementation such as: improvements to water quality (DO, pH), improvements to external and internal nutrient inputs, capital costs, operation and maintenance costs, ease of operation,

potential for stakeholder support, social benefits, and timeline for implementation. In addition to more conventional stormwater/watershed BMPs, several stormwater treatment measures and in-lake treatment measures were also considered. Daly City and SFPUC convened a workshop to discuss the final screening and ranking of the BMPs and treatment measures and produced a final list of nine management actions to include in this LMP. The complete list of actions that were considered is presented in a matrix in Appendix D. The list of BMPs below comprises potential measures that could be implemented.

5.1 Watershed Best Management Practices

5.1.1 Detention and Filtration

Description

This BMP would involve building infrastructure for stormwater filtration, such as bioretention/rain gardens, vegetated filter strips, sand filters, and vegetated swales throughout the Vista Grande Watershed. Such measures may reduce levels of sediment, nutrients, trash, metals, bacteria, oil and grease, organics, and oxygen-demanding substances in source water. Additional infrastructure, such as infiltration basins and trenches would promote infiltration and reduce the volume and rate of runoff in the watershed, as well as reduce levels of sediment, metals, bacteria, and nutrients in stormwater flows.

These measures would have a minor influence on DO and pH by reducing particulate-bound nutrient levels in storm flows that could potentially stimulate additional algal growth.

Most low-impact design (LID) projects in Daly City and San Francisco would be implemented as opportunities arise with redevelopment and infrastructure projects.

Existing Sites

- (Daly City) Serramonte Library Bioswale Demonstration Garden
- (Daly City) Home Depot Vortfilter system in the parking lot
- (Daly City) Monarch Village/Peninsula Del Rey senior care facility treats stormwater flow onsite using a dual-vortex hydrodynamic separator

Potential Sites for Implementation

- (Daly City) Post-construction stormwater management actions for all development projects that disturb 5,000 or more square feet of land
- (Daly City) Potential funding source through Proposition 84 – Clean Water, Parks, and Coastal Protection Bonds
- (Daly City) John Daly Boulevard segment between Mission and De Long Street
- (SFPUC) Lake Merced Watershed Green Infrastructure - Holloway Avenue Green Street would install bioretention bulbouts and planters

Management Action Assessment

Describe projects that were implemented.

5.1.2 Pet Waste Management

Description

Daly City would implement an education program and provide facilities such as compostable clean-up bag stations and trash receptacles to reduce pet wastes within the Canal watershed. This BMP is intended to reduce levels of nutrients, bacteria, and oxygen-demanding substances in source water.

Reduction in levels of oxygen-demanding substances and nutrients present in pet wastes would reduce the potential for stormwater to stimulate algal growth in the lake and degrade DO levels.

Potential Sites for Implementation

Daly City would install compostable clean-up bag stations and trash receptacles in Westlake Park, Westmoor Park, and Marchbank Park. San Francisco would install them around Lake Merced. Daly City would also work with pet food stores, veterinarians, and other pet-related businesses to provide educational materials to pet owners about the impacts of pet waste and how to reduce them.

Management Action Assessment

Describe the educational efforts implemented and how many clean-up bag stations and trash receptacles were installed and where.

5.1.3 Green Infrastructure Education Programs

Description

“Green infrastructure” describes systems and practices that use or mimic natural processes to promote the infiltration, evapotranspiration (the return of water to the atmosphere either through evaporation or by plants), or reuse of stormwater or runoff on the site where it is generated (USEPA, 2014). These include but are not limited to green roofs, trees and tree boxes, rain gardens, vegetated swales, pocket wetlands, infiltration planters, vegetated median strips, reforestation, and protection and enhancement of riparian buffers and floodplains (USEPA, 2007). Green infrastructure education programs could include public workshops, school programs, and curriculum development such as the existing programs described below. This BMP could be combined with the detention and retention BMP. The proposed Vista Grande Drainage Basin Improvement Project is a significant green infrastructure effort that would capture and divert large volumes of stormwater to Lake Merced that would otherwise be “wasted” by continued conveyance to the ocean.

Opportunities for Implementation

Daly City, in partnership with the Bay Area Water Supply and Conservation Agency (BAWSCA), contracts with EarthCapades to present the "H_2O Show" that uses an interactive approach at school assemblies for kindergarten through 6th grade. The show teaches students about how vital water is to sustain life, and explains how water travels from its source to Daly City homes and schools; how to conserve, protect, and respect water; and how to prevent water pollution. EarthCapades has several teams of performers, ensuring that participating schools receive a different show each year. These educational assemblies engage the students and uses comedy, music, juggling, storytelling, and theatrics to teach children about water resources and conservation while using California State Science Standards content to reinforce learning for standardized testing. In 2012, the program conducted 18 performances before 3,758 students.

SFPUC also conducts education programs such as the "Our Water" curriculum for schools. This program is designed to teach 4th to 6th grade students about San Francisco's water resources and the importance of conservation. It is in interdisciplinary unit that supports California State Standards. The program includes classroom presentations, lesson plans, and activity sheets.

Management Action Assessment

Describe the materials developed and distributed through education programs.

5.1.4 Habitat Enhancement

Description

Enhancing the wetland and riparian habitat around the edges of Lake Merced could provide a moderate beneficial effect on DO and pH by assisting with filtration of and uptake of nutrients from direct stormwater runoff to the lake. While SFPUC's Lake Merced Watershed Report (2011) recommends potentially reducing the width of some sections of Lake Merced Boulevard, John Muir Drive, and Skyline Boulevard to incorporate bioswales and open space, the available road area may be limited due to the need to accommodate bicycle lanes.

This BMP could result in a slight localized DO depletion due to respiration by submerged parts of the enhanced growths of vegetation.

Management Action Assessment

The improved aesthetic, habitat creation, and erosion protection aspects of this alternative would offset any potential likely immeasurable localized DO decreases along the shoreline.

5.1.5 Separating Stormwater

Description

The goal of this BMP would be to separate stormwater from SFPUC's combined stormwater and sewer system and "daylight" streams within the historic Lake Merced watershed, restoring a

portion of the lake's historic drainage area. Separating stormwater would have a minor influence on DO and pH by increasing the volume of stormwater runoff to the lake, while having a negligible impact on nutrient concentrations in the lake. Projects may be implemented with major redevelopment and infrastructure projects. The SFPUC's Sewer System Improvement Program (SSIP) is considering some daylighting creek projects, including those that could connect to receiving water such as Lake Merced. However, there are no current plans to implement such plans in the short term.

Potential Sites for Implementation

A non-SSIP potential option for directing stormwater into Lake Merced exists. Parkmerced, a neighborhood of high-rise and garden apartments located east of Lake Merced in San Francisco, currently uses the SFPUC combined stormwater and sewer system. The development's owners plan to create a stormwater conveyance system almost entirely on the surface that would be composed of rain gardens, a stormwater collection pond, swales, and a new stream corridor (Parkmerced, 2011). These facilities would treat stormwater and convey it to the southwest corner of the site, where they would connect to the combined sewer system or use an existing direct connection to Lake Merced. As of April 2012, the developer is studying the possibility of using the connection to the Lake; if this is found to be feasible and constructed, this project would increase runoff volumes into the Lake.

Management Action Assessment

Monitor stormwater flows to Lake Merced for trash, debris, and functional/maintenance issues. Monitor water quality at stormwater outlet(s) to lake to determine nutrient content after traveling through swales and detention ponds.

5.1.6 Reduce Nutrient Sources

Description

This educational effort would target the largest contributors of nutrient sources from regions upland of Lake Merced, which include parks and public agencies that maintain green space where fertilizer and irrigation (which, if not properly managed, can contribute to nutrient-rich runoff) may be used. Some alternative maintenance measures could include the use of woodchips, restriction of lawn fertilizers, and minimization of irrigation runoff through planting (e.g., lawns, shrubs, medians) and inspection and repair of sprinklers contributing to incidental runoff.

This BMP would have a potentially moderate influence on DO and pH by reducing the concentration of nutrients in stormwater runoff that could stimulate algal growth in the lake. This benefit would potentially be more substantial in the summer because warm inflows would float in the photic zone rather than mixing deeper into the lake. However, it is assumed that all of the dry season flows would be conveyed to and treated via the constructed wetlands, thereby significantly reducing the level of nutrients in the Canal baseflow reaching the Lake.

Effective implementation of this BMP would require an inventory of nutrient sources in the watershed to target these sources specifically. It may require coordination of multiple agencies to provide education, implementation, and enforcement, and may require phased implementation. This BMP could be combined with other education-focused BMPs in this report such as the Green Infrastructure Education Programs.

Management Action Assessment

Qualitative description of actions that were implemented by owner/operators of parks and green space to reduce nutrients in runoff.

5.1.7 Catch Basin Screening

Description

A limited pilot program would test the efficacy of installing storm drain catch basin screens at targeted locations in Daly City that would screen out large trash, potentially reducing nutrient levels, which would reduce the potential for stormwater to stimulate additional algal growth in the lake. This program could also reduce the frequency of maintenance and cleaning of the gross solids screening device for particles that are greater than 5 millimeters proposed to be installed at the entrance to the Canal (described in Section 3.2.2).

The Wastewater Collection Division in Daly City has tested a pilot program to keep large pieces of trash out of the ocean by inserting catch basin nets (larger than the 5 mm standard) in an area south of the Basin.

Potential Sites for Implementation

A similar pilot program could be implemented during the dry season around the area of the wastewater plant using the same type of catch basin nets used in the pilot program described above. This would include areas around Westlake Park and the Burger King at the intersection of Daly City Boulevard and Lake Merced Boulevard.

Management Action Assessment

Monitor catch basin screens and record frequency of cleaning and/or volume of debris removed from stormwater upstream of the linear radial screening device to determine benefit to project operation.

5.2 Adaptive Management Actions

5.2.1 Additional Measures

This plan uses a tiered approach for managing stormwater quality and quantity before it enters Lake Merced. As described above, numerous BMPs have been evaluated for their inclusion into this plan. Several actions considered but not described above were dismissed because they were found to be infeasible or to conflict with the project objectives (see Appendix D). Following the

installation of the project components and the implementation of the selected BMPs, water quality would be monitored as described in Section 4. Should there be less improvement in in water quality in the lake attributable to lake management actions than expected, the addition of flows from Canal, additional stormwater quality investigations, stormwater treatment, and in-lake treatment measures could be re-considered for implementation. Additional stormwater source and water quality investigations would include monitoring of stormwater inputs to the lake to determine potential sources of pollutants that could be contributing to significant deviations in water quality trends towards planning and implementing corrective actions, such as adjustments to the timing and input of Canal flow to the lake. Investigations may also suggest that implementation of appropriate BMPs and direct lake management actions may otherwise provide for lake quality benefits.

It is also an option that flows from Canal could be reduced or terminated while any water quality changes was investigated. Additionally, as part of adaptive management, stormwater contributions to the Lake could be utilized directly to dilute lake water and re-establish flows to the Pacific Ocean, as historically occurred (Lake Merced once had an outlet to the Pacific Ocean and therefore was not a terminal lake). As discussed in Section 3.2.1, when feasible, overfilling and thereby flushing the lake with low-alkalinity stormwater could reduce the background pH of the lake by diluting salts in the lake and displacing higher alkalinity water. Such a measure would be implemented through adaptive management of the project provision to temporarily extend the duration of elevated WSE conditions above target maximum.

While the additional BMPs described in Appendix D were initially proposed for inclusion in the LMP, upon further evaluation, it was determined that it is highly improbable that they could be easily implemented successfully; or would conflict with project objectives. These measures are included in Appendix D and could be revisited (with the exception of those that do not meet project objectives) depending on the specific condition in the lake if the situation requires. Of those measures, aeration mixing is an action that has been implemented in other, generally more eutrophic and deeper lakes than Lake Merced. It was generally viewed as a method-of-last-resort, if deemed necessary to increase bottom layer dissolved oxygen concentrations during periods of stratification, but with the potential for unintended consequences to the Lake's functions and aquatic health.

5.2.2 Aeration Mixing

Description

Consistent with SFPUC and Regional Board discussions of December 2011, because aeration mixing is not typically conducted in lakes similar to Lake Merced water quality benefits are not proven and aeration mixing may have unintended consequences, and so aeration mixing is not included as a BMP to be implemented as part of the proposed project. However, SFPUC is separately implementing a demonstration aeration mixing project to evaluate potential benefits to the lake. The demonstration system is further discussed below.

If used, aeration mixing would be achieved by installing a bubbler device near the lake bottom to create a mixing force that causes circulation of lake waters so the lower layer of low-DO water is mixed with upper waters with higher DO concentration to reduce or eliminate anoxic conditions. Oxygen produced by photosynthesis during the day at the surface would be mixed with uprising lower DO water and circulated though most of the lake volume. The system would likely be operated to provide complete top-to-bottom mixing throughout the potentially stratified period. Circulation could potentially also create conditions that allow for enhanced growth of non-blue green phytoplankton, thereby creating a potentially more sustaining food web for fisheries.

It is expected that aeration mixing in and of itself would have a minor direct influence on DO and pH, but a moderate to major indirect effect due to the transport of higher surface DO (due to algal photosynthesis and atmospheric reaeration) to the lower waters. There is also a potential to reduce algae-related pH levels by reducing algae exposure to sunlight (which would reduce algal production). To the extent that mixing allowed for a greater oxidized layer to be maintained at the surface of the sediments, there could be a potential reduction in the amount of internal nutrient loading from the sediments. While it is not likely that aeration mixing in Lake Merced would alter chlorophyll concentrations, it would potentially increase water clarity (Secchi depth) since the algae would be spread over a greater depth rather than being concentrated floating at the Lake surface. However, due to the high alkalinity and thus high background pH of the lake, the effect on pH would be limited.

Because algae are responsible for producing DO, on rare occasions when algae growth is inhibited too much, aeration can lead to anoxic periods that may result in fish kills to some species. Aeration mixing would disrupt lake stratification, resulting in a reduction in the volume of colder hypolimnion habitat that helps supports an existing recreational trout fishery. Conversely, there would be an increase in DO levels in the hypolimnion. As described in the fisheries section of the WQA, the warm water and cold water species have different preferences for and tolerances of mutually occurring DO and temperature conditions in the lake strata.

Aeration mixing would require the installation and long-term maintenance of new infrastructure in the lake (air lines and bubble diffusers), and an air compressor(s) on shore. There are multiple possible aeration mixing system designs. Two possible options for South Lake Merced based on information from Alex Horne are presented below.

> **Option # 1.** Install a diffuser array in deeper water only, with diffusers located approximately 1 foot above the lake bottom and set at about 200-300 feet intervals in water greater than 15 feet deep. This could result in aeration mixing of most of the lake. In shallow edge water, the effect would likely be minimal unless water is within 150 feet of a diffuser head. Installation of diffusers in areas greater than 15 feet deep would likely include a relatively small, but well-used part of Lake Merced. Air could be supplied from a compressor shed with sound baffling located on shoreline via self-sinking hoses connected to each diffuser. No change in total chlorophyll would expected; however, edge scums should be reduced, depending on location of diffusers.
>
> **Option # 2.** In addition to the deep water array described under Option 1, an additional array of diffusers would be installed in shallow water between approximately 5 feet and 15 feet deep, with diffuser heads set at about 70-130 feet intervals. The shallow array would

likely break up blue-green algae scums and replace them with smaller algae which may or may not be blue-green. No change in total chlorophyll a would be expected, but water clarity would improve with edge scums greatly reduced. Longer runs of aeration pipes with regulators would be required for each diffuser. A larger compressor shed with more compressors would be required.

SFPUC Demonstration Aeration Mixing System

Consistent with the February 2015 meeting with the RWQCB, the SFPUC is in initial planning to implement a demonstration aeration mixing system in the south portion of Lake Merced's South Lake. The purpose of this demonstration would be to evaluate potential benefits as well as any unanticipated negative effects of aeration mixing for Lake Merced.

Following required environmental review and installation of the demonstration project, the SFPUC will evaluate pertinent water quality parameters to determine whether aeration mixing would produce an overall improvement to key water quality parameters without causing unanticipated negative impacts to the Lake.

The results of post-installation monitoring and data review will be shared with the RWQCB staff. Based on these findings the SFPUC will be prepared to implement a full-scale aeration mixing system for Lake Merced's South Lake, if deemed necessary to increase bottom layer dissolved oxygen concentrations during periods of stratification and assuming the results from the demonstration program indicate measurable benefits in key water quality parameters.

5.2.3 Management Action Assessment and Adaptation

As described in Sections 4.3.2 and 4.3.3, lake management actions (BMPs) would be implemented if monitoring and analysis of lake hydrology and water quality identifies significant deviations in expected water quality trends attributable to addition of Canal flows or other lake management actions. Water quality trends could include less water quality improvement than predicted, or trends of increased nuisance conditions (e.g., excessive algal blooms) that can be addressed primarily though adjustment of the operational protocols (e.g., amount and timing of diversions). If the addition of BMPs would provide additional benefits and are implemented, an assessment and adaptation program would be implemented to track their effectiveness. The ambient water quality would be monitored and assessed on an annual basis, the BMPs that were implemented would be tracked alongside the results of the water quality monitoring and analysis. The BMP management action assessment and adaptation program would help identify the effectiveness of a given BMP. Assessment would consist of an adaptive management plan that would track a list of actions taken to improve water quality and document whether water quality was maintained or improved. To the extent practicable, this assessment would be linked to the water quality monitoring and reporting program described in Section 4.

6. References

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APPENDIX A

RWQCB Consultation History

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

May 9, 2013
CIWQS Place ID 766747

Sent via electronic mail: No hard copy to follow

City of Daly City
333 90th Street
Daly City, CA 94015-1895
Attn.: Ms. Patricia Martel
Email: pmartel@dalycity.org

Subject: Concurrence with Proposed Regulatory Process for Vista Grande Drainage Basin Improvement Project, Lake Merced Alternative

Dear Ms. Martel:

We have reviewed the letter dated March 12, 2013, summarizing the proposed regulatory process for the Vista Grande Drainage Basin Improvement Project, Lake Merced Alternative (Regulatory Process Letter). In general, we concur with the regulatory process as proposed by the City of Daly City. However, we are providing clarifications to the Regulatory Process Letter to help improve the City's understanding of the process and our expected outcomes from the process.

Lake Management Plan

On page 2 of the Regulatory Process Letter, the text indicates that the Lake Management Plan (LMP) would specify best management practices (BMPs) to maintain and where feasible, improve the water quality of Lake Merced. We suggest "where feasible," be deleted from the objective in the LMP. Our expected outcome from implementation of the LMP is for the water quality of Lake Merced to improve. Although we agree that technical and logistical feasibility as well as cost considerations will need to be evaluated during the BMP selection process, our expectation is that implementing the LMP would improve the water quality of Lake Merced.

Basin Plan Amendment

On page 4 of the Regulatory Process Letter, the text indicates that we could recommend to the U.S. Environmental Protection Agency (USEPA) that Lake Merced be taken off the 303(d) list of impaired water bodies after (1) the LMP is implemented via an operational agreement between the City and the San Francisco Public Utilities Commission and (2) the Regional Water Board adopts site-specific dissolved oxygen and pH implementation provisions via a Basin Plan amendment. Although we agree with this approach, please note that any Basin Plan amendment would need to be approved by the State Water Board, the State Office of Administrative Law, and USEPA before we could recommend delisting Lake Merced. We would also need adequate

evidence that Lake Merced water quality complies with the site-specific dissolved oxygen and pH implementation provisions.

Closing

If you have any questions, please contact Xavier Fernandez of my staff at (510) 622-5685 or by e-mail at xafernandez@waterboards.ca.gov.

Sincerely,

Digitally signed by Bruce H. Wolfe
Date: 2013.05.09 10:58:49 -07'00'

Bruce H. Wolfe
Executive Officer

cc: SFPUC, Steve Ritchie, SRitchie@sfwater.org
ESA, Josh Ferris, JFerris@esassoc.com
ESA, Alisa Moore, AMoore@esassoc.com

CITY OF DALY CITY

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March 12, 2013

San Francisco Bay Regional Water Quality Control Board
Mr. Bruce H. Wolfe, Executive Officer
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Draft - Proposed Regulatory Process for the Vista Grande Drainage Basin Improvement Project

Dear Mr. Wolfe,

I appreciate the time and attention that you and your staff have committed to the preliminary review of the Vista Grande Drainage Basin Improvement Project. This project is critical to resolving ongoing flooding issues in Daly City and provides an important means to improve the use, enjoyment, and health of Lake Merced. Daly City has worked closely with the San Francisco Public Utilities Commission (SFPUC), other stakeholders, and Regional Water Quality Control Board (RWQCB) staff in developing the Lake Merced Alternative, which if approved, would divert selected storm flows from the Vista Grande Canal to Lake Merced, reconnecting a significant portion of the lake's original recharge area and thereby providing a reliable water supply to raise and maintain lake levels.

Daly City is committed to developing the Lake Merced Alternative and, if approved, operating it in a manner that protects the water quality and beneficial uses of Lake Merced. Daly City and the SFPUC expect that implementation of the project, in conjunction with the proposed Lake Management Plan, would improve the health of Lake Merced over time. To ensure the attainment of dissolved oxygen (DO) and pH standards, the RWQCB, Daly City, and SFPUC have agreed that site-specific implementation provisions should be developed to address the lake's unique conditions. This letter summarizes the regulatory approach that has been developed by the three parties, and requests that the RWQCB staff provide their written concurrence with this approach as part of the overall project review and approval process.

PROJECT DESCRIPTION

The Vista Grande Drainage Basin Improvement Project is being proposed by the City to pro-actively address instances of storm-related flooding in the Vista Grande Watershed Drainage Basin while providing the benefit of restoring the Lake Merced water surface elevation to desired levels. This approach builds upon the City's previous determination to focus on downstream improvements within the Vista Grande Watershed in advance of upstream projects within the basin. Of seventeen alternatives analyzed, the City has identified the

Lake Merced Alternative as its preferred alternative/proposed action, and will complete an environmental impact report (EIR) to evaluate the potential environmental impacts of the project prior to consideration for approval.

The project would consist of the following:

- Partial replacement of the existing Vista Grande Canal to incorporate a gross solid screening device, a treatment wetland, and diversion and discharge structures to route selected stormwater (and authorized non-storm water) flows from the Vista Grande Canal to South Lake Merced;
- Replacement of the existing Vista Grande Tunnel to expand its capacity; and
- Replacement of the existing outfall structure at Fort Funston.

Please refer to the project description provided as **Attachment A** for a detailed description of the project. Daly City released a Notice of Preparation for the EIR in February 2013.

TWO-PART REGULATORY APPROACH OVERVIEW

Daly City, SFPUC, and the RWQCB have developed a two-part approach to address the 303(d) listing of Lake Merced. The first part is the development and implementation of a Lake Management Plan (LMP). The LMP would define the applicable best management practices (BMPs) that would be implemented to maintain and where feasible, improve water quality conditions in Lake Merced. However, with these BMPs alone, the existing water quality objectives may not always be met throughout the water column during seasonally stratified conditions that independently exist. Accordingly, new site-specific implementation provisions for the existing DO and pH water quality objectives (WQO) are proposed to be developed to address the unique conditions of Lake Merced.

Part 1 - Lake Management Plan

The City and SFPUC have agreed to develop and propose for approval a LMP that would maintain and, where feasible, improve the water quality of Lake Merced. The LMP will include goals and objectives, an operational plan for the proposed Vista Grande diversions, a water quality monitoring plan, evaluation of BMPs, and an implementation and adaptive management plan. The LMP will be developed in consultation with the RWQCB. The LMP will include pre- and post-project in-lake and Vista Grande Canal monitoring, and an adaptive management process regarding future monitoring and BMP implementation. Annual monitoring and management reporting to the RWQCB will be provided independently and separately from annual reporting provided in compliance with the Municipal Regional Stormwater NPDES Permit (MRP). The LMP, if approved by Daly City and the SFPUC, would be implemented pursuant to a legally binding operational agreement between Daly City and the SFPUC. The agreement would contain provisions requiring RWQCB notification and approval of specified changes to the LMP. A draft of these provisions will be provided to the RWQCB for review prior to finalizing the operational agreement.

The Draft LMP will be developed in the first half of 2013. Please refer to **Attachment B**, which provides an outline of the LMP.

Part 2 – Basin Plan Amendment

As the second part of the regulatory approach, the Basin Plan will be amended to incorporate site-specific implementation provisions for the DO and pH objectives. This is consistent with Basin Plan guidance (p. 3-2),

which states "*Compliance with water quality objectives may be prohibitively expensive or technically impossible in some cases. The Regional Board will consider modification of specific water quality objectives as long the discharger can demonstrate that the alternate objective will protect existing beneficial uses, is scientifically defensible, and is consistent with the state Antidegradation Policy. This exception clause properly indicates that the Regional Board will conservatively compare benefits and costs in these cases because of the difficulty in quantifying beneficial uses.*"

The unique conditions of Lake Merced that necessitate site-specific DO and pH implementation provisions include the following:

Polymictic. It is normal for deeper lakes and reservoirs to stratify in the summer, remain stratified until the fall turnover, and then remain mixed until the next summer stratification. During stratification, DO concentrations decrease in the lower unmixed layer (hypolimnion) due to the absence of aeration from the surface and from the oxygen demand by organic material decay in the sediments. Lake Merced also stratifies between late spring and early fall but is shallow enough for winds to periodically mix the lake (polymictic) from top to bottom for short periods of time before the stratification is re-established. These periodic mixing events are not sufficient to significantly increase the low dissolved oxygen levels (< 5 mg/L) that can be present within the hypolimnion during this seasonal stratification.

Terminal lake. Lake Merced was once a seasonal lagoon, but in the late 1800s, was developed into a reservoir to serve as a public water supply, and drainage from the increasingly urban watershed was diverted from the lake to the Pacific Ocean. The only outlet is an overflow to the Vista Grande Canal at a water surface elevation that has not been exceeded since the 1940s. Because the lake is not flushed with storm flows from the watershed, minerals have built up over time, increasing the alkalinity of the lake and thereby increasing the ambient baseline pH levels above those of typical lakes in the region. Therefore, normal diurnal pH increases due to algal photosynthesis in the upper photic zone can cause pH levels to increase above 8.5 solely due to the elevated alkalinity in this terminal lake.

Marine coastal influence. Lake Merced has relatively low temperatures for a lake of moderate depth at this latitude. This is due to the lake's close proximity to the Pacific Ocean. Prevailing winds bring cool air off the ocean as well as fog that blocks solar radiation, keeping the lake cooler than similar inland lakes.

Artificially maintained coldwater fishery. Lake Merced does not contain suitable spawning habitat nor is it connected to streams that provide suitable spawning habitat; therefore, it does not and cannot support a self-sustaining population of trout. However, the California Department of Fish and Wildlife (CDFW) has stocked the lake with rainbow trout for many decades in support of a popular put-and-take recreational fishery. The current DO and pH conditions in Lake Merced do not appear to be adversely affecting CDFW's ongoing stocking program.

Self-sustaining warmwater recreational fishery. Lake Merced maintains self-sustaining populations of native and non-native warm water fish species, including largemouth bass, carp, and catfish, which

are targeted by anglers. The current DO and pH conditions in Lake Merced do not appear to be adversely affecting warm water habitat.

Emergency non potable water supply for San Francisco. The SFPUC has designated Lake Merced as an emergency non-potable water supply for the City of San Francisco to be used for firefighting or sanitation purposes if no other sources of water are available. Given that the Lake is designated as a potential water supply, SFPUC prohibits body contact recreation (e.g., swimming, wading) in the Lake.

The State's Impaired Waters Policy also recognizes that water quality standards may be inappropriately applied, making attainment impossible. In such cases, the Policy identifies that revision of the standards may be the best or only way to address the impairment. Daly City, SFPUC, and RWQCB have come to consensus that although implementation of the Lake Management Plan is expected to improve water quality, it will not independently resolve the impairment. Therefore, site-specific implementation provisions are required to make attainment of DO and pH objectives possible.

The findings made by the U.S. Environmental Protection Agency (USEPA) in its 2003 listing of Lake Merced for DO and pH impairment highlight the need to amend the water quality objectives (WQOs) for DO and pH, and/or establish a manner in which compliance with those WQOs is assessed to reflect site-specific conditions. In its findings, USEPA established "a low priority for this listing based on the considerations that *no specific beneficial use impairments have been associated with DO and pH problems in the Lake*, and that additional monitoring is warranted to verify these listings prior to developing TMDLs." USEPA concluded that *"absent Basin Plan language to the contrary, these standards apply at all water depths"* (*emphasis added*).

The proposed two-part regulatory approach is supported by the State Water Board's TMDL Guidance and the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (Resolution No. 2005-0050). This policy established that RWQCBs can formally recognize regulatory or non-regulatory actions of other entities as appropriate implementation programs that will result in the attainment of standards. The LMP, which if approved would be implemented by Daly City and SFPUC via an enforceable operational agreement, would serve as the appropriate implementation program, in combination with the site-specific implementation provisions modification.

An annotated version of the Regulatory Decision Tree (**Attachment C**) from the State's Impaired Waters Policy graphically shows how the two-part regulatory process would proceed. If and when both the LMP becomes effective via the operational agreement and the site-specific DO and pH implementation provisions are adopted via a Basin Plan Amendment, the RWQCB could proceed with recommending to USEPA the delisting of Lake Merced (green arrow labeled Future Goal). Depending on the timing of the listing cycle, it could take several years for a delisting request to be approved. There may also be modifications needed to the SWB 2004 Listing Policy to accommodate the proposed DO and pH implementation provisions. If so, the RWQCB could potentially request that USEPA move Lake Merced to 303(d) Category 4b or 4c, clarifying that a TMDL is not required, while 303(d) list timing and/or Policy language issues are resolved to allow for full delisting.

Daly City, SFPUC, and RWQCB staff have agreed that the scope of the standards action will be to adopt site-specific objective implementation provisions for Lake Merced within the Basin Plan specifying how the existing DO and pH numerical objectives would be implemented and evaluated for 303(d) water quality assessment purposes. The State of Colorado has adopted standards and methodologies specific to lakes and reservoirs that take stratification into account. Colorado's approach to DO and pH assessment (summarized below) provides an example that can be applied as a starting point template and modified as necessary to reflect the site-specific conditions unique to Lake Merced:

> Dissolved Oxygen Assessment. Assessment of dissolved oxygen within a profile of a lake or reservoir is accomplished by comparing the average of the measurements within the upper portion of the lake to the applicable standard. For lakes over 5 meters deep (such as Lake Merced), the upper portion is assessed as the average of all measurements from 0.5 meters to 2.0 meters. The lower portion of a lake is assessed by averaging the measurements from 1-3 meters above the bottom of the lake. In the lower portion of a lake, dissolved oxygen may be less than the applicable standard except where a site-specific standard has been adopted, or where adequate refuge is necessary for assessment of the temperature standard. Colorado's assessment methodology also provides for fall turnover of lakes and reservoirs, when seasonal stratification breaks down and low-DO water from the bottom of the lake rises and for a short period of time mixes with and lowers the DO of surface waters.
>
> pH Assessment. Assessment of the pH standard for a lake is accomplished by calculating the pH from the upper and lower portions of the lake. The 15th and 85th percentiles of the sample values from each portion are then compared to the minimum and maximum pH standard for the determination of attainment. Discrete samples from the upper and lower portions are evaluated separately because they represent different habitat regions in a stratified lake. When variations in pH are driven largely by biological processes within a lake, the risks of exceedance are generally associated with high pH in the upper portion (due to high rates of algal productivity) and low pH in the lower portion (due to high rates of decomposition).

A similar assessment methodology will be adapted for Lake Merced to address site-specific conditions. We do not propose changing the numeric DO and pH objectives presented in Chapter 3 of the Basin Plan, only how or where these standards are applied to Lake Merced. At the RWQCB's discretion, a footnote or other language may be added to the appropriate section(s) of Chapter 3 pointing to the Lake Merced Site-Specific Implementation Provisions language that would be added to the Chapter 4 Implementation Plan and/or Chapter 7 Water Quality Attainment Strategies Including TMDLs.

A draft scope and schedule for the Basin Plan Amendment process is provided as **Attachment D**. The scope and schedule is intended to assist in estimating the level of effort and duration of the Basin Plan Amendment process. Daly City will provide technical support to the RWQCB throughout the process. Daly City will also work with RWQCB to address its administrative costs to adequately staff this effort.

PROJECT PLANNING COORDINATION

The development of the LMP and Basin Plan Amendment will require consideration of, and coordination with, the following planning activities.

CEQA review

Daly City will begin preparation of an EIR to address the Vista Grande Project in early 2013. This EIR will also address the implementation of the LMP. Daly City understands that RWQCB will need to comply with the California Environmental Quality Act (CEQA) to address the means of compliance and environmental consequences of the Basin Plan Amendment. Daly City will work with RWQCB to ensure that the scope of the environmental analysis addresses the CEQA-equivalent requirements relative to the RWQCB's approval of the proposed Basin Plan Amendment to the extent practicable. As provided by CEQA, no approvals of the LMP, the Basin Plan Amendment, the operational agreement, and other discretionary projects decisions will be made prior to completion of the environmental analysis process.

Coverage under the Municipal Regional Permit

RWQCB staff has indicated that the proposed diversions of stormwater from the Vista Grande Canal to Lake Merced are covered under the existing MRP. Daly City understands that no additional NPDES permits are needed for operation of the proposed project. The City understands that additional discussion will need to be conducted with RWQCB and MRP co-permittees as the project progresses to determine the need, if any, to more specifically address the project via modifications to the MRP during the scheduled 2014 MRP reissuance process. Daly City will apply for and obtain a Clean Water Act Section 404 Permit from the US Army Corps of Engineers and associated Section 401 Water Quality Certification from RWQCB for the construction of the proposed facilities.

Operational Agreement

Upon completion of the CEQA process, Daly City and SFPUC will consider the approval of a legally binding operational agreement to address development of permanent Daly City facilities on CCSF lands, operation of the project, stormwater diversion threshold criteria, wetlands flow management, lake level management, and implementation of the LMP. The agreement would include commitments and conditions describing how the treatment wetlands would be constructed and managed to comply with RWQCB Resolution No. 94-102 *"Policy on the Use of Constructed Wetlands for Urban Runoff Pollution Control."* The agreement would contain provisions requiring RWQCB notification of specified changes to the LMP. Daly City and SFPUC are currently working on an outline of the operational agreement, and will provide it to the RWQCB for review.

Timeline of Permits and Approvals

Daly City anticipates completing the CEQA process for the proposed project in mid-2014, assuming the full cooperation of state and federal agencies. During completion of the CEQA process, Daly City will begin to obtain all necessary permits and approvals for the project, including the Section 401 Water Quality Certification required from the RWQCB. The Section 401 Water Quality Certification is the only permit/approval believed to be necessary from RWQCB to allow construction and operation of the proposed facilities. The Basin Plan Amendment would require approval by the RWQCB followed by approval by the State Water Resources Control Board, Office of Administrative Law, and USEPA. Please refer to the draft scope and schedule provided in Attachment D for additional details on the sequence of major activities.

CONCLUSION

Daly City respectfully requests the RWQCB staff's written concurrence with the regulatory process as outlined above as the initial step in the overall project approval process. The City understands that the

RWQCB will be providing comments and/or conditions on the project as part of the 401 Certification and CEQA processes. Following completion of the 401 Certification and CEQA processes, the City may request a second letter from RWQCB staff indicating approval of the project conditioned on compliance with the terms and conditions contained in the LMP, operational agreement, 401 certification, and CEQA monitoring and mitigations.

Sincerely,

Patricia E. Martel
City Manager

L13-039

cc: Steve Ritchie, SFPUC

PROJECT DESCRIPTION

Daly City Vista Grande Drainage Basin Improvement Project

Introduction

The City of Daly City (City) is proposing the Vista Grande Drainage Basin Improvements project to address storm related flooding in the Vista Grande Watershed Drainage Basin while providing the benefit of restoring the level of Lake Merced. The Vista Grande stormwater system drains the northwestern portion of the City and an unincorporated portion of San Mateo County – areas originally within the watershed of Lake Merced. In the 1890s, the Vista Grande Canal and Tunnel were built to divert stormwater away from the lake to an outfall at the Pacific Ocean, below what is now Fort Funston. The existing canal and tunnel do not have adequate hydraulic capacity to convey peak storm flows, and during storm events, flooding periodically occurs in adjacent low lying residential areas and along John Muir Drive. The proposed project would alleviate flooding and protect the ocean outfall from ongoing coastal erosion while reconnecting a significant portion of the Lake Merced Watershed.

Background

The City evaluated seventeen alternatives for managing stormwater in the Vista Grande Drainage Basin. The alternatives included various combinations of facilities including different tunnel alignments and capacities, storm water detention structures and groundwater recharge facilities. Alternatives were evaluated based on their potential for reducing flooding, operational viability, public impacts, environmental benefits and constructability. The Lake Merced Alternative emerged as the preferred alternative, based on its "green infrastructure" approach of using stormwater to restore the level of Lake Merced, which declined in the late-80s and early-90s and has not fully recovered. The City has worked closely with the San Francisco Public Utilities Commission (SFPUC) and the San Francisco Bay Regional Water Quality Control Board (RWQCB) in the development of this project. The City intends to prepare an Environmental Impact Report (EIR) for the proposed project in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The Lake Merced Alternative, described below, will be considered the proposed project in the EIR. Other alternatives will be evaluated as required by CEQA and NEPA.

Project Location

The Vista Grande watershed area is located in the city of Daly City and unincorporated Broadmoor Village, in northwestern San Mateo County. This watershed is approximately 2.5 square miles in area and is bordered by San Francisco County to the north, Colma Creek watershed to the south and east, and the Pacific Ocean on the west. The watershed is drained

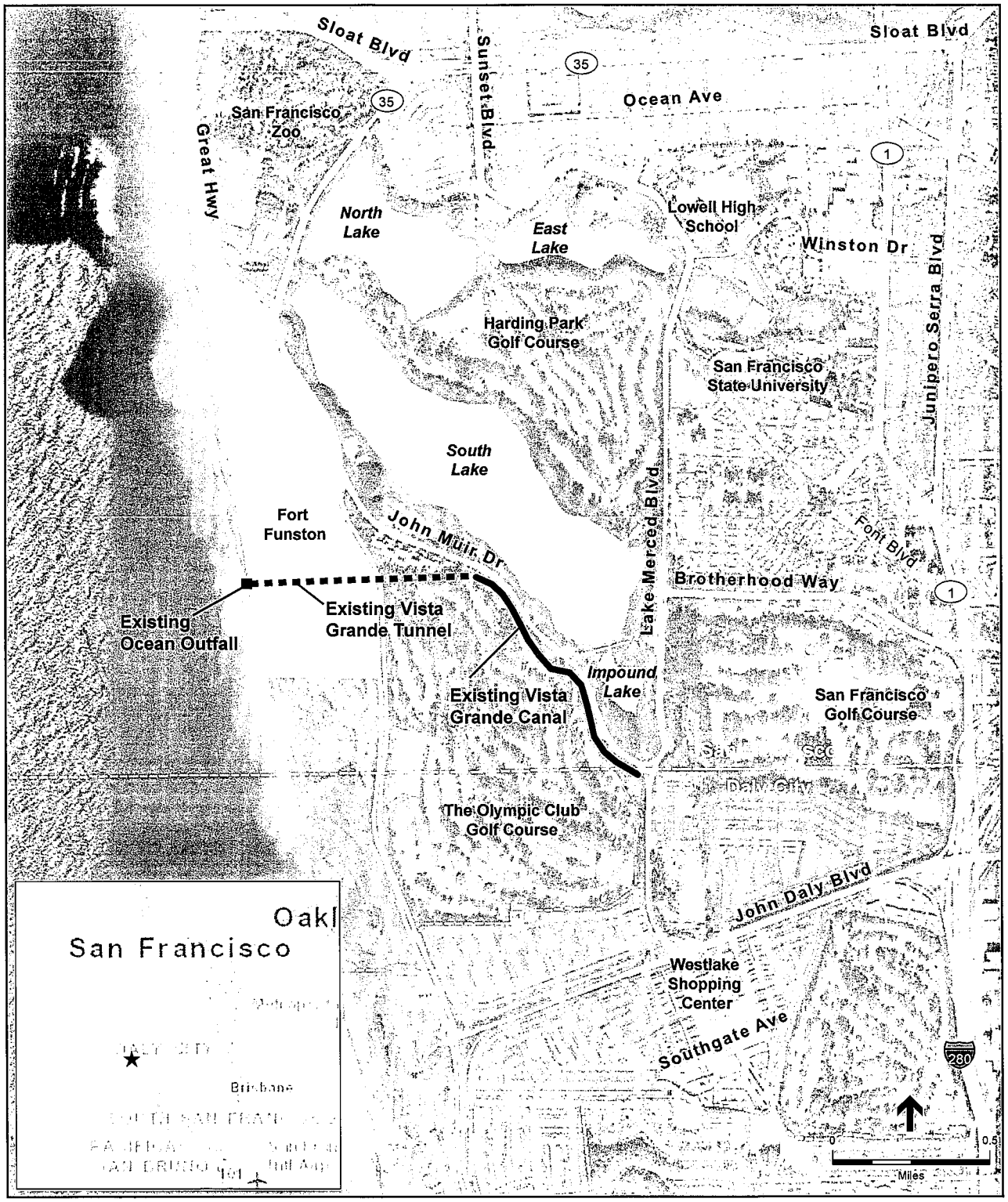
through the Vista Grande Canal and Tunnel which are located in the City and County of San Francisco, adjacent to John Muir Drive and the southwestern shoreline of Lake Merced. The tunnel outfall is located at the Pacific Ocean at Fort Funston, which is managed by the National Park Service (NPS) as part of the Golden Gate National Recreation Area (GGNRA). The Project location is shown in **Figure 1**.

Project Objectives

The City has identified the following objectives for the proposed project:

Flood Protection	• Improve the lower Vista Grande Drainage Basin to safely route stormwater to reduce public hazard and minimize property damage, business interruption and public inconvenience • Reduce the number of uncontrolled overflows from the Vista Grande canal into Lake Merced
Water Resource Management	• Implement stormwater best management practices to facilitate the beneficial re-use of stormwater • Provide a sustainable source of stormwater to facilitate the management of the Lake Merced water surface elevation • Increase groundwater recharge • Protect and, where feasible, improve South Lake Merced water quality • Manage Lake Merced overflow capacity to minimize environmental and property damage associated with large storms and high lake levels
Environmental	• Improve the recreation access along the beach below Fort Funston • Reduce litter transfer and deposition on the beach below Fort Funston • Reduce the project footprint and minimize construction-related disruptions of surrounding recreational uses and vehicle and pedestrian traffic by maximizing use of existing rights-of-way, easements, and infrastructure • Provide environmental benefits by providing, among other benefits, water quality treatment and wildlife habitat • Accommodate sea level rise and coastal erosion • Improve the aesthetic, educational and recreational benefits of stormwater facilities
Economic	• Protect residential property values by improving flood protection • Reduce construction cost, time, and materials by maximizing use of existing rights-of-way, easements, and infrastructure alignments • Reduce stormwater management life-cycle costs (capital, operating and maintenance) • Reduce waste water effluent management life-cycle costs (capital, operating and maintenance) • Reduce coastal litter cleanup and disposal costs • Minimize property damage and business interruption by improving flood protection

Attachment A



SOURCE:

Vista Grande Drainage Basin Improvement Project. 207036.01

Figure 1

Project Location

Proposed Project Components

The project would consist of the following:

- Improvements within the Vista Grande watershed collection system upstream of the Vista Grande Canal;
- Partial replacement of the existing Vista Grande Canal to incorporate a gross solid screening device, a treatment wetland, and diversion and discharge structures to route some stormwater (and authorized non-storm water) flows from the Vista Grande Canal to South Lake Merced;
- Replacement of the existing Vista Grande Tunnel to expand its capacity; and
- Replacement of the existing outfall structure at Fort Funston.

These components are described below, and locations are shown in **Figure 2.**

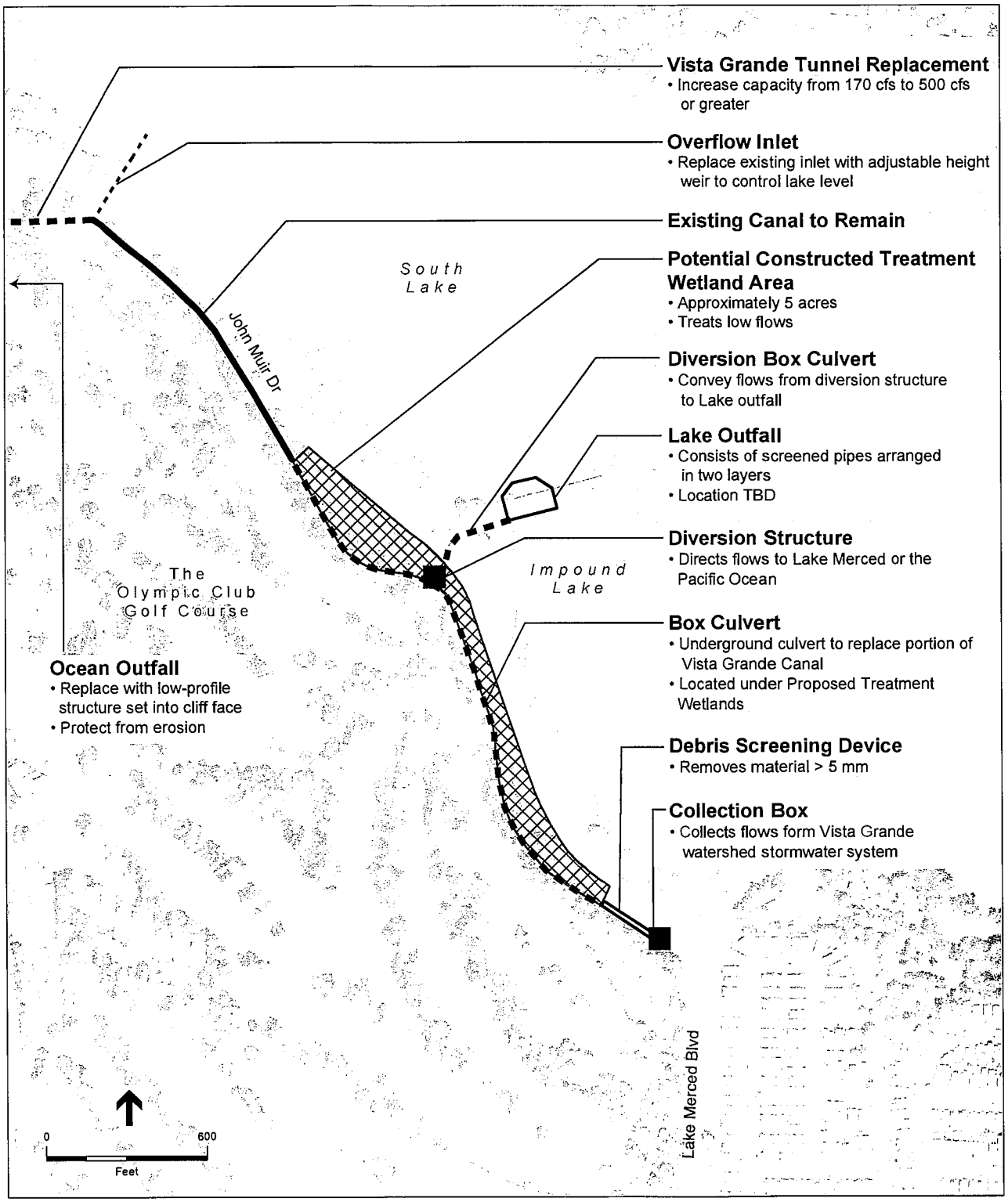
Vista Grande Canal Improvements and Diversion to Lake Merced

The existing Vista Grande Canal is a 3,600-foot-long brick-lined trapezoidal channel with a flow capacity of 500 cubic feet per second (cfs). Under the proposed project, a portion of the canal would be replaced with several new facilities to improve storm water quality and conveyance capacity. A collection box, debris screening device, box culvert, and diversion structure would replace the upstream portion of the canal. A treatment wetland would be developed over the box culvert in an area between John Muir Drive and the southern edge of the canal. From the diversion structure, a box culvert would be developed under John Muir Drive and a screened outfall structure constructed at the edge of South Lake. These components are described below.

Collection Box and Debris Screening Device

A collection box would replace the headworks of the existing Vista Grande Canal to collect flows from the contributing storm drains. An approximately 275-foot long linear radial debris screening device would be installed downstream of the collection box. Stormwater would enter the box culvert structure through several cylindrical casings and exit through louvers perforated in the casings, trapping all debris greater than 5 mm within the casings. Debris would be removed from the well casings with vacuum trucks on a scheduled basis.

Attachment A



SOURCE: ESA

Vista Grande Drainage Basin Improvement Project. 207036.01

Figure 2
Project Components

Box Culvert

Directly downstream of the debris screening structure, a reinforced concrete box culvert would replace approximately 1,500 feet of the existing canal. The proposed box culvert would run underneath the proposed treatment wetland described below.

Constructed Treatment Wetland

A constructed treatment wetland would be developed along John Muir Drive, a portion of which would overly the box culvert. The wetland would treat low flows from the watershed (also referred to as base flows), which consist of authorized non-stormwater flows (such as irrigation runoff that are present in the canal all year). The water would be pumped from the box culvert to the wetland. Water would flow via gravity through a cascading series of hydraulically connected cells. Portions of each cell would be planted with emergent reeds such as cattails or bulrush, which would provide water quality improvement by intercepting and settling out suspended particulates and providing attachment surfaces for beneficial bacteria. Open-water portions of each cell would allow wind mixing of the water column and would provide habitat for mosquitofish to reduce mosquito breeding in the wetlands. After passing through the wetland, the treated water would flow by gravity through the diversion structure to the outfall at South Lake. During periods of very low or no flow, a recirculating pump would draw water from South Lake and replenish the wetland.

Diversion Structure

A semi-automated hydraulic diversion structure would be constructed directly downstream of the box culvert and treatment wetlands to direct flows to either the Pacific Ocean or South Lake. The diversion structure would be comprised of a box culvert with one set of control gates that would direct flows to the existing Vista Grande Canal and ocean, and one set of control gates that would direct flows to a diversion box culvert and Lake Merced. The diversion of flows would be conducted as described in the System Operation section below.

Diversion Box Culvert and Lake Outfall Structure

Flows that are directed into South Lake would be conveyed into the lake via a box culvert constructed under John Muir Drive to an outfall at the southwestern edge of South Lake or northwestern portion of Impound Lake. The water would flow through the submerged outfall structure into the lake. The specific location of the outfall structure will be determined based on further engineering and environmental review. Depending on the final location, the outfall structure and/or the associated box culvert may be routed beneath the SFPUC's existing transport tunnel that crosses between Impound Lake and South Lake.

Lake Merced Overflow

An existing Lake Merced overflow structure consists of a brick and masonry riser and tunnel that connects South Lake with the Vista Grande Canal. Under the proposed project, a portion of the existing Lake Merced overflow would be replaced with an adjustable-height weir that would be used to control the lake level and allow water to be diverted back into the Vista Grande Canal. As described in the System Operation section below, three operational lake level scenarios will be

evaluated with overflow elevations at El. 7.5, 8.5, or 9.5 (San Francisco City Datum). At water surface elevations below approximately 8.5 feet, pumping would be required to lift the water to the elevation of the canal.

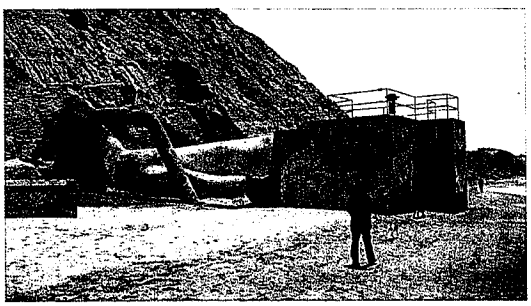
Vista Grande Tunnel Replacement

The existing Vista Grande Tunnel constructed in 1896 has a hydraulic capacity of 170 cfs. The Tunnel would be enlarged to increase its capacity to 500 cfs or greater and to extend its operating life. Alternatively, a new tunnel could be bored adjacent to and parallel with the existing tunnel. Under either option, the new tunnel would have a concrete lining and would incorporate a wholly contained section of a 30-inch diameter pipeline to transport treated effluent from the Daly City Wastewater Treatment Plant to the ocean outfall.

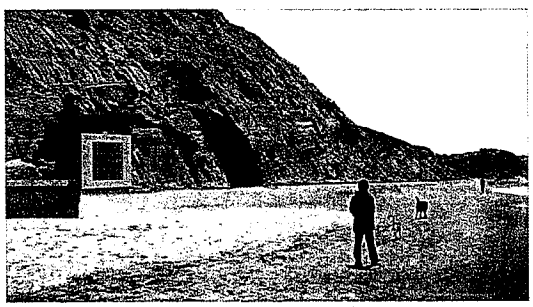
Ocean Outfall

Daly City's existing outfall structure is located on the beach below Fort Funston. The outfall structure discharges the Vista Grande Watershed stormwater and also connects an existing 30-inch effluent force main from the Daly City Wastewater Treatment Plant with a subsurface and sub-marine outfall pipeline. The outfall structure, a segment of the Vista Grande Tunnel, and the force main segment are fully exposed to the surf and waves which have caused significant damage to the structure and contributed to the ongoing erosion of the cliff face.

The proposed project would reconfigure these structures to provide protection from the surf and waves. The existing Daly City outfall structure would be removed and replaced with a low-profile outfall structure set into the existing cliff face to reduce future erosion (**Figure 3**). The existing 30-inch force main would also be removed and replaced with a similar configuration set back into the cliff face. The existing submarine outfall pipeline and diffuser would be renovated to protect it from erosion and extend its operating life.



View of Existing Outfall Structure



Simulation of Proposed Outfall Structure

Figure 3
Existing and Proposed Ocean Outfall Structure

Project Construction

Improvements to the Vista Grande Canal and the facilities associated with the diversion to Lake Merced would be constructed from staging areas located adjacent to the construction areas. Construction of the canal improvements, diversion structure, and treatment wetland would require site clearing and removal of trees in the area bounded by Lake Merced Boulevard, John Muir Drive, and the southern edge of the canal. Some utility relocations will also be needed.

The proposed Vista Grande Tunnel would be constructed using a tunnel shield or a soft ground tunnel boring machine. The machine would be launched from a construction shaft located at Fort Funston, or from a staging area adjacent to the Vista Grande Canal off John Muir Drive. The City has an existing 100-foot right of way across Fort Funston providing perpetual use for sewerage, drainage and lake protection purposes. The construction shaft would be approximately 40 feet in diameter. A crane would be positioned near the shaft edge to hoist personnel, materials, and equipment between the tunnel and the surface. The main construction staging area would be located adjacent to the shaft and most construction activities associated with tunnel construction would take place in this area. The desired construction shaft staging area acreage is about four acres.

Construction access to the new Daly City Ocean Outfall structure on the beach below Fort Funston would be provided either through the construction shaft or from a temporary access road constructed between Fort Funston and the beach.

Operation

Lake Level Management

The proposed project will divert some stormwater and authorized non-stormwater flows to South Lake to aid the SFPUC in operating Lake Merced within desired water levels. The water level of Lake Merced has fluctuated historically from Elevation (El.) 13 feet (San Francisco City Datum) in the 1940s to a low of El. -3.2 feet in 1993. Since then, the water surface elevation (WSE) of Lake Merced has risen due to increases in average rainfall and water additions by the SFPUC (SFPUC, 2011). From 2006 to 2010, the lake level ranged from El. 4.8 feet to El. 6.9 feet with an average of approximately El. 5.8 feet (City Datum). SFPUC has identified a goal of restoring historic water levels in the lake to serve beneficial uses and provide a reliable emergency water supply for firefighting and sanitation purposes.(SFPUC, 2011). The SFPUC has identified a preliminary target range of El. 5.5 to El. 9.5 feet (City Datum). The EIR will evaluate three lake level operational scenarios within this preliminary target range, and based on the analysis presented in the EIR, the SFPUC will identify the preferred operational scenario under which the project will be managed.

The three operational scenarios are identified by the target maximum WSE– 7.5, 8.5, and 9.5 feet (see **Figure 4**). This is the elevation at which the lake overflow weir would be set under each scenario. After winter rains taper off, about 1.5 feet of water is lost each year, primarily due to evaporation. Thus, for each scenario there is a corresponding target normal minimum WSE. The term normal is used to refer to normal and wet year conditions. Under dry year and multiple dry

year conditions, it is assumed that WSE of Lake Merced would fall below the target normal range. During a storm event, the lake's WSE may rise above the target maximum WSE, as the flow of stormwater being diverted into the lake exceeds the capacity of the overflow outlet, thus providing short-term water storage for flood events.

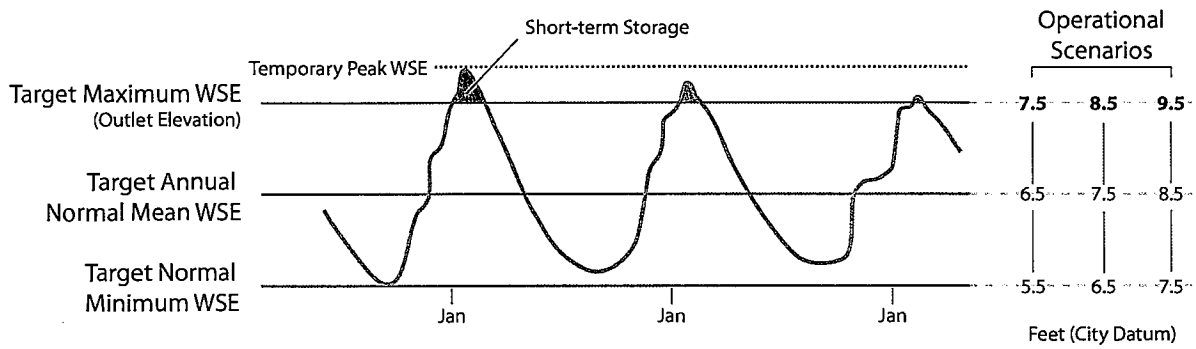


Figure 4
Lake Level Operational Scenarios

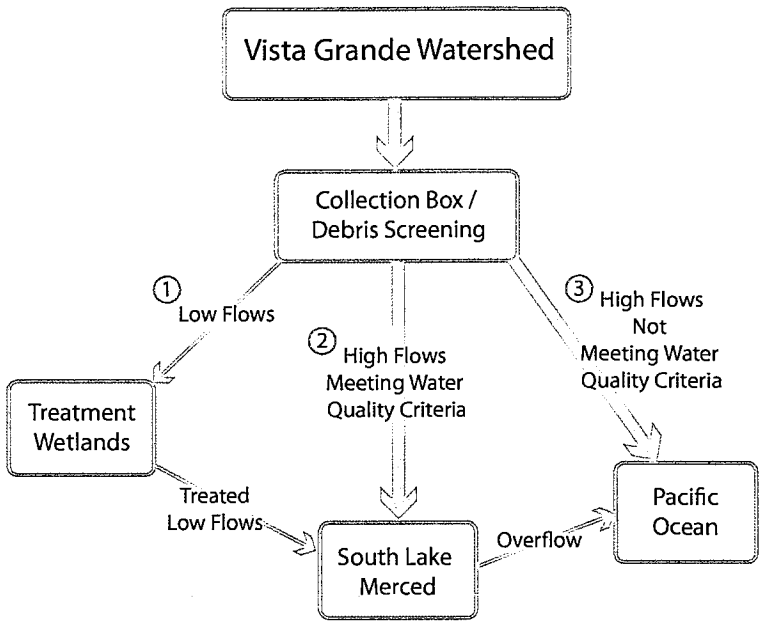
Operating Modes

In order to maintain lake levels within target WSEs and to ensure protection of Beneficial Uses within Lake Merced, the proposed operating model includes provisions for several operating modes dependant on flow and storm water quality. Three principal operating modes are described below and shown in **Figure 5**.

1. **Screened low-flows in the Canal can be routed through a wetlands system before being released to Lake Merced.** Screened dry weather flows (authorized non-stormwater) and low stormwater flows can be routed through a wetlands natural treatment system. These flows would help to maintain overall lake level and sustain the proposed treatment wetlands throughout the year.

2. **Screened higher canal flows satisfying a storm water quantity or quality criteria can be routed into Lake Merced.** Winter storm water flows exceeding the capacity of the wetlands natural treatment system can be routed to either Lake Merced or the Pacific Ocean.

3. **Screened higher canal flows can be routed to the Pacific Ocean.** Screened storm water flows exceeding the capacity of the wetlands natural treatment system but not satisfying the storm water quantity or quality criterion can be routed to the Pacific Ocean via the canal, tunnel, and outfall structure.



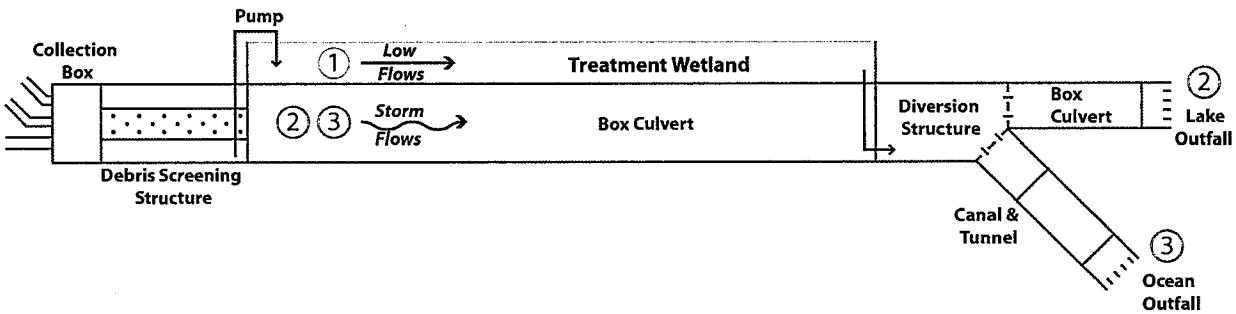


Figure 5
Flow Diagram

Lake Management Plan

The City and SFPUC have agreed to develop a Lake Management Plan (LMP) to maintain and where feasible improve the water quality of Lake Merced. The LMP will include an operational plan for the proposed Vista Grande diversions, a water quality monitoring plan, and best management practices that would be implemented by the City and SFPUC. The LMP will be developed in consultation with the RWQCB with respect to project review under the National Pollution Discharge Elimination System (NPDES).

Regulatory Requirements, Permits and Approvals

Private, local, state, and federal entities own the lands needed to construct, operate, and maintain the proposed project. The City would need to consult with relevant resource agencies and follow prescribed environmental review processes to evaluate project environmental effects and obtain construction permits for proposed components or improvements. The following table summarizes the agencies with regulatory oversight, the governing regulation and the likely permits and approvals that would be necessary.

Agency	Governing Regulation	Potential Requirements
City of Daly City, Lead Agency, (California)	California Environmental Quality Act (CEQA)	CEQA Compliance (EIR)
U.S. National Park Service - Golden Gate National Recreation Area, Lead Agency (Federal)	National Environmental Policy Act (NEPA)	NEPA Compliance, Special Use Permit; Right-of-Way Permit
California Coastal Commission	California Coastal Act; Coastal Zone Management Act	Coastal Development Permit; Local Coastal Plan compliance; Public Works Plan; Federal Consistency Determination
U.S. Army Corps of Engineers	Clean Water Act	Section 404 Authorization
U.S. Fish and Wildlife Service	Endangered Species Act	Section 7 Consultation
National Oceanic and Atmospheric Association	Endangered Species Act and Magnuson-Stevens Essential Fish Habitat	Section 7 Consultation
State Water Resources Control Board	Clean Water Act	General Construction Permit
San Francisco Bay Regional Water Quality Control Board	Clean Water Act	NPDES Stormwater coverage; Section 401 Water Quality Certification; Section 402 Policy on the Use of Constructed Wetlands for Urban Runoff (No. 94-201)
California Department of Fish and Game	Fish and Game Code Section 1602	Lakebed Alteration Agreement
California Office of Historic Preservation	National Historic Preservation Act	Section 106 Consultation

References

San Francisco Public Utilities Commission (SFPUC), *Lake Merced Watershed Report*. January, 2011.

Attachment B

Vista Grande Drainage Basin Improvement Project March 11, 2012
South Lake Merced Alternative
Lake Management Plan Outline

1. Plan Goals and Objectives
   - Restore and maintain water surface elevation of Lake Merced
   - Maintain/improve water quality in Lake Merced
   - Maintain /improve aquatic habitat

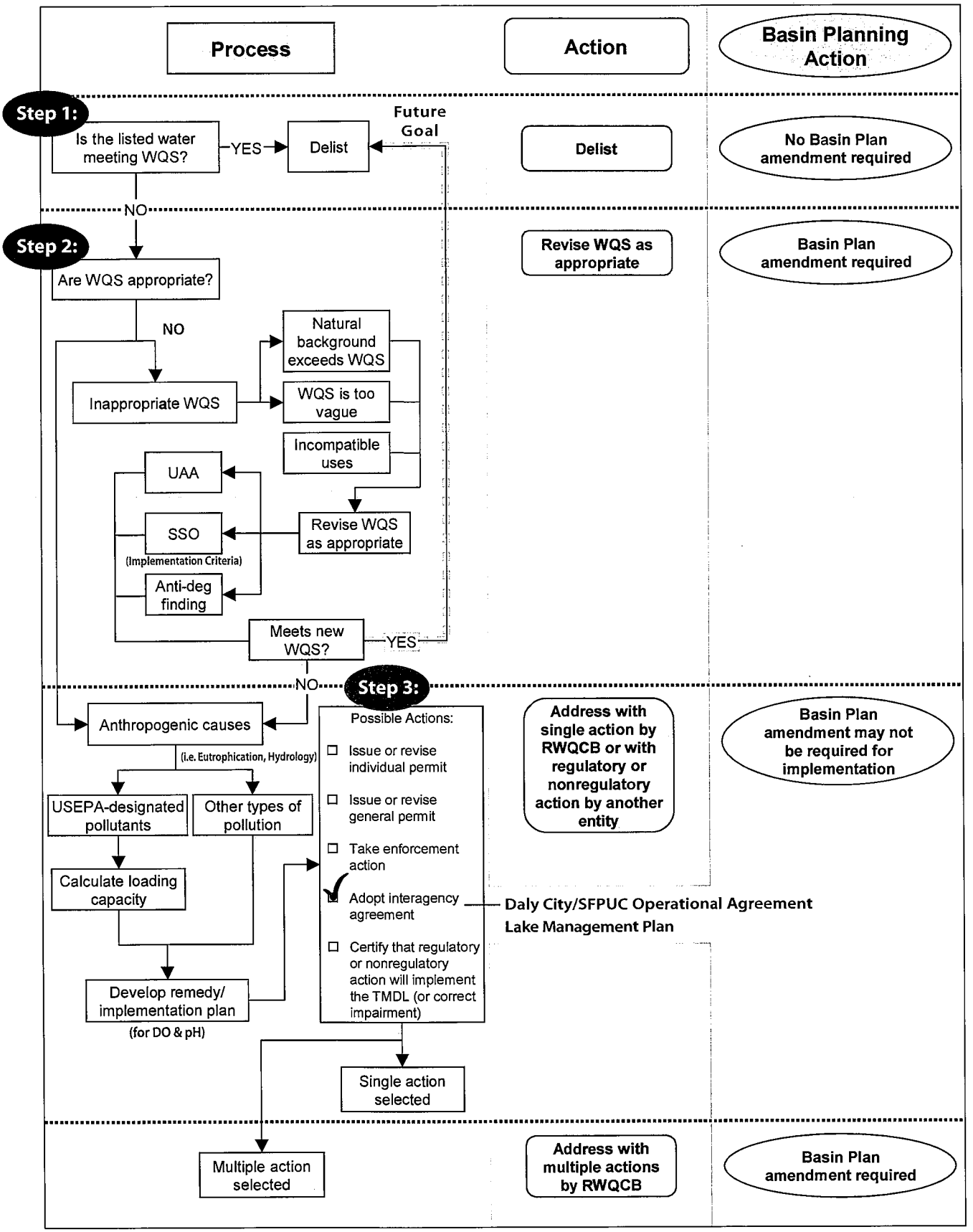
2. Vista Grande Operational Plan
   - Lake level management
     - Normal operational range, overflow elevation
   - Diversion operation
     - Diversion criteria for storm flows (dry weather interlude duration, volume)
     - Treatment criteria for canal base flows
     - Facility operation and maintenance

3. Implementation and Adaptive Management Plan
   - BMPs
     - Schedule/Phasing
     - BMP assessment & adaptive management
   - Lake Management Actions (DO and pH maintenance)
     - Implementation Criteria
     - Management action assessment & adaptation
   - Reporting schedule
   - Implementation plan assessment & adaptation

4. Water Quality Monitoring Plan
   - Summary of existing water quality
   - Water quality objectives and goals
   - List of constituents and parameters to be monitored
   - Temperature, DO and pH monitoring
   - Sampling program
     - Lake Merced
     - Vista Grande Canal
   - Reporting schedule
   - Monitoring plan assessment & adaptation

Appendix A: BMP & Lake Management Actions Evaluation

Attachment C



Source: Adapted from SWRCB, 2005
Version: December 7, 2012

SWB Regulatory Decision Tree: Process for Addressing Impaired Waters - Adapted for Lake Merced

Attachment D

Regulatory Process Scope & Schedule
Vista Grande Drainage Basin Improvement Project

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vista Grande Project Environmental Review	Notice of Preparation (NOP) and Notice of Intent (NOI) Issued		Preparation of draft CEQA Project Description Scoping Meetings	Preparation of Administrative Draft EIR/EIS					Preparation of Public Draft EIR/EIS Prepare Permit Applications (USACE 404, RWQCB 401, USFWS Section 7, CDFW Lakebed Alteration Agreement, CCC Coastal Development Permit, etc.)		Public Review and Comment Period	
Lake Management Plan	**Develop Draft LMP:** Develop Goals and Objectives - Identify broad project goals tied to specific physical attributes (objectives) that can be measured, monitored, and used in an evaluation of enhancement actions Vista Grande Operational Plan – Define the normal operation range, stormwater diversion criteria, treatment criteria, and facility operation and maintenance Feasibility Review - Assess the feasibility of source control and lake management actions including the review of available technology, engineering and site constraints, planning and phasing considerations, etc. Water Quality Evaluation - Evaluate the selected range of management actions to determine the ability to meet water quality goals, addressing influences on DO and pH levels and general water quality benefits Fisheries Evaluation – Evaluate in-lake management options to address potential effects to fish habitat Implementation and Adaptive Management Plan - Identify: 1) BMPs and lake management actions to maintain/improve water quality, 2) an implementation schedule, and 3) assessment and adaptive management Water Quality Monitoring Plan – identify list of constituents and parameters to be monitored; locations, depths, frequency, and methodology for monitoring; and a reporting and monitoring plan assessment schedule											
Basin Plan Amendment	**Project Analysis** - Complete Phases 1-5 of California Impaired Water Process (see Table 3-3, pg. 3-5 of *A Process for Addressing Impaired Waters in California*, SWRCB, 2005) Phase 1 – Definition of project, pollutant(s)/waterbody, justification Phase 2 – Compile existing information, identify data needs, develop study plans, and engage stakeholders Phase 3 – Data collection and analyses Phase 4 – Project report(s) with data and analysis findings. May include impairment assessment, source and loading analysis, implementation alternatives Phase 5 – Develop recommendations for regulatory action, compile results/findings *NOTE: This information will be provided by the Lake Management Plan and Water Quality Assessment*											
SFPUC	**LMP**: Review and provide comments on goals and objectives	**ENV**: Review and provide comments on draft CEQA Project Description **LMP**: Provide input on feasibility analysis and cost estimates		**LMP**: Provide input on operational plan, evaluation, management and monitoring plan	**LMP**: Review and provide comments on Draft LMP		**ENV**: Review and provide comments on Admin Draft EIR/EIS **LMP**: Review Final LMP	**ENV**: Review and provide comments on Screencheck Draft EIR/EIS				
RWB	**ENV**: Review and provide comments on NOP **LMP**: Review and provide comments on goals and objectives **BPA**: Start Administrative Record			**LMP**: Provide input on operational plan, evaluation, management and monitoring plan			**LMP**: Review and provide comments on Draft LMP **BPA**: CEQA Scoping for Basin Plan Amendment					**ENV**: Review and provide comments on Draft EIR/EIS
NPS	**ENV**: Issue Notice of Intent (NOI) in Federal Register	**ENV**: Review Project Description & Scope of EIS **ENV**: Hold scoping meeting(s)					**ENV**: Review and provide comments on Admin Draft EIR/EIS	**ENV**: Review and provide comments on Screencheck Draft EIR/EIS **ENV**: Consultation with California Office of Historic Preservation - compliance with the National Historic Preservation Act (NHPA).				

March 11, 2013

Attachment D

Regulatory Process Scope & Schedule
Vista Grande Drainage Basin Improvement Project

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vista Grande Project Environmental Review	Preparation of Administrative Draft Responses to Comments (RtC) and Final EIS/EIR Permitting: Consultation with permitting agencies (USACE, RWQCB, USFWS, CDFW, CCC, etc.)			Preparation of Public RtC/Final EIR/EIS Develop Mitigation Monitoring and Reporting Plan		**CEQA Findings and EIR/EIS Approval** Preparation of Record of Decision (NPS)	Obtain permits: USACE 404, RWQCB 401, USFWS Section 7, CDFW Lakebed Alteration Agreement, CCC Coastal Development Permit, etc. *Dependent on completion of CEQA/NEPA*		*Final Engineering and Design*			
Lake Management Plan	**Develop Final LMP:** Address comments on Draft LMP						Daly City and SFPUC sign Operational Agreement *Dependent on completion of CEQA*		Commence Pre-Project Monitoring (as determined by LMP)			
Basin Plan Amendment	Preparation of internal Draft Regional Board Agenda Item Package (Staff Report) *NOTE: Endangered species consultation will be undertaken for the Vista Grande project. Coordination will occur with RWB to address BPA*					Regional Board Attorney review of Draft Staff Report	Basin Plan Unit pre-review of Draft Staff Report	Scientific State Peer Review of Draft Staff Report			Response to reviewer comments and internal Draft Agenda Item Package/Staff Report review. *NOTE: Technical Support provided by Daly City*	
SFPUC		**ENV:** Review and provide comments on Draft Responses to Comments (RtC) and Final EIS/EIR					**LMP:** Sign Operational Agreement *Dependent on completion of CEQA*					
RWB	**BPA:** Prepare Draft Staff Report **LMP:** Review RWBQB notification provisions of Draft DC/SFPUC Operational Agreement					**BPA:** Internal RWB review of Draft Agenda Item Package/Staff Report **ENV:** Issue 401 Water Quality Certification					**BPA:** Response to reviewer comments and internal package review	
NPS		**ENV:** Review and provide comments on Draft Responses to Comments (RtC) and Final EIS/EIR				**ENV:** Complete consultation with California Office of Historic Preservation. **ENV:** Prepare and sign Record of Decision (NPS)	**ENV:** Approve special use permit and/or ROW *Dependent on completion of NEPA*					

March 11, 2013

Attachment D

Regulatory Process Scope & Schedule
Vista Grande Drainage Basin Improvement Project

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vista Grande Project Environmental Review	*Pre-Construction Activities*					*Construction (through 2017)* ⇨						
Lake Management Plan	Pre-Project Monitoring (as determined by LMP)											
Basin Plan Amendment	Preparation and distribution of Public Draft Agenda Item Package/Staff Report.	Public review and comment period Draft Agenda Item Package/Staff Report.		Revision of Agenda Item Package/Staff Report based on comments received. Preparation and distribution of Final Agenda Item Package/Staff Report to public.		Presentation of proposed Amendment to Board; Regional Board Adopts Amendment	State Board review of Administrative Record and Hearing for regionally adopted Basin Plan Amendment				OAL Process	EPA Approval ⇨
SFPUC												
RWB	**BPA:** Revise and distribute Staff Report. *Dependent on completion of CEQA*					**BPA:** Present BPA to board for adoption, submit press release to EO and obtain signature, finalize Administrative Record.	**BPA:** Submit Admin Record to SB and OAL **303(d):** Prepare 303(d) Demonstration Package					**BPA:** Pay CDFW fees, file NOD, revise Basin Plan ⇨
NPS												

March 11, 2013

APPENDIX B

SFPUC South Lake Merced Limnology Monitoring Report

San Francisco Public Utilities Commission

Land and Natural Resources - Limnology

Reservoir: Lake Merced - **Pistol Range**
Date: August 9, 2012 **Limnologist:** ST EF

Limnological Profile

Depth ft.	Temp °C	pH pH units	Cond µS/cm	TDS mg/L	DO mg/L	ORP mV	TKN mg/L	Hard mg/L	NO_3-N mg/L	NH_3-N mg/L	PO_4-P mg/L	Tot P mg/L	Mn mg/L	Fe mg/L	Pb mg/L	TOC mg/L	Turb NTU
0	20.2	8.65	723	463	12.7	236	8.60	228	<0.01	0.03	0.15	0.35	0.062	0.005	<0.001	7.25	19.6
5	19.4	8.49	726	465	9.7	230	12.21	230	<0.01	0.04	0.14	0.39					19.2
10	19.0	8.28	728	466	7.3	223	2.13	224	<0.01	0.05	0.16	0.29					18.0
15	18.6	7.94	732	468	3.3	202	20.83	226	<0.01	0.04	0.18	0.33					15.4
20	18.3	7.85	732	468	2.0	180											
Btm	18.3	7.80	732	469	0.4	140	14.20	228	<0.01	0.05	0.22	0.39	0.112	0.037	<0.001		13.1

Depth ft.	Chlorophyll-*a* µg/L	Algal Biomass µg/L
0		
5		

Bacteriological Data (MPN)	
Total Coliform	>2420
E. Coli	20

Secchi Disc (ft): 1.25
Air Temp (°C): 18.1
Weather: Fog burning o
Wind: W-SW 2-5 mp

Phytoplankton Count (>98% of total population)

Phytoplankter	1	2	3	4	Total	Natural Unit/m³	Natural Unit/mL

Summary

Reservoir: Lake Merced - **Pump Station**
Date: August 9, 2012 **Limnologist:** stef

Limnological Profile

Depth ft.	Temp °C	pH pH units	Cond µS/cm	TDS mg/L	DO mg/L	ORP mV	TKN mg/L	Hard mg/L	NO_3-N mg/L	NH_3-N mg/L	PO_4-P mg/L	Tot P mg/L	Mn mg/L	Fe mg/L	Pb mg/L	TOC mg/L	Turb NTU
0	20.3	8.61	724	463	12.7	267	15.01	228	<0.01	0.03	0.18	0.28	0.059	0.005	<0.001	7.14	20.7
5	19.8	8.58	724	463	11.2	263	9.72	230	<0.01	0.04	0.21	0.27					20.3
10	19.0	8.19	730	467	6.8	266	28.73	232	<0.01	0.05	0.19	0.33					17.9
15	18.8	7.98	731	468	4.3	263	26.43	230	<0.01	0.02	0.23	0.29					15.2
20	18.4	7.83	732	469	2.3	262											
Btm	18.4	7.80	733	469	1.7	261	1.82	232	<0.01	0.08	0.24	0.32	0.129	0.010	<0.001		13.7

Depth ft.	Chlorophyll-*a* µg/L	Algal Biomass µg/L
0		
5		

Bacteriological Data (MPN)	
Total Coliform	>2420
E. Coli	7

Secchi Disc (ft): 1.25
Air Temp (°C): 18
Weather: Fog burning o
Wind: W-SW 2-5 mp

Phytoplankton Count (>98% of total population)

Phytoplankter	1	2	3	4	Total	Natural Unit/m³	Natural Unit/mL
Oscillatoria	6994	6994	6786	6630	27404	697,000,000	697
Blue-green, Diatom, Other					Total	697,000,000	697

Summary

APPENDIX C

Wet and Dry Season Water Quality Monitoring Plans for the Vista Grande Drainage Basin Improvement Project

Final 2011 Dry Season Water Quality Monitoring Plan – Vista Grande Drainage Basin Improvement Project

September 16, 2011

1.0 INTRODUCTION

The City of Daly City has prepared this water quality monitoring plan in support of the Lake Merced Alternative of the Vista Grande Drainage Basin Improvement Project (Project). Lake Merced is the largest freshwater lake located within the City and County of San Francisco (CCSF) and it is operated and maintained by the San Francisco Public Utilities Commission (SFPUC). The northwestern area of Daly City and unincorporated portions of San Mateo County drain into the Vista Grande portion of the City's stormwater collection system. The underground collection system conveys the storm flows to the Vista Grande Canal and then into the Vista Grande Tunnel, which discharges through the Daly City outfall structure into the Pacific Ocean at the beach below Fort Funston. Historically wet weather flows in excess of the capacity of the Canal and the Tunnel have occasionally resulted in local flooding and overflows across John Muir Drive into Lake Merced, causing property damage, bank erosion, traffic nuisances, and public safety issues (RMC, 2006).

The Lake Merced Alternative (the Project) would route a portion of wet season storm flows from the Vista Grande Canal directly to South Lake Merced (South Lake) and a smaller portion of wet season storm flows from the Canal through a proposed treatment wetland to South Lake. In addition, dry season base flow (or runoff) would be routed through the proposed treatment wetland to South Lake.

This monitoring plan has been developed based on a review of water quality monitoring data previously collected by the SFPUC, the City of Daly City and the City and County of San Francisco (Kennedy Jenks, 2010). The intent of the proposed monitoring plan is to provide specific water quality information needed to inform project design and environmental analysis for CEQA and NEPA[1] documentation; and to facilitate project review by the San Francisco Bay Regional Water Quality Control Board (RWQCB). To that effect, the monitoring data will help quantify dry season flow and establish baseline water quality within the Canal and expand on the existing water quality data set for South Lake. The data will be collected from the Canal and South Lake at the same time to develop a comparable data set for the Project.

2.0 PROPOSED MONITORING PLAN

Dry season monitoring of flow and water quality will be conducted in the Canal from approximately August 15 to October 31, 2011. Water quality in South Lake will be monitored during the same period to assess the baseline conditions of the receiving waters for the project and to inform conceptual design of

[1] California Environmental Quality Act, National Environmental Policy Act

the treatment wetlands. For the purpose of this plan, low flows are defined as flows that occur in the Vista Grande Canal during the summer and fall (June 1-October 31) and are primarily associated with exempted and conditionally exempted non-stormwater discharges (e.g., car washing, lawn watering, and landscape irrigation) as described in Provision C.15 of the Municipal Regional Stormwater NPDES permit. Typical dry season base flow within the Vista Grande Canal is estimated to average between 0.1 and 0.4 million gallons per day (mgd) or approximately 0.2 to 0.6 cubic feet per second (cfs). Constructed wetlands must have a source of water throughout the year so that the wetland plants and other organisms within the wetland ecosystem can be maintained. However, dry season flow data is limited and has not yet been accurately quantified and assessed for water quality.

The objectives of the dry season monitoring are to:

- Provide flow and water quality data to characterize baseline conditions in the Vista Grande Canal during summer months for the Project;
- Further establish the water quality of the receiving waters (South Lake) to adequately characterize baseline receiving water quality and provide for the assessment of the Project's potential for impacts (in particular, from future low flow discharges from the Canal through the treated wetlands); and
- Inform conceptual design of the proposed treatment wetlands based on the water quality in the Canal and in South Lake and the summer base flow in the Canal.

2.1 Monitoring Locations

The dry season monitoring would involve collecting flow and water quality data from the Canal and water quality data from South Lake. **Figure 1** shows the proposed monitoring locations (Vista Grande Canal Station or VGC-1 in the Canal; and LM-1, LM-2, LM-3, and LM-4 in South Lake; discussed below).

Canal: Based on field reconnaissance, VGC-1 has been selected to avoid areas of backwatering or velocity changes that may occur at some constricted points along the Canal. Due to very low base flow (≤0.6 cfs) observed in the Canal during the summer, flow will be monitored through combined use of a V-Notch weir of known dimensions with associated pressure transducer (see **Figure 2** at the end) to monitor extreme low flows up to 0.6 cfs, as well as an ISCO Area-Velocity continuously recording data logger, to monitor higher flows exceeding the design capacity of the V-Notch weir (such as from rainfall events). A hand-held water quality meter will be used to measure pH, DO, and temperature and samples will be collected for laboratory analysis of specific constituents, as described in Section 2.2 below.

South Lake: The proposed four monitoring locations for South Lake have been identified based on review of historic data (Kennedy/Jenks, 2010) and the proposed discharge location of the stormwater from the treatment wetlands. Continuously recording (hourly) water quality loggers will be installed at these locations to record pH, DO, specific conductance, and temperature. Depending on the location, the loggers will record water quality at multiple depths (see **Table 1** in Section 2.2).

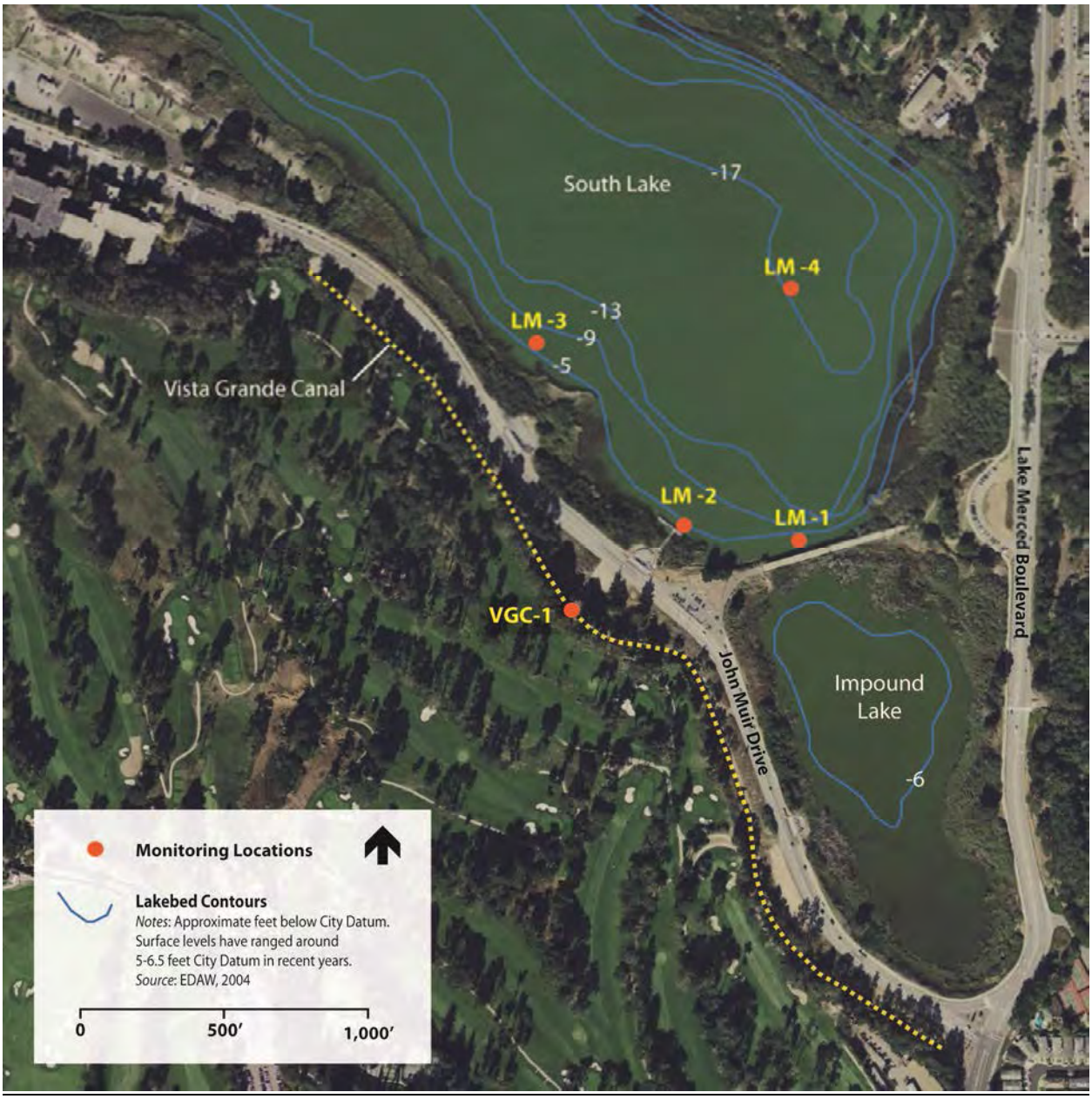


Figure 1
Proposed Vista Grande Canal and South Lake Monitoring Locations

- **Station LM-1** is located close to the proposed discharge point midway across the SFPUC's sewer transport structure separating South Lake Merced and Impound Lake.
- **Station LM-2** is located at a public access floating dock between LM-1 and LM-3 to provide an estimate of the receiving water quality in the close vicinity of the proposed stormwater discharge.

- **Station LM-3** is located approximately 1,000 feet northwest of the SFPUC's sewer transport structure separating South Lake and Impound Lake and adjacent to the existing riprap Canal overflow discharge structure. The loggers here will be installed, with permission, on a temporary marker buoy for the duration of the Project. The water quality data here can serve as backup data in case of equipment malfunction, theft, or vandalism at Station LM-1.

- **Station LM-4** is located at a point that has been used by the SFPUC for monitoring water quality in the South Lake since 1997 and has been determined to be representative of the overall water quality of South Lake (Kennedy/Jenks, 2010). LM-4 has been selected for collecting samples for a more detailed water quality analysis (see **Table 2** in Section 2.2), to be consistent with the location (e.g., South Lake Merced Pump Station) used for long-term quarterly water quality monitoring conducted by the SFPUC. This will allow comparison of the 2011 dry season monitoring data to the larger historic record. Field data and analysis of existing conditions suggest that Lake Merced does not experience persistent, seasonal stratification, but rather stratifies weakly and intermittently in the summer to late fall of some years (EDAW, 2004) (Kennedy/Jenks, 2010), but is otherwise fairly well mixed given its shallow depth and the prevailing winds. . Surface water monitoring (i.e., from 0 to 5-foot depth) is also intended to be representative of the receiving water quality in that portion of the water column most likely to be influenced by the proposed low flow summer discharges from the proposed treatment wetlands.

2.2 Monitoring Methodology

The proposed water quality monitoring will be conducted by:

- Monitoring dry season base flow at VGC-1, and

- Both directly measuring water quality constituents and collecting samples for laboratory analysis at all the locations in the Canal and South Lake as identified in Figure 1.

Direct measurements will involve measuring pH, DO, conductivity, and temperature, using a standard hand-held water quality meter. The samples will be collected using standard accepted field methods and delivered to a commercial lab for analysis of water quality constituents summarized in **Table 2**.

Tables 1 and 2 shows the monitoring protocol proposed for the dry weather season at all locations. **Table 2** lists the proposed water quality constituents that will be monitored in at VGG-1 and LM-4. The constituents listed are based on a review of prior SFPUC reports and data and the RWQCB comment letter dated May 19, 2011. The list includes key constituents that were sampled previously by the SFPUC, to ensure consistency with long-term historic records, and/or constituents identified by regulatory agencies for environmental and human health protection (e.g., constituents appearing on the Section 303(d) list). **Table 3** provides the tests and detection limits along with the rationale for each constituent that would be tested under this plan.

TABLE 1. PROPOSED MONITORING PROTOCOL FOR DRY WEATHER SEASON (DIRECT MEASUREMENT)

Constituent	Location	Depth (feet)	Frequency of Measurements
Vista Grande Canal*			
Flow	VGC-1	-	Continuous, hourly
pH**	VGC-1	-	Twice a month
DO**	VGC-1	-	Twice a month
Temperature**	VGC-1	-	Twice a month
Conductivity**	VGC-1	-	Twice a month
South Lake Merced			
pH, DO, temperature, conductivity	LM-1	Surface (<5)	Continuous, Hourly
pH, DO, temperature, conductivity	LM-2	Surface (<5), near bottom	Continuous, Hourly
pH, DO, temperature, conductivity	LM-3	Surface (<5), near bottom	Continuous, Hourly
pH, DO, temperature, conductivity	LM-4	Surface (<5), 10, 15, near bottom	Continuous, Hourly
pH, DO, temperature, conductivity	LM-1,2,3,4	Manual depth profiles at one-foot intervals	Twice a month

* Monitoring is proposed to occur at a frequency of twice every month, as conditions allow. However, during summer months, flow may be absent in Vista Grande Canal. If sampling cannot be completed due to lack of flow during summer months, the sample schedule and methodology will be revised as appropriate.

** pH, DO, conductivity and temperature will be measured manually twice or thrice during each individual field monitoring event (twice per month).

TABLE 2. PROPOSED MONITORING PROTOCOL FOR DRY WEATHER SEASON (SAMPLING AND LABORATORY ANALYSIS)

Constituent	Location		Sampling Frequency
	Canal	**South Lake Merced**	
Nutrients: Total phosphorous [P], orthophosphate, Total Kjeldahl Nitrogen (TKN), ammonia, nitrate	VGC-1	LM-4 Surface (<5 feet)	Twice a month
Chemical Oxygen Demand	VGC-1		Twice a month
Biochemical Oxygen Demand	VGC-1		Twice a month
Metals: Lead, Copper, Mercury, Nickel, Zinc	VGC-1		Twice a month
Total suspended solids	VGC-1		Twice a month
Volatile suspended solids	VGC-1		Twice a month
Total dissolved solids	VGC-1		Twice a month
Hardness	VGC-1		Twice a month
Conductivity	VGC-1		Twice a month
TC, FC, EC, Ent., MS-2*	VGC-1		Twice a month
Giardia and Cryptosporidium spp**	VGC-1		Once a month
Human Bacteroidales**	VGC-1		Once a month
Chlorophyll a	-		Twice a month
Secchi Depth	-		Twice a month

* TC=Total Coliform, FC=Fecal Coliform, EC=E.Coli, Ent=Enterococcus, MS-2=Male Specific Phage

Giardia, Cryptosporidium spp., and* Human Bacteroidales *will be tested once a month.

TABLE 3. LABORATORY METHODS AND RATIONALE FOR PROPOSED CONSTITUENTS FOR MONITORING

Constituent	Laboratory Test Method	Detection Limits	Type /Indicator / Purpose of Constituent
Dissolved oxygen, pH	-	-	303(d) Impairment evaluation
Temperature	-	-	Dissolved oxygen percent saturation calculation
Total phosphorous [P]	EPA 365.1	0.04 mg/L	Nutrients (factor in eutrophication)
Orthophosphate and Nitrate	EPA 300.1	0.1 mg/L	
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	0.2 mg/L	
Ammonia	EPA 350.1	0.05 mg/L	
Chemical Oxygen Demand	SM 5220D	10 mg/L	Oxygen demand (factor in ambient dissolved oxygen concentration)
Biochemical Oxygen Demand	SM 5210B	4 mg/L	
Total Metals	EPA 200.8	Pb, Cu, Ni (0.1 µg/L) Zn (1 µg/L)	Metals (potential aquatic life impacts)
Mercury	EPA 1631	0.005 µg/L	Bioaccumulation potential (in fish tissue)
Dissolved Metals	E200.8 (filtered)	Pb, Cu, Ni (0.5 µg/L) Zn (5 µg/L)	CTR water quality objectives are expressed as the dissolved metals fraction
Total suspended solids (TSS)	SM 2540D	1 mg/L	Solids loading indicator
Volatile suspended solids (VSS)	SM 2540D	4 mg/L	Organic matter content in TSS
Total dissolved solids (TDS)	SM 2540C	10 mg/L	Mineral content
Hardness	SM 2340B & 200.7	1 mg CaCO3/L	Calculation of fresh water quality objectives
Total Coliform, Fecal Colifom, E. coli*	SM 9222	1 cfu/100 ml	Pathogen Indicators

TABLE 3 (cont.). LABORATORY METHODS AND RATIONALE FOR PROPOSED CONSTITUENTS FOR MONITORING

Constituent	Laboratory Test Method	Detection Limits	Type /Indicator / Purpose of Constituent
Enterococcus*	EPA 1600	1 cfu/100 ml	Pathogen Indicators
MS-2	EPA 1602	1/100 ml	
Human Bacteroidales*	Multiple Markers	1 pfu/vol analyzed	
Giardia and Cryptosporidium spp*	EPA 1623	0.1 cyst of oocyst/L	Human pathogens
Chlorophyll a	SM 10200 Part 4	50 µg/L	Phytoplankton/ algal growth indicator
Secchi Depth	-	-	Lake clarity

Note: * Detection limits shown are target values. Actual detection limits will depend on amount of sample able to be filtered.

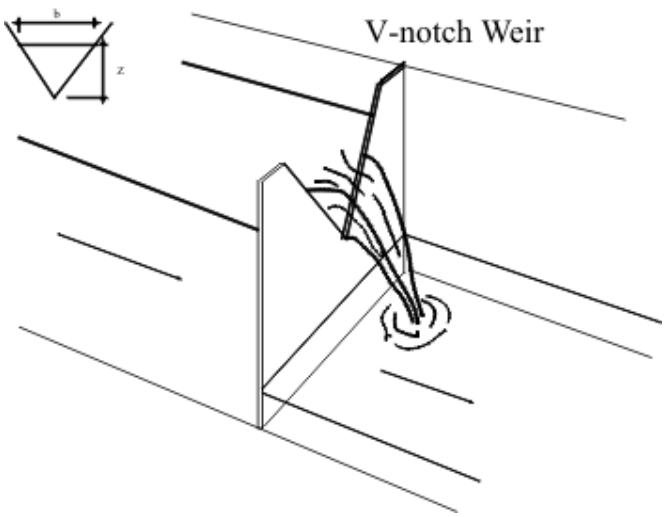


Figure 2
Example of V-Notch Weir for Flow Monitoring

REFERENCES

EDAW and Talavera and Richardson, *Task 4 Technical Memorandum: Impacts to Water Quality, Vegetation, Wildlife and Beneficial Uses, Lake Merced Initiative to Raise and Maintain Lake Level and Improve Water Quality*, Prepared for the San Francisco Public Utilities Commission, September, 2004.

Kennedy/Jenks Consultants, *Lake Merced Water Quality Data Organization, Review, and Analysis, Prepared for the San Francisco Public Utilities Commission*, 2010.

RMC, *Vista Grande Watershed Study*, Prepared for the City of Daly City and City and County of San Francisco. 2006.

Final 2011-2012 Wet Season Water Quality Monitoring Plan

Vista Grande Drainage Basin Improvement Project

November 17, 2011

1.0 INTRODUCTION

The City of Daly City (Daly City) has prepared this water quality monitoring plan in support of the South Lake Merced Alternative of the Vista Grande Drainage Basin Improvement Project (Project). Lake Merced is the largest freshwater lake located within the City and County of San Francisco (CCSF) and it is operated and maintained by the San Francisco Public Utilities Commission (SFPUC). The northwestern area of Daly City and unincorporated portions of San Mateo County drain into the Vista Grande portion of Daly City's stormwater collection system. The underground collection system conveys the storm flows to the Vista Grande Canal (Canal) and then into the Vista Grande Tunnel (Tunnel), which discharges through the Daly City outfall structure into the Pacific Ocean at the beach below Fort Funston. Historically wet weather flows in excess of the capacity of the Canal and the Tunnel have occasionally resulted in local flooding and overflows across John Muir Drive into South Lake Merced, causing property damage, bank erosion, traffic nuisances, and public safety issues (RMC, 2006).

The Lake Merced Alternative (the Project) would route a portion of wet season storm flows from the Vista Grande Canal directly to South Lake Merced (South Lake) and a smaller portion of dry and wet season flows from the Canal through a proposed treatment wetland to South Lake.

2.0 MONITORING PLAN OBJECTIVES

The intent of the monitoring plan is to provide specific water quality data needed to support project design and environmental analysis for California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) documentation and to facilitate project review by the San Francisco Bay Regional Water Quality Control Board (RWQCB). To that effect, the monitoring data will help quantify wet season flow and establish baseline water quality within the Canal and expand on the existing water quality data set for South Lake. This monitoring plan has been developed based on a review of water quality monitoring data previously collected by Daly City and the SFPUC (Kennedy/Jenks, 2010).

The scope of this monitoring plan has been developed based on the System Understanding and Assessment Strategy (**Attachment A**) that has been developed to provide an understanding of current water quality conditions in South Lake Merced, the processes and factors governing water quality in South Lake Merced, how the contribution of Vista Grande flows to South Lake Merced might alter existing water quality conditions in South Lake Merced, and a strategy for assessing impacts to existing water quality conditions. Based on the assessment needs identified in the System Understanding and Assessment Strategy, specific information needs, analytical approaches, and data criteria have been

identified within the Water Quality Data Objectives Matrix (**Attachment B**). This monitoring plan incorporates the analytic strategy and data objectives developed in these attached documents.

3.0 PROPOSED MONITORING PLAN

Wet season monitoring of flow and water quality will be conducted in the Canal from approximately November 20, 2011 to May 31, 2012. Water quality in South Lake will be monitored during the same period to assess the baseline conditions of the receiving waters for the project.

The objectives of the wet season monitoring are to:

- Provide flow and water quality data to characterize baseline conditions in the Vista Grande Canal during winter months, including storm event flows and base flow (which is typically lower than summer base flow due to reduced irrigation return flow);
- Characterize the baseline water quality of the receiving waters (South Lake) during the proposed stormwater diversion period to provide for the assessment of the Project's potential impacts; and
- Provide data that will support development of the conceptual design of the proposed treatment wetlands based on the water quality and the winter base flow in the Canal.

Additional specific data objectives are identified in the Water Quality Data Objectives Matrix (Attachment B).

3.1 Monitoring Locations

The wet season monitoring would involve collecting flow and water quality data from the Canal and water quality data from South Lake. **Figure 1** shows the proposed monitoring locations (Vista Grande Canal Station, VGC-1; and South Lake stations, LM-1, LM-2, LM-3, and LM-4; discussed below).

Canal

VGC-1 has been selected for hydrologic monitoring and water quality sampling to avoid areas of backwatering or velocity changes that may occur at some constricted points along the Canal.

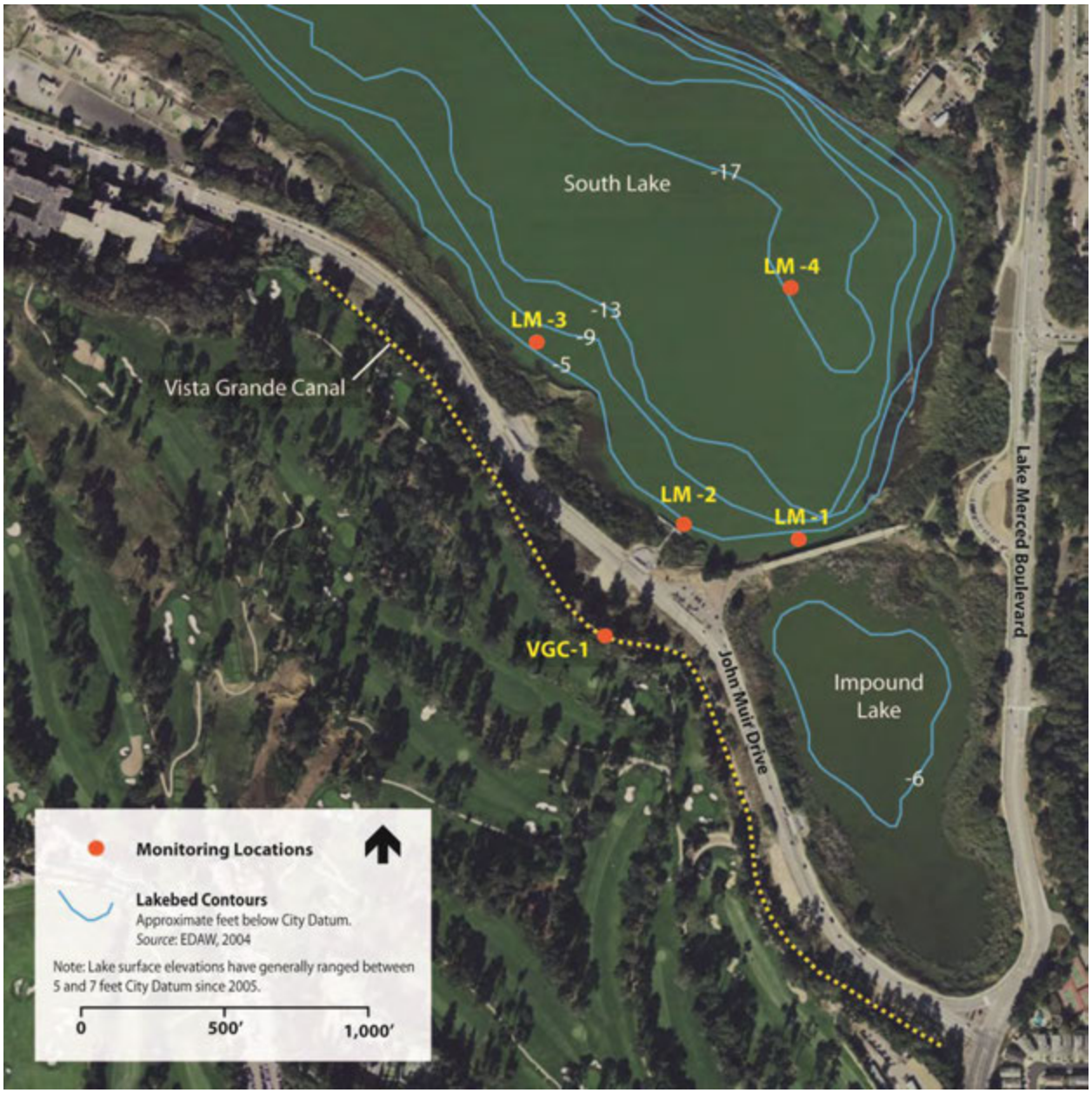


Figure 1
Proposed Vista Grande Canal and South Lake Monitoring Locations

South Lake

The proposed four monitoring locations for South Lake have been identified based on review of historic data (Kennedy/Jenks, 2010) and the proposed discharge location of the stormwater. Locations within South Lake were selected to provide representative data as follows:

- **Station LM-1** is located close to the proposed discharge point midway across the SFPUC's sewer transport structure separating South Lake Merced and Impound Lake. One multiprobe, continuously logging, water quality sonde (pH, DO, temperature, and conductivity) has been installed here at a depth of approximately 1.5-feet depth[1].

- **Station LM-2** is located at a public access floating dock. Between LM-1 and LM-3, the pH, DO, temperature, and conductivity values at LM-2 will provide an estimate on the receiving water quality in the close vicinity of the proposed stormwater discharge. Two loggers have been installed here at the surface and approximately 8-feet of depth.

- **Station LM-3** is located approximately 1,000 feet northwest of the SFPUC's sewer transport structure separating South Lake and Impound Lake and adjacent to the existing riprap Canal overflow discharge structure. Two loggers have been installed here at the surface and approximately 15-feet of depth on a temporary marker buoy for the duration of the Project. The water quality data (pH, DO, temperature, and conductivity) here can serve as backup data in case of equipment malfunction, theft, or vandalism at Station LM-4 and will also capture water quality changes that may result if Canal water flows into South Lake as a result of a Canal overflow or intentional diversion during a major storm.

- **Station LM-4** is located at a point that has been used by the SFPUC for monitoring water quality in South Lake since 1999 and is representative of the overall health and water quality of South Lake (Kennedy/Jenks, 2010). As part of this proposed monitoring plan, LM-4 has been selected for collecting samples for a more detailed water quality analysis (see **Table 1** in Section 2.2), to be consistent with the location (e.g., South Lake Merced Pump Station) used for long-term quarterly water quality monitoring conducted by the SFPUC, allowing comparison of the 2011-2012 wet season monitoring data to the larger historic record. Surface water sampling (i.e., from 0 to 5-foot depth) would be representative of the receiving water quality in that portion of the water column most likely to be influenced by the proposed stormwater discharges from the Canal. In addition, it is noted that the historical data suggests the lake is well mixed during winter months due to low air temperatures and wind action[2].

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[1] Note: max depth at location LM-1 is 2-feet.

[2] Due to health and safety concerns for open water sampling during storm event, LM-2 (public dock) will be used as a back-up location for surface water quality sampling during winter months. As noted in the text, data from 12 years of monitoring by the SFPUC indicate that Lake Merced is well mixed during winter months and surface water

3.2 Monitoring Methodology

The proposed wet season water quality monitoring will be conducted using the following techniques:

- Basic water quality constituents (dissolved oxygen, pH, temperature, and conductivity) will be recorded continuously throughout the wet season using multi-probe water quality sondes with logging capability at all the locations in the Canal and South Lake as identified in Figure 1. The sondes are located at depths identified in **Table 2**.
- Hydrologic characterization of stormflow within the Canal will utilize a continuously recording Area-Velocity meter to capture water depth, velocity, and flow within the Canal in real time.
- Detailed water quality characterization of stormflow and South Lake receiving waters will be conducted through collection of water quality samples for laboratory analysis at VGC-1 and LM-4 (or LM-2) as identified in Figure 1. Detailed water quality characterization both in the Canal and in South Lake would be conducted during and following, precipitation events that result in stormflow within the Canal above base flow conditions.
- Detailed water quality characterization of base flow in the Canal will be conducted through collection of water quality samples for laboratory analysis.

The following sections describe the detailed methodologies being employed for water quality and hydrologic characterization of the Canal and South Lake.

Canal

Rainfall: In order to correlate Canal flow to precipitation events, rainfall will be monitored at a local rain gage (Station AS891) located approximately 2.5 miles northwest of Vista Grande Canal at Ocean Beach at an elevation of 33 feet via the MesoWest weather portal online (MesoWest, 2011), administered by the University of Utah, Department of Atmospheric Sciences. Raw tipping bucket rainfall data will be downloaded for Station AS891 monthly, standardized to Pacific Standard Time, and processed to calculate total cumulative rainfall (inches) for the monitoring period; total daily rainfall (inches) for the monitoring period; and cumulative hourly rainfall (inches per hour) for each storm event for which water quality was characterized by sample collection and laboratory analysis (approximately 6 events).

Flow: To monitor flow within the Canal, an ISCO 2150 Area-Velocity meter will be installed at the VGC-1 monitoring station (Figure 1). The ISCO 2150 records continuous measurements of water depth (foot) and water velocity (foot/second). Channel dimensions (from survey data) and channel form (trapezoidal) allow the Area-Velocity meter to report real time flow (cfs). The velocity sensor will be mounted onto a pre-fabricated stainless steel plate which will be fixed in place on the Canal bottom. Flow data will be

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samples at LM-2 would be representative of surface water quality within Lake Merced within the vicinity of the proposed discharge.

used to generate hydrographs of Canal flows. In addition, hydrographs will be generated to correlate water quality data to the timing and volume of storm events sampled.

Water Quality Monitoring by Direct Measurement: For continuous direct measurement of basic water quality constituents of stormflow within the Canal, a multi-probe water quality sonde with logging capability will be installed in the Canal within a PVC stilling well, mounted onto the Canal bank (Olympic Club side). The sonde will continuously record dissolved oxygen levels, pH, and temperature (15 minute interval, synced to Area-Velocity recorder measurements).

Detailed Stormwater Quality Characterization: The intent of the detailed water quality monitoring methodology is to characterize water quality in the Canal (storm flows and base flows proposed for diversion). Table 1 details the water quality constituents proposed for wet season water quality characterization of Canal storm and base flows.

Sampling of the Canal storm flows has two basic objectives. The primary objective is to estimate the constituent loading of storm events. A secondary objective is to measure the variation of pollutant concentrations within each storm event. To meet the primary objective, an Event Mean Concentration (EMC) will be calculated for each storm event and multiplied by the total event flow volume. Due to the flashy nature of urban watersheds, the Vista Grande Canal experiences short durations of storm event runoff and stormflow receds to baseflow levels rapidly following cessation of precipitation.It is therefore problematic to successfully collect grab samples manually. As a result, samples from the Canal will be collected using an ISCO automatic water sampler. To enable calculation of the EMC, flow-interval (volumetric paced) sampling will be used. A pre-determined volume of water (approximately 100mL to 900mL) will be sampled at pre-determined flow rate (e.g. for every 100,000 gallons) that is tracked by the area-velocity meter. Each targeted storm event will be evaluated for intensity and duration using weather forecasts, and the autosampler will be programmed via a telemetry device. In addition to being informed by weather forecasts, programming will be informed by the analysis of previous storm hydrographs and the results of prior sampling events. The following sampling parameters will be determined prior to each sampling event.

- Flow threshold trigger: establishes the point at which the auto sampler will begin sampling a storm event. The flow threshold may range from 2 to 20 cfs, depending on the expected intensity and duration of a flow event. The goal will be to use the lowest flow threshold in order to capture the greatest extent of the hydrograph (and therefore reduces error in calculating the EMC), without triggering a number of smaller pre-storm runoff events that could result in exceeding the bottle capacity before the storm event is finished.

- Sample size: a smaller sample size allows for more samples to be taken (which reduces error in calculating the EMC), however a smaller sample size requires more frequent back flushing of the sampling line, which can limit the ability to sample quickly enough at the peak of the hydrograph (and introduce error in the EMC calculation). As noted, sample sizes are expected to range from 100mL to 900mL.

- Flow interval: determines the rate (volumetric or time paced) at which samples will be taken. The rate will be adjusted according to the expected intensity and duration, and selected sample size. The autosampler will be connected to an ISCO Area-Velocity meter and set to collect water quality samples from the Canal at pre-determined flow thresholds to allow collection of water quality samples during precipitation events that generate Canal storm flow.

The autosampler will sequentially collect samples in 24 (900mL) bottles, filling one bottle before starting the next. At the completion of the sampling, field staff will create a composite event sample by consolidating all or a portion of the individual bottles into one large container. This large container will then be used to fill constituent sample bottles. Because the sampling will be flow weighted, if the storm event is adequately captured by the autosampler this composite sample will provide the EMC for individual constituents. Adequate precautions will be required to ensure the contributing volume from the 24 individual sample bottles is accurately measured, and that settling of the samples is controlled. Water quality samples will be collected from the autosampler for delivery to a commercial lab for analysis within 24 hours of a precipitation event.[3]

To sample the entire suite of constituents indentified in Table 1, a minimum event composite sample of 16.65 liters will be required. In the event that an inadequate volume of water is collected by the autosampler, the sample for giardia and cryptosporidium will be not be included, reducing the minimum event composite sample to 9.08 liters. If less than 9.08 liters is representatively sampled, constituents will be prioritized, or the sampling event will be concluded without sending the samples for laboratory analysis.

Using separate sample bottles in the autosampler instead of one large composite sample container will facilitate the secondary objective – to measure the variation of pollutant concentrations across the storm hydrograph (e.g. pollutant concentrations characterizing the rising versus falling limb of the hydrograph) – to be achieved. If an adequate volume of water is remaining in the 24 individual sample bottles, then this remaining sample volume will be used to develop 1-3 composite samples of the hydrograph. Three potential groupings will be used. The first grouping will consist of two groups, one composite group below a flow threshold, and another group above the flow threshold. This will provide concentration data based on the flow in the canal and may assist in developing operational diversion criteria. The second potential grouping will be to develop 1-3 composite samples relating to the rising limb, peak flow, and falling limb of the hydrograph. This will provide concentration data based on the sequence of flows. If only 1 sample is taken (for instance of the rising limb), this sample would provide some characterization of that segment of the hydrograph as compared to the EMC. The following

[3] Due to the flashy nature of the Vista Grande Basin and Canal, and depending on the timing of precipitation event, sample collection and delivery to a commercial lab will need to occur during business hours Monday to Friday. This is a constraint for water quality analysis that reflects commercial lab operation hours, sample hold times, and staff health and safety considerations. Microbiological constituents will be collected and shipped to the lab as expeditiously as possible.

constituents (listed in order of priority) would be sampled to characterize variation within the hydrograph:

Constituent	Sample Size (L)
Total Suspended Solids	1
Orthophosphate & Nitrate as N	0.25
Total Metals (Pb, Cu, Ni)	0.25
Total Metals (Zn)	0.25
Mercury	0.5
Bacteria	0.5

Base flow samples would be collected to characterize the quality of water that would be diverted to South Lake through the proposed treatment wetlands. Six samples would be taken periodically through the wet season (approximately 1 per month), subject to adequate base flow volume. Table 1 lists the laboratory methods for the proposed water quality constituents that will be monitored at VGC-1 (and at LM-4, as detailed below).

South Lake

Water Quality Monitoring by Direct Measurement: For continuous direct measurement of basic water quality constituents for receiving waters, multi-probe water quality sondes with logging capability will be installed at various locations (LM-1 through LM-4 as shown on Figure 1) and at a range of depths (Table 2) to characterize basic receiving water quality both spatially and throughout the water column (where appropriate). The sondes will record dissolved oxygen levels, pH, conductivity, and temperature on an hourly interval, allowing comparative analysis of event based and seasonal water quality trends between the Canal stormwater and South Lake receiving water.

Detailed Receiving Water Quality Characterization: To facilitate comparative analysis and impact assessment, water quality sample collection from South Lake will be synchronized with collection of water quality samples from the Canal. To the extent possible, samples will be collected within 24 hours of a precipitation event (for 6 events) that generates stormflow and autosampler collection within the Canal. Water quality samples collected for laboratory analysis will be collected from station LM-4[4] (Figure 1) surface waters (< 5 foot depth; rationale for location and depth provided in Section 2.1, above). Table 1 details the water quality constituents proposed for wet season water quality characterization of South Lake receiving waters. All samples will be collected using standard accepted field methods and delivered to a commercial lab for analysis of the water quality constituents summarized in Table 1. Additionally, subsequent water quality samples will be collected from LM-4 approximately 24 hours after the cessation of a precipitation/runoff event for analysis of microbiological

[4] Or alternately LM-2 as discussed in Section 3.1, above.

constituents (indicator bacteria as detailed in Table 1) to characterize and assess the rate of bacterial die-off in Lake Merced following contribution of stormflows as part of a Microbial Risk Assessment (see Attachment B for a description of specific data objectives). Table 1 lists the laboratory methods for the proposed water quality constituents that will be monitored at LM-4.

Stormwater Diversion: To facilitate the analysis of indicator bacteria levels, stormwater diversions previously conducted by Daly City and the SFPUC (as described in EOA, 2011) may be conducted during the 2011-2012 wet season to expand on the analysis of potential project-related impacts on bacteria levels in South Lake. The intent of stormwater diversions is to convey a volume of water that more closely approximates volumes that would be diverted by the project. The maximum diversion in the pilot project was 5.4 million gallons, however most diversion volumes were much smaller (ranging from 0.09 to 3.3 million gallons). If feasible during storm events of large magnitude and extent, stormwater would be diverted through the Continuous Deflection System (CDS) established for the pilot project to screen trash and disperse flows into the riparian buffer of South Lake. Indicator bacteria levels at near shore and offshore would be monitored to characterize dilution. A series of 2 samplings would occur at a minimum of 3 locations in South Lake. Sampling would occur at the end of the event and a second sampling would be taken 24 hours following the first sample event to characterize indicator bacteria die-off. Sampling of Vista Grande stormwater would occur during the diversion to characterize indicator bacteria/pathogen levels of the water diverted to South Lake.

TABLE 1. PROPOSED MONITORING PROTOCOL FOR WET WEATHER SEASON (SAMPLING AND LABORATORY ANALYSIS)

Constituent	Canal Sampling Frequency (VGC-1)	South Lake Merced Sampling Frequency LM-4 Surface (<5 feet)	Units	Laboratory Test Method	Method Detection Limits	Reporting Limits	Sample Size
Dissolved oxygen (manual)	A target of 6 storm events and 6 base flow samples	A target of 6 storm events with 2 samples per event	mg/L	N/A (field measurement)			
pH (manual)			pH scale				
Temperature (manual)			Degrees Celsius				
Total phosphorous			mg/L	EPA 365.1	0.03 mg/L	0.04mg/L	(1) 1 Liter
Orthophosphate			mg/L	EPA 300.0	0.021 mg/L	0.1 mg/L	(1) 250 ml
Nitrate as N			mg/L	EPA 300.0	0.019 mg/L	0.1 mg/L	Same Container w/ Ortho.
Total Kjeldahl Nitrogen			mg/L	EPA 351.2	0.04 mg/L	0.15 mg/L	(1) 1 Liter
Total Ammonia [as N]			mg/L	EPA 350.1	0.05 mg/L	0.05 mg/L	(1) Liter
Chemical Oxygen Demand			mg/L	SM 5220D	10 mg/L	10 mg/L	(2) 40 ml
Biochemical Oxygen Demand			mg/L	SM 5210B	4 mg/L	4 mg/L	(1) 1 Liter
Total Metals (Pb, Cu, Ni)			µg/L	EPA 200.8	0.1 µg/L	0.5 µg/L	(1) 250 ml
Total Metals (Zn)			µg/L	EPA 200.8	1 µg/L	5 µg/L	(1) 250 ml
Total Mercury			µg/L	EPA 1631	0.0005 µg/L	0.0005 µg/L	(1) 500 ml
Dissolved Metals (Pb, Cu, Ni)			µg/L	E200.8 (filtered)	0.1 µg/L	0.5 µg/L	(1) 250 ml

TABLE 1 (cont.). PROPOSED MONITORING PROTOCOL FOR WET WEATHER SEASON (SAMPLING AND LABORATORY ANALYSIS)

Constituent	Canal Sampling Frequency (VGC-1)	South Lake Merced Sampling Frequency LM-4 Surface (<5 feet)	Units	Laboratory Test Method	Method Detection Limits	Reporting Limits	Sample Size
Dissolved Metals (Zn)	A target of 6 storm events and 6 base flow samples	A target of 6 storm events with 2 samples per event	µg/L	E200.8 (filtered)	1 µg/L	5 µg/L	(1) 250 ml
Total suspended solids			µg/L	SM 2540D	N/A	1 µg/L	(1) 1 Liter
Volatile suspended solids			µg/L	SM 2540D	N/A	4 µg/L	(1) 1 Liter
Total dissolved solids			µg/L	SM 2540C	N/A	10 µg/L	(1) 500 ml
Hardness			mg/L CaCO3/L	SM 2340B & 200.7	1 mg/L CaCO3/L	1 mg/L CaCO3/L	(1) 250 ml
Chlorophyll a			µg/L	SM 10200 Part 4	5 µg/L	5 µg/L	(1) 1 Liter
Total Coliform, Fecal Colifom, E. coli*			cfu/ml	SM 9222	1 cfu/100 ml	1 cfu/100 ml	(1) 200 ml
Enterococcus*			cfu/ml	EPA 1600	1 cfu/100 ml	1 cfu/100 ml	(1) 100 ml
Male Specific Bacteriophage (MS-2)			PFU/100 ml	EPA 1602	1/100 ml	1/100 ml	(1) 100 ml
Human Bacteroidales*			Number of Markers	Multiple Markers	N/A	N/A	(1) 100 ml
Giardia spp*	A target of 6 storm events**		cyst/L	EPA 1623	0.1 cyst of cyst/L	0.1 cyst of cyst/L	(2) 1 Gallon
Cryptosporidium*			oocyst/L	EPA 1623	0.1 cyst of oocyst/L	0.1 cyst of oocyst/L	
Secchi Depth	n/a		Feet	N/A (field measurement)	N/A	N/A	N/A

Notes: * Detection limits shown are target values. Actual detection limits will depend on amount of sample able to be filtered.

** Due to large sample volume requirements for Giardia and Cryptosporidium (2 gallons) and limitations on volumes collected by the autosampler, sampling of these constituents may be forfeited in favor of providing a representative composite sample of the remaining constituents (to estimate event loading) and characterizing the variation of pollutant concentrations across the storm hydrograph.

TABLE 2. PROPOSED MONITORING FOR WET WEATHER SEASON (DIRECT MEASUREMENT)

Constituent	Location	Monitoring Depth (feet)	Frequency of Measurements
pH, DO, temperature, conductivity	VGC-1	Surface*	Continuous (Hourly)
pH, DO, temperature, conductivity	LM-1	Surface** (<5 ft)	Continuous (Hourly)
pH, DO, temperature, conductivity	LM-2	Surface** (<5 ft), near bottom (8 ft)	Continuous (Hourly)
pH, DO, temperature, conductivity	LM-3	Surface** (<5 ft), near bottom (15 ft)	Continuous (Hourly)
pH, DO, temperature, conductivity	LM-4	Surface** (<5 ft), 10 ft, 15 ft, and near bottom (20 ft)	Continuous (Hourly)

* Continuous water quality monitoring within the Canal is only feasible above a depth of 0.5-feet (stormflow), and as such continuous water quality data will be collected for stormflow but not for baseflow.
**Continuous water quality monitoring between zero and up to 5 feet of depth in the Lake are assumed to be representative of surface sampling.

REFERENCES

EDAW, *Lake Merced: Initiative to Raise and Maintain Lake Level and Improve Water Quality, Task 4 Technical Memorandum*, Prepared for the San Francisco Public Utilities Commission, September 2004.

EOA, *Preliminary Water Quality Screening Results, 2003/04 – 2008/09 Wet Weather Seasons, Lake Merced Pilot Stormwater Enhancement Project*, Prepared for the North San Mateo County Sanitation District, June 2011

Kennedy/Jenks Consultants (KJ)*, Lake Merced Water Quality Data Organization, Review and Analysis*, Prepared for the San Francisco Public Utilities Commission, 25 January 2010.

RMC, *Vista Grande Watershed Study*, Prepared for the City of Daly City and City and County of San Francisco, 2006.

APPENDIX D

BMP Screening and Ranking Matrix and Additional Treatment Measures

Lake Management Actions Eliminated from Further Consideration

Daly City and SFPUC convened a workshop on July 16, 2013 to discuss the final screening and ranking of the BMPs and treatment measures and produced a final list of management actions to include in this LMP. During the discussion, the following BMPs, stormwater treatment measures and in-lake treatment measures were considered and eliminated from further consideration and potential implementation.

Watershed BMPs

Expanded Street Sweeping and Maintenance

Daly City and San Francisco would examine existing street sweeping schedules within the Lake Merced and Vista Grande watersheds and expand efforts and frequency where possible.

Reason for Elimination

Originally this measure was assessed and carried forward for inclusion in the LMP (as reflected in the matrix, below). However, after further assessment this BMP was eliminated from further consideration. Daly City is already implementing a weekly cleaning schedule, which goes beyond the MRP-required once per month schedule. Daly City streets are swept once each week in both residential and commercial areas. There is no formalized coordination between the garbage collection and street sweeping, and coordination would be infeasible because garbage collection requires residents to place bins on the street, where they would interfere with street sweeping. Daly City also sweeps Mission Street/El Camino Real five times per week along the section of Mission Street that drains into the Vista Grande Drainage Basin. In addition to mechanical sweeping, the Public Works Street Division crews hand-sweep the curb returns along streets that are being swept. Additionally, there is no foreseeable benefit in expanding San Francisco's street sweeping activities because of the deep (between 3-8ft) settling basins (cleaned annually) in the catch basins San Francisco has installed in the Lake Merced area.

Infiltration

Retention based green infrastructure BMPs include raingardens/bioretention, infiltration trenches/basins and permeable pavement. This measure would reduce available stormwater for reuse in Lake Merced.

Reason for Elimination

This BMP was eliminated because it conflicts with Objectives 1a (Increase surface water input to the Lake) and 1b (Capture and manage stormwater as a resource) from the LMP Goals and Objectives.

Rainwater Harvesting

The installation of rain barrels and cisterns in the Vista Grande Drainage Basin and/or Lake Merced watershed could reduce peak stormwater flows, increase infiltration, and conserve water for later non-potable use. In the Vista Grande Drainage Basin, rainwater harvesting could reduce the volume of water available for diversion into South Lake.

Reason for Elimination

This BMP was eliminated because it conflicts with Objectives 1a (Increase surface water input to the Lake) and 1b (Capture and manage stormwater as a resource) from the LMP Goals and Objectives.

Downspout Disconnection

Disconnection of downspouts would redirect rainwater to lawns and reduce the volume of peak stormwater flows and increase infiltration. As a voluntary program, its effectiveness would be dependent on the degree of homeowner participation. In the Vista Grande Drainage Basin, downspout disconnection would reduce the volume of water available for diversion into South Lake.

Reason for Elimination

This BMP was eliminated because it conflicts with Objectives 1a (Increase surface water input to the Lake) and 1b (Capture and manage stormwater as a resource) from the LMP Goals and Objectives.

Stormwater Treatment Measures

Stormwater filtration

The use of filtration systems in catch basins or vaults would reduce levels of suspended solids, nutrients and metals from stormwater. Filtration systems would require regular maintenance of vault filters.

Reason for Elimination

This measure could be used as a last resort if water quality is not improving with the implementation of BMPs and end of pipe treatment. San Francisco and Daly City are currently approaching stormwater management at a City-wide level.

Alum or Phoslock treatment of stormwater

This treatment binds with phosphates and removes them from the water column. It is used to reduce or limit the growth of algae. The public perception of chemical use (concerns on the toxicity of aluminum) would not make this a very popular option.

Reason for Elimination

This measure was eliminated due to lack of public support, feasibility of implementation, and a concern that it may not be beneficial to the water quality.

Ferrate treatment of stormwater

The use of Ferrate (Iron VI) serves as an oxidant, coagulant, and disinfectant and requires contact time. It could reduce levels of bacteria, metals, phosphorus in stormwater and have a minor influence on DO & pH. The reduction in nutrient levels could reduce potential for stormwater to stimulate additional algal growth.

Reason for Elimination

This measure was eliminated due to lack of public support, feasibility of implementation, and a concern that it may not be beneficial to the water quality.

In-Lake Management Measures

Alum treatment

Aluminum sulfate (alum) or Phoslock is applied directly to the Lake, which binds with phosphorus in the water and settles to the bottom creating a barrier to phosphorus uptake. This removes and controls internal cycling of phosphorus, reduces algae, and improves clarity. It would have a minor influence on DO & pH and a short-term effect of improving DO by reducing oxygen demand and improving pH by reducing algae.

Reason for Elimination

Lake-wide treatment could be costly, and would only be effective for a limited duration (1-10 years). The effectiveness is limited by ongoing phosphorus inputs to the Lake. This measure was eliminated due to lack of public support, feasibility of implementation, and a concern that it may not be beneficial to the water quality.

Algaecide treatment

This action would apply peroxides (e.g., PAC27) directly to the Lake to reduce algal growth and increase water clarity. Algaecide treatment is expected to have a moderate influence on DO and pH. It may improve DO by reducing oxygen demand, and improve pH by reducing algae, which contribute to high pH.

Reason for Elimination

This measure was eliminated due to lack of public support, feasibility of implementation, and a concern that it may not be beneficial to the water quality.

Biomanipulation

This action is intended to reduce algae in a sustainable manner by manipulating the existing ecology in the Lake. Biomanipulation would require increasing zooplankton and removing small fish, as well as creating a submerged aquatic vegetation zone. It may have a moderate influence on DO and pH by reducing algae, thereby reducing biochemical oxygen demand (BOD) from sediments and production of high pH during the day.

Reason for Elimination

This measure was eliminated due to lack of public support, feasibility of implementation, and a concern that it may not be beneficial to the water quality.

Macrophyte Harvesting

This action would directly remove a small amount of nutrients from Lake water and could improve DO by reducing oxygen demand. It may be combined with biomanipulation.

Reason for Elimination

This measure was eliminated due to lack of public support, feasibility of implementation, and a concern that it may not be beneficial to the water quality.

			Ranking Criteria							
ID#	**Action**	**Action Type**	**Estimated benefit to water quality (including cumulative benefits)**	**Estimated benefit to lake levels**	**Capital costs**	**Operation and maintenance costs**	**Ease of operation**	**Potential for stakeholder support**	**Social benefits**	**Timeline for implementation**
Proposed Vista Grande Project Components										
1	Return storm water to Lake (proposed for Vista Grand Project)	Watershed/ Source Control	?	2	SFPUC 1 DC 0	SFPUC 2 DC 1	1	2	1	SFPUC 2 DC 1
2	Solids Screening >5mm (proposed for Vista Grande Project)	Treatment	2	0	SFPUC 2 DC 0	SFPUC 2 DC 1	SFPUC 2 DC 1	2	SFPUC 0 DC 1	SFPUC 2 DC 1
3	Treatment wetland for stormwater and year-round flows (low flow wetland proposed for Vista Grande Project)	Treatment	2	1	SFPUC 1 DC 0	SFPUC 2 DC 1	1	SFPUC 2 DC 1	SFPUC 0 DC 1	SFPUC 2 DC 1
4	Flushing of lake water to ocean outfall	In-lake management	2	2	1	2	2	SFPUC 2 DC 1	SFPUC 0 DC 1	SFPUC 2 DC 1
5	Recirculation of lake water to treatment wetland	Treatment	?	?	1	DC 1	SFPUC 1 DC 0	SFPUC 2 DC 1	SFPUC 0 DC 1	SFPUC 2 DC 1
Watershed BMPs										
6	Detention Based Green Infrastructure BMPs (Detention and Filtration): vegetated swales, vegetated filter strips, flow-through planters, sand filters, constructed wetlands, detention ponds	Watershed/ Source Control	1	1		DC 0	DC 1	SFPUC 2 DC 1	1	DC 2
7	Retention Based Green Infrastructure BMPs (Infiltration): raingardens/bioretention, infiltration trenches/basins, permeable pavement	Watershed/ Source Control	0	0	DC -2		DC 1	SFPUC 2 DC -1	SFPUC 1 DC 0	DC 0
8	Separating stormwater from combined system (San Francisco) and daylighting streams	Watershed/ Source Control	0	1				SFPUC 2	SFPUC 1	
9	Pet Waste Management Education program and facilities (clean-up bag stations, trash receptacles)	Watershed/ Source Control	1	0	2	SFPUC 1	SFPUC 2 DC 1	2	1	2
10	Reduce nutrient sources from upland areas surrounding Lake (woodchips, restrict use of lawn fertilizers, minimize irrigation runoff etc.)	Watershed/ Source Control	1	0	SFPUC 1	SFPUC 1	SFPUC 1 DC 0	SFPUC 1 DC 0	SFPUC 1 DC 0	SFPUC 1
11	Expanded Street Sweeping and Maintenance	Watershed/ Source Control	1	0	DC 1		DC 1	SFPUC 2 DC -1	DC 1	2
12	Catch Basin Screening	Watershed/ Source Control	2	0	DC 0	DC 0	DC 1	SFPUC 2 DC -1	DC 0	DC 1
13	Incentive Programs for Downspout Disconnection and Companion Raingardens	Watershed/ Source Control	0	0		DC 2	DC 2	DC -1	SFPUC 1 DC 0	DC 0
14	Incentive Programs for Rainwater Harvesting/Cisterns	Watershed/ Source Control	0	0		DC 2	DC 2	SFPUC 2 DC -1	SFPUC 1 DC 0	DC 0
15	Green Infrastructure Education Programs (public workshops, school programs and curriculum development,	Watershed/ Source Control	0	0	DC 2	DC 2	DC 2	2	DC 1	DC 2
16	Enhance wetland and riparian habitat around Lake	Treatment	1	0	DC 0	SFPUC 1 DC 2	2	SFPUC 0 DC 2	1	1
Potential Stormwater Treatment Measures (if Required)										
17	Stormwater Filtration (Use of filtration systems in catch basins or vaults)	Treatment	1	0	DC 0	DC 0	DC 0	SFPUC 2 DC -1	SFPUC 1 DC 0	DC 1
18	Alum or Phoslock treatment of stormwater	Treatment	2	0		SFPUC 1 DC 0	SFPUC 2 DC 0	SFPUC 2 DC -1	0	SFPUC 2 DC 0
19	Ferrate treatment of stormwater (Use of Ferrate (Iron VI) as an oxidant, coagulant, and disinfectant; requires contact time)	Treatment	?	0		SFPUC 1 DC 0	SFPUC 2 DC 0	SFPUC -2 DC -1	SFPUC -1 DC 0	SFPUC 2 DC 1
Potential In-Lake Management Measures (if Required)										

			Ranking Criteria							
ID#	**Action**	**Action Type**	**Estimated benefit to water quality (including cumulative benefits)**	**Estimated benefit to lake levels**	**Capital costs**	**Operation and maintenance costs**	**Ease of operation**	**Potential for stakeholder support**	**Social benefits**	**Timeline for implementation**
20	Aeration Mixing (Bubbler devices in Lake bottom create a mixing force that causes circulation of Lake waters)	In-lake Management	2	0	SFPUC 0 DC 1	0	1	SFPUC 1 DC -1	0	SFPUC 2
21	Alum Treatment (Aluminum sulfate (alum) or Phoslock (see earlier) is applied directly to the Lake, which binds with phosphorus in the water and settles to the bottom creating a barrier to phosphorus uptake)	In-lake Management	2	0		1	SFPUC 2 DC 0	-2	0	SFPUC 2
22	Algaecide Treatment (Application of peroxides (e. g. PAC 27) directly to the Lake to reduce algae growth). Copper-based algaecides will not be considered.	In-lake Management	2	0		SFPUC 2 DC 0	SFPUC 2	SFPUC -1 DC -2	SFPUC 0	SFPUC 2
23	Biomanipulation	In-lake Management	1	0		SFPUC 2	SFPUC 2	SFPUC -2	SFPUC 0	SFPUC 2
24	Macrophyte harvesting	In-lake Management	1	0		SFPUC 2	SFPUC 2	SFPUC 0	SFPUC 0	SFPUC 2

Different
Exactly the same
No input provided

Ranking Criteria	Category weighting	Score	Description
Estimated benefit to water quality (including cummulative benefits)	**1**	2	Would improve water quality in a detectable manner
		1	Would improve water quality in a non-detectable manner
		0	Would have no effect on water quality
		-1	Would degrade water quality in a non-detectable manner
		-2	Would degrade water quality in a detectable manner
Estimated benefit to lake levels (including cumulative benefits)	**1**	2	Would improve lake levels in a detectable manner
		1	Would improve lake levels in a non-detectable manner
		0	Would have no effect on lake levels
		-1	Would degrade lake levels in a non-detectable manner
		-2	Would degrade lake levels in a detectable manner
Capital costs	**1**	2	< $100,000
		1	$100,000 - $1 million
		0	> $1 million
Operations and maintenance costs	**1**	2	Would require no additional operations and maintenance staff and equipment
		1	Would require intermittent operational and maintenance staff and equipment
		0	Would require dedicated operations and maintenance staff and equipment
Ease of operation	**1**	2	Self maintaining system
		1	Performance would be slightly affected by operational decisions
		0	Performance would be dependent on operational decisions
Potential for stakeholder support	**1**	2	Majority stakeholder support - minority neutral
		1	Majority stakeholder support - minority oppose
		0	All stakeholders neutral
		-1	Majority stakeholder oppose - minority support
		-2	Majority stakeholder oppose - minority neutral
Social benefits	**1**	1	The management action would be expected to provide positive social benefits
		0	The management action would be expected to provide neutral social benefits
		-1	The management action would be expected to provide negative social benefits
Timeline for implementation	**1**	2	1-5 years
		1	5-10 years
		0	10-20 years

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May 11, 2012

Xavier Fernandez
San Francisco Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Vista Grande Drainage Basin Improvement Project - Preliminary list of potential lake management actions

Dear Mr. Fernandez:

Daly City is in the initial stages of engineering design and environmental review for the proposed Vista Grande Drainage Basin Improvement Project. The South Lake Merced Alternative, which is currently identified as the proposed project, would divert storm water (and authorized non-storm water) flows from the Vista Grande Canal to South Lake Merced. Daly City, in cooperation with the San Francisco Public Utilities Commission (SFPUC), intends to develop a Lake Management Plan which would include a phased program of measures intended to maintain and where feasible improve the water quality of South Lake and Lake Merced in general.

As the first step in developing the Lake Management Plan, Daly City, in cooperation with the SFPUC, has prepared a preliminary list of potential actions intended to help improve water quality in South Lake (attached). The list includes watershed source control measures, treatment options, and lake management options which can be used singularly or collectively. This preliminary list has been expanded into the attached matrix that identifies the intended benefits of each action, the potential improvement of DO and pH levels, application and feasibility considerations, and whether additional evaluation is warranted at this time. Also attached is a description of the types of oxygenation and aeration techniques considered.

The list of potential actions was developed by ESA, EOA, Jacobs Associates and Dr. Alex Horne in consultation with Daly City and SFPUC staff. Dr. Alex Horne provided the evaluation of each action's influence on DO and pH levels. The list includes actions that are currently included in the proposed project, alternative actions that are proposed for further evaluation and possible incorporation into the Lake Management Plan, and those alternative actions that Daly City and SFPUC have determined do not warrant further investigation. The list is not intended as a substitute for the actions and Best Management Practices (BMPs) specified by the Municipal Regional Permit (MRP).

Based on comments provided by the Water Board, Daly City and SFPUC will further evaluate and determine the feasibility and likely effectiveness of the individual alternative actions. During the evaluation, Daly City will work with SFPUC and the Water Board to develop a framework for the Lake Management Plan to identify the criteria and timeline for implementation. Based on this framework and the evaluation of individual actions, Daly

City and SFPUC will develop a Draft Lake Management Plan that will be provided to the Water Board for review, and then finalized.

We appreciate the Water Board's ongoing participation in the review of the Vista Grande project and look forward to reviewing your comments. If you have any questions, please don't hesitate to call me at (510) 740-1720.

Sincerely,

Josh Ferris

cc: Patrick Sweetland, City of Daly City
Obi Nzewi, San Francisco Public Utilities Commission
Nicole Granquist, Downey Brand
Blake Rothfuss, Jacobs Associates
Tom Hall, EOA
Dr. Alex Horne

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
Proposed Vista Grande Components						
1	Return storm water to Lake (proposed for Vista Grand Project)	Watershed/ Source Control	Assist in maintaining Lake at target elevation (potential increase over existing conditions) Increase fisheries habitat Improve recreational benefits Alleviate flooding	Expected to have a minor, if any, impact on DO and pH. Likely to have a negligible impact on nutrient concentrations in South Lake water Depending on the amount of depth increase, there is a potential increase in the duration of stratification events, and corresponding anoxic conditions in the hypolimnion	Need to determine target lake water surface elevation Potential changes to water quality and habitat will need to be evaluated	Yes
2	Solids Screening >5mm (proposed for Vista Grande Project)	Treatment	Reduce levels of gross solids and trash in source water	Minor influence on DO & pH Reduction in nutrient levels would reduce potential for stormwater to stimulate additional algal growth	Space constraints in a constricted utility area Requires maintenance of screening device	Yes
3	Treatment wetland for stormwater flows (low flow wetland proposed for Vista Grande Project) *Also see similar Action #13, Treatment wetland for Lake water*	Treatment	Would remove sediment, suspended solids, metals, and nutrients from stormwater Public amenity, educational value	Potential moderate influence on DO & pH; lake has high background concentration of nutrients at present Reduction in nutrient levels in source water, potential reduction in nutrient concentrations in receiving waters	Need to determine sizing and treatment capacity Need to ensure vector control Aesthetic concerns can be addressed	Yes
Potential Actions to be Evaluated Further						
4	LID Filtration: Bioretention/rain gardens, vegetated filter strips, sand filters, vegetated swales	Watershed/ Source Control	Reduce levels of sediment, nutrients, trash, metals, bacteria, oil and grease, organics and oxygen demanding substances in source water	Minor influence on DO and pH Reduction in particulate-bound nutrient levels would reduce potential for stormwater to stimulate additional algal growth	Most LID projects in Daly City and San Francisco would be implemented with redevelopment and infrastructure projects Need to identify potential sites in the watershed for early implementation	Yes
5	LID Infiltration: Infiltration basins/trenches	Watershed/ Source Control	Promote infiltration and reduce volume and rate of runoff in the watershed Reduce levels of sediment, metals, bacteria and nutrients in source water	Minor influence on DO & pH Reduction in particulate-bound nutrient levels would reduce potential for stormwater to stimulate additional algal growth	Most LID projects would be implemented with redevelopment and infrastructure projects (Daly City and San Francisco) Need to identify potential sites in the watershed for early implementation	Yes
6	Separating stormwater from combined system (San Francisco) and daylighting streams	Watershed/ Source Control	Restore historical drainage to Lake Merced	Minor influence on DO & pH Increase volume of stormwater to Lake Negligible impact on nutrient concentrations in Lake	Separating stormwater from combined system is expected to occur as a part of SFPUC's SSIP Projects may be implemented with major redevelopment and infrastructure projects	Yes

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
7	Pet Waste Management Education program and facilities (clean-up bag stations, trash receptacles)	Watershed/ Source Control	Reduce levels of nutrients, bacteria and oxygen demanding substances in source water	Reduction in levels of oxygen demanding substances and nutrients would reduce potential for stormwater to degrade DO levels and stimulate algal growth in Lake High DO and cool temperatures would reduce harmful effects of BOD from pet waste in winter but summer flows would be more harmful	Coordination of multiple agencies to provide education, implementation, and enforcement	Yes
8	Reduce nutrient sources from upland areas surrounding Lake (woodchips, restrict use of lawn fertilizers, minimize irrigation runoff etc.)	Watershed/ Source Control	Reduce nutrient inputs to South Lake	Potentially moderate influence on DO & pH (if nutrients are currently limiting algae growth) Potential reduction of nutrient inputs to Lake from stormwater runoff. Benefit would be more substantial in summer since warm inflows float in photic zone	Need inventory of nutrient sources May require coordination of multiple agencies to provide education, implementation, and enforcement. May require phased implementation	Yes
9	Expanded Street Sweeping and Maintenance	Watershed/ Source Control	Reduce levels of sediment, trash, metals, oil and grease, organics and oxygen demanding substances in source water	Minor influence on DO & pH Reduction in levels of oxygen demanding substances would reduce potential for stormwater to degrade DO levels in Lake	Street sweeping, and hand cleaning and maintenance of curb returns is currently implemented in Daly City; San Francisco sweeps the streets surrounding Lake Merced. Expanding these existing programs may result in minimal additional benefit	Yes
10	Catch Basin Screening	Watershed/ Source Control	Reduce levels of gross solids and trash in source water	Minor influence on DO & pH Reduction in nutrient levels would reduce potential for stormwater to stimulate additional algal growth	Requires maintenance of catch basin screens Need inventory of contributing catch basins in San Francisco Downstream screening is proposed in Vista Grande basin (catch basin screens may be redundant)	Yes
11	Downspout Disconnection	Watershed/ Source Control	Reduce peak stormwater flows Increase infiltration	Negligible effect to Lake ecology Decrease volume of stormwater to Lake Minor potential to increase the contribution of shallow groundwater (some of which has elevated nitrate levels) into Lake Merced	In Vista Grande Drainage Basin, downspout disconnection would reduce the volume of water available for discharge into South Lake Effectiveness dependent on degree of homeowner participation A permit is required for the disconnection of residential downspouts in San Francisco Need to assess the potential for increased infiltration in the watershed to increase groundwater contribution to Lake Merced. Likewise, need to assess the potential to increase nitrate levels in Lake Merced due to elevated nitrate levels present in some shallow groundwater near the lake.	Yes
12	Rain Barrel/Cisterns	Watershed/ Source Control	Reduce peak stormwater flows Increase infiltration Conserve water for later non-potable use	Negligible effect to Lake ecology since any changes in the volume of water entering the lake is likely to be small relative to lake volume	In Vista Grande Drainage Basin, rainwater harvesting would reduce the volume of water available for discharge into South Lake SFPUC has an existing Discounted Rain Barrel and Cistern Program	Yes

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
13	Treatment wetland for Lake water (recirculation of Lake water) *Also see similar Action #3, Treatment wetland for stormwater flows*	Treatment	Would remove algae, sediment, suspended solids, metals, and nutrients from Lake water	Potential moderate-major influence on DO & pH; direct algal removal reduces summer BOD load to sediments Reduction in nutrient levels in the Lake; much of nutrients in algae removed in wetland (N better removed than P)	Need to determine if sites are available for the development of treatment wetlands Need to determine area requirements Would require pumping from lake (operational pump maintenance and energy cost)	Yes
14	Enhance wetland and riparian habitat around Lake	Treatment	Assist in filtering stormwater runoff Provide beneficial uptake of nutrients	Possible moderate beneficial effect on DO & pH if submerged plants prosper Reduction in nutrient levels in source water, potential reduction in nutrient concentrations in receiving waters	Possible undesirable influence on DO & pH; at night respiration by submerged parts of vegetation will reduce DO and in daytime increase pH. Effect can be moderated if water mixing is used on calm days Need to determine if suitable shallow water sites are available for the development of wetland/riparian habitat SFPUC's Lake Merced Watershed Report recommends potentially reducing the width of some sections of Lake Merced Boulevard, John Muir Drive and Skyline Boulevard to incorporate bioswales and open space.	Yes
15	Alum or posloc treatment of stormwater	Treatment	Reduce phosphorus levels Reduce or limit the growth of algae	Possible moderate-major short-term influence on DO & pH Potential reduction in phosphorus levels in source water and/or receiving waters will decrease algae and thus drop pH and BOD loading	Public perception of chemical use (concerns on the toxicity of aluminum). Rarely, if ever, used on larger water bodies in California but its use is common in other states. Posloc, replaces aluminum with lanthanum, which has lower toxicity perceptions	Yes
16	Ferrate treatment of stormwater Use of Ferrate (Iron VI) serves as an oxidant, coagulant, and disinfectant (requires contact time)	Treatment	Reduce levels of bacteria, metals, phosphorus in stormwater	Minor influence on DO & pH Reduction in nutrient levels would reduce potential for stormwater to stimulate additional algal growth	New technology; Need to determine if there have been similar applications Requires contact time – usually accommodated through storage (equalization basins).	Yes
17	Stormwater Filtration Use of filtration systems in catch basins or vaults	Treatment	Reduce levels of suspended solids, nutrients and metals from stormwater	Minor influence on DO & pH Reduction in nutrient levels would reduce potential for stormwater to stimulate additional algal growth	Filtration systems typically handle baseflow and bypass peak flows; limited practicality for a flashy basin like Vista Grande. Requires regular maintenance of vault filters	Yes
18	Aeration Mixing Bubbler devices in Lake bottom create a mixing force that causes circulation of Lake waters	In-lake Management	Causes mixing of the Lake so anoxic layer near bottom is reduced or eliminated Circulate waters to disrupt blue-green algae and favor more beneficial phytoplankton (better food web for fisheries)	Minor direct influence on DO & pH; indirect moderate to major effect likely via transport of surface DO to bottom waters Mixing reduces or eliminates anoxia at depth Potential reduction of pH levels by reducing sunlight exposure to algae and nutrient loading (which would reduce algal production) Depends on algae to produce DO, so aeration can fail on rare occasions if algae become low.	Requires installation and long term maintenance of new infrastructure in lake (air lines and bubble diffusers), and air compressor(s) on shore. Would disrupt stratification of lakes (colder hypolimnion habitat would be lost) affecting habitat that supports an existing recreational trout fishery.	Yes

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
19	Alum Treatment Aluminum sulfate (alum) or Phosloc (see earlier) is applied directly to the Lake, which binds with phosphorus in the water and settles to the bottom creating a barrier to phosphorus uptake	In-lake Management	Removes and controls internal cycling of phosphorus Reduces algae, improves clarity	Minor influence on DO & pH Short-term effect improving DO by reducing oxygen demand Short-term effect improving pH by reducing algae	Lake-wide treatment would be costly, and would only be effective for a limited duration (1-10 years) Effectiveness is limited by ongoing phosphorus inputs to the lake Alum treatment can reduce phosphorus cycling in sediment, may assist in addressing legacy nutrients	Yes
20	Algaecide Treatment Application of peroxides (e. g. PAC 27) directly to the Lake to reduce algae growth *Copper-based algaecides will not be considered*	In-lake Management	Reduces algae, improves clarity	Moderate influence on DO & pH May improve DO by reducing oxygen demand May improve pH by reducing algae	Chemical concerns (concerns on public perception - toxicity of herbicide, impact to fish and consumers of fish) Use of peroxides (e. g. PAC 27) would be effective, but expensive since treatment may be needed several times per year May assist in breaking internal nutrient cycle	Yes
21	Biomanipulation	In-lake Management	Reduces algae in a sustainable fashion. Requires manipulation of zooplankton (increase) & fish populations (removal of small fish by various methods) & presence of a submerged aquatic vegetation zone	Possible moderate influence on DO & pH Reducing algae would reduce sediment oxygen demand and lower pH	Potential disruption in existing fishery, potential sport fishing group opposition Would require coordination of stocking programs conducted by CDFG and SFPUC	Yes
22	Macrophyte harvesting	In-lake Management	Directly removes a small amount of nutrients	May improve DO by reducing oxygen demand	Potential disruption in beneficial uses, especially fishing and boating Need to quantify biomass to determine if harvesting is warranted Need to quantify nutrient reduction potential & weed disposal requirements on land May be combined with biomanipulation (for open water access)	Yes

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
Actions Dismissed from Further Evaluation						
23	Diversion of some flows (with higher pollutant loads) to a wastewater treatment plant	Treatment	Provide treatment of stormwater flows that carry higher pollutant loads.	Negligible effect to Lake (WWTP effluent would be discharged to ocean)	Does not satisfy criteria developed by the Bay Area Stormwater Management Agencies Association for pilot stormwater pump station diversion projects identified in the Municipal Regional Permit: • Land uses are primarily residential and limited commercial without significant sources of mercury or polychlorinated biphenyls (PCBs). • Lack of an existing suitable stormwater pump station. • First flush flows from the Vista Grande Drainage Basin have been and will continue to be conveyed to the ocean. • Dry weather from the Vista Grande Drainage Basin will be diverted and treated via a managed constructed treatment wetland. • Does not address regional water management strategies to increase recycled water use and restore Lake Merced water surface elevation. • Prohibitively expensive capital costs. Inconsistent with efforts to separate stormwater from wastewater and reduce San Francisco's combined sewer overflows.	No (Significant feasibility and regulatory costs with minor water quality benefit, lack of adequate justification for required rate increases)
24	Hypolimnetic Aeration Uses air-lift systems (e.g. LIMNO aerator) that mixes air into the hypolimnion without disrupting stratification	In-lake Management	Increases DO levels in hypolimnion Maintains stratification – this improves quality of deeper, colder waters for cold water fish (trout) Reduces anoxic conditions that support nutrient cycling	Moderate influence on DO, minor effect on pH Directly increases DO levels in hypolimnion Potential reduction of pH levels by reducing sunlight exposure to algae and nutrient loading (which would reduce algal production)	The permitting, capital and O&M costs to implement this action would be high relative to other efforts to improve water quality. Requires installation and long term maintenance of new infrastructure in lake (air-lift aerator(s), air lines), and air compressor(s) on shore Aerator may be located on shore, with lake water pumped to aerator and back to lake	No (significant permitting, capital and maintenance costs) Preliminary evaluation with SFPUC indicates that alternative methods may be more effective in managing lake conditions. Alternative lake management actions should be fully evaluated prior to re-consideration of this alternative.

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
25	Hypolimnetic Oxygenation Speece Cone, TVA-Mobley array, or similar device that mixes oxygen into the hypolimnion without disrupting stratification	In-lake Management	Increases DO levels in hypolimnion Maintains stratification – this improves quality of deeper, colder waters for cold water fish (trout) Reduces anoxic conditions that support nutrient cycling	Possible moderate-major influence on DO & pH Only method that ensures direct increase of DO levels in hypolimnion to a specified level. Potential reduction of pH levels by reducing nutrient loading (which would reduce algal production)	The permitting, capital and O&M costs to implement this action would be very high relative to other efforts to improve water quality. Requires installation and long term maintenance of new infrastructure in lake (Speece cone, oxygen lines), and oxygen storage facility (tank, fencing, access) on shore Cone is usually sited on lake bed so there is no visible structure. Shore based oxygen tanks or generators can be used. Cone can also be located on shore and water pumped in and back to lake	No (significant permitting, capital and maintenance costs) Preliminary evaluation with SFPUC indicates that alternative methods may be more effective in managing lake conditions. Alternative lake management actions should be fully evaluated prior to re-consideration of this alternative.
26	Surface Mixing Use of mixers at the surface to circulate water in the epilimnion and disrupt the growth of blue-green algae	In-lake Management	Vigorous water circulation to disrupt blue-green algae	Minor influence on DO & pH Would distribute DO in epilimnion & improve pH by adding some CO2	Requires installation and maintenance of new infrastructure in lake To have an effect on DO & pH, extensive fountains would be required that would result in visual intrusion and interference with passive and active recreation (i.e., rowing, boating, fishing) Application would be required in deepest areas of the lake, which rowers and other boaters frequent.	No (Significant disruption of beneficial uses, less disruptive methods are available)
27	Mechanical Whole-Lake Mixing Use of mechanical mixers at the Lake surface or in the Lake bottom (propeller) to break up stratification	In-lake Management	Cause mixing of the entire water column to increase DO levels at depth so anoxic layer near bottom is reduced or eliminated	Possible moderate-major influence on DO & pH Mixing reduces or eliminates anoxia at depth Potential reduction of pH levels by reducing nutrient loading (which would reduce algal production) Drawbacks similar to aeration if algae decline too much	The permitting, capital and O&M costs to implement this action would be high relative to other efforts to improve water quality Requires installation and long term maintenance of new infrastructure in lake Large propellers would disturb water surface and present a potential hazard to rowers and boaters. Application would be required in deepest areas of the lake, which rowers and other boaters frequent Visual intrusion, interference with passive and active recreation	No (significant permitting, capital and maintenance costs) Preliminary evaluation indicates that alternative methods may be more effective in managing lake conditions. Alternative lake management actions should be fully evaluated prior to re-consideration of this alternative.
28	Fountain Provides aeration and circulation of epilimnion	In-lake Management	Increase DO in epilimnion and circulate shallow waters Aesthetic feature	Minor influence on DO & pH Would slightly increase and distribute DO in epilimnion	Requires installation and maintenance of new infrastructure in lake. There would be capital and O&M costs to implement this action with only a minor benefit to water quality. May be perceived as a visual intrusion in an otherwise natural setting	No (capital and maintenance costs outweigh minor benefit to water quality).

ID#	Action	Action Type	Intended Benefits	Influence on Lake DO and pH level Factors	Application, Performance and Feasibility Considerations	Additional Evaluation Warranted?
29	Sediment Removal (dredging) Removes legacy nutrients in sediment reducing internal cycling	In-lake Management	Reduce a significant source of nutrients (internal loading) Restore Lake morphology Could change seasonal water mixing regime from current polymictic mixing if sufficient sediment removed (original depth not known)	Moderate influence on DO & pH Reduces nutrients in summer & decreases algal growth DO may improve by lowering sediment oxygen demand pH may improve by reducing algae	Very high sediment evaluation and implementation cost. Would create local disturbance for settling ponds and haulage areas. May not work well if nutrient flux continues at present rate Potential to re-suspend/release nutrients and metals from sediment Would require core sample analysis for age of lake and contaminant concentrations Highly disruptive of Beneficial Uses (recreation, fisheries) Would remove legacy nutrients	No (Significant disruption of beneficial uses, less disruptive methods are available)
30	Algae harvesting (Direct)	In-lake Management	Remove moderate amount of nutrients Directly removes larger nuisance algae	Moderate influence on DO & pH May improve DO by reducing oxygen demand May improve pH by reducing algae	Potential disruption in beneficial uses, especially fishing and boating Very difficult to get substantial amounts of algae separated from the water but could work if the wetlands filter option were used	No (Disruption of beneficial uses, difficult to achieve due to size of algae)
31	Dilution/flushing	In-lake Management	Remove nutrients, reduce nutrient concentrations	Minor-moderate influence on DO & pH Reduce nutrient concentrations and algae	The most effective application would be during the summer Would require a large volume of high quality water supply Lack of lake outlet that would facilitate flushing (would require large outlet/siphon near lake bottom)	No (Lack of adequate water supply and suitable outlet)
32	Selective withdrawal of hypolimnion water	In-lake Management	Remove anoxic water to increase overall DO levels	Moderate influence on DO & pH Would remove low DO water Would reduce pH by reducing internal nutrient cycling	Lack of adequate inflow, would be counterproductive to goal of increasing lake level Would require large siphon. May require treatment for water leaving siphon	No (Lack of adequate water supply and suitable outlet)
33	Shading (dyes)	In-lake Management	Reduce algal growth	Moderate influence on DO & pH May improve DO by reducing oxygen demand May improve pH by reducing algae	Would need to be repeated, dye lasts only a few months Disruptive of Beneficial Uses (recreation, fisheries) Public perception concerns	No (Disruption of beneficial uses, less disruptive methods are available)

General Types of Oxygenation and Aeration

Vista Grande Drainage Basin Improvement Project

Type	**Hypolimnetic** Methods that increase oxygen levels in the hypolimnion without disrupting stratification.		**Mixing (whole lake)** Method that mixes oxygen-rich epilimnion with oxygen-poor hypolimnion to increase oxygen levels near the lake bottom.
	Oxygenation	**Aeration**	**Aeration**
Description	Speece Cone or similar device that dissolves pure oxygen in bottom water in the hypolimnion with no bubbles. See **Figure 1**. TVA-Mobley array that introduces oxygen bubbles into the hypolimnion which dissolve as they rise. See **Figure 2**.	Air-lift systems (e.g. LIMNO aerator) that mixes compressed air and bottom water inside a large pipe. At top of pipe, aerated water flows down back to hypolimnion in outer pipe. Maintains thermal stratification. See **Figure 3**.	Bubbler devices in lake bottom create a mixing force that causes circulation of lake waters. Prevents thermal stratification. See **Figure 4**.
Equipment	Speece Cone, water pump, small diffuser manifold, & oxygen storage facility (tank, fencing, access) on shore. Cone is usually sited on lake bed so there is no visible structure. Shore-based oxygen tanks or generators can be used. Cone can also be located on shore and water pumped in and back to lake. Needs electric power. TVA-Mobley array as Speece Cone but with long lines of pipe diffusers replacing cone & water pump. Can be run without electric power if liquid oxygen is trucked in.	Air-lift aerator(s), air lines, and air compressor(s) on shore. Aerator is usually sited on lake bed. Most designs have a large surface mixing box to vent nitrogen to the air. Some use submerged pipes to vent gas in a very visible air boil. Aerator may be located on shore, with lake water pumped to aerator and back to lake. Aeration is not very efficient at adding oxygen to water so the aerator towers are tall and large. Several may be needed.	Long air lines and bubble diffusers arrays or pipes with holes to release air near bottom in lake, and air compressor(s) on shore. Air flow regulators on each diffuser simplify design in all but flat bottomed reservoirs. Needs electric power. System efficiency increases with depth so more diffusers are needed for shallow lakes.
Purpose	Increases DO levels in hypolimnion to any desired standard Maintains stratification to improve quality of deeper, colder waters for cold water fish (trout). This is accomplished by containing the oxygenation process within a device (e.g., Speece Cone, air-lift system) so that the pumped air or oxygen does not result in the vertical mixing of the water column or by using pure oxygen bubbles (TVA-Mobley system) that are too few to cause destratification. Speece Cone (horizontal flow of oxygenated water over sediments) reduces anoxic (oxygen-poor) conditions that support nutrient cycling from sediments. TVA-Mobley has vertical motion of bubbles so does less well on sediments but is a better method for general hypolimnion oxygenation.		Causes mixing of the lake so anoxic layer near bottom is reduced or eliminated. Circulate waters to disrupt growth of blue-green algae and favor more beneficial phytoplankton (encouraging better food web for fisheries). Cannot guarantee full DO saturation. Depends on algal photosynthesis to provide oxygen and this may be insufficient on occasion.

Speece Cone at Camanche Reservoir (EBMUD)

Speece Cone at Upper Oso Reservoir (Santa Margarita WD)

Source: Schuler Engineering

Figure 1

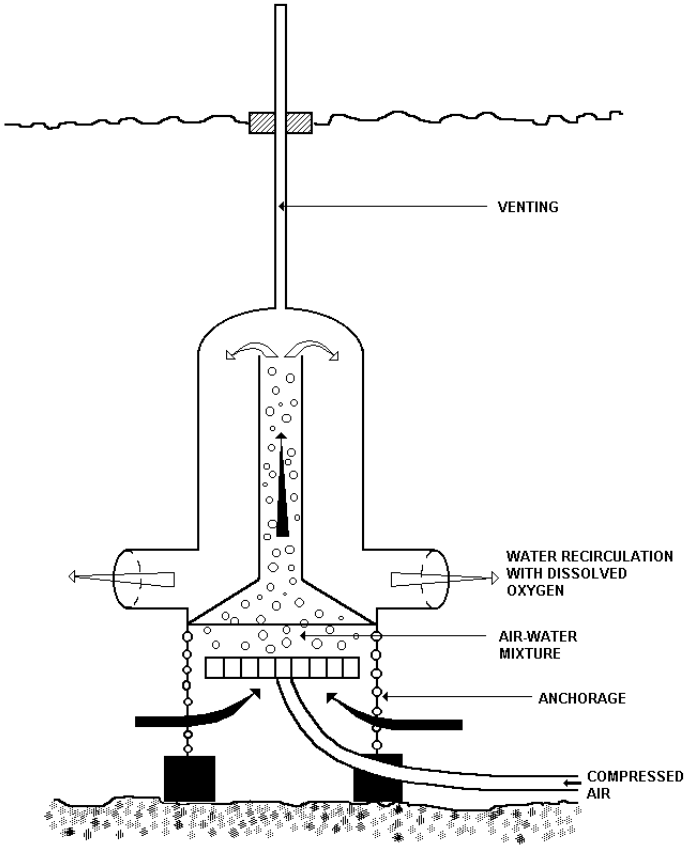
Hypolimnetic Oxygenation – Speece Cone

TVA-Mobley array installation at Calaveras Reservoir (SFPUC).
Line is laid out water surface prior to sinking to bottom of reservoir.

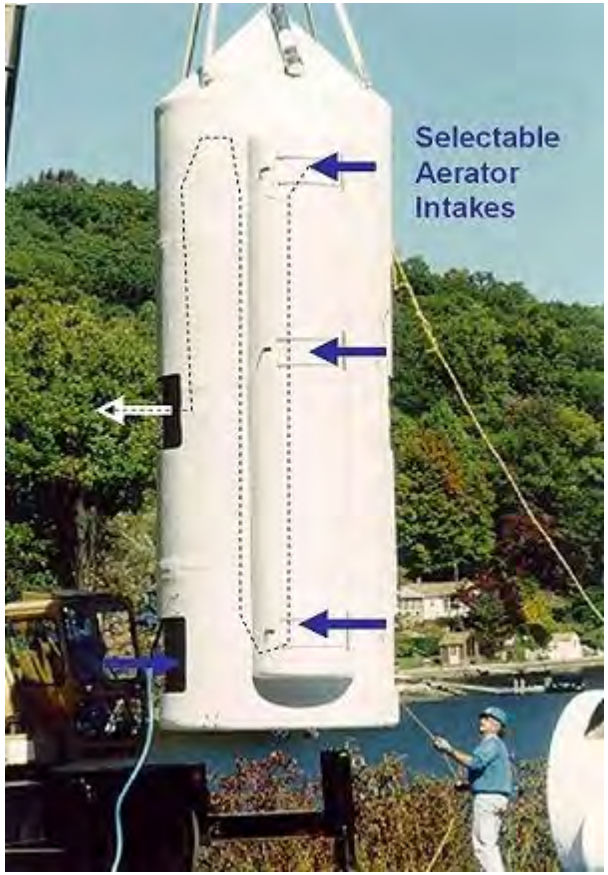
Liquid oxygen facility at Calaveras Reservoir.

Source: Mobley Engineering, Inc.

Figure 2
Hypolimnetic Oxygenation – TVA-Mobley Array



Aerator Diagram



Aerator installed at Lake Waramaug Task, CT

Source: Lake Waramaug Task Force

Figure 3
Hypolimnetic Aeration

Ceramic Diffuser

Installing Diffuser

Source: CLEAN-FLO

Figure 4
Mixing Aeration

APPENDIX B

Scoping Memorandum

ESA Water

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memorandum

date July 10, 2013

to Patrick Sweetland, Robert Ovadia

from Alexandra Kostalas, Alisa Moore

subject Vista Grande Drainage Basin Improvement Project Scoping Process and Comments

This memorandum summarizes the scoping process undertaken for the Vista Grande Drainage Basin Improvement Project (project) draft Environmental Impact Report (EIR) and Environmental Impact Statement (EIS) under the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA).

Noticing

The City of Daly City issued a joint Notice of Preparation (NOP) and Notice of Intent (NOI) to prepare a joint Draft EIR-EIS for the project on February 28, 2013. The NOP-NOI described the project, announced the dates and locations of public meetings in support of the scoping process, and requested comments on the scope of the Draft EIR-EIS by April 26, 2013. Notices were mailed to 183 recipients, including the State Clearinghouse; federal, state, and local agencies; organizations; and individuals. Agency recipients received printed copies of the NOP-NOI, and others received postcards briefly describing the project and directing recipients to Daly City's website, where the NOP-NOI was made available electronically, at: http://www.dalycity.org/City_Hall/Departments/public_works/Reports_1119/vistagrande_alts.htm. The NOP-NOI and postcard are included in Attachment A.

Additionally, Daly City posted notices of the public scoping meeting at the City of Daly City Department of Water and Wastewater Resources Administration Office, City of Daly City Office of the City Clerk, and the Westlake Library and John Daly Library, and published a notice in the San Mateo County Times on March 21, 2013.

The National Park Service (NPS) Golden Gate National Recreation Area (GGNRA) sent a message to its electronic mailing list on March 4, 2013, inviting recipients to an open house featuring this and other projects within the GGNRA, and providing a link to Daly City's project website described above, where visitors could access the NOP-NOI. Additionally, the NPS posted a notice at locations within Fort Funston notifying the public about the project and Daly City's scoping meeting. The NPS also published a NOI in the Federal Register on May 8, 2013 (78 FR 26807). The comment period for the Federal Register NOI ended on June 7, 2013. The posted notice and Federal Register NOI are included in Attachment A.

Meetings

Daly City held a public scoping meeting to educate members of the public about the project and to solicit comments on the scope of the Draft EIR-EIS on March 28, 2013, at the Doelger Senior Center Cafe/Kitchen in Daly City. Three members of the public attended. A presentation was given at the meeting that included an overview of the environmental review process and the project background, objectives, and description. Oral comments given at the scoping meeting are summarized below based on notes taken by meeting organizers. All attendees were encouraged to submit written comments and comment cards were made available for that purpose. Meeting materials are included in Attachment B.

The NPS held an open house on March 19, 2013, at the General's Residence at Fort Mason. Several projects and topics were covered at the open house, including the Vista Grande project. Daly City staff and consultants attended the open house and spoke with attendees about the project. Posters depicting the project location and proposed components were available for viewing, and copies of the NOP-NOI were made available for attendees. Comment cards were also given to interested attendees to solicit written comments on the scope of the Draft EIR-EIS.

Comment Letters Received

The table below lists the comment letters received by mail, electronic mail (e-mail), or facsimile (fax) on or before the close of the NOI comment period, June 7, 2013, in the order that they were received. These letters are included in Attachment C. Should further comments be received, they will be considered in the EIR-EIS analysis. Comments not received at least 30 days in advance of the Draft EIR-EIS publication will be considered during preparation of the Final EIR-EIS.

Commenting Agency, Organization, or Individual	Date Received (2013)
California Department of Transportation (Caltrans), District 4; Erik Alm, District Branch Chief	March 5 (fax), March 11 (mail)
San Mateo County Planning and Building Department; Michael Schaller, Senior Planner	March 14
Dick Morten	March 30
Carolyn Cooper	April 3
Golden Gate Audubon Society; Dan Murphy, Conservation Committee	April 26
San Francisco Public Utilities Commission (SFPUC); Steven R. Ritchie, Assistant General Manager, Water	April 26
California State Lands Commission; Cy R. Oggins, Division of Environmental Planning and Management	April 26
Bold, Polisner, Maddow, Nelson & Judson; Robert Maddow, Special Counsel to The Olympic Club	June 7

Summary of Comments on the Scope of the Draft EIR-EIS

The following sections summarize the comments that were received during the scoping period by topic. This summary is limited to comments that are within the scope of CEQA and NEPA analyses.

Project Description and Alternatives

- Provide precise descriptions of the types of equipment and construction methods that may be used, timing and length of all construction activities, maximum work area, and volume of materials and sediments disturbed or removed and locations for disposal.

- Describe in detail the construction methods for the canal and tunnel replacement under State Route 35 (Skyline Boulevard). It was noted by Caltrans that they would not permit cut and cover construction within the State Route 35 right of way.
- Describe in detail how each Project component would contribute to the overall function of the Project, and how the wetland would treat flows.
- Describe how all flow scenarios would be managed in the proposed system.
- Consider an off-shore outfall option.

Required Permits and Authorizations

- A Coastal Development Permit would be required for portions of project within San Mateo County Coastal Zone.
- A Caltrans encroachment permit(s) would be required for work within the state right of way.
- A Caltrans transportation permit(s) would be required for transport of oversized or excessive load vehicles on state roadways.
- Portions of the Project may require authorization and an amended or new lease from the California State Lands Commission, which has jurisdiction and management authority over ungranted tidelands, submerged lands, and the beds of navigable lakes and waterways.
- The EIR-EIS should describe the authority, responsibility, and accountability of all proponents and responsible agencies for all aspects of design, construction, operation, maintenance, and replacement of the Project.

General Comments on Impact Analysis

- Conclusions should be preceded by a reasoned, fact-based analysis of the potential impact.

Aesthetics

- Remove riprap/hard cover added to Lake Merced shore after canal overflows.
- Limit night lighting near Lake Merced to only when necessary, and include night lighting mitigation measures described in the Vista Grande Drainage Basin Alternatives Evaluation Report.[1]
- Describe the effects of the treatment wetland on views from The Olympic Club.

Biological Resources

- Conduct database searches to identify special-status plant or wildlife species that may occur in the Project area.
- Consult and coordinate with U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and National Oceanic and Atmospheric Administration's (NOAA) Fisheries Service to obtain information on species that may be present and potential mitigation for significant impacts, such as species-specific construction periods.
- Conduct a native plants assessment and consider seed collection and replanting on site or at Lake Merced as mitigation for removal of native plants (in particular, oak trees along John Muir Drive). Acorns should be

[1] Volume 4, Section 3 of this report contains suggested mitigation and is available at http://www.dalycity.org/Assets/Departments/Public+Works/pdf/Vol4-Sec3.pdf

collected in fall and planted at Lake Merced, the edge of Harding Golf Course, the edge of the Olympic Club, along Brotherhood Way, or in other nearby open space, in an area unlikely to be disturbed.

- Acknowledge that the existing canal provides habitat for migrating birds in the fall season.
- Consider the effects of construction on nesting birds, including the cliff swallows that nest on the bridge between South Lake and Impound Lake, and the bank swallow colony at the northern end of the Fort Funston bluffs.
- Evaluate the potential impacts on birds and fish from noise and vibration from construction, restoration, and/or flood control activities.
- Consider installing swallow nesting boxes on trees along the wetland to attract swallows to help control insects.
- Survey the Project site for Western Snowy Plover. This species may be present on the beach, and are known to be present north of Sloat Boulevard in San Francisco from mid July through mid May.
- Consider effects of any proposed night lighting on birds, such as collisions and increased predation.
- Acknowledge that special-status species present at Lake Merced include San Francisco common yellowthroat, which nests in bulrush marsh. Avoid construction that may disrupt nesting yellowthroats between March 1 and July 15.
- Acknowledge that tri-colored blackbird is also present but does not nest at the lake. Other special-status species may occur in the willows and wetlands near the concrete bridge and along the canal during fall migration (September-October).
- Avoid the start of construction in wetlands and woodlands during the February 15 to July 15 nesting season.
- Consider the potential for the Project to encourage the establishment or proliferation of invasive species, such as the quagga mussel or other aquatic or terrestrial species. Potential mitigation measures could include using local construction vehicles or boats, requiring hull cleaning, procedures for removal of invasive species, and post-construction monitoring.
- Use mosquito-eating fish in the wetland to reduce insects.
- Consider the potential for the wetland to attract wildlife from Lake Merced across John Muir Drive, which may increase the likelihood of wildlife roadkills. Consider installing a wildlife crossing structure as mitigation.

Cultural Resources

- Include documentation of a current (no more than 5 years old) archaeological record search of California Historical Resources Information System (CHRIS).
- If needed, a cultural resource study should be conducted by a qualified professional archaeologist
- Undertake Native American consultation in compliance with CEQA Sections 5024.5 and 5097, applicable sections of NEPA, and Caltrans requirements if work would occur within a state right of way.
- Evaluate potential impacts on submerged cultural resources in the Project area, such as known and potential shipwrecks, which are under the jurisdiction of the State Lands Commission.

Geology and Soils

- Consider effects of liquefaction potential under the bridge between South Lake and Impound Lake.

Greenhouse Gas Emissions and Climate Change

- Identify a threshold of significance for greenhouse gas emissions and quantify emissions to compare to this threshold.
- If the Project would result in significant greenhouse gas emissions, identify mitigation measures that would avoid, reduce, or compensate to the extent feasible.
- Consider effects of climate change on weather patterns and lake levels for future operations.
- Consider the effects of sea level rise on the Project and on all resources potentially affected by the Project. If applicable, indicate how the Project would address sea level rise and what adaptation measures are planned throughout the operational phase.

Hazards and Hazardous Materials; Public Health

- Consider the potential effects of the wetland on the prevalence of disease vectors such as mosquitoes.
- For safety and security reasons, the Project should not propose to allow public access onto property owned by The Olympic Club.

Hydrology and Water Quality

- Consider the effects of Vista Grande discharges to Lake Merced on recharge of the Westside Aquifer.
- Describe the effectiveness of the debris screening device under storm flow conditions.
- Describe the proposed water quality monitoring methods and schedules at the proposed wetland and ocean outfall.
- Consider the use of injection wells to aquifer.
- Describe effects of beach discharges.
- Describe the effects on the Project components and adjacent properties of storms that would be larger than the 25-year storm event or design storm.

Land Use and Planning

- Consider the Project's consistency with the San Mateo County Local Coastal Program and other land use plans and policies.

Noise and Odor

- Describe the potential for the proposed treatment wetland to produce odors that would be noticeable from adjacent properties, particularly after a large storm event.

Recreation

- Characterize current public uses of the Project area and analyze potential impacts of the Project on public uses such as boating, swimming, surfing, or other recreational uses. If appropriate, identify alternative access points for public access to recreational resources, and post signs to minimize the impact to recreational users.
- Acknowledge that the shoreline of Lake Merced is closed to fishing except in those areas of shoreline designated for fishing, such as at the Boathouse Picnic Area and at the south end of South Lake.
- Use of water from the Vista Grande Watershed to raise the level of Lake Merced would provide a recreational benefit to lake users.

- The existing canal is used by birders in September and October to view migrating birds. Consider providing viewing access for the wetland and canal to support this use.
- Consider the potential for the Project to adversely affect recreational and tournament uses at The Olympic Club, and provide as much advance notice of nearby site preparation or construction as possible.

Transportation

- Acknowledge that the project proponent would be responsible for mitigation related to improvements to state highways.
- Preparation of a Traffic Impact Study (TIS) may be required.
- If traffic restrictions and detours would affect state highways, a Caltrans-approved Transportation Management Plan (TMP) or construction TIS may be required.

Cumulative Impacts

- Evaluate the potential cumulative effects of this project in combination with the SFPUC's proposed projects that would affect Lake Merced, as well as other projects planned in San Francisco and/or Daly City.

Mitigation

- Present mitigation measures that are specific, feasible, enforceable obligations, or as formulas containing performance standards.
- Include an explanation of the logical connection between significance conclusions, mitigation measures, and residual impacts after mitigation measures are implemented.

Comments Outside the Scope of the Draft EIR-EIS

Several comments received were outside the scope of CEQA and NEPA and are not considered in the Draft EIR-EIS, including:

- General statements of support for the Project;
- The operational and maintenance cost of the proposed system;
- Public availability of water quality monitoring data; and
- Whether building the outfall at Lake Merced would complicate later removal of the SFPUC sewer between South Lake and Impound Lake.

ATTACHMENT A

Public Notices

NOTICE OF PREPARATION / NOTICE OF INTENT TO PREPARE A JOINT EIR / EIS FOR THE VISTA GRANDE DRAINAGE BASIN IMPROVEMENT PROJECT

The City of Daly City, as the Lead Agency under the California Environmental Quality Act (CEQA), and the National Park Service (NPS), as the Lead Agency under the National Environmental Policy Act (NEPA), will prepare a joint Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) for the proposed project referenced above, and would like your views regarding the scope and content of the environmental analysis. If applicable, this EIR/EIS may be used by your agency when considering any discretionary approvals for this project.

The project location, description, and a summary of the probable environmental effects of the project are attached. These effects and all issue areas required by CEQA and NEPA will be evaluated in the Draft EIR/EIS. The Draft EIR/EIS is anticipated to be published in late 2013.

This Notice of Preparation/Notice of Intent is being circulated for a public comment period, beginning on February 28 and ending on April 26, 2013. Please identify a contact person, and send your comments on the proposed scope and content of the EIR/EIS in writing to:

City of Daly City, Department of Water and Wastewater Resources
Attn: Patrick Sweetland, Director
153 Lake Merced Blvd., Daly City, CA 94015
Phone: (650) 991-8201, e-mail: psweetland@dalycity.org

The City of Daly City will hold a Public Scoping Meeting to provide an opportunity for the public and regulatory agencies to learn about the Project and be informed about how to submit comments on the scope of the Draft EIR/EIS analysis. The NPS will also host an open house, which will include information about the Project and opportunities to comment. You are welcome to attend and provide your input on the scope of the Draft EIR/EIS so that it addresses all relevant environmental issues. The date and location of each meeting is as follows:

Daly City Scoping Meeting
March 28, 2013
7:00 p.m. to 9:00 p.m.
Doelger Senior Center
Cafe/Kitchen
101 Lake Merced Boulevard
Daly City, CA

National Park Service Open House
March 19, 2013
4:30 p.m. to 6:30 p.m.
General's Residence at Fort Mason
San Francisco, CA

For more information visit:
http://www.nps.gov/goga/parkmgmt/publicinvolvement.htm

Patrick Sweetland, Director
City of Daly City, Department of Water and Wastewater Resources

Date: February 28, 2013

Project Location

The City of Daly City is proposing the Vista Grande Drainage Basin Improvement project in Daly City, unincorporated Broadmoor Village in northwestern San Mateo County, and the City and County of San Francisco. The Vista Grande Watershed Drainage Basin (Basin) is located in Daly City and unincorporated Broadmoor Village. The Basin is approximately 2.5 square miles in area and is bordered by the City and County of San Francisco to the north, the Colma Creek watershed to the south and east, and the Pacific Ocean on the west. Stormwater that falls within the Basin is drained through the Vista Grande Canal and Tunnel, which are located in the City and County of San Francisco, adjacent to John Muir Drive and the southwestern shoreline of Lake Merced. The tunnel outfall is located at the Pacific Ocean at Fort Funston, which is managed by the National Park Service (NPS) as part of the Golden Gate National Recreation Area (GGNRA). **Figures 1** and **2** (presented at the end of this Notice of Preparation/Intent) show the project's location and the locations of planned improvements.

Project Description

Daly City is proposing the project to address storm-related flooding that currently occurs in the Basin and to provide other environmental benefits, including restoration and management of water levels within Lake Merced. Lake Merced is made up of four individual but connected lakes (East, North, South, and Impound Lakes) and is owned by the City and County of San Francisco. The San Francisco Public Utilities Commission (SFPUC) maintains the lake as a non-potable emergency water supply for the San Francisco and is a responsible agency for this project. Historically, the Basin was part of the Lake Merced Watershed. The Vista Grande Canal and Tunnel were built in the 1890s to divert stormwater away from the lake to an outfall at the Pacific Ocean, below what is now Fort Funston. The existing canal and tunnel do not have adequate hydraulic capacity to convey peak storm flows, and flooding into adjacent low-lying residential areas and along John Muir Drive periodically occurs during storm events. The existing outfall structure and a portion of the Vista Grande Tunnel, once enclosed within the cliffs at Fort Funston, have become exposed due to the ongoing erosion of the cliff face. The project would alleviate flooding and improve the ocean outfall while reconnecting a significant portion of the lake's historic watershed.

The project would consist of the following structural components (further described below):

- Partial replacement of the existing Vista Grande Canal to incorporate a debris screening device, a treatment wetland, and diversion and outfall structures to route some stormwater (and authorized non-storm water) flows from the Vista Grande Canal to Lake Merced;
- Replacement of the existing Vista Grande Tunnel to increase its peak capacity and extend its operating life; and
- Replacement of the existing ocean outfall structure at Fort Funston.

The locations of these components are shown in Figure 2. Additionally, operational components of the project would include management of water elevations in Lake Merced and a Lake Management Plan that would implement water quality best management practices.

Vista Grande Canal Improvements and Diversion to Lake Merced

The existing Vista Grande Canal is a 3,600-foot-long brick-lined channel with a flow capacity of 500 cubic feet per second (cfs). The canal carries storm flows as well as low flows (also referred to as base flows), which consist of authorized non-stormwater flows such as irrigation runoff that are present in the canal all year. Under the project, a portion of the canal would be replaced with several new facilities to improve storm water quality and conveyance capacity. A collection box, debris screening device, box culvert, and diversion structure would replace the upstream portion of the canal. A treatment wetland would be developed over the box culvert (Figure 2). From the diversion structure, Daly City would construct a box culvert under John Muir Drive and install a screened outfall structure at the edge of South Lake or Impound Lake. Key components are described in more detail below.

Collection Box and Debris Screening Device

A collection box would replace the upstream portion of the existing Vista Grande Canal to collect flows from the contributing storm drains. A debris screening device would be installed downstream of the collection box to trap debris greater than 5 millimeters in diameter, which would be removed using vacuum trucks on a scheduled basis.

Box Culvert

A reinforced concrete box culvert would replace approximately 1,500 feet of the existing canal directly downstream of the debris screening structure. The box culvert would run underneath the proposed treatment wetland described below.

Constructed Treatment Wetland

A constructed treatment wetland would be developed to improve water quality. The treatment wetland would be located along John Muir Drive, partially over the box culvert described above. The treatment wetland would be planted with emergent reeds such as cattails or bulrush, which would improve water quality by intercepting and settling out suspended particulates. After passing through the wetland, the treated water would flow through the diversion structure to the outfall at Lake Merced. During periods of very low or no flow, a recirculating pump would draw water from South Lake to maintain flow in the wetland.

Diversion and Lake Outfall Structures

A semi-automated hydraulic diversion structure would be constructed directly downstream of the box culvert and treatment wetlands to direct flows to either the Pacific Ocean or to a submerged outfall structure into Lake Merced. The specific location of the outfall structure will be determined based on further engineering and environmental review. The diversion of flows would be conducted as described in the Lake Management Plan section below.

Lake Merced Overflow

An existing Lake Merced overflow structure, consisting of a brick and masonry riser and tunnel, connects South Lake with the Vista Grande Canal. Under the proposed project, a portion of the existing Lake Merced overflow would be replaced with an adjustable-height weir that would be used to control the lake level and allow water to be diverted back into the Vista Grande Canal.

Vista Grande Tunnel Replacement

The existing Vista Grande Tunnel has a hydraulic capacity of 170 cfs. The tunnel would be enlarged to increase its capacity to 500 cfs or greater to accommodate storm flows and reduce flooding in the Basin, and to extend its operating life by replacing the aging structure. Alternatively, a new tunnel could be bored adjacent to and parallel with the existing tunnel. Under either option, the new tunnel would incorporate a 30-inch diameter pipeline to transport treated effluent from the Daly City Wastewater Treatment Plant to the ocean outfall. At Fort Funston, the existing tunnel and outfall are located within an existing utility easement,.

Ocean Outfall

Daly City's existing outfall structure, which is located on the beach below Fort Funston, discharges flows from the Vista Grande Tunnel, and also connects an existing 30-inch effluent force main from the Daly City Wastewater Treatment Plant with a subsurface and sub-marine outfall pipeline. Erosion of the cliff face by the surf and waves of the Pacific Ocean has resulted in the outfall structure, a segment of the Vista Grande Tunnel, and the force main segment being exposed and lying across a portion of the beach. The project would remove the existing Daly City outfall structure and replace it with a low-profile outfall structure set into the existing cliff face to reduce future erosion. The existing 30-inch force main would also be removed and replaced with a similar configuration set back into the cliff face. The existing submarine outfall pipeline and diffuser would be renovated to protect it from erosion.

Other Project Components

Lake Level Management

The project would divert some stormwater and authorized non-stormwater flows to Lake Merced to aid the SFPUC in operating Lake Merced within desired water levels. The water surface elevation (WSE) of Lake Merced has fluctuated historically from Elevation (El.) 13 feet (San Francisco City Datum) in the 1940s to a low of El. -3.2 feet in 1993. From 2006 to 2010, the lake had an average WSE of approximately El. 5.8 feet. SFPUC has identified a goal of raising the WSE in the lake compared to current conditions to serve beneficial uses and provide a reliable emergency water supply for firefighting and sanitation purposes. The EIR will evaluate range of average WSEs from El. 6.5 to El. 8.5 feet.

Lake Management Plan

Daly City and SFPUC propose to develop a Lake Management Plan (LMP) as part of the proposed project to maintain and where feasible improve the water quality of Lake Merced. The LMP will include an operational plan for the proposed Vista Grande diversions, a water quality

monitoring plan, and best management practices that would be implemented by Daly City and SFPUC. The LMP will be developed in consultation with the San Francisco Bay Regional Water Quality Control Board.

Potential Environmental Impacts of the Project

The EIR/EIS will describe the existing environmental conditions on the project site and will identify the significant environmental impacts anticipated to result from development of the project as proposed. Where potentially significant environmental impacts are identified, the EIR/EIS will also discuss mitigation measures that may make it possible to avoid or reduce significant impacts, as appropriate. The EIR/EIS will address all environmental issue areas required under CEQA and NEPA. The following paragraphs describe key environmental issues that will be addressed in the EIR/EIS.

Aesthetics/Visual Resources

The EIR/EIS will discuss the visual and aesthetic resources of the site and its surroundings, particularly from publicly accessible locations on or near the project site, and evaluate potential impacts on scenic vistas and scenic resources that could occur as a result of the project.

Air Quality

The EIR/EIS will describe the federal, state, and local air quality policies, regulations, and standards as they pertain to the project. The EIR/EIS will also describe local air quality based on air quality data from nearby monitoring stations and will identify locations of sensitive land uses in the project area. The EIR/EIS will then evaluate the project's potential air quality impacts. The analysis will include an assessment of local community risk related to emissions of toxic air contaminants and fine particulate matter from construction activities.

Biological Resources

The EIR/EIS will evaluate impacts of the project on biological resources such as sensitive habitats and special-status species including, but not limited, to San Francisco spineflower, bank swallow, Western snowy plover, Peregrine falcon, California brown pelican, and San Francisco wallflower. The analysis will also address potential effects on aquatic habitat associated with diverting flows from the Vista Grande Canal to Lake Merced and raising the WSE of the lake.

Cultural and Archaeological Resources

The EIR/EIS will describe the project's potential effects on cultural and archaeological resources. Because a portion of the project would be located within a historic landscape at Fort Funston, the analysis will include an evaluation of the project's conformance with standards set by the state and federal historic preservation regulations.

Greenhouse Gas Emissions

The EIR/EIS will describe existing federal, state and local regulations related to greenhouse gases and climate change in the project area, quantify direct and indirect GHG emissions that would be

associated with the project, examine the potential for the project to result in global climate change impacts and discuss the measures included in the project to minimize impacts and reduce greenhouse gas emissions.

Hazards and Hazardous Materials

The EIR/EIS will discuss hazards and hazardous material present in the project area, including hazardous material spills, leaks or cleanups, wildland fire risk, and other public safety issues. The EIR/EIS will evaluate the potential impacts related to hazards and hazardous materials including potential for soil contamination from existing and previous uses at the project site and the potential for accidental release of hazardous materials during project construction and operation.

Hydrology and Water Quality

The EIR/EIS will analyze the project in light of applicable requirements under the Clean Water Act, state objectives to protect beneficial uses of water bodies, and policies concerning stormwater reuse and water quality. The EIR/EIS will evaluate the project's potential effects from erosion and sedimentation during construction and impacts on groundwater levels, flooding, and water quality in Lake Merced.

Land Use

The EIR/EIS will identify the land uses and development on and around the project site, assess consistency with applicable local plans and policies governing land use in the project area, and evaluate potential land use impacts, including the project's compatibility with existing and proposed land uses in the project area.

Noise and Vibration

The EIR/EIS will describe relevant noise policies, regulations and standards and discuss noise and vibration levels likely to be generated by project construction and operation. The EIR/EIS will evaluate the potential for project construction and operation to adversely affect adjacent land uses or violate applicable noise control ordinances. The analysis will also evaluate continuous vibrations produced by project construction (shaft construction, tunnel boring and muck handling) based on the potential to impact sensitive receptors.

Public Services and Utilities

The EIR/EIS will describe existing fire protection, emergency medical services, and public utilities in the project area and will evaluate impacts on these services resulting from the proposed project.

Recreation

The EIR/EIS will describe existing publicly accessible recreational facilities in the project area and evaluate the impacts of the project on recreational facilities in surrounding areas including Lake Merced, Fort Funston, and the Olympic Club Golf Course. The analysis will identify

feasible mitigation measures that would reduce any significant recreation impacts of the proposed project.

Socioeconomics/Environmental Justice

Consistent with NEPA requirements, the EIR/EIS will present the socioeconomic conditions in the action area, including demographic information on the local population. The EIR/EIS will assess the effects of project construction and operation activities on minority and low-income populations in the vicinity of the project area.

Soils, Seismicity and Geologic Resources

The EIR/EIS will discuss the existing geologic and soil conditions on the project site. Potential impacts to be evaluated include seismic hazards and/or increased exposure of structures to seismic hazards related to ground-shaking in the event of an earthquake, exposure of structures to geologic hazards (such as liquefaction, poor soil conditions, or unstable slopes), and soil erosion. The EIR/EIS will also include an evaluation of the effects of removal and replacement of the ocean outfall structure on the rate and occurrence of coastal erosion and bluff retreat, including the consequences of sea level rise on those processes.

Traffic and Transportation

The EIR/EIS will identify describe current traffic conditions within the project area. The traffic analysis will describe and assess impacts to roadway conditions, circulation patterns, parking, transit systems, traffic hazards, emergency access and bicycle and pedestrian facilities.

Alternatives to the Project

The EIR/EIS will consider a range of alternatives, including alternative tunnel alignments and capacities, stormwater detention structures, and lake level scenarios. The EIR/EIS will also identify and evaluate alternatives that might reasonably be assumed to reduce project impacts, especially significant impacts. Pursuant to CEQA Guidelines Section 15126.6(e) and NEPA Regulations Section 1502.14(d), the EIR/EIS will also evaluate a No Project/No Action alternative to provide decision-makers the information necessary to compare the relative impacts of approving and not approving the project. For each alternative, the EIR/EIS will assess the degree to which it might reduce one or more project impacts, whether it could result in other or increased impacts, its feasibility, and the degree to which it is consistent with the project objectives. The EIR/EIS will also identify the Environmentally Preferable/Superior Alternative.

Cumulative Impacts

The EIR/EIS will include a discussion of the potentially significant cumulative impacts of the project when considered with other past, present, and reasonably foreseeable future projects in the area. This section will cover all relevant subject areas discussed in the EIR/EIS (e.g., traffic, air quality, and noise) and will specify which of the areas are anticipated to experience significant cumulative impacts.

Other Required Sections

The EIR/EIS will also include other information typically required for an EIR/EIS. These other sections include the following: 1) Growth Inducing Impacts; 2) Significant and Unavoidable Impacts; 3) Significant Irreversible Environmental Changes; 4) Irreversible and Irretrievable Commitment of Resources; 5) References; and 6) EIR/EIS Authors. Relevant technical reports will be provided as technical appendices.

SOURCE: ESA

Vista Grande Drainage Basin Improvement Project. 207036.01

Figure 1
Project Location

SOURCE: ESA

Vista Grande Drainage Basin Improvement Project. 207036.01

Figure 2
Project Components

NOTICE OF PREPARATION / INTENT TO PREPARE A JOINT EIR/EIS AND PUBLIC MEETINGS

An electronic copy of the NOP/NOI is available at http://www.dalycity.org/City_Hall/Departments/public_works/Reports_1119/vistagrande_alts.htm. Requests for hard copies of the NOP should be sent to vistagrande@esassoc.com. The NOP is also available at the Westlake Branch of the Daly City Public Library and the Merced Branch of the San Francisco Public Library.

The scoping period begins on February 28, 2013 and **closes at 5:00 p.m. on April 26, 2013**. The City of Daly City will hold a Public Scoping Meeting to provide an opportunity for the public and regulatory agencies to learn about the Project and be informed about how to submit comments on the scope of the Draft EIR/EIS on **March 28, 2013**: 7:00 p.m. to 9:00 p.m. at the Doelger Senior Center Cafe/Kitchen, 101 Lake Merced Blvd, Daly City, CA.

Additionally, the National Park Service will host an open house, which will include information about the Project and opportunities to comment, on **March 19, 2013**: 4:30 p.m. to 6:30 p.m. at the General's Residence at Fort Mason in San Francisco, CA. More information can be obtained from the National Park Service at http://www.nps.gov/goga/parkmgmt/publicinvolvement.htm. The Draft EIR/EIS is anticipated to be published in late 2013. Input on the scope of the environmental analysis may be submitted either at the Scoping Meeting or in writing via mail, fax, or email. Please send comments, and include a name, address, and telephone number of a contact person for all future correspondence on this subject, to:

City of Daly City Department of Water and Wastewater Resources
Attention: Patrick Sweetland, Director
153 Lake Merced Boulevard
Daly City, CA 94015
Fax: (650) 991-8220
Email: psweetland@dalycity.org

NOTICE OF PREPARATION / INTENT TO PREPARE A JOINT EIR/EIS AND PUBLIC MEETINGS

An electronic copy of the NOP/NOI is available at http://www.dalycity.org/City_Hall/Departments/public_works/Reports_1119/vistagrande_alts.htm. Requests for hard copies of the NOP should be sent to vistagrande@esassoc.com. The NOP is also available at the Westlake Branch of the Daly City Public Library and the Merced Branch of the San Francisco Public Library.

The scoping period begins on February 28, 2013 and **closes at 5:00 p.m. on April 26, 2013**. The City of Daly City will hold a Public Scoping Meeting to provide an opportunity for the public and regulatory agencies to learn about the Project and be informed about how to submit comments on the scope of the Draft EIR/EIS on **March 28, 2013**: 7:00 p.m. to 9:00 p.m. at the Doelger Senior Center Cafe/Kitchen, 101 Lake Merced Blvd, Daly City, CA.

Additionally, the National Park Service will host an open house, which will include information about the Project and opportunities to comment, on **March 19, 2013**: 4:30 p.m. to 6:30 p.m. at the General's Residence at Fort Mason in San Francisco, CA. More information can be obtained from the National Park Service at http://www.nps.gov/goga/parkmgmt/publicinvolvement.htm. The Draft EIR/EIS is anticipated to be published in late 2013. Input on the scope of the environmental analysis may be submitted either at the Scoping Meeting or in writing via mail, fax, or email. Please send comments, and include a name, address, and telephone number of a contact person for all future correspondence on this subject, to:

City of Daly City Department of Water and Wastewater Resources
Attention: Patrick Sweetland, Director
153 Lake Merced Boulevard
Daly City, CA 94015
Fax: (650) 991-8220
Email: psweetland@dalycity.org

VISTA GRANDE DRAINAGE BASIN IMPROVEMENT PROJECT OVERVIEW

The City of Daly City, as Lead Agency under the California Environmental Quality Act (CEQA), and the National Park Service, as Lead Agency under the National Environmental Policy Act (NEPA), are preparing a joint Environmental Impact Report (EIR) and Environmental Impact Statement (EIS) for the Vista Grande Drainage Basin Improvement project. Daly City proposes this project to address storm-related flooding that currently occurs in the Basin and proposes to provide other environmental benefits, including restoration and management of water levels within Lake Merced. The project would consist of partial replacement of the existing Vista Grande Canal to incorporate a debris screening device, a treatment wetland, and diversion and outfall structures to route some stormwater (and authorized non-storm water) flows from the Vista Grande Canal to Lake Merced; replacement of the existing Vista Grande Tunnel to increase its peak capacity and extend its operating life; and replacement of the existing ocean outfall structure at Fort Funston. Operational components of the project would include management of water elevations in Lake Merced and a Lake Management Plan that would implement water quality best management practices.

City of Daly City Department of Water and Wastewater Resources,
Attention: Patrick Sweetland, Director
153 Lake Merced Boulevard
Daly City, CA 94015

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City of Daly City Department of Water and Wastewater Resources,
Attention: Patrick Sweetland, Director
153 Lake Merced Boulevard
Daly City, CA 94015

Notice of Public Meeting

Vista Grande Drainage Basin Improvement Project

The City of Daly City, as Lead Agency under the California Environmental Quality Act (CEQA), and the National Park Service, as Lead Agency under the National Environmental Policy Act (NEPA), are preparing a joint Environmental Impact Report (EIR) and Environmental Impact Statement (EIS) for the Vista Grande Drainage Basin Improvement project.

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Construction activities at Fort Funston would include the development of a construction shaft and staging area near the main parking lot, and construction of the ocean outfall on the beach.

Existing Outfall

Proposed Outfall

The public is invited to participate in the scoping process for this project by attending the public meeting, reviewing the documents on the internet at ***http://www.dalycity.org/City_Hall/Departments/public_works/Reports_1119/vistagrande_alts.htm***, and submitting comments to:

City of Daly City Department of Water and Wastewater Resources
Attn: Patrick Sweetland, Director
153 Lake Merced Boulevard, Daly City, CA 94105

Daly City will hold a **Public Scoping Meeting** to provide an opportunity for the public and regulatory agencies to learn about the Project and be informed about how to submit comments on the scope of the Draft EIR/EIS:

March 28, 2013: 7:00 p.m. to 9:00 p.m. – Doelger Senior Center Cafe/Kitchen, 101 Lake Merced Blvd, Daly City, CA.

consumption and have no connection with energy policy.

Executive Order 13352, Facilitation of Cooperative Conservation

In accordance with Executive Order 13352, the BLM has determined that the proposed supplementary rules would not impede facilitating cooperative conservation; would take appropriate account of and consider the interests of persons with ownership or other legally recognized interests in land or other natural resources; would properly accommodate local participation in the Federal decision-making process; and would provide that the programs, projects, and activities are consistent with protecting public health and safety.

Paperwork Reduction Act

These proposed supplementary rules do not contain information collection requirements that the Office of Management and Budget must approve under the Paperwork Reduction Act of 1995, 44 U.S.C. 3501–3521.

Author

The principal author of these proposed supplementary rules is Kristi Murphy, Outdoor Recreation Planner, BLM, Gunnison Field Office.

V. Proposed Rules

For the reasons stated in the Preamble, and under the authority of 43 U.S.C. 315a, 1733(a), and 1740, and 43 CFR 8365.1–6, the State Director proposes supplementary rules for public lands within the Gunnison Field Office, Colorado, to read as follows:

Supplementary Rules for the Gunnison Basin Travel Management Plan Area

Definitions

Camping means erecting a tent or a shelter of natural or synthetic materials, preparing a sleeping bag or other bedding material for use, or parking a motor vehicle, motor home, or trailer for the purpose or apparent purpose of overnight occupancy.

Designated travel routes means roads and trails open to specified modes of travel and identified on a map of designated roads and trails that is maintained and available for public inspection at the Bureau of Land Management (BLM) Gunnison Field Office, Colorado. Designated roads and trails are open to public use in accordance with such limits and restrictions as are, or may be, specified in the resource management plan (RMP) or travel management plan (TMP), or in future decisions implementing the RMP. This definition excludes any road or trail with BLM-authorized restrictions that prevent use of the road or trail. Restrictions may include signs or physical barriers such as gates, fences, posts, branches, or rocks.

Existing travel routes means immediately recognizable motor vehicle travel routes or two-track trails that are not identified as closed to motorized vehicle use by a BLM sign or map.

Public land means any land or interest in land owned by the United States and administered by the Secretary of the Interior through the BLM without regard to how the United States acquired ownership.

Mechanized vehicle means a human-powered mechanical device, such as a bicycle; not powered by a motor.

Motorized vehicle means a vehicle that is propelled by a motor or engine, such as a car, truck, off-highway vehicle, motorcycle, or snowmobile.

Prohibited Acts

1. Except as provided by Rule 2 below, you must not operate or possess a motorized or mechanized vehicle in an area designated as closed to such use by a BLM sign or map.

2. You must not operate or possess a mechanized or motorized vehicle except in areas designated or routes identified for such use by a BLM sign or map, unless:

- You are using a mechanized game cart for the purpose of retrieving a large game animal outside of Congressionally designated wilderness areas or wilderness study areas; or
- You are using a motorized vehicle for the purpose of parking or camping within 30 feet of the edge of a designated travel route or on existing travel routes within 300 feet of a designated travel route.

3. You must not operate or possess a motorized vehicle from March 15 to May 15 in specific areas of priority sage-grouse habitat as designated by a BLM sign or map, except to access private inholdings with proper authorization.

Exceptions

These supplementary rules do not apply to emergency, law enforcement, and Federal or other government vehicles while being used for official or other emergency purposes, or to any other vehicle use that is expressly authorized or otherwise officially approved by the BLM.

Penalties

Under Section 303(a) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1733(a) and 43 CFR 8360.0–7), any person who violates any of these supplementary rules may be tried before a United States Magistrate and fined no more than $1,000 or imprisoned for no more than 12 months, or both. Such violations may also be subject to the enhanced fines provided for by 18 U.S.C. 3571.

Helen M. Hankins,

Bureau of Land Management, Colorado State Director.

[FR Doc. 2013–10896 Filed 5–7–13; 8:45 am]

BILLING CODE 4310–JB–P

DEPARTMENT OF THE INTERIOR

National Park Service

[NPS–PWR–PWRO–12638; PPPWGOGAY0 PPMPSAS1Z.YP0000]

Vista Grande Drainage Basin Improvement Project, Fort Funston, Golden Gate National Recreation Area, San Francisco County, CA

AGENCY: National Park Service, Interior.

ACTION: Notice of Intent to Prepare an Environmental Impact Statement.

SUMMARY: In accordance with § 102(2)(C) of the National Environmental Policy Act (NEPA), and the California Environmental Quality Act (CEQA) Guidelines Section 15082, the National Park Service, together with the City of Daly City, intends to prepare a joint Environmental Impact Statement (EIS) and Environmental Impact Report (EIR) to evaluate the potential environmental effects of the proposed Vista Grande Drainage Basin Improvement Project (Project). The EIS/EIR will address proposed improvements to Daly City's infrastructure to address storm-related flooding in the Vista Grande Watershed Drainage Basin and the effects of coastal erosion. The National Park Service (NPS) is the lead agency for the environmental review under NEPA. The City of Daly City is the lead agency for the environmental review under CEQA.

DATES: All written comments must be postmarked not later than June 7, 2013.

Background: The Vista Grande watershed area is located in the City of Daly City and unincorporated Broadmoor Village, in northwestern San Mateo County. This watershed is approximately 2.5 square miles in area and is bordered by San Francisco County to the north, Colma Creek watershed to the south and east, and the Pacific Ocean on the west. The Vista Grande watershed is drained through the Vista Grande Canal and Tunnel, which are located in the City and County of San Francisco, adjacent to John Muir Drive and the southwestern shoreline of Lake Merced. The Vista

Grande Tunnel is a sub-surface tunnel beneath Fort Funston, which is owned and managed by NPS as part of the Golden Gate National Recreation Area (GGNRA). The Vista Grande Tunnel connects the Vista Grande watershed to an outfall located on the beach below the Fort Funston bluffs, through which stormwater flows are discharged into the Pacific Ocean.

The City of Daly City has proposed the Project to address storm-related flooding in the Vista Grande Watershed Drainage Basin. The existing Vista Grande Canal and Tunnel do not have adequate hydraulic capacity to convey peak storm flows. As a result, during storm events, flooding periodically occurs in adjacent low-lying residential areas and along John Muir Drive. The Project would involve upgrades to the Vista Grande watershed collection system upstream of the Vista Grande Canal; partial replacement of the existing Vista Grande Canal to incorporate a gross-solid screening device, a treatment wetland, and diversion and discharge structures to route some stormwater (and authorized non-storm water) flows from the Vista Grande Canal to Lake Merced; replacement of the existing Vista Grande Tunnel to expand its capacity; and replacement of the existing outfall structure at Fort Funston.

SUPPLEMENTARY INFORMATION: Along with evaluating a No-Action Alternative, the EIS/EIR will consider a range of alternatives, including various combinations of facilities, such as alternative tunnel alignments and capacities, storm water detention structures, lake level scenarios, and groundwater recharge facilities. The Project would increase the hydraulic capacity of the canal and tunnel and extend its operating life. In addition, the Project would utilize stormwater to restore the level of Lake Merced, which declined in the late-1980s and early-1990s and has not fully recovered. Under the Project, an adjustable-height weir would be used to control the lake level and allow water to be diverted back into the Vista Grande Canal.

The existing outfall, a segment of the Vista Grande Tunnel, and the force main segment are presently exposed to the surf and waves, which have caused significant damage to the structure. The Project would reconfigure these structures to provide protection from the surf and waves. The existing Daly City outfall structure would be removed and replaced with a low-profile outfall structure set into the existing cliff face to reduce future erosion. The existing force main would also be removed and replaced with a similar configuration set back into the cliff face. The existing submarine outfall pipeline and diffuser would be renovated to protect it from erosion and extend its operating life.

FOR FURTHER INFORMATION CONTACT: Steve Ortega, Golden Gate NRA, Fort Mason, Building 201, San Francisco, CA 94123; telephone (415) 561–2841 or email *goga_planning@nps.gov*.

Public Scoping and Comment: Notice is hereby given that a public scoping process and comment phase has been initiated for the EIS/EIR. The purpose of the public scoping process is to elicit public comment regarding the full spectrum of issues and concerns, a suitable range of alternatives, the nature and extent of potential environmental impacts or ecological benefits, and appropriate mitigation strategies that should be addressed in preparing a draft EIS/EIR. Preliminary issues to be addressed in the EIS/EIR include habitat for fish and wildlife, ecosystem conditions and processes, effects on special status plant and animal species, hydrology, flood hazards, traffic, air quality, visitor access, and visitor experience. Public scoping meetings will be scheduled in San Francisco and San Mateo Counties. Meeting dates, times, and locations will be publicized through local and regional news media, by email to the park mailing list (to be included on the Project email list, please visit: *http://ww.nps.gov/goga* and click the "Join the Mailing List" link), and via the Project Web site: *http://parkplanning.nps.gov/Vista_Grande*. This Project Web site will also provide relevant information, including the Project description, planning process updates, meeting notices, reports and documents, and useful links associated with the Project.

All written comments should be mailed to the following address: Superintendent, Golden Gate National Recreation Area; Attn: Vista Grande Project; Fort Mason, Building 201, San Francisco, CA 94123. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Decision Process: At this time, it is anticipated that the draft EIR/EIS will be distributed for public review in late 2013. Availability of the document for review will be announced by the publication of a Notice of Availability in the **Federal Register**, through local and regional news media, via the Project Web site, and by email to Project email recipients. Additional public meetings will be held, and further opportunities for public comment will be provided, after the draft EIS/EIR is distributed. Following due consideration of all comments received on the draft EIS/EIR, preparation of the final document is anticipated to be completed in 2014. Because this is a delegated EIS, the official responsible for approval of the Project is the Regional Director, Pacific West Region. Subsequently the official responsible for implementation of the approved Project is the Superintendent, Golden Gate National Recreation Area.

Dated: March 15, 2013.

Christine S. Lehnertz,

Regional Director, Pacific West Region.

[FR Doc. 2013–10914 Filed 5–7–13; 8:45 am]

BILLING CODE 4312–FF–P

DEPARTMENT OF LABOR

Office of the Secretary

Agency Information Collection Activities; Submission for OMB Review; Comment Request; Well-being Supplement to the American Time Use Survey

ACTION: Notice.

SUMMARY: The Department of Labor (DOL) is submitting the Bureau of Labor Statistics (BLS) sponsored information collection request (ICR) titled, "Well-being Supplement to the American Time Use Survey," to the Office of Management and Budget (OMB) for review and approval for continued use in accordance with the Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 et seq.).

DATES: Submit comments on or before June 7, 2013.

ADDRESSES: A copy of this ICR with applicable supporting documentation; including a description of the likely respondents, proposed frequency of response, and estimated total burden may be obtained free of charge from the RegInfo.gov Web site, *http://www.reginfo.gov/public/do/PRAMain*, on the day following publication of this notice or by contacting Michel Smyth by telephone at 202–693–4129 (this is not a toll-free number) or sending an email to *DOL_PRA_PUBLIC@dol.gov*.

Submit comments about this request to the Office of Information and Regulatory Affairs, Attn: OMB Desk

ATTACHMENT B

Scoping Meeting Materials

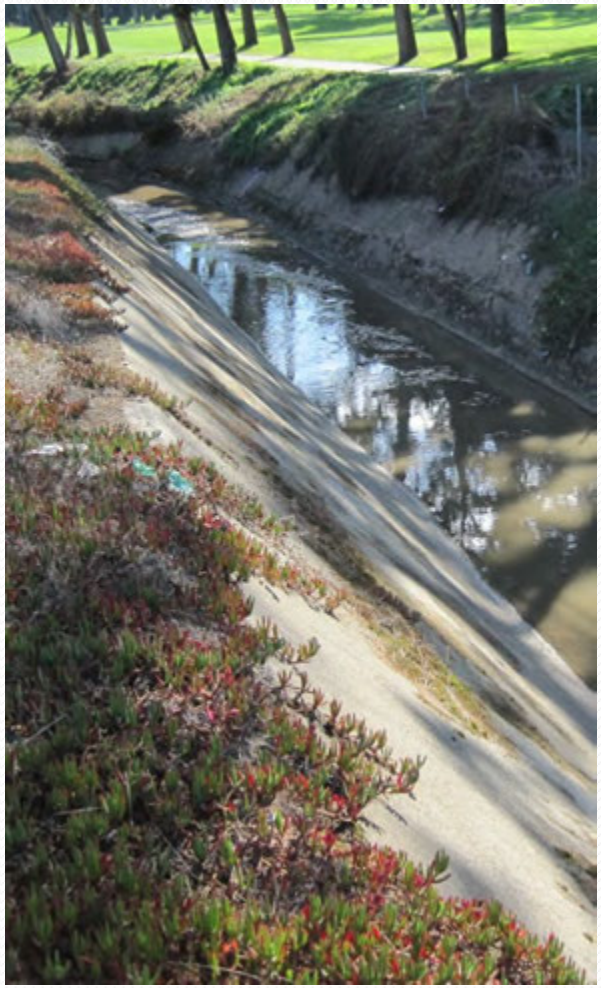
Vista Grande Drainage Basin Improvement Project

Scoping Meeting

City of Daly City
Department of Water and Wastewater Resources

March 28, 2013

Meeting Agenda



- Agencies and roles
- Purpose of public scoping
- Project introduction
- Next steps
- How to comment
- Questions

Agencies and Roles

Project Proponent
(Water and Wastewater Resources)

Administers Ft. Funston

Manages Lake Merced

CEQA Lead Agency

NEPA Lead Agency

Responsible Agency

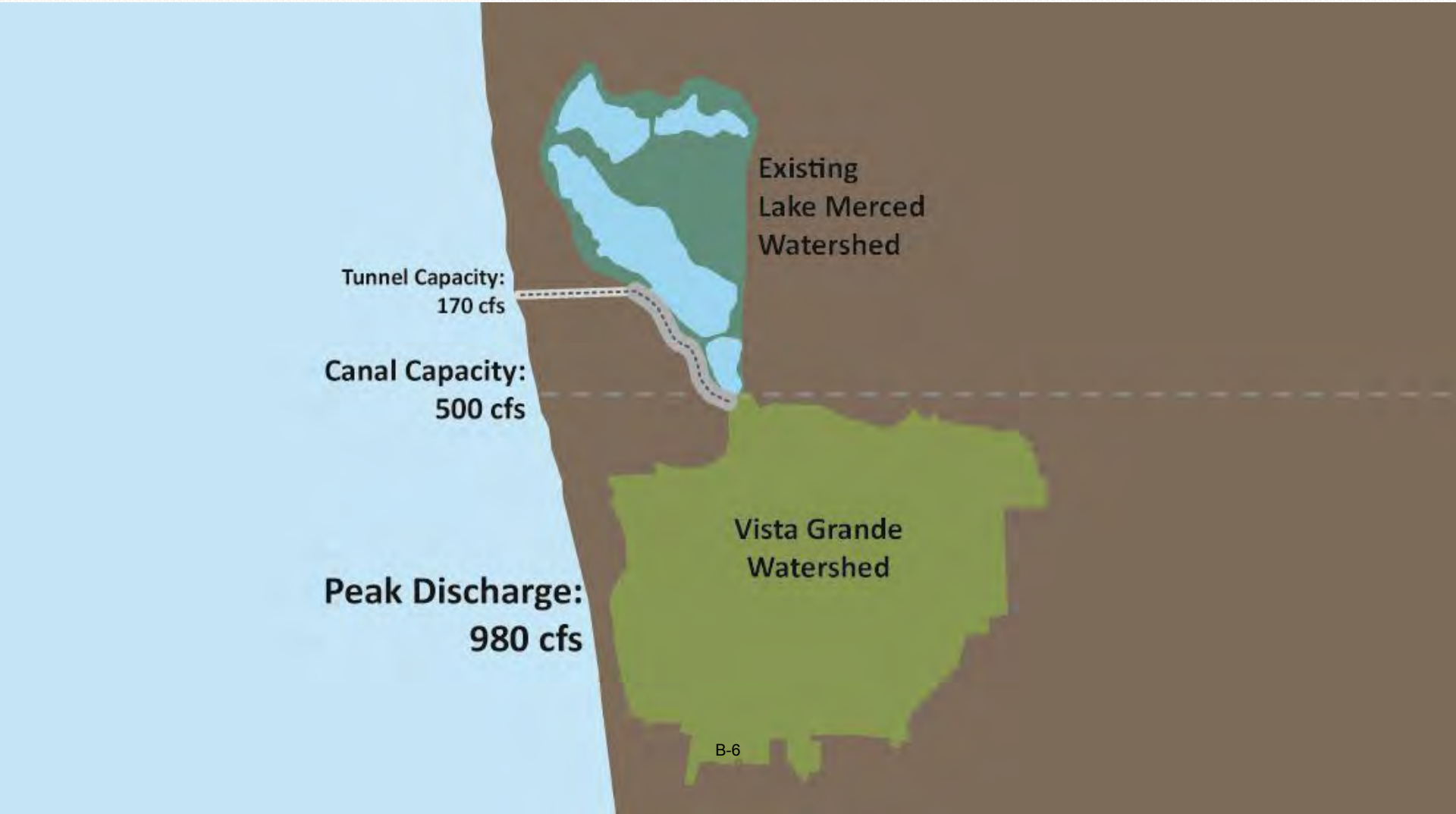
Prepare Joint EIR/EIS

Purpose of Public Scoping

- Determine the scope of the environmental analysis
- Solicit input from agencies and the public on:
  - the Project
  - range of alternatives
  - potential significant impacts
  - mitigation measures

To ensure that your input is accurately understood and considered, please submit your comments in writing.

Need for Project



Project Objectives

- Reduce flooding hazards and property damage
- Improve quality of storm water discharges
- Provide a non-groundwater sustainable water source to maintain Lake Merced at desired levels
- Protect and improve lake water quality
- Provide lake overflow capacity to minimize damage

B-7

Existing Vista Grande System

Existing Structures

Existing Canal

Existing Tunnel (historic outfall)

Existing Outfall

B-9

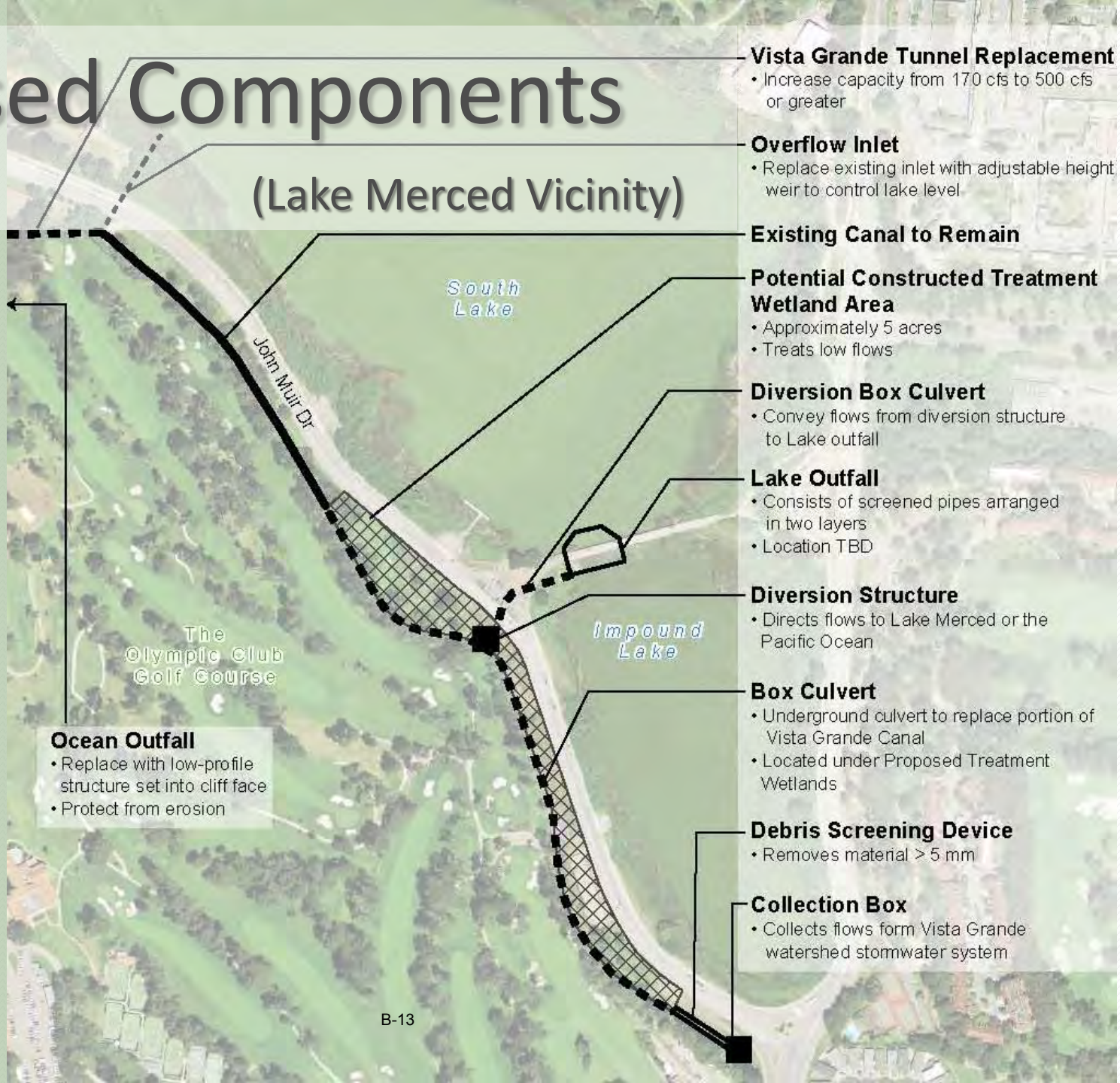
Overflow Incident

Overflow Impact

Overflow Impact

Proposed Components

(Lake Merced Vicinity)



Vista Grande Tunnel Replacement
- Increase capacity from 170 cfs to 500 cfs or greater

Overflow Inlet
- Replace existing inlet with adjustable height weir to control lake level

Existing Canal to Remain

Potential Constructed Treatment Wetland Area
- Approximately 5 acres
- Treats low flows

Diversion Box Culvert
- Convey flows from diversion structure to Lake outfall

Lake Outfall
- Consists of screened pipes arranged in two layers
- Location TBD

Diversion Structure
- Directs flows to Lake Merced or the Pacific Ocean

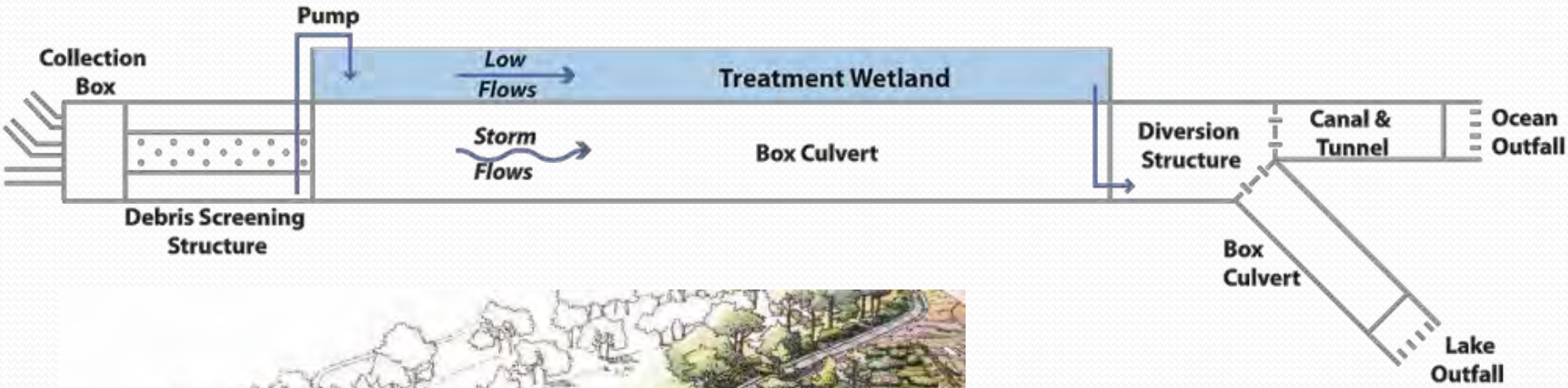
Box Culvert
- Underground culvert to replace portion of Vista Grande Canal
- Located under Proposed Treatment Wetlands

Debris Screening Device
- Removes material > 5 mm

Collection Box
- Collects flows form Vista Grande watershed stormwater system

Ocean Outfall
- Replace with low-profile structure set into cliff face
- Protect from erosion

Culvert and Wetland Design



Artist Rendering. Wetland would be built over box culvert rather than alongside open canal.

B-14

Ocean Outfall

Existing beach discharge structure

Proposed beach discharge structure

B-15

Next Steps

- Complete Scoping
  - Notice of Preparation /Notice of Intent was circulated to solicit input from agencies and the public: You can submit comments on the scope and contents of the EIR/EIS on or before April 26, 2013.
  - This meeting is part of the scoping process.
- Continue preliminary engineering in support of EIR/EIS
- Draft EIR/EIS and public comment period (late 2013)
- Final EIR/EIS (early 2014)
- Daly City Council certification of Final EIR/EIS
- National Park Service consideration of the EIR/EIS and other factors, issuance of a Record of Decision
- Daly City approval of Project, National Park Service issuance of ROW grant

How to Comment

Please submit written comments on the scope of the environmental analysis by **April 26, 2013** to:

City of Daly City, Department of
Water and Wastewater Resources
Attn: Patrick Sweetland, Director
153 Lake Merced Blvd., Daly City, CA 94015

e-mail: psweetland@dalycity.org

Questions?

Vista Grande Drainage Basin Improvement Project

SCOPING MEETING SIGN-IN SHEET

Doelger Senior Center Cafe/Kitchen

Daly City, California

March 28, 2013, 7:00-9:00 PM

Name	Organization/Agency	Mailing Address	Email Address	Check here to be added to paper mailing list	Check here to be added to email list
Dick Allen	Lake Merced			Me	✓
Jeff Gilman	SFPUC				✓
Dan Murphy	Golden Gate Audubon				✓
DICK MORTEN					✓

City of Daly City Dept. of Water & Wastwater Resources
Attention: Patrick Sweetland, Director
153 Lake Merced Boulevard
Daly City, CA 94015

City of Daly City Department of Water and Wastewater Resources
Attenton: Patrick Sweetland, Director
153 Lake Merced Boulevard
DALY CITY, CA 94015

To mail this form, fold on the dashed line so the address is visible, tape closed (no staples please), and drop in the mail.
Please print your name and address below.

Name: _____

Address: _____

City/State/Zip: _____

E-mail address: _____

Note: Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Vista Grande Drainage Basin Improvement Project

Public Open House – March 2013

City of Daly City

Public Scoping Comment Form

The project team values your feedback regarding the scoping for the Vista Granda Drainage Basin Improvement Project.
Please provide your comments and questions below.
If submitting comments by mail, **please post no later than April 26, 2013.**

Thank you for your interest.

ATTACHMENT C

Scoping Comments

DEPARTMENT OF TRANSPORTATION
111 GRAND AVENUE
P. O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 286-6053
FAX (510) 286-5559
TTY 711

RECEIVED
MAR 11 2013
DWWR

Flex your power!
Be energy efficient!

March 5, 2013

SM035092
SM-35-0.5

Mr. Patrick Sweetland, Director
Department of Water and Wastewater Resources
City of Daly City
153 Lake Merced Boulevard
Daly City, CA 94015

Dear Mr. Sweetland:

Vista Grande Drainage Basin Improvement Project -Notice of Preparation/Notice of Intent

Thank you for including the California Department of Transportation (Caltrans) in the early stages of the environmental review process for the above project. The following comments are based on the Notice of Preparation/Notice of Intent. As the lead agency, the City of Daly City (City) is responsible for all project mitigation, including any needed improvements to state highways. Since an encroachment permit is required for work in the state right of way (ROW), and Caltrans will not issue a permit until our concerns are adequately addressed, we strongly recommend that the City work with Caltrans to ensure that our concerns are resolved during the environmental process, and in any case prior to submittal of an encroachment permit application. Further comments will be provided during the encroachment permit process; see the end of this letter for more information regarding encroachment permits.

Cultural Resources
Caltrans requires that a project environmental document include documentation of a current archaeological record search from the Northwest Information Center of the California Historical Resources Information System if construction activities are proposed within the state ROW. Current record searches must be no more than five years old. Caltrans requires the records search, and if warranted, a cultural resource study by a qualified, professional archaeologist, and evidence of Native American consultation to ensure compliance with California Environmental Quality Act, Section 5024.5 and 5097 of the California Public Resources Code, and Volume 2 of Caltrans' Standard Environmental Reference (http://ser.dot.ca.gov). These requirements, including applicable mitigation, must be fulfilled before an encroachment permit can be issued for project-related work in state ROW; these requirements also apply to National Environmental Policy Act documents when there is a federal action on a project. Work subject to these requirements includes, but is not limited to: tunneling, lane widening, channelization, auxiliary lanes, and/or modification of existing features such as slopes, drainage features, curbs, sidewalks

and driveways within or adjacent to state ROW.

Environmental Maintenance
The environmental document and the plans must detail the method of construction that will be used for the Vista Grande tunnel replacement under State Route (SR) 35. A cut and cover method of construction will not be acceptable.

Traffic Impact Study
Construction and construction related activities of this project may generate traffic at volumes sufficient to impact the operation of nearby state highway facilities, and it may be necessary to prepare a Traffic Impact Study (TIS). We recommend using the Department's *"Guide for the Preparation of Traffic Impact Studies"* for determining which scenarios and methodologies to use in the analysis. The guide can be accessed from the following webpage: http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

1. The project would generate over 100 peak hour trips assigned to a state highway facility.

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

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

Transportation Management Plan
If it is determined that traffic restrictions and detours are needed on or affecting the state highway system, a Transportation Management Plan (TMP) or construction TIS may be required and approved by Caltrans prior to construction. TMPs must be prepared in accordance with *California Manual on Uniform Traffic Control Devices* (CA-MUTCD). This includes impacts to bicycle and pedestrian facilities as well as motor vehicles. Further information is available for download at the following web address:
http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/pdf/camutcd2012/Part6.pdf

Please ensure that such plans are also prepared in accordance with the transportation management plan requirements of the corresponding jurisdictions. For further TMP assistance, please contact the Office Traffic Management Plans at (510) 286-4647.

Transportation Permit
Project work that requires movement of oversized or excessive load vehicles on state roadways, such as SR 35, requires a transportation permit that is issued by Caltrans. To apply, a completed transportation permit application with the determined specific route(s) for the shipper to follow from origin to destination must be submitted to the following address: Transportation Permits Office, 1823 – 14th Street, Sacramento, CA 95811-7119. See the following website link for more information: http://www/hq/traffops/permits/

Encroachment Permit

Please be advised that any work or traffic control that encroaches onto the state ROW requires an encroachment permit that is issued by Caltrans. To apply, a completed encroachment permit application, environmental documentation, and five (5) sets of plans clearly indicating the state ROW must be submitted to: Office of Permits, California Department of Transportation, District 4, P.O. Box 23660, Oakland, CA 94623-0660. Traffic-related mitigation measures should be incorporated into the construction plans during the encroachment permit process. See the website link below for more information.
http://www.dot.ca.gov/hq/traffops/developserv/permits/

Please forward at least one hard copy and one CD of the environmental document, along with the TIS, including Technical Appendices, and a CD of the plan set to the following address as soon as they are available: Sandra Finegan, Associate Transportation Planner, Office of Transit and Community Planning, Mail Station 10D, California Department of Transportation, District 4, P.O. Box 23660, Oakland, CA 94623-0660.

Please feel free to call or email Sandra Finegan at (510) 622-1644 or sandra_finegan@dot.ca.gov with any questions regarding this letter.

Sincerely,

ERIK ALM, AICP
District Branch Chief
Local Development – Intergovernmental Review

County of San Mateo
Planning & Building Department
455 County Center, 2nd Floor
Redwood City, California 94063
650/363-4161 Fax: 650/363-4849
Mail Drop PLN122
plngbldg@smcgov.org
www.co.sanmateo.ca.us/planning

RECEIVED
MAR 14 2013
DWWR

March 12, 2013

City of Daly City, Department of Water and Wastewater Resources
Attn: Patrick Sweetland, Director
153 Lake Merced Blvd., Daly City, CA 94015

Dear Mr. Sweetland:

SUBJECT: Notice of Preparation - Vista Grande Drainage Basin Improvement Project

Thank you for including San Mateo County in the distribution of the NOP for this project. Please be advised that a portion of the project, specifically the collection box adjacent to Lake Merced Blvd. (APN 002-012-060), lies within San Mateo County's jurisdiction. This parcel is also within the Coastal Zone as established by the California Coastal Commission. Please include consistency with the San Mateo County Local Coastal Program in your EIR analysis. Also, please be advised that those portions of the project within the County's Coastal Zone require the issuance of a Coastal Development Permit.

Sincerely,

M. Schaller

Michael Schaller
Senior Planner

From: Morten
Sent: Saturday, March 30, 2013 9:50 AM
To: Patrick Sweetland
Cc: Dick Morten; Jerry Cadagan; Dick Allen; Richard Roos-Collins; Mondy Lariz; Dan Murphy; Tim Colen
Subject: Aquifer recharge and Vista Grand Canal EIR

Patrick, The aquifer recharge should be within the scope of the Vista Grand Canal EIR because Lake Merced treated stormwater infusions from the canal should have an impact on the aquifer.

I am not sure if the EIR for Sunset well ground water extractions discuss this point.

The text below was sent me by an interested non-cowboy although he too may be a cranky, old guy on issues related to the PUC, especially Sunset wells.

Dick Morten

Perhaps you'd like to have the numbers below, too. The aquifer is the Westside aquifer. While the South Westside Aquifer is the subject of the management plan of July 2012, it's all one aquifer. The South part is just south of SF. You can't study (or manage) half of it; it's all one.

-------- Original Message --------

Subject: Re: A good news story about the "workshop"
Date: Sat, 30 Mar 2013 09:08:10 -0700
From:
To:

On 3/30/2013 6:51 AM, Jerry Cadagan wrote:

> one comment below the story makes the obvious point that pumping more groundwater is NOT going to benefit the water level situation. But we've learned that Steve Ritchie thinks that whatever he says, no matter how ridiculous, is supposed to be accepted as the gospel truth.

According to numbers that emerged last year, the aquifer will be over-subscribed. South of the line (San Mateo County users) uses, and is expected to use, 8600 acre feet (formerly 8700). The aquifer's annual yield is estimated to be 10,600 AF. The difference, using the latest numbers that are better for SF, 2000 AF. SF intends to pump about 4500 AF of groundwater once its program gets going; it does ramp up to that level, and will monitor.

But, they claim, the aquifer is not really over-subscribed because they plan to capture water that now flows out into the ocean. Impliedly this is not included in the aquifer's yield number. The capture figure is 2160 AF. While that is still less than 2500, it is deemed close enough. All figures are estimates. Maybe they are conservative ones. They will closely monitor to see whether the aquifer water levels fall. That's the party line these days.*

It raises my eyebrows. They are real keen to use groundwater. While you are probably right about "Ritchie knows best" and Lake Merced is unconnected to the aquifer--have faith--I'm not sure the best tactic is to call him ridiculous. Perhaps the best tactic is to insist on the strict monitoring, *and* add reporting on the internet site. Then we'll see what happens. Once it is proven by experience that--what a surprise!--the Lake and aquifer are indeed connected (who knew?), then they will do what they've committed to do: stop pumping. Oh, that's another thing to get now: a *firm commitment* to actually respond when the monitoring shows that the aquifer is suffering.

As far as I know there's only vague implication, not real commitment. Advocates should get the commitment in a resolution. You won't if you belittle Ritchie for being ridiculous. The above will require long memory and follow-up. That's my unsolicited advice. I'm not part of this fight. I only follow what's happening. I hardly use the Lake. Take it FWIW. Best, SL * Note, I *think* that's the party line; it would be best to verify. They've not objected to these numbers, but the numbers come from a management plan that SFPUC may have helped fund, but did not sign off on or anything. The numbers are from the Southwestside Aquifer management plan done by Will Anderson; did I get you the ftp site? I think so. The 4500 and 2160 are Ritchie's. If Ritchie has other numbers he's keeping them close.

From: carolyn cooper
Sent: Wednesday, April 03, 2013 1:41 PM
To: Patrick Sweetland
Subject: Vista Grande comments

I would like to provide a comment on the scope of the Environmental Impact Report (EIR) for the Vista Grande Drainage Basin Improvement project. Like many people, I visit Lake Merced to view wildlife. There is already a high number of roadkilled animals on the roadways around the lake. With the plans to construct wetlands across John Muir Boulevard from the lake, it seems likely that more animals will want to cross the road in that area. Would you please consider adding a culvert or another type of wildlife crossing in that area to try to help make the area safer for their passage? Thank you.

San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

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San Francisco, CA 94102
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APR 26 2013
DWWR

April 25, 2013

Mr. Patrick Sweetland
Director, Department of Water and Wastewater Resources
City of Daly City
153 Lake Merced Blvd.
Daly City, CA 94015

Subject: Vista Grande Drainage Basin Improvement Project

Dear Mr. Sweetland,

The San Francisco Public Utilities Commission (SFPUC) is pleased to support the City of Daly City (Daly City) in its efforts to implement the proposed infrastructure improvement project, *The Vista Grande Drainage Basin Improvement Project*, to address storm related flooding in the Vista Grande Watershed Drainage Basin (Basin) while providing the benefit of restoring the level of Lake Merced. The SFPUC supports Daly City's approach for implementing improvements to the drainage basin.

The proposed project would alleviate flooding that periodically occurs in low lying residential areas in the Basin and along John Muir Drive by reconnecting a significant portion of the historic Lake Merced Watershed and diverting some stormwater and authorized non-storm flows into Lake Merced; and would protect the ocean outfall on the beach below Fort Funston from ongoing coastal erosion.

The SFPUC is working closely with Daly City and the San Francisco Bay Regional Water Quality Control Board in the development of this project and the accompanying Lake Management Plan. Daly City, in cooperation with the National Park Service, intends to prepare a joint Environmental Impact Report/ Environmental Impact Statement for the proposed project in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act. The SFPUC is a responsible agency for this project under CEQA.

If you have any questions, please contact Obi Nzewi at (415) 554-1876 or onzewi@sfwater.org.

Sincerely,

for Steven R. Ritchie
Assistant General Manager, Water

Edwin M. Lee
Mayor

Art Torres
President

Vince Courtney
Vice President

Ann Moller Caen
Commissioner

Francesca Vietor
Commissioner

Anson Moran
Commissioner

Harlan L. Kelly, Jr.
General Manager

CALIFORNIA STATE LANDS COMMISSION
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JENNIFER LUCCHESI, *Executive Officer*
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California Relay Service From TDD Phone **1-800-735-2929**
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Contact Phone: **(916) 574-1900**
Contact FAX: **(916) 574-1885**

RECEIVED
APR 26 2013
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April 26, 2013

File Ref: SCH # 2013032001

City of Daly City, Department of Water and Wastewater Resources
Attn: Patrick Sweetland, Director
153 Lake Merced Blvd.
Daly City, CA 94015

Subject: Notice of Preparation/Notice of Intent (NOP/NOI) to Prepare a Joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Daly City Vista Grande Drainage Basin Improvement Project (Project), San Francisco County.

Dear Mr. Sweetland:

The California State Lands Commission (CSLC) staff has reviewed the subject NOP/NOI prepared by Daly City (City). The City, as a public agency proposing to carry out the subject Project, is the lead agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.) and the National Park Service is the lead agency under the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 as amended). The CSLC is a trustee agency with responsibility of natural resources held in trust for the people of the State of California which may be affected by a project, as provided in CEQA and the State CEQA Guidelines.[1] The CSLC will act as a trustee agency because of its trust responsibility for projects that could directly or indirectly affect sovereign lands, their accompanying Public Trust resources or uses, and the public easement in navigable waters. Additionally, if the Project involves work within sovereign lands, the CSLC will act as a responsible agency.

CSLC Jurisdiction and Public Trust Lands

The CSLC has jurisdiction and management authority over all ungranted tidelands, submerged lands, and the beds of navigable lakes and waterways. The CSLC also has certain residual and review authority for tidelands and submerged lands legislatively granted in trust to local jurisdictions (Pub. Resources Code, §§ 6301, 6306). All tidelands and submerged lands, granted or ungranted, as well as navigable lakes and waterways, are subject to the protections of the Common Law Public Trust.

[1] The State "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

As general background, the State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable lakes and waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all people of the State for statewide Public Trust purposes, which include but are not limited to waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation, and open space. On tidal waterways, the State's sovereign fee ownership extends landward to the mean high tide line, except for areas of fill or artificial accretion or where the boundary has been fixed by agreement or a court. Such boundaries may not be readily apparent from present day site inspections.

Because the Pacific Ocean at this location is ungranted sovereign land, the CSLC has jurisdiction over a portion of this Project. However, the CLSC Land Management Division has not made a determination as to the location of the ordinary high tide line at this location insofar as it would define the limit of State ownership. The uplands at this location are located within lands the State acquired and patented under a 500,000 acre federal grant. An easement over sovereign State land at this location was granted in 1962 to North San Mateo County Sanitation District for a sanitary sewer outfall line. Please contact the Public Land Management Specialist identified at the end of this letter for further information about determining the extent of the CSLC's sovereign ownership and leasing requirements.

Project Description

The proposed Project is located in the Grande Drainage Basin (Basin) which is approximately 205 square miles in unincorporated Broadmoor Village area in Daly City. The Basin is bordered by the City and County of San Francisco to the north, the Colma Creek watershed to the south and east, and the Pacific Ocean on the west. The stormwater within the Basin is drained through the 1890s constructed Vista Grande Canal and Vista Grande Tunnel located adjacent to John Muir Drive and the southwestern shoreline of Lake Merced. These structures were built to divert stromwater away from the Lake to an outfall at the Pacific Ocean, below what is now Fort Funston.

Because these existing structures do not have adequate hydraulic capacity to convey peak storm flows and flooding, the adjacent low-lying residential areas and John Muir Drive periodically experience flooding during storm events. The proposed Project will address storm-related flooding and provide other environmental benefits such as restoration and management of water levels within Lake Merced, improve the ocean outfall, and reconnect a significant portion of the Lake's historic watershed by the following Project components:

- Partial replacement of the existing Vista Grande Canal to incorporate a debris screening device, a treatment wetland, and diversion and outfall structures to route some stormwater (and authorized non-storm water) flows from the Vista Grande Canal to Lake Merced;
- Replacement of the existing Vista Grande Tunnel to increase its peak capacity and extend its operating life; and
- Replacement of the existing ocean outfall structure at Fort Funston.

Environmental Review

CSLC staff requests that the following potential impacts be analyzed in the Draft EIR/EIS.

General Comments

1. Project Description: A thorough and complete Project Description should be included in the Draft EIR/EIS in order to facilitate meaningful environmental review of potential impacts, mitigation measures, and alternatives. The Project Description should be as precise as possible in describing details of all allowable activities (e.g., types of equipment or methods that may be used, maximum area of impact or volume of sediment removed or disturbed, seasonal work windows, locations for material disposal, etc.), as well as the details of the timing and length of activities for all components of the Project listed in Figure 2 of the NOP. Please provide detailed discussions of how each individual Project component will contribute to the overall function of the entire proposed Project. Thorough descriptions (including images and diagrams) will facilitate CSLC staff's determination of the extent and locations of its leasing jurisdiction, make for a more robust analysis of the work that may be performed, and minimize the potential for subsequent environmental analysis to be required.

Biological Resources

2. Sensitive Species: The City should conduct queries of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) and U.S. Fish and Wildlife Service's (USFWS) Special Status Species Database to identify any special-status plant or wildlife species that may occur in the Project area. However, these queries alone should not be used as a substitute for coordination with the CDFW and USFWS, as well as direct surveys or data collection. The City should also consult directly with CDFW, USFWS, and possibly the National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries or NMFS) for information on species that may be present, their life histories, and possible mitigation for any significant impacts. The Draft EIR/EIS should use this information to analyze the potential for such species to occur in the Project area, and if impacts to special-status species are found to be significant, the Draft EIR/EIS should identify feasible mitigation measures that would avoid or reduce the impact.

3. Construction Noise: The Draft EIR/EIS should evaluate noise and vibration impacts on fish and birds from construction, restoration or flood control activities in the water, on the levees, and for land-side supporting structures to be added to the proposed "Noise and Vibration" section on page 6 of the NOP. Mitigation measures (see "Deferred Mitigation" discussion below) could include species-specific work windows as defined by CDFW, USFWS, and NOAA Fisheries. Again, CSLC staff recommends early consultation with these agencies to minimize the impacts of the Project on sensitive species.

4. Deferred Mitigation: In order to avoid the improper deferral of mitigation, mitigation measures should either be presented as specific, feasible, enforceable obligations, or should be presented as formulas containing "performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way" (State CEQA Guidelines, §15126.4, subd. (b)). For example, possible impacts to a specific biological resource should discuss how these impacts will be mitigated by specific formulas like applying a ratio of 1:1 to reduce possible impacts to the extent feasible. In addition, the conclusions in the Draft EIR/EIS should always be preceded by a reasoned, fact-based analysis of the potential impact, including an explanation of the logical connection between identified mitigation measures and the resulting significance conclusion.

5. Invasive Species: Because introduced species are one of the major stressors in California waterways, the Draft EIR/EIS should consider the Project's potential to encourage the establishment or proliferation of aquatic invasive species (AIS) such as the quagga mussel, or other nonindigenous, invasive species including aquatic and terrestrial plants to be included in the proposed "Hydrology and Water Quality" section on page 6 of the NOP. For example, construction boats and barges brought in from long stays at distant projects may transport new species to the Project area via hull biofouling, wherein marine and aquatic organism attach to and accumulate on the hull and other submerged parts of a vessel. If the analysis in the Draft EIR/EIS finds potentially significant AIS impacts, possible mitigation (see "Deferred Mitigation" discussion above) could include contracting vessels and barges from nearby, or requiring a certain degree of hull-cleaning from contractors. The CDFW's Invasive Species Program could assist with this analysis as well as with the development of appropriate mitigation (information at www.dfg.ca.gov/invasives/).

   In light of the recent decline of native pelagic organisms and in order to protect at-risk fish species, the Draft EIR/EIS should examine if any elements of the Project (e.g., changes in bankside vegetative cover) would favor non-native fisheries within Lake Merced by discussing implementation of the following provisions:

   - Environmental training of operational and maintenance personnel to inform them about invasive species;
   - Actions to be taken to prevent the release and spread of marine and/or terrestrial invasive species;
   - Procedures for safe removal and disposal of any invasive taxa observed; and
   - A post-operations and maintenance report identifying what, if any, invasive species were found attached to and/or removed from equipment and materials, as well as the treatment/handling/disposal of identified invasive species.

Climate Change

6. Greenhouse Gases: The NOP on page 5 proposes to include greenhouse gas (GHG) emissions analysis in the Draft EIR/EIS, which is consistent with the California Global Warming Solutions Act (AB 32) and required by the State CEQA Guidelines. This analysis should identify a threshold for significance for GHG emissions, calculate the level of GHGs that will be emitted as a result of construction

and ultimate build-out of the Project (including GHG emissions of all equipment expected to be used), and determine the significance of the impacts of those emissions. If impacts are significant, identify mitigation measures that would avoid, reduce, or compensate for them to the extent feasible.

7. Sea Level Rise: The "Other Required Sections" discussion on page 8 of the NOP does not state the document will address sea level rise. CSLC staff recommends the Draft EIR/EIS consider these effects on all resource categories potentially affected by the proposed Project. At its meeting on December 17, 2009, the CSLC approved the recommendations made in a previously requested staff report, "A Report on Sea Level Rise Preparedness" (Report), which assessed the degree to which the CSLC's grantees and lessees have considered the eventual effects of sea level rise on facilities located within the CSLC's jurisdiction. (The Report can be found on the CSLC's website, www.slc.ca.gov.) One of the Report's recommendations directs CSLC staff to consider the effects of sea level rise on hydrology, soils, geology, transportation, recreation, and other resource categories in all environmental determinations associated with CSLC leases.

   Please note that, when considering lease applications, CSLC staff is directed to: (1) request information from applicants concerning the potential effects of sea level rise on their proposed projects; (2) if applicable, require applicants to indicate how they plan to address sea level rise and what adaptation strategies are planned during the projected life of their projects; and (3) where appropriate, recommend project modifications that would eliminate or reduce potentially adverse impacts from sea level rise, including adverse impacts on public access.

Cultural Resources

8. Submerged Resources/Title to Resources: The Draft EIR/EIS should evaluate potential impacts to submerged cultural resources in the Project area. The CSLC maintains a shipwrecks database that can assist with this analysis. CSLC staff requests that the City contact Senior Staff Counsel Pam Griggs at the contact information noted at the end of this letter to obtain shipwrecks data from the database and CSLC records for the Project site, and include these discussion in the proposed "Cultural and Archaeological Resources" section on page 5 of the NOP. The database includes known and potential vessels located on the State's tide and submerged lands; however, the locations of many shipwrecks remain unknown. Please note that any submerged archaeological site or submerged historic resource that has remained in State waters for more than 50 years is presumed to be significant.

   The Draft EIR/EIS should also mention that the title to all abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the State and under the jurisdiction of the CSLC. CSLC staff requests that the City consult with Senior Staff Counsel Pam Griggs at the contact information noted at the end of this letter, should any cultural resources on state lands be discovered during construction of the proposed Project.

Public Trust Concerns

9. Public Access. Because public access and recreation on navigable waters are protected under the Public Trust, the Draft EIR/EIS should characterize current public uses of the Project site and explain how Project-related activities might impact public uses such as, but not limited to, kayaking, canoeing, swimming, surfing, etc. The Draft EIR/EIS should also discuss how members of the public will be notified of Project-related activities in the Project area. CSLC staff recommends identifying alternate access points, if needed, and posting signage, in advance, at and around the proposed Project in order to minimize the impact to recreationalists and other members of the public. Other discussions of notification and operational or construction practices should be addressed in the Draft EIR/EIS (proposed under "Recreation" section on page 6 of the NOP) in order to minimize the impacts to members of the public.

Thank you for the opportunity to comment on the NOP for the Project. As a responsible agency, the CSLC will need to rely on the Final EIR/EIS for the issuance of any amended/new lease as specified above and, therefore, we request that you consider our comments prior to certification of the EIR/EIS. Please send additional information on the Project to the CSLC as plans become finalized.

Please send copies of future Project-related documents, including electronic copies of the Final EIR/EIS, Mitigation Monitoring and Reporting Program (MMRP), Notice of Determination (NOD), CEQA Findings and, if applicable, Statement of Overriding Considerations when they become available, and refer questions concerning environmental review to Afifa Awan, Environmental Scientist, at (916) 574-1891 or via e-mail at Afifa.Awan@slc.ca.gov. For questions concerning archaeological or historic resources under CSLC jurisdiction, please contact Senior Staff Counsel Pam Griggs at (916) 574-1854 or via email at Pamela.Griggs@slc.ca.gov. For questions concerning CSLC leasing jurisdiction, please contact Al Franzoia, Public Land Management Specialist, at (916) 574-0992, or via email at Al.Franzoia@slc.ca.gov.

Sincerely,

Cy R. Oggins, Chief
Division of Environmental Planning
and Management

cc: Office of Planning and Research
Afifa Awan, DEPM, CSLC
Jennifer DeLeon, DEPM, CLSC
Al Franzoia, LMD, CSLC
Pamela Griggs, Legal, CSLC
Jessica Rader, Legal, CSLC

RECEIVED
APR 26 2013
DWWR

2945 Ulloa St.
San Francisco, CA 94116
murphsf@comcast.net
April 27, 2013

Patrick Sweetland
City of Daly City
Department of Water and Wastewater Resources
Attention: Patrick Sweetland, Director
153 Lake Merced Boulevard
Daly City, CA 94015

Re: Vista Grande Drainage Basin Alternative Analysis (2013)

Dear Mr. Sweetland:

The Golden Gate Audubon Society (GGAS), representing about 4000 memberships in the greater Bay Area is very pleased to support the Lake Merced Alternative, the preferred alternative, proposed in the "Vista Grande Drainage Basin Alternatives Analysis (2013). Though we have a few reservations and concerns, we certainly support this project for a number of reasons. We have had an active interest in Lake Merced since our founding in 1917. Briefly we are very pleased that some of the waters from the Vista Grande Watershed will be made available for Lake Merced. Given the real possibility we will experience water shortages in coming years, this is a very significant contribution to the lake which serves as a major recreational asset for residents of both Daly City and San Francisco. Much more of the water from the watershed will be available to recharge the Westside Aquifer as well and that too is significant. Both of those benefits will ultimately benefit wildlife and that is of particular interest to our organization. The following paragraphs are our concerns about the project.

A native plant assessment needs to take place. Seeds from native species that occur on the project site should be collected and either planted on the project site if there is adequate space, or included in native plant restoration at Lake Merced. This is particularly the case with the oak trees on the wetland site if they are removed. The oaks probably represent a gene pool native to this area and as such, measures should be taken to preserve that local bit of our historic flora. Acorns should be collected in fall and should be planted at either Lake Merced, the edge of Harding Golf Course, the edge of the Olympic Club, along Brotherhood Way or in other nearby open space. Care should be taken so that wherever they are planted they are at sites unlikely to be disturbed in the future.

On p. 5 in the description of fishing at Lake Merced there is an error. Rather than state "Fishing is permitted along all shorelines except for those areas designated "No Fishing", it would be more accurate to say the entire shoreline is closed to fishing except areas of shoreline that are posted for fishing. That includes fishing infrastructure and the beaches at the Boathouse Picnic Area on the North Lake and the beaches at the ends of the concrete bridge/viaduct at the south end of South Lake. Historically fishing was also permitted on a small beach at the north end of the North Lake, but because of neglect that beach is now covered by a dense marsh. Prior to the mid 90's the entire shore of the lake, except for the sites mentioned above were posted "No Fishing".

GOLDEN GATE AUDUBON SOCIETY
2530 San Pablo Avenue, Suite G Berkeley, California 94702
phone 510.843.2222 *fax* 510.843.5351 *web* www.goldengateaudubon.org

This is based on regulations that were in place prior to the decline of the recreational fishery and the infrastructure that supported it.

GGAS agrees that "using a natural storm water treatment process, e.g. surface flow wetlands, for low flow storm water and authorized non-storm water flows, and screening for diverted high flows, the Lake Merced Alternative could satisfy multiple project objectives. This alternative would provide the CCSF with supplemental storm water to operate Lake Merced within a desired water level range from the Vista Grande Drainage Basin in the City." (p.9) This offers a water source for the lake which is historically natural and desirable at the present time and into the foreseeable future. Including the use of high flow storm water, it seems likely water levels at that lake could be maintained at a reasonably high level. In addition, the proposed project would provide a water resource which would otherwise be wasted. Though not stated, this also provides a recreational benefit to the many people who use the lake for a number of activities and who reside both in Daly City and San Francisco.

We are satisfied with assurances that waters from the Vista Grande Watershed that reach the lake will meet quality standards necessary to maintain the lake's water quality in terms of dissolved oxygen and pH. Meeting standards set by the Clean Water Act and regulated by the State and Regional Water Quality Boards should assure water quality.

It would be beneficial to the public if some type of view access is made available for the wetland and the remainder of the Vista Grande Canal. The canal provides a rich habitat for migrating birds in fall and is used by many birders during September and October. Public access or view points offer the opportunity for birders to continue to view migrating birds during the fall, and they offer Daly City the opportunity to provide some interpretation of this program. (p. 12)

Permitting Workbook
Aesthetics: Night lighting. GGAS is opposed to the use of night lighting in areas like Lake Merced. This is a sensitive area that attracts large numbers of birds, particularly during migration. It is well documented that night lighting, particularly in foggy areas, can attract night flying birds, disorient them and cause fatal collisions with the light structures. It also creates conditions more favorable to predators and less favorable to prey organisms. Should lighting be a requirement for this project one reasonable mitigation feature, in addition to those mentioned in Vol 4, would be to use the lighting only when necessary and to turn it off at other times. San Francisco presently uses timers to control lighting at playing fields, but apparenlty doesn't have an on/off switch to override the timers. This project should include measures to turn off the lights when they aren't necessary. That would permit lighting for necessary operations at night, but would eliminate the light at other times. This is a very important issue and we hope this simple solution will be incorporated in the project.

Special-Status Species
It is unlikely the Bank Swallow colony will be impacted. Most recently it was sited at the north most end of the Fort Funston bluffs, across from the Westside Sewage Treatment Plant in San Francisco. A more likely, though still unlikely candidate for impacts, is the Western Snowy Plover. Since the area of the beach where the project will take place is not monitored for plovers, it should be noted they are present north of Sloat Blvd in San Francisco from mid July through mid May. They are not known to breed locally. The site should be surveyed for plovers. The National Park Service may have some data on this site.

At Lake Merced we have an unknown number of special status species. The ones we know of there are "San Francisco" Common Yellowthroat and Tri-colored Blackbird. The yellowthroat is

a permanent resident that nests in the bulrush marsh. Since it is a skulker and very hard to find once it starts nesting, the best course would be not to commence construction that require impacts on a marsh area between March 1 and July 15. That should avoid impacting any nests of this and any other species that is not of special concern. The other species that could be impacted is the Tri-colored Blackbird. It does not nest at Lake Merced, but small numbers turn up annually as part of post breeding disbursal. They are usually present from September through December. We do not know of any measures that can be used to mitigate impacts on this species at this site. If they are present when works begins, they will fly out with other blackbirds. Unknown special-status species are likely to occur at Lake Merced during fall migration. They are likely to occur in the willows and wetlands along the edge of the concrete bridge (viaduct), and along the Vista Grande Canal. If they occur they would most likely be present for a brief period during the period of September through October. It would be best not to start construction operations on the south side of the concrete bridge during that time. Most such migrants that use the Vista Grande corridor are found immediatley north of the northern part of the project site.

One additional biological resource mitigation measure that we recommend is to avoid the start of construction in wetlands and woodlands during the nesting season, between February 15 and July 15. If construction is ongoing during that time, nests of that season wouldn't be destroyed since birds would be unlikely to construct nests in the construction zone.

We have two recommendations to include at the end of this project. First regards the overflow chutes on John Muir Dr. They were installed with the understanding between GGAS, Cal Trout, the San Francisco PUC, and we understand subsequently Daly City for the purpose of an immediate, but temporary fix to curtail flooding. The understanding was structured rip rap would be placed to break sheet flows from the Vista Grande Canal and when the long term problem was addressed, the rip rap would be removed and replaced with either a soft or hard fix that would be permanent. Rip rap is not an acceptable permanent remedy for the flooding problem. This needs to be addressed. The second recommendation is that it would be prudent to install swallow nesting boxes on trees along the wetland site. This would require the cooperation of the Olympic Club, since most of the trees are on their property. The most likely birds to nest there would be Tree Swallows. They nest in the area, but in natural cavities in trees. Placement of nest boxes near the project site would increase the numbers of swallows and would help control insects without the use of chemicals. Mosquito eating fish should be part of the wetland as well. It would also be necessary to take the boxes down and clean them annually.

Thank your for the opportunity to comment on this project. We look forward to providing any information or support Daly City may need for the successful completion of the project.

Very truly yours,

Dan Murphy
Conservation Committee

ROBERT B. MADDOW
CARL P. A. NELSON
CRAIG L. JUDSON

JEFFERY D. POLISNER
(RETIRED)

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SHARON M. NAGLE
DOUGLAS E. COTY
MICHAEL W. NELSON

FREDERICK BOLD, JR.
(1913-2003)

June 7, 2013

Superintendent
Golden Gate National Recreation Area
Attn: Vista Grande Project
Fort Mason, Building 201
San Francisco, CA 94123

Re: **Proposed Vista Grande Drainage Basin Improvement Project**

Dear Madam or Sir:

This law firm serves as special counsel to The Olympic Club (Club), which owns the majority of the real property on, under, or adjacent to which the subject Project has been proposed (i.e., other than real property which we understand to be owned by the National Park Service, Olympic believes that it owns all of the land that will be utilized for the proposed Project). Olympic offers these comments in response to the Notice of Intent to Prepare an Environmental Impact Statement that appeared in the Federal Register on May 8, 2013.

In one form or another, Olympic has been dealing with the subject Project, or with the planning and analysis being done by or on behalf of the City of Daly City and/or the City and County of San Francisco on the direct antecedents of the proposed Project, since at least 2006. Olympic's representatives have participated in numerous meetings with officials and agents of both entities, and Olympic has offered its comments and observations on a number of previous occasions. Upon review of the Federal Register Notice mentioned above and Daly City's February 28, 2013 Notice of Preparation/Notice of Intent to Prepare a Joint EIR/EIS for the Vista Grande Drainage Improvement Project, we reviewed some of the past correspondence and believe it is still strikingly relevant to the present Project proposal. We have therefore attached copies of Olympic's letters of October 19, 2007 to San Francisco's Manager of Water Resources Planning, and of October 15, 2008 to the City Manager of Daly City. Although each letter deals with a slightly different subject than the proposed Project, both touch on areas which were and still remain of significant concern to Olympic.

Olympic owns and operates two world-renowned golf courses, and has a large membership which utilizes both golf courses to their fullest extent. One of them has played host to the United States Open (i.e., the national championship of American golf, and one of the world's four top annual golf events) on five occasions, the most recent of which was 2012, and Olympic is in the running to be selected for another Open in the near future. It will also be announced soon that Olympic will host the inaugural USGA Amateur Four-Ball Championship in late April of 2015, and it has been the site of the U.S. Amateur Championship three times.

When Olympic hosts an Open, it is one of the most significant events that occurs in the Bay Area in that year, with as many as 50,000 attendees per day for the four days of competition, and large numbers of people who attend the pre-tournament practice rounds and related activities, many of which are hosted by leading national and international corporations. Television coverage is extensive, worldwide, and reaches a huge audience. Preparation for the tournament takes more than one year prior to the competition, and if neighboring construction or related activities have the potential to in any way delay or disrupt that work, the United States Golf Association may decide that the Open should be held elsewhere. Olympic therefore needs the maximum possible advaance notice from the proponents of the proposed Project prior to the commencement of any site preparation or construction activities

The proposed Project will involve the partial replacement of the Vista Grande Canal, construction of a "treatment wetlands" in or above a portion of the Canal, and replacement of the Vista Grande Tunnel. The Canal is on Olympic-owned property, over which San Francisco owns an easement that has been assigned to Daly City. It is immediately adjacent to large portions of the golf course on which the U.S. Open and the other significant tournaments are played.

The Tunnel, which conveys both treated wastewater and stormwater that emanate primarily from Daly City to the Pacific Ocean, is located under Olympic-owned property in which San Francisco owns an easement; that easement was leased to Daly City in 2007, so that it could continue to operate and maintain the Tunnel. We understand that the lease will expire in 2017. Daly City's wastewater system also includes a treated wastewater "force main" 30 inches in diameter and that occupies still another easement under Olympic-owned property. Unlike the Canal and the Tunnel which are generally on, under, or adjacent to the periphery of Olympic's property, the force main crosses it diagonally. We understand that each of these elements of the Daly City system is in some way involved in the proposed Project, and we believe that work related to each of these elements has the potential to adversely impact the use and enjoyment of Olympic's properties in a potentially significant way.

Although Olympic has looked at the materials related to the proposed Project that have been issued by or on behalf of Daly City, Olympic remains somewhat concerned about what actually happen on, under or adjacent to its property. At various times over the past decade, both Daly City and San Francisco have analyzed, planned and even preliminarily designed various public works projects involving the Canal and its relationship to Lake Merced (located directly across the street from Olympic). The degree to which the planning and project proposals were integrated or coordinated by the two Cities was usually not clear to Olympic, and therefore this type of concern has been voiced several times (including in each of the attached comment letters). Daly City's principal concern has been stormwater management for the Vista Grande watershed and upgrading of its stormwater/wastewater systems and conveyance capacity; among San Francisco's principal concerns are water supply issues and management of the water surface elevation in Lake Merced. At various times, and sometimes jointly, the two entities have looked at a proposed wetlands to be constructed above or along the Canal, but it is not clear to Olympic whether the current proposed Project represents the final coordinated and consolidated positions

of both entities. Olympic has attempted to make the point for many years that planning and management of the watershed and of facilities like the Canal and any wetlands element should be the product of a thorough integrated approach to resources policies and planning.

One example of why Olympic remains concerned about the apparently lack of coordination between the efforts of Daly City and those of San Francisco is that San Francisco has issued a draft Environmental Impact Report (DEIR) for a proposed water supply improvement project involving conjunctive use of surface water and groundwater in areas south and east of Olympic. That proposed Project, in which Daly City is also involved (although it is not the proponent) is primarily intended to assist San Francisco in coping with the yield limitations of its Hetch Hetchy water supply importation system, but the DEIR indicates that one of its potential adverse impacts could be to reduce the water levels of Lake Merced. Should that happen, Olympic is concerned that the design, operation, and maintenance of Daly City's proposed Vista Grande Project might be modified in an effort to offset adverse impacts of San Francisco's proposed regional groundwater project (e.g., might there be an effort to increase the production capacity of the proposed treatment wetlands to assist with Lake Merced water levels, and might such an effort result in consideration of expanding the wetlands onto more of Olympic's property?). The EIR/EIS for the proposed Vista Grande Project should evaluate the linkage and cumulative effects between these and other current and planned projects by either City.

Also as indicated in the attached letters, Olympic remains particularly concerned about the wetlands element of the proposed Project. Olympic still does not have a clear picture of what it will mean to have a large constructed "treatment wetlands" on its property at the edge of its golf course. Comments have periodically been made about concerns about aesthetics, odors, and insects, largely because Olympic is unable to thoroughly describe what this new facility would look (or smell) like. Olympic prides itself on being an excellent steward of the lands it owns, and has been recognized for that ethic and for vigorously implementing it – e.g., it has received certification by the Audubon Society for its environmentally sensitive management practices. One component of such certification deals with use of best management practices with regard to safe and protective use of fertilizers and pesticides as a part of a successful golf course; Olympic is concerned that construction of the proposed wetlands immediately adjacent to its golf course not adversely restrict or otherwise impact its operations in this or any other regard. Establishment of a new sensitive habitat or facility on or adjacent to Olympic's property should not expressly or implicitly create any new form of liability, responsibility, or any other form of obligation for Olympic. Olympic would object to inclusion of provision for public access into its property as part of any treatment wetlands element of the proposed Project, primarily for safety and security reasons.

Similarly, if the proposed wetlands should provide new or enhanced habitat for animal or plant species not now present on or adjacent to Olympic's property, Olympic should not bear any responsibility whatsoever for such species, and the proponents of the proposed Project should expressly acknowledge and agree to permanently assume all such responsibility. The proponents of the proposed Project should also be made expressly responsible for preventing spread or

migration of attracted species onto Olympic's property. Olympic should not have any responsibility for provision or establishment of any form of buffer between the proposed wetlands and Olympic's golf course, nor for any aspect of the physical, biological, chemical, hydrological or any other form of security for the wetlands or for any other portion of the Canal. For example, Olympic has its principal maintenance facility near the uppermost portion of the Canal, and should not be limited or restricted in its use, maintenance, or replacement of its facilities as a result of any element of the proposed Project.

It is Olympic's understanding the proposed Project is intended to be able to cope with stormwater resulting from a storm that can be statistically predicted to occur once every 25 years, with the most concentrated rainfall coming in a 4-hour period. As it has noted several times in the past, Olympic is quite concerned about what will happen in a more severe storm, particularly in light of what Olympic understands to be the current scientific consensus about the types, magnitudes, and frequency of recurrence of storms that might be predicted as a result of climate change. In marked contrast to the 25-year storm design criterion, Olympic understands that the 2004 storm event that resulted in significant flooding near the site of the proposed Project is believed by some experts to have been a 1000-year event. Olympic needs to know what is predicted to happen to the wetlands, the Canal, and Olympic's adjacent property if the facilities in the proposed Project are subjected to a more severe storm than the design criteria. The post-storm-wetlands are probably the most critical among Olympic's concerns in this regard (e.g., what will it look and smell like, and for how long?), and Olympic believes that the proponents of the proposed Project must expressly accept all responsibility for cleaning up, restoring or remediating the site after any flood or similar incident affecting the proposed Project.

Each of the elements of the proposed Project of which Olympic is aware, save for the westerly part of the Tunnel and outfall structure, will involve construction on, under, or adjacent to Olympic's property. Olympic tries hard to operate and maintain its property in a responsible manner that does not intrude upon or disrupt the community. Olympic expects that the implementation of the proposed Project will be undertaken with a similar respect for and sensitivity to the need to control construction activities so that they are as carried out as carefully as possible given the nature of the special setting in which the construction will occur. To the extent that doing so will require special efforts and components of construction management, Olympic believes that the proponents of the proposed Project must expressly accept full responsibility to provide and pay for such efforts.

Olympic believes it is critical that the planned EIR/EIS clearly describe the authority, responsibility, and accountability of the proponents of the proposed Project for all aspects of its design, construction, operation, maintenance, and replacement. The proposed Project will, if approved and implemented, be a massive undertaking in a location that is serene, quiet, and aesthetically unique. Olympic, as the owner of so much of the property that would be utilized for the proposed Project, should not have and does not want to have any increased responsibilities if that Project is ever built. Clear and unambiguous delineation of the responsibilities of the parties involved in the proposed Project should be provided. Similarly, Olympic believes that the environmental analysis should be accompanied with a thorough

description of the financial plan and program that will be used to fund the proposed Project, as well as a detailed listing of the approval and permitting procedures (federal, state and local) and milestones that will be part of the process leading up to the ultimate Project approval steps. Olympic is particularly concerned that there be assurance that if approved and started, there will not be a set of circumstances in which the undertaking is then abandoned or delayed for a protracted period, resulting in unsightly, intrusive, or disruptive site conditions in the area where work had been started.

Olympic appreciates the opportunity to provide these comments during the federal aspect of the scoping for the planned EIR/EIR. Olympic will continue to track and monitor project planning and environmental documentation work, and reserves the right to make further comments when and if it deems that to be necessary.

Very truly yours,

Robert B. Maddow

Robert B. Maddow

Attachments
cc: Pat Finlen, Olympic Club
Patrick Sweetland, Daly City

THE OLYMPIC CLUB

October 19, 2007

Ms. Paula Kehoe
Manager of Water Resources Planning
San Francisco Public Utilities Commission
1145 Market Street, Suite 401
San Francisco, CA 94103

Re: Comments on Draft Alternatives Analysis Report for Lake Merced Water Level Restoration

Dear Ms. Kehoe:

The Olympic Club is pleased to comment on the September 24, 2007 Draft Alternative Analysis Report which concerns establishing the desired water surface elevation of Lake Merced and identifying the preferred alternative sources of supplemental water to maintain that elevation (AAR). As the owner of real property across John Muir Drive, the Olympic Club has been involved for many years with San Francisco and the City of Daly City (Daly City) with issues related to the proper management of the entire watershed, including Lake Merced water levels. We support the continuing efforts of the San Francisco Public Utilities Commission (SFPUC) and Daly City to work with a wide variety of people and entities in seeking to find ways to enhance Lake Merced as a regional amenity and as part of an environmentally sound integrated watershed management program.

Draft Alternatives Analysis Report

We have reviewed the AAR and two Technical Memoranda that SFPUC staff issued in September, 2007; attended a public presentation at your office on October 1, 2007; and were able to meet with you and others (from the San Francisco Public Utilities Commission (SFPUC) and City Attorney's office and one of your planning consultants) on October 12. As the Club told you then, we were surprised to learn of the AAR so long after it apparently had been under discussion with a number of organizations; but appreciate the fact you indicated the Club has until October 19 to submit its written comments on the AAR. It should be noted these comments are based upon my review of the documents, with assistance of the Club's professional advisers. The AAR has not yet been reviewed by the Club's Board of Directors, and thus this should not be construed as the Club's final position; the Club may have additional comments in the future.

Susan S. Morse, *President* Patrick J. Murphy, *Vice President* Christine N. Lustic, *Secretary* Kirk G. Werner, *Treasurer* E. Jeffrey Banchero
John J. Cope James S. Kirk Maurice Monserez Bill R. Poland Joseph C. Sheehy David A. Thompson William L. Timoney Dennis P. Bouey, *General Manager*

We understand, at this time, staff intends to present the AAR, public comments, and SFPUC staff's responses to the Commission on or about November 13, 2007; but that no action is scheduled at that time. We also have been informed after the Commission hears from staff and others, staff may commence conceptual engineering for the preferred alternative(s), culminating in design up to the 10% level, and may also start the process of environmental documentation. Beyond that, we do not understand the process you are following or the selection criteria that will be used to determine which alternatives will be pursued.

Our fundamental concern is that this AAR may represent a backtracking from the earlier integrated watershed management approach that was being pursued by San Francisco in cooperation with Daly City. From an environmental perspective, integrated approaches to managing whole watersheds have become the preferred, if not mandatory, approach. In addition, for environmental review purposes, consideration of the possible implications for public and private actions in interrelated parts of the watershed is required. This is true, as you know, whether or not all of the public works project(s) or all of the watershed is under the San Francisco's jurisdiction. Finally, the prudent use of public resources would indicate that what Daly City may do should be understood and factored into San Francisco's approach to a part of the watershed. This holistic integrated approach has been reflected in prior work, and we do hope San Francisco intends to continue in that manner.

In addition, we have reviewed the Draft Programmatic Environmental Impact Report for the SFPUC's Water Supply Improvement Program (DPEIR), and note that maintaining the Lake Merced water level is one of the many program elements. Much of the discussion of this element focuses on use of recycled water and groundwater as supplemental sources of water for the Lake. Use of stormwater as such a source is also discussed, but frequent reference is made to requiring "advanced treatment." We do not understand whether the AAR's proposed Wetlands would constitute the advanced treatment technique to which the DPEIR refers; if not, the Technical Memorandum attached to the AAR needs to be revised or updated. If the proposed Wetlands is considered the advanced treatment that is said to be required, the DPEIR should be carefully reviewed prior to being certified because we did not find a reference to using a constructed Wetlands as an alternative treatment method. Either way, it appears to us that consideration of the constructed Wetlands project that is proposed in the AAR will need to be included in the DPEIR, or be the subject of a parallel environmental impact report.

Similarly, we have previously reviewed the Vista Grande Watershed Study prepared for Daly City and the SFPUC concerning flood control issues. That Study also included a wetlands proposal—one that was larger than the AAR's proposed Wetlands, and that would have been located on the property now occupied by the Vista Grande Canal. The AAR does not explain the manner in which it is being coordinated with the

current flood control planning and studies being pursued by Daly City. We have had and will continue to have discussions with the SFPUC staff and with the City Manager and staff of Daly City concerning the relationships between the various planning processes that are being followed and how they might affect the Club. At this point, we do not yet have a clear understanding of what is likely to be the outcome of either of the two cities' planning efforts; or whether the results will be compatible with one another and with the interests of the Club. We are even more uncertain about the timing of any resulting project(s).

As you know, The Olympic Club owns a substantial amount of property in San Francisco and San Mateo Counties; including two golf courses that are universally deemed to be among the best in the world. The Club's property includes land on both sides of the Vista Grande Canal, which is located in an easement held by San Francisco. Because a principal focus of the AAR is to build and operate a "constructed wetland" adjacent to the Canal on San Francisco property and on a portion of the Club's property, we have a great deal of interest in both the AAR and the Technical Memo concerning the proposed Wetlands. If we proposed to build such a project on San Francisco property, you certainly would have the same kind of concerns. In addition, as the owner of the privately held property in closest proximity to the proposed project, and as a long-time stakeholder in policy issues and projects in the Lake Merced area, our comments are intended to provide a constructive contribution to the SFPUC's analysis and consideration of the issues raised in the AAR.

Because of the Club's historic reliance on groundwater for irrigation and in light of what led to the decisions concerning switching to recycled water, we also looked carefully at the discussion of groundwater as a new source of water for the Lake. The work reflected in the AAR's Technical Memo on the groundwater alternative demonstrates that such a project is likely to be compatible with protection of the Westside Basin aquifer for other beneficial uses.

Our other comments at this time about the groundwater alternative concern the need for long-term monitoring to validate the Technical Memo and to ensure that new pumping for the benefit of the Lake will not have adverse impacts on other groundwater uses. As you know, the Club continues to rely on some groundwater pumping for irrigation and to back up the recycled water system, and expects to do so permanently. However, the proposed new pumping for the Lake, especially in combination with the SFPUC's new program to pump and inject groundwater directly into the San Francisco potable water supply (and with your expansion of the conjunctive use program being pursued jointly with utilities in San Mateo County) can create new demands and patterns of use for the Westside Basin aquifer that should be observed and tracked with data that is publicly available. Such monitoring needs to include both quantity considerations regarding the yield and stability of the aquifer, and water quality considerations.

Our principal concerns with the AAR's proposed Wetlands to be located between the Canal and John Muir Drive are:

- As stated above, the proposal does not appear to be part of an integrated watershed management approach but, rather, a piecemeal response to one part of the overall problems of the watershed.
- The proposal has the potential for significant adverse impact on the Club. Several of these potential impacts concern the location and design of the proposed Wetlands, which are discussed below.

A. Wetlands water supply

The only information we have seen concerning the availability of stormwater for the proposed Wetlands is cursory and conclusory. The Technical Memo fails to address the quantity of water that will be available for the proposed Wetlands in wet and dry months and in wet and dry annual cycles. The water supply for the proposed Wetlands must be well understood before any such project is selected and pursued. Flow rates and volume in winter and summer periods should be known, as well as the quality of the water that will be available in each period. If quantities are limited or if quality considerations prevent or limit the use of the available water, we are concerned there will be periods when the proposed Wetlands might "dry up," and we have no understanding of what that would mean for the Club. For example, we understand there is a relatively high level of coliform bacteria in the water found in the Canal throughout the year, but we do not know the significance of that fact in terms of the feasibility or operation/maintenance of the proposed Wetlands. We also do not understand how water will be introduced into or discharged from the proposed Wetlands; and we are not yet certain about the regulatory requirements with which the proposed Wetlands would have to comply.

B. Normal operating conditions

After reviewing the AAR and Technical Memo, we remain somewhat uncertain about what we will see on the ground if the Wetlands are built and operated in the manner proposed in the AAR. We fully recognize you are only at the preliminary planning stage and that considerable engineering and environmental analysis will be required before you can commence detailed design, but we are concerned that we really don't know what to expect. Will we have a permanent or seasonal marsh next to our property? What will it look like and smell like? Will there be insect problems or will the plant species and perhaps animal species to be introduced onto our property create new land management issues or otherwise impact our golf courses? Will the traffic barrier be a wall between the wetland and John Muir Drive?

C. Sustainability in flood events

We do not understand how the proposed Wetlands will work in a period of high stormwater flows that exceed the capacity of the Vista Grande Canal and tunnel and lead to overtopping and flood flows toward the Lake. We understand that the Wetlands is designed to be able to receive and detain some flood flows, but we do not yet understand whether it would be susceptible to damage that might render it inoperative, unsightly, or cause it to generate unpleasant odors or insect problems after a flood. For example, if the vegetation in the wetland cells is washed out, or if the mosquito fish that are intended to control insects are displaced or killed, what will the ensuing conditions be and how long would they last? What flood frequency and intensity will the Wetlands be planned to survive, and how severe a flood would have to occur before its sustainability is threatened? If Daly City decides to pursue the larger wetlands preliminarily described in the jointly funded Study, what impact will that have on the operation and sustainability of the proposed Wetlands? Will the Wetlands project include result in any change in the frequency, severity, or duration of the accumulation of stormwater on the Club's property? Will the presence of the traffic barrier or the Wetlands access road result in more stormwater backing up onto Club property?

D. Compatibility with Lake level

We understand the AAR proposes a long-term water surface elevation for the Lake that will exceed levels that have occurred for many years. In the past, SFPUC representatives have told us that a Lake level above about 4.5 feet City datum (or about 22 feet on the L.M. Gage Board) will result in South Lake "spilling" into Impound Lake, and the two Lakes equilibrating. Based on our discussions with Daly City, we believe that the long-term Vista Grande solution may not be determined or implemented for quite some time. If the AAR is implemented, South Lake and Impound Lake will be fully connected and may not be able to accommodate as much stormwater as in recent years. We do not understand how that will be reflected in the SFPUC's consideration of the AAR or in the coordination of the planning being done by the SFPUC and Daly City, and we do not know how that will impact the likelihood of greater stormwater accumulation and resulting damage to Club property.

E. Timing

Finally, assuming the problems described above can be resolved satisfactorily, a remaining critical issue is the timing of the implementation of this project, which due to a unique circumstance, we believe you should take into account in any possible project planning and scheduling.

In 2012, the Club will host its fifth United States Open Golf Tournament. This event is the national championship of professional golf, and , since World War II, the Club is one of only three golf courses at which the Open has been held this many times. The United States Golf Association (USGA) selection process for the tournament location is extremely competitive, in part because it is the most prestigious event in all of professional golf; and, in part, because it always is a very substantial source of revenue to the community in which it is held.

The Club is concerned about the uncertainty and confusion that can arise from an announcement about a proposal to build a major public works project immediately adjacent to the golf course before or during the Open that might affect the golf course playing surface and areas that will be used by competitors, spectators, sponsors, and the media. Any such uncertainty could lead to a decision by the USGA to revisit its previous decision about the award of the tournament to our Club and to San Francisco.

Current estimates are that the Open will draw as many as 50,000 people per day, from all over the world, to the City and to the Club for the four days of competition, and smaller, but still significant, numbers for the tournament preparation period and for the several days of practice rounds. National and international television and radio networks, and a wide variety of print media will cover the Open. Many large corporations will be sponsors of the event and will have a large presence before and during the tournament. The Club is convinced a major construction project like the proposed Wetlands adjacent to the Canal would be incompatible with the tournament (i.e., with the Open itself and with the related traffic and logistics management) if construction is underway at the same time as or just prior to the competition.

The Club is also concerned that construction of the Wetlands adjacent to the golf course could create unsightly or undesirable conditions if the project is incomplete or has not been successful by the time of the tournament. The Club therefore believes if the construction and complete implementation of the Wetlands project (including full maturation of plants in each of the Wetlands cells) cannot be completed well prior to the Open, then the commencement of construction should be delayed until after the Tournament has finished. We do not purport to be experts in the design, construction, or operation of Wetlands, but we believe that the proposed John Muir Wetlands would have to be completed and fully implemented for at least one full year prior to the summer of 2012 in order to avoid the type of uncertainty that we have described above.

We appreciate the opportunity to present these comments, and look forward to continuing our discussions with the SFPUC staff and with Daly City about the subjects of current public works planning that involve our mutual and individual concerns. To reiterate, we are especially concerned that both the SFPUC and Daly City give ample consideration of the impacts of the various project proposals on the Club and particularly

on the U.S. Open. If you have any questions about any aspect of these comments, please do not hesitate to contact me.

Very truly yours,

Dennis P. Bouey
General Manager

DB/cp

cc: Patricia Martel, City Manager, Daly City
Zane Gresham
Robert B. Maddow

THE OLYMPIC CLUB

October 15, 2008

Patricia Martel
City Manager
City of Daly City
333 90th Street
Daly City, CA 94015

Re: Vista Grande Canal Alternatives Analysis Report and Supplemental Analysis

Dear Pat:

I write once again in our on-going effort to work collaboratively with the City of Daly City and the City and County of San Francisco to address the problems with stormwater and flooding in the Vista Grande Watershed.

This letter concerns the Vista Grande Canal Alternatives Analysis Report of December 2007 ("AAR") and Supplemental Analysis of August 2008 ("SA"). The Olympic Club has reviewed the AAR, and I want to share directly with you our observations and concerns. As the Olympic Club is an owner of substantial land in the Vista Grande Watershed, including the site of the Vista Grande Canal and the land under which the current Vista Grande Tunnel is located, efforts to address stormwater and flooding issues are important to us. We appreciate the efforts of the City and other local agencies to find long-term solutions to flooding in the watershed. However, in candor we must question the adequacy of the AAR and related documentation to provide the City and the City Council with reliable information and coherent analysis so critical to the City's meaningful decision-making.

As you know, the Olympic Club has monitored and participated in the current watershed planning process since its early stages. Drawing on the counsel of experts in watershed management, we have previously submitted letters communicating our concerns with the Vista Grande Stormwater Conceptualization Study and Vista Grande Watershed Plan, as well as the San Francisco Public Utilities Commission's ("SFPUC") efforts to manage water levels in Lake Merced, and have engaged in ongoing discussions concerning the status of planning with both Daly City and SFPUC. Our comments, while responding specifically to the AAR and SA, build upon these previous communications. Specifically, the Club has continually expressed its support for realistic, effective solutions that do not unnecessarily disrupt the use of the Club's property. We continue to believe that any effective solution

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must be the product of a unified watershed management plan, rather than fragmented, piecemeal, and inconsistent approaches by the various individual municipalities and agencies.

We understand the City's planning for possible stormwater improvements is far from complete, and not all details can be anticipated or fully addressed at this stage. Nevertheless, a review of the AAR analysis reveals major gaps and inconsistencies that need to be remedied before the City Council reasonably should be asked to commit any more resources to a preferred option or particular outcome. As the completion of the AAR and SA, collectively, appear to represent an important step for the City, we feel it is important to communicate candidly our concerns. Moreover, it is essential that the City Council understands the limitations of the analysis to date, and takes those limitations seriously before committing irretrievably to an inadequately studied course of action.

The public now has three separate reports addressing issues and options for the Vista Grande Watershed from Daly City alone – not including SFPUC's recent studies concerning options for Lake Merced. At the most basic level, it is confusing and cumbersome for the public and other agencies to navigate among the Vista Grande Watershed Plan, AAR, and SA, and SFPUC documents. More crucially, even the Daly City documents do not present a coherent point of view. Rather, numerous inconsistencies exist within and among the three studies. Let me share with you in summary the key deficiencies of these reports, and especially the AAR.

Failure to Adopt Integrated Watershed Management

Since 2006, the Olympic Club has emphasized, in its communications with both the City and SFPUC, the need for the two entities to plan improvements for the entire Vista Grande watershed through a single integrated process. From an environmental perspective, the strongly preferred approach is to manage the entire watershed as an integrated whole. Additionally, the sensible use of public resources would require the two entities to collaborate toward a unified solution. As it stands, however, Daly City and the SFPUC's planning processes appear disconnected at best.

As the specific examples in the following discussion illustrate, our overarching concern is that the AAR and SA represent a step backward from the earlier integrated watershed management approach San Francisco and Daly City were pursuing in collaboration, as of at least 2006. An integrated approach would have significant benefits with respect to environmental impacts (and the environmental review process), land use planning, constructability, operability, and expenditure of public resources. Conversely, if Daly City proceeds with stormwater improvements in isolation, without considering the relationship to the wetlands and Lake Merced improvements, the result is likely to be increased costs,

increased environmental impacts, construction and operational conflicts, and ultimately delayed and/or reduced public benefits.

Fragmented and Inconsistent Analysis Regarding Wetlands

Responsibility for Planning and Implementing Wetlands Project. Some of the most problematic inconsistencies concern the description of the responsibility for the wetlands that have been proposed for construction near Lake Merced. Although the Watershed Plan contemplated a cooperative project between Daly City and San Francisco, the AAR leaves a reader wondering whether the proposed project would in fact be a "holistic," "joint," "integrated" one between the cities (see, e.g., AAR Executive Summary; sec. 4.1.5; sec. 10.2), or a "separate" one handled by San Francisco, and divorced from the Vista Grande stormwater improvements (e.g., sec. 4.7.2; sec. 6.1.1).

Although it is difficult to discern the AAR's basic assumptions regarding responsibility for the wetlands, the report clearly represents a departure from previous efforts to integrate planning for Vista Grande stormwater improvements with SFPUC's plans for improvements to Lake Merced and adjacent wetlands.

Relationship to Other Improvements. Moreover, the description of the relationship between the proposed stormwater improvements and wetlands is unclear and inconsistent. An example of the failure to consider improvements in an integrated manner is the treatment of the AAR's Alternative 10, which called for stormwater re-use through wetlands development and/or groundwater replenishment. The AAR noted that Alternative 10 could be used in combination with various other alternatives (although we note the AAR made no attempt to quantify impacts/benefits of doing so, or how stormwater re-use would affect the ultimate weighing of alternatives; and AAR Chapter 6, addressing constructability issues, omitted discussion of Alternative 10 entirely). Yet Alternative 10 is inexplicably absent from the SA – either on its own or as a supplemental opportunity for addressing stormwater impacts – and rather, the SA appears to assume that the wetlands will simply be a part of the "future baseline" of conditions.

Working from this future baseline, the analysis does not adequately account for the creation of wetlands areas beyond those contemplated earlier by the Watershed Plan. The AAR (sec. 4.7.2) states that up to 2.4 acres of additional wetlands could be created under Alternative 5B, 6, or 7, "on top of the proposed box culvert." However, the box culverts in each alternative (as depicted in Appendix C to the AAR) appear to be located in areas already contemplated for wetlands; therefore, would the box culvert areas truly be "additional"? If so, the location of the box culvert relative to the wetlands should be explained more clearly. Has Daly City discussed the proposed addition of wetlands with SFPUC – the agency intending to develop and maintain those wetlands? How would the expansion fit in with

SFPUC's existing plans? Would these additional areas be located on the Olympic Club's property, and if so, has Daly City considered the process for reaching agreement on the location and operation of these wetlands?

Similarly, the AAR and SA provide no real consideration of how plans for the Vista Grande Canal will fit into Lake Merced water level management plans. This lack of analysis raises several questions. For example, will Lake Merced require use of water from the new canal? Will water entering Lake Merced be filtered through the new, constructed wetlands? How will Lake Merced plans fit with the Olympic Club's use of recycled water and groundwater for irrigation – and will there be "competition" for these resources? To the extent that these issues have been considered in previous studies, the AAR and SA fail to incorporate the analysis or conclusions.

Relationship to Stormwater Detention. Finally, the AAR and SA fail to reconcile what appear to be conflicting statements regarding the interplay between stormwater detention facilities and creation of new wetlands. Table 4.3 to the AAR indicates that diversion of 1,000 cfs would "reduce" or "significantly reduce" wetlands opportunities, depending upon the alternative. However, we could find no mention in the report's text of decreasing wetlands opportunities, and in fact, section 4.6.5 states that Alternative 9, providing for storage of up to 30.8 MG, "would not affect the current planning for wetlands" adjacent to the Vista Grande Canal. In the SA, all three of the "finalist" alternatives contemplate 4 MG storage for peak stormwater flow, and the SA never mentions that this diversion would affect wetlands construction. Perhaps Table 4.3 referred to ongoing diversion, rather than diversion only at peak flow, but the lack of explanation in the table or text can only leave us wondering

Flawed Environmental Assumptions

The AAR and SA are flawed in relying on questionable underlying assumptions about the environmental "baseline" – particularly with regard to consideration of the impact of climate change on existing conditions. The analysis assumes, for purposes of determining the need for stormwater improvements, that storm events will be "statistically average" (SA at 1). Is this a realistic view given climate change, which is likely to affect both the intensity and frequency of storms? A "statistically average" storm in 2020 may look very different from a "statistically average" storm in 2008, yet the analysis does not even acknowledge, let alone try to quantify, the potential for climate change to affect the need for stormwater diversion.

Additionally, the AAR and SA rely upon a "recent" rate of coastal retreat (two feet per year) to predict impacts on the proposed new outfall structure (SA at 6). The analysis fails to address, however, whether it is realistic to assume that this rate will continue unchanged in the face of rising sea levels, which may be caused by global climate change.

As the courts and the Legislature have made clear, local agencies must study and consider seriously the effect of climate change, both in the assessment of baseline conditions and in the determination of significant impacts. Given the regulatory landscape and the potential for climate change to affect the effectiveness of the project itself, it is essential to take a hard look at shifting environmental conditions even at this stage in the planning process.

Constructability Analysis

The "constructability" analysis in both the AAR and SA disregards or discounts important practical factors.

Impacts on Olympic Club. The analysis to date continues to understate grossly the significance of impacts on the site of most of the proposed improvements: the Olympic Club. All alternatives currently under consideration (Alternatives 5B, 6B, and 7) involve substantial tunneling under the Olympic Club's golf courses. In the past, City representatives assured that the tunneling would occur so far underground that there would be no effects on the surface. However, the AAR reverses those assurances and state flatly that tunneling for thousands of feet under the Olympic Club will have adverse effects on the surface. Neither the AAR nor the SA offers any real analysis of the nature or extent of these construction-related effects, or takes into consideration the impact on the painstaking design and unique playing characteristics of the Club's world-class golf course.

Additionally, the SA offers alternative locations for a tunnel inlet portal and staging (at Fort Funston). It concludes that these alternatives would, respectively, "significantly affect" and "significantly disrupt" operations at the Olympic Club. Again, the SA does not explain whether these significant impacts on the Club would be greater or less than the original proposals, or explain whether the analysis takes into account the special characteristics of the Club.

The Olympic Club takes these issues very seriously, and would expect that the City would do the same. The consultants' work to date, however, is wholly inadequate to inform either the City or the Olympic Club of the risks and costs associated with possible damage to an internationally renowned sports venue.

Coordination of Timing & Project Components. Although the AAR notes that the timing construction of stormwater improvements could affect wetlands construction, these matters are only dealt with cursorily. In reference to each alternative, the AAR simply states that tunnel alignment would affect the areas being considered for wetlands development, but that "scheduling the wetlands development to follow the tunnel construction would eliminate this

conflict" (e.g., AAR sec. 9.1.3). The report fails to consider, for example, whether SFPUC would find this arrangement acceptable; how long wetlands construction would be delayed; or whether the timing would exacerbate or prolong environmental or flooding effects in the interim. Additionally, the SA concludes that, although Alternatives 5B and 6B receive the same weighted ranking in the comparative analysis, 6B is preferred because it "provides a greater opportunity to support the SFPUC's efforts to improve Lake Merced's water quality" (SA at 9). However, the SA provides no indication as to what specific factors in Alternative 6B support Lake Merced water quality to a greater extent than 5B, or how the report arrived at this conclusion.

Conclusion

The above observations by no means are comprehensive. There are many other issues raised by the AAR and SA, but what I have indicated is representative of the scope of our concerns. We offer these comments in the spirit of cooperation, as part of the community directly affected by the on-going Vista Grande Watershed issues, and efforts to address them. We have a major stake in seeing Daly City succeed in its efforts to prevent flooding. However, the deficiencies in the analysis to date frankly are troubling. We hope that the City will demand better information and cogent analysis from its consultants, in order to allow the public to comment meaningfully and then for the City Council to make informed decisions about the nature, location, and construction of an integrated watershed improvements that are bound to have substantial financial and physical effects on Daly City, its residents and businesses.

Sincerely,

Dennis P. Bouey
General Manager

cc: Patrick Sweetland
Robert Ovadia

APPENDIX C

Air Quality

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Summary

Summary of Criteria Pollutants Emissions (CEQA)

Average Daily Construction-related Emissions (lbs/day)

	ROG	CO	NOX	SOX	PM2.5	PM10
Off-road	2.8	15.6	23.1	0.0	1.5	1.5
On-road	1.1	8.0	21.5	N/A	0.4	0.5
Combined	**3.9**	**23.6**	**44.6**	**0.0**	**1.9**	**1.9**

Annual Construction Related Emissions (MT/year)

	Year 2016	Year 2017	Year 2018	All Years
	CO2e	CO2e	CO2e	CO2e
Off-road	175.1	436.0	119.5	730.6
On-road	845.3	550.1	97.9	1,493.2
Combined	**1,020.4**	**986.1**	**217.3**	**2,223.8**

Summary of Criteria Pollutants Emissions (NEPA)

Year 2016:

	ROG	CO	NOX	SOX	PM2.5	PM10
Off-road	0.2	1.1	1.8	0.0	0.1	0.1
On-road	0.1	0.9	2.5	N/A	0.0	0.1
Combined	**0.4**	**2.0**	**4.3**	**0.0**	**0.2**	**0.2**

Year 2017:

	ROG	CO	NOX	SOX	PM2.5	PM10
Off-road	0.5	2.8	4.1	0.0	0.3	0.3
On-road	0.2	1.4	3.5	N/A	0.1	0.1
Combined	**0.7**	**4.2**	**7.5**	**0.0**	**0.3**	**0.3**

Year 2018:

	ROG	CO	NOX	SOX	PM2.5	PM10
Off-road	0.1	0.8	1.2	0.0	0.1	0.1
On-road	0.0	0.2	0.6	N/A	0.0	0.0
Combined	**0.2**	**1.0**	**1.8**	**0.0**	**0.1**	**0.1**

Construction Equipment Usage by Project Component

Provided by Project Applicant

Equipment	Construction Usage			
	Project Component	**Number**	**Duration of Use (weeks)**	**Daily Use (hours/day)**
Crane (150 ton)	Tunnel	1	90	24
Excavator (CAT 320E L)	Shaft/Ocean Outlet and Tunnel Portal	1	18	6
Excavator with hammer (750 Hitachi)	Canal and Wetlands	1	18	6
Excavator to clean ditch (CAT 320E L)	Canal and Wetlands	1	18	6
Road Header (Alpine EBZ132) or mini-excavator	Tunnel Drive (each)	1a	28a	16
Loader (CAT 966 or 950)	Tunnel/Ocean Outlet and Tunnel Portal/Canal and Wetlands	1	110	8
Pile Driver	Shaft/Ocean Outlet and Tunnel Portal/Canal and Wetlands	1	18	8
Drill Rig	Ocean Outlet and Tunnel Portal	1	2	6
Compactor (CAT 563)	Canal and Wetlands	1	26	6
Air Compressor	Tunnel	1	90	24
Ventilation Fan (100 HP)	Tunnel	2	90	24

Note: Equipment use hours split up evenly between project components, when applicable.

Off-road Equipment Inventory

Project Equipment Use Summary - 2016

Equipment	total hours	Total workdays
Excavator with hammer (750 Hitachi)	540	90
Excavator to clean ditch (CAT 320E L)	540	90
Crane (150 ton)	2,623	109
Loader (CAT 966 or 950)	874	109
Air Compressor	2,623	109
Ventilation Fan (100 HP)	2,623	109
Excavator (CAT 320E L)	540	90
Drill Rig	40	10
Pile Driver	360	90
See tables below for details		

Project Equipment Use Summary - 2017

Equipment	total hours	Total workdays
Compactor (CAT 563)	780	130
Crane (150 ton)	6,257	261
Road Header (Alpine EBZ132) or mini-excavator	4,480	140
Loader (CAT 966 or 950)	2,086	261
Pile Driver	360	90
Drill Rig	40	10
Air Compressor	6,257	261
Ventilation Fan (100 HP)	6,257	261
See tables below for details		

Project Equipment Use Summary - 2018

Equipment	total hours	Total workdays
Crane (150 ton)	2,057	86
Loader (CAT 966 or 950)	686	86
Air Compressor	2,057	86
Ventilation Fan (100 HP)	2,057	86
See tables below for details		

Vista Grande Canal

Equipment	No.	hours/day	days/location	total hours	Total days	Year*	
Excavator with hammer (750 Hitachi)	1	6	90	540	90	2016	Assuming occurs in first phases of construction activity, in 2016
Excavator to clean ditch (CAT 320E L)	1	6	90	540	90	2016	Assuming occurs in first phases of construction activity, in 2016
Compactor (CAT 563)	1	6.0	130	780	130	2017	Assuming occurs in middle phases of construction activity, in 2017
Pile Driver	1	4.0	90	360	90	2016	Assuming occurs in early phases of construction activity, in 2016

Vista Grande Tunnel

Equipment	No.	hours/day	days/location	total hours	Total days	Year*	
Crane (150 ton)	1	24.0	109	2,623	109	2016	
Crane (150 ton)	1	24.0	261	6,257	261	2017	
Crane (150 ton)	1	24.0	86	2,057	86	2018	
Road Header (Alpine EBZ132) or mini-excavator	2	16	140	4,480	140	2017	Assuming occurs in middle phases of construction activity, in 2017
Loader (CAT 966 or 950)	1	8.0	109	874	109	2016	Loader emissions assigned to Tunnel only, for simplicity
Loader (CAT 966 or 950)	1	8.0	261	2,086	261	2017	Loader emissions assigned to Tunnel only, for simplicity
Loader (CAT 966 or 950)	1	8.0	86	686	86	2018	Loader emissions assigned to Tunnel only, for simplicity
Pile Driver	1	4	90	360	90	2017	Assuming occurs in middle phases of construction activity, in 2017
Drill Rig	1	4	10	40	10	2017	Assuming occurs in middle phases of construction activity, in 2017
Air Compressor	1	24	109	2,623	109	2016	
Air Compressor	1	24	261	6,257	261	2017	
Air Compressor	1	24	86	2,057	86	2018	
Ventilation Fan (100 HP)	1	24	109	2,623	109	2016	
Ventilation Fan (100 HP)	1	24	261	6,257	261	2017	
Ventilation Fan (100 HP)	1	24	86	2,057	86	2018	

Ocean Outlet

Equipment	No.	hours/day	days/location	total hours	Total days	Year*	
Excavator (CAT 320E L)	1	6	90	540	90	2016	Assuming occurs in first phases of construction activity, in 2016
Drill Rig	1	4	10	40	10	2016	Assuming occurs in middle phases of construction activity, in 2016

All equipment designated to each project component, by year, based on project parameters provided by the applicant, unless otherwise noted.

Year 2016

Emission Source	Off-road: Average Daily Construction Emissions (pounds)						
	ROG	CO	NOX	SOX	PM	CO2	
Excavator with hammer (750 Hitachi)	10.57	71.98	115.29	0.14	5.67	14,783.87	
Excavator to clean ditch (CAT 320E L)	10.57	71.98	115.29	0.14	5.67	14,783.87	
Crane (150 ton)	70.78	284.08	801.28	0.54	36.36	56,888.82	
Loader (CAT 966 or 950)	25.37	105.24	245.58	0.21	13.70	22,385.95	
Air Compressor	107.79	539.05	690.43	0.94	57.82	80,028.25	
Ventilation Fan (100 HP)	198.42	1119.92	1449.88	2.11	106.18	179,948.98	
Excavator (CAT 320E L)	10.57	71.98	115.29	0.14	5.67	14,783.87	Tunnel Portal
Drill Rig	0.92	9.55	13.30	0.02	0.39	2,377.52	
Sum (pounds):	**435**	**2,274**	**3,546**	**4**	**231**	**385,981.1**	
Sum (metric tons):						**175.1**	

Year 2017

Emission Source	Off-road: Average Daily Construction Emissions (pounds)					
	ROG	CO	NOX	SOX	PM	CO2
Compactor (CAT 563)	11.53	99.03	135.98	0.18	0.05	18,343.16
Crane (150 ton)	151.95	677.85	1,723.67	1.30	76.84	135,742.37
Road Header (Alpine EBZ132) or mini-excavator	81.83	597.01	867.09	1.17	42.66	122,626.80
Loader (CAT 966 or 950)	55.85	251.10	531.59	0.51	29.62	53,412.37
Pile Driver	12.91	47.47	108.15	0.08	8.47	8,531.36
Drill Rig	0.83	9.55	11.55	0.02	0.03	2,376.63
Air Compressor	238.16	1,281.64	1,550.45	2.24	125.44	190,917.10
Ventilation Fan (100 HP)	434.44	2,660.08	3,262.20	5.04	231.33	429,289.89
Sum (pounds):	**988**	**5,624**	**8,191**	**11**	**514**	**961,240**
Sum (metric tons):						**436.0**

Year 2018

Emission Source	Off-road: Average Daily Construction Emissions (pounds)					
	ROG	CO	NOX	SOX	PM	CO2
Crane (150 ton)	49.96	222.86	566.69	0.43	25.26	44,627.63
Loader (CAT 966 or 950)	16.65	74.29	188.90	0.14	8.42	14,875.88
Air Compressor	84.54	422.78	541.52	0.74	45.35	62,767.26
Ventilation Fan (100 HP)	142.83	874.55	1072.50	1.66	76.06	141,136.40
Sum (pounds):	**294**	**1,594**	**2,370**	**3**	**155**	**263,407**
Sum (metric tons):						**119.5**
Total Sum for all years (pounds)	1,716	9,492	14,107	18	901	1,610,628
Total Sum for all years (MT)						731
Average pounds/day	**2.81**	**15.56**	**23.13**	**0.03**	**1.48**	**2,640.37**

On-road Criteria Pollutant Emissions

Note: All trips are round trips

Construction Vehicle ROUND Trips PER DAY

Provided by the Project Applicant

Trip Type	Tunnel / Staging Area	Project Component: Ocean Outlet and Tunnel Portals	Canal and Wetlands
Concrete Truck*	30	2	5
Haul Truck**	17	3	40
Worker Vehicle	70	5	10
Maximum Total	**117**	**10**	**55**

*Concrete Truck Staging Area trips would occur for 30 days, according to the project applicant, and are assumed to occur in 2017.

**Haul truck staging area trips would occur for 280 days, according to the project applicant, and are assumed to occur in 2017.

All other trips are assumed to occur for the full length of the project component, for each year construction is expected to occur.

Construction Vehicle Round Trips in 2016

Calculated

Trip Type	Tunnel / Staging Area	Project Component: Ocean Outlet and Tunnel Portals	Canal and Wetlands	Totals
Concrete Truck	-	219	1,304	1,522
Haul Truck	-	328	10,429	10,756
Worker Vehicle	7,650	546	2,607	10,804
Totals	**7,650**	**1,093**	**14,339**	

Construction Vehicle Round Trips in 2017

Calculated

Trip Type	Tunnel / Staging Area	Project Component: Ocean Outlet and Tunnel Portals	Canal and Wetlands	Totals
Concrete Truck	900	44	1,304	2,248
Haul Truck	4,760	66	10,429	15,255
Worker Vehicle	18,250	111	2,607	20,968
Totals	**23,910**	**221**	**14,339**	

Construction Vehicle Round Trips in 2018

Calculated

Trip Type	Tunnel / Staging Area	Project Component: Ocean Outlet and Tunnel Portals	Canal and Wetlands	Totals
Concrete Truck	-	-	350	350
Haul Truck	-	-	2,800	2,800
Worker Vehicle	6,000	-	700	6,700
Totals	**6,000**	**-**	**3,850**	

Total Workdays per year: 261

Emission Factors

Vehicle Type	Units	Running Exhaust Emission Factors: ROG	NOx	PM10	PM2.5	CO	CO2
Light duty truck (LDT2 gas)*	g/mile	0.04	0.20	0.00	0.00	1.63	411.65
Light duty truck (LDT2 gas)	lb/mile	0.00	0.00	0.00	0.00	0.00	0.91
Light duty truck (LDT2 diesel)*	g/mile	0.04	0.59	0.03	0.03	0.23	293.27
Light duty truck (LDT2 diesel)	lb/mile	0.00	0.00	0.00	0.00	0.00	0.65
Heavy duty truck (T7 diesel)*	g/mile	0.25	4.80	0.10	0.09	1.21	1657.64
Heavy duty truck (T7 diesel)	lb/mile	0.00	0.01	0.00	0.00	0.00	3.65

* Emission factor obtained online from EMFAC 2011 for 2016, San Mateo County, average model years, and average speed

2016 Total Worker and Material Delivery/Haul-off Trips Criteria Pollutant Emissions

Vehicle Type	Trips/year	miles/trip	ROG	NOx	PM10	PM2.5	CO
Light duty truck (gas)	5,402	24.8	12.4	60.1	0.6	0.5	480.4
Light duty truck (diesel)	5,402	24.8	12.3	173.4	9.7	8.9	68.3
Heavy duty truck - Haul	10,756	40.0	233.8	4548.6	92.3	84.9	1147.8
Heavy duty truck - Vendor	1,522	14.6	12.1	234.9	4.8	4.4	59.3
Total Annual Emissions (pounds/year)			**271**	**5,017**	**107**	**99**	**1,756**
Average 2016 Daily Emissions (lbs/day)			**1.04**	**19.24**	**0.41**	**0.38**	**6.73**

2017 Total Worker and Material Delivery/Haul-off Trips Criteria Pollutant Emissic

Vehicle Type	Trips/year	miles/trip	ROG	NOx	PM10	PM2.5	CO
Light duty truck (gas)	10,484	24.8	24.2	116.6	1.1	1.0	932.3
Light duty truck (diesel)	10,484	24.8	23.9	336.6	18.8	17.3	132.6
Heavy duty truck - Haul	15,255	40.0	331.6	6451.0	130.9	120.4	1627.9
Heavy duty truck - Vendor	2,248	14.6	17.8	347.0	7.0	6.5	87.6
Total Annual Emissions (pounds/year)			**380**	**6,904**	**151**	**139**	**2,780**
Average 2017 Daily Emissions (lbs/day)			**1.46**	**26.48**	**0.58**	**0.53**	**10.66**

2018 Total Worker and Material Delivery/Haul-off Trips Criteria Pollutant Emissic

Vehicle Type	Trips/year	miles/trip	ROG	NOx	PM10	PM2.5	CO
Light duty truck (gas)	175	24.8	0.4	1.9	0.0	0.0	15.6
Light duty truck (diesel)	175	24.8	0.4	1.9	0.0	0.0	15.6
Heavy duty truck - Haul	2,800	40.0	10.4	1184.1	24.0	22.1	298.8
Heavy duty truck - Vendor	350	14.6	0.5	54.0	1.1	1.0	13.6
Total Annual Emissions (pounds/year)			**11**	**1,188**	**24**	**22**	**344**
Average 2018 Daily Emissions (lbs/day)			**0.04**	**4.56**	**0.09**	**0.08**	**1.32**

Total Construction Period - Total Worker and Material Delivery/Haul-off Trips Criteria Pollutant Emissi

	ROG	NOx	PM10	PM2.5	CO
Average Daily Emissions (lbs/day)	**1.08**	**21.49**	**0.46**	**0.43**	**8.00**

All trips per day are round-trips. The light-duty truck trips represent employee commute trips. Trips lengths based on CalEEMod v2103.2.2 defaults for San Mateo County.
It is assumed that half of total trips would be associated with light-duty diesel vehicles and half would be associated with light-duty gasoline vehicles.

On-road GHG Emissions

CH4 and N2O Emission Factors

Vehicle Type	Running Exhaust Emission Factors (pounds/mile)	
	CH4***	N2O***
Light duty truck (gas)	0.0001	0.0001
Light duty truck (diesel)	0.0001	0.0001
Heavy duty truck	0.0000	0.0000
Total	0.0003	0.0002

** Emission factor obtained online from EMFAC 2011, for San Mateo County, average model years, and average speed

*** California Climate Action Registry, General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1, January 2009. Tables C.3 and C.6.

2016 Worker and Material Delivery/Off-haul Trips GHG Emissions

Vehicle Type	Trips/year	miles/trip	CO2	CH4	N2O	CO2e
Light duty truck (gas)	5,402	24	53.37	0.01	0.00	54.93
Light duty truck (diesel)	5,402	24	38.02	0.01	0.00	39.58
Heavy duty truck - Haul	10,756	40	713.22	0.00	0.00	713.92
Heavy duty truck - Vendor	1,522	14.6	36.84	0.00	0.00	36.87
Total (metric tons)	**NA**	**NA**	**841.45**	**0.02**	**0.01**	**845.31**

2017 Worker and Material Delivery/Off-haul Trips GHG Emissions

Vehicle Type	Trips/year	miles/trip	CO2	CH4	N2O	CO2e
Light duty truck (gas)	173	24	1.7	0.5	0.3	112.5
Light duty truck (diesel)	173	24	1.2	0.0	0.0	1.3
Heavy duty truck - Haul	6,451	40	427.7	0.0	0.0	428.2
Heavy duty truck - Vendor	337	14.6	8.1	0.0	0.0	8.2
Total (metric tons)	**NA**	**NA**	**438.82**	**0.52**	**0.34**	**550.05**

2018 Worker and Material Delivery/Off-haul Trips GHG Emissions

Vehicle Type	Trips/year	miles/trip	CO2	CH4	N2O	CO2e
Light duty truck (gas)	27	24	0.3	0.1	0.1	17.5
Light duty truck (diesel)	27	24	0.2	0.0	0.0	0.2
Heavy duty truck - Haul	1,188	40	78.8	0.0	0.0	78.8
Heavy duty truck - Vendor	54	14.6	1.3	0.0	0.0	1.3
Total (metric tons)	**NA**	**NA**	**80.53**	**0.08**	**0.05**	**97.86**

Total Construction Period - Total Worker and Material Delivery/Haul-off Trips Criteria Pollutant Emissions

	CO2	CH4	N2O	CO2e
Total (metric tons)	**1,360.80**	**0.62**	**0.40**	**1,493.22**
Average Daily Emissions (lbs/day)	**4,918**	**0.00**	**0.00**	**4,918**

All trips per day are round-trips. The light-duty truck trips represent employee commute trips. Trips lengths based on CalEEMod v2103.2.2 vehicles.

Notes: 0.907194 metric tons = 1 ton; 2000 pounds = 1 ton.
Global Warming Potential for CH4 = 23; GWP for N2O = 296.

Gasoline emission factors for GHG

0.0563	g CH4/mile	(CCAR, 2009)
0.03639	g NO2/mile	(CCAR, 2009)

Diesel emission factors for GHG (CCAR, 2009)

0.0048	g CH4/mile	(CCAR, 2009)
0.0051	g NO2/mile	(CCAR, 2009)

Reference:

California Climate Action Registry, General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1, January 2009. Tables C.3 and C.6.

Off-road Output

Emission factors below are provided by the Road Construction Emissions Model, which is based off of OffRoad 2011 Model factors.

Year 2016

			ROG	CO	NOX	SOX	PM	CO2	Load Factors	ROG	CO	NOX	SOX	PM	CO2
Equipment Type	**Horsepower**	**Max HP**	**g/hp/hr**							**g/hr**					
Crane	226.2	250	0.188	0.754	2.126	0.001	0.096	150.967	0.288	**12.2**	**49.1**	**138.6**	**0.1**	**6.3**	**9,838**
Excavator	162.7	175	0.143	0.973	1.559	0.002	0.077	199.859	0.382	**8.9**	**60.5**	**96.8**	**0.1**	**4.8**	**12,418**
Rubber Tired Loader	170	175	0.214	0.888	2.072	0.002	0.116	188.830	0.362	**13.2**	**54.6**	**127.4**	**0.1**	**7.1**	**11,614**
Trencher	80.8	120	0.414	1.473	3.468	0.003	0.272	264.741	0.503	**16.8**	**59.8**	**140.8**	**0.1**	**11.0**	**10,749**
Bore/Drill Rigs	205.8	250	0.101	1.047	1.458	0.002	0.043	260.705	0.503	**10.5**	**108.3**	**150.8**	**0.3**	**4.4**	**26,961**
Roller	145	175	0.133	1.059	1.590	0.002	0.074	196.123	0.375	**7.2**	**57.6**	**86.5**	**0.1**	**4.0**	**10,670**
Air Compressor	105.7	120	0.367	1.837	2.353	0.003	0.197	272.784	0.480	**18.6**	**93.2**	**119.4**	**0.2**	**10.0**	**13,840**
Ventilation Fan	100	120	0.464	2.617	3.388	0.005	0.248	420.542	0.740	**34.3**	**193.7**	**250.7**	**0.4**	**18.4**	**31,120**

Year 2017

			ROG	CO	NOX	SOX	PM	CO2	Load Factors	ROG	CO	NOX	SOX	PM	CO2
Equipment Type	**Horsepower**	**Max HP**	**g/hp/hr**							**g/hr**					
Crane	226.2	250	0.169	0.754	1.917	0.001	0.085	150.998	0.288	**11.0**	**49.1**	**125.0**	**0.1**	**5.6**	**9,840**
Excavator	162.7	175	0.133	0.973	1.413	0.002	0.070	199.819	0.382	**8.3**	**60.4**	**87.8**	**0.1**	**4.3**	**12,416**
Rubber Tired Loader	170	175	0.197	0.888	1.880	0.002	0.105	188.858	0.362	**12.1**	**54.6**	**115.6**	**0.1**	**6.4**	**11,616**
Trencher	80.8	120	0.401	1.473	3.356	0.003	0.263	264.749	0.503	**16.3**	**59.8**	**136.3**	**0.1**	**10.7**	**10,749**
Bore/Drill Rigs	205.8	250	0.091	1.047	1.267	0.002	0.036	260.607	0.503	**9.4**	**108.3**	**131.0**	**0.3**	**3.8**	**26,951**
Roller	145	175	0.123	1.059	1.453	0.002	0.068	196.072	0.375	**6.7**	**57.6**	**79.1**	**0.1**	**3.7**	**10,667**
Air Compressor	105.7	120	0.340	1.831	2.215	0.003	0.179	272.784	0.480	**17.3**	**92.9**	**112.4**	**0.2**	**9.1**	**13,840**
Ventilation Fan	100	120	0.426	2.606	3.196	0.005	0.227	420.542	0.740	**31.5**	**192.8**	**236.5**	**0.4**	**16.8**	**31,120**

Year 2018

			ROG	CO	NOX	SOX	PM	CO2	Load Factors	ROG	CO	NOX	SOX	PM	CO2
Equipment Type	**Horsepower**	**Max HP**	**g/hp/hr**							**g/hr**					
Crane	226.2	250	0.146	0.754	1.663	0.001	0.072	150.973	0.288	**9.5**	**49.1**	**108.4**	**0.1**	**4.7**	**9,839**
Excavator	162.7	175	0.109	0.973	1.117	0.002	0.054	199.828	0.382	**6.8**	**60.4**	**69.4**	**0.1**	**3.4**	**12,416**
Rubber Tired Loader	170	175	0.170	0.888	1.580	0.002	0.088	188.862	0.362	**10.4**	**54.6**	**97.2**	**0.1**	**5.4**	**11,616**
Trencher	80.8	120	0.346	1.472	2.972	0.003	0.226	264.562	0.503	**14.1**	**59.8**	**120.7**	**0.1**	**9.2**	**10,742**
Bore/Drill Rigs	205.8	250	0.081	1.043	1.082	0.002	0.031	259.656	0.503	**8.4**	**107.9**	**111.9**	**0.3**	**3.2**	**26,852**
Roller	145	175	0.104	1.059	1.194	0.002	0.055	196.125	0.375	**5.7**	**57.6**	**64.9**	**0.1**	**3.0**	**10,670**
Air Compressor	105.7	120	0.312	1.825	2.073	0.003	0.160	272.784	0.480	**15.9**	**92.6**	**105.2**	**0.2**	**8.1**	**13,840**
Ventilation Fan	100	120	0.387	2.595	2.999	0.005	0.204	420.542	0.740	**28.6**	**192.0**	**222.0**	**0.4**	**15.1**	**31,120**

0.002205	pounds per gram
2000	pounds per ton
2204.62	pounds per metric ton
610	Approx # of Days of Construction Activity:

Road Dust Calculations

Source: AP-42 Handbook, Chapter 13.2.1, page 5

Equation:

E equals $[k\ (sL)^{0.91} \times (W)^{1.02}]*(1-P/4N)$

where:

k	=	particle size multiplier for particle size range and units of interest. k = particle size multiplier. The AP-42 value for PM10 is 1.00 g/mile and that for PM2.5 is 0.25 g/mile.
sL	=	road surface silt loading (grams per square meter)
W	=	average weight (tons) of *all the vehicles* traveling the road (2.4 tons)
P	=	number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N	=	number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly)

For the Existing Scenario (San Francisco Bay Area):

For PM_{10}			**For $PM_{2.5}$**		
k	=	1	k	=	0.25
sL	=	0.1	sL	=	0.1
W	=	2.4	W	=	2.4
P	=	64	P	=	64
N	=	365	N	=	365
Therefore:			Therefore:		
E	=	**0.287308**	E	=	**0.071827**

2016 Road Dust

Miles Travelled = 711766.1

PM10 Emissions =	204496.3	gm/yr	=	0.225418	ton/yr
PM2.5 Emissions =	51124.06	gm/yr	=	0.056355	ton/yr

Fugitive Dust Calculations

1.Truck Loading

Processes such as truck dumping on the pile or loading out from the pile to a truck with a front-end loader also cause fugitive dust emissions.
Calculated emissions use the methodology described in Section 13.2, Introduction to Fugitive Dust Sources, of USEPA AP-42.
The emission factor that is based on the material moisture content and mean wind speed is calculated using the following formula:

A. Emission factors

EF = k x (0.0032) x ((u/5)^1.3/(M/2)^1.4)

Where:
EF = Emission factor (lb/ton)
k = particle size multiplier (AP-42)
U = mean wind speed (mph)
M = material moisture content (%)

k =	0.35	pm10
	0.053	pm2.5
U =	10.3	mph (SFO)
M =	12	% (cover)
EF_{pm10} =	2.33E-04	lb/ton
$EF_{pm2.5}$ =	3.53E-05	lb/ton

B. Emissions

Emissions = EF x throughput (tons)

i. 2016

Truck trips =	10,756	daily round trips (loads)
Assume 18 cy/truck =	193615.7	cy/year

Annual thoughput =	193615.7	cy/year			
Loam density =	1.264	tons/cy (CalEEmod)			
Annual throughput =	244730.3	tons			
PM10 emissions =	57.08	lb/yr	=	0.028542	ton/yr
PM2.5 emission =	8.64	lb/yr	=	0.004322	ton/yr

ii. 2017

Truck trips =	15,255	daily round trips (loads)
Assume 18 cy/truck =	274590	cy/year

Annual thoughput =	274590	cy/year			
Loam density =	1.264	tons/cy (CalEEmod)			
Annual throughput =	347081.8	tons			
PM10 emissions =	80.96	lb/yr	=	0.04048	ton/yr
PM2.5 emission =	12.26	lb/yr	=	0.00613	ton/yr

iii. 2018

Truck trips =	2,800	daily round trips (loads)
Assume 18 cy/truck =	50400	cy/year

Annual thoughput =	50400	cy/year			
Loam density =	1.264	tons/cy (CalEEmod)			
Annual throughput =	63705.6	tons			
PM10 emissions =	14.86	lb/yr	=	0.00743	ton/yr
PM2.5 emission =	2.25	lb/yr	=	0.001125	ton/yr

APPENDIX D
Biological Resources

This appendix includes:

- Special-status Species occurrence tables
- Vegetation change analysis methodology associated with Lake Merced water level changes

Special-status Species Occurrence Tables

TABLE 1
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
PLANT SPECIES LISTED OR PROPOSED FOR LISTING					
Franciscan manzanita *Arctostaphylos franciscana*	FE	--	1B.1	Open, rocky, serpentine outcrops in chaparral. February – April	**Low.** No suitable habitat present. This species was believed to be extinct in the wild (although still extant through cultivation), but was rediscovered in Presidio National Park in late 2009.
San Bruno Mountain manzanita *Arctostaphylos imbricada*	--	CE	1B.1	Chaparral and coastal scrub, usually on sandstone outcrops. February – May	**Low.** Regional occurrences are restricted to San Bruno Mountain and the Santa Cruz Mountains. .
Presidio manzanita *Arctostaphylos montana* ssp. *ravenii*	FE	CE	1B.1	Open, rocky, serpentine slopes in chaparral, coastal scrub, and coastal prairie. February – March	**Low.** No suitable habitat present.
Pacific manzanita *Arctostaphylos pacifica*	--	CE	1B.2	Coastal scrub and chaparral. February – April	**Low.** Regional occurrences are restricted to San Bruno Mountain
Marsh sandwort *Arenaria paludicola*	FE	CE	1B.1	Freshwater or brackish marshes and swamps. May – August	**Low.** Potentially suitable habitat present at Lake Merced, but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; SFPD, 2011); species presumed extirpated in San Francisco.
Robust spineflower *Chorizanthe robusta* var. *robusta*	FE	--	1B.1	Sandy or gravelly coastal dunes, coastal scrub, cismontane woodland and maritime chaparral. April – September	**Low.** Potentially suitable habitat present at Lake Merced but species not observed there (SFPD, 2011; May and Associates, 2009; Nomad Ecology, 2011); species presumed extirpated in San Francisco. Potentially suitable habitat present at Avalon Canyon access road site though only regional occurrences are historical.
Presidio clarkia *Clarkia franciscana*	FE	CE	1B.1	Serpentine outcrops in coastal scrub, and valley and foothill grassland. May – July	**Low.** No suitable habitat present.
Marin western flax *Hesperolinon congestum*	FT	CT	1B.1	Chaparral and grassland, usually on serpentine barrens. April – July	**Low.** No suitable habitat present.
Beach layia *Layia carnosa*	FE	CE	1B.1	Sand dunes. March – July	**Low**. Potentially suitable habitat present at Fort Funston. Recorded generally from sand dunes in San Francisco in 1904; may be present in the seed bank.

TABLE 1 (Continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
PLANT SPECIES LISTED OR PROPOSED FOR LISTING (cont.)					
San Francisco lessingia *Lessingia germanorum*	FE	CE	1B.1	Coastal scrub, sandy soils free of competing species. July – November	**Low.** Historically known to Lake Merced but not recently observed; may be present in the seed bank. Documented at Fort Funston in 2002 (GGNRA, 2013); Fort Funston is identified as an important recovery site for this species (USFWS, 2003). Potentially suitable habitat is present in the lower portion of Avalon Canyon access road.
White rayed pentachaeta *Pentachaeta bellidiflora*	FE	CE	1B.1	Open, dry, rocky slopes and grassy areas, usually on serpentine. March – May	**Low.** No suitable habitat present.
San Francisco popcornflower *Plagiobothrys diffusus*	--	CE	1B.1	Coastal prairie, and valley and foothill grasslands. March – June	**Low.** No suitable habitat present.
Adobe sanicle *Sanicula maritima*	--	Rare	1B.1	Moist clay or ultramafic soil in chaparral, coastal prairie, meadows, seeps, and valley and foothill grassland. February – May	**Low.** No suitable habitat present.
Showy Indian clover *Trifolium amoenum*	FE	--	1B.1	Valley grassland and wetland and riparian areas. Affinity to serpentine soils. April – June	**Low.** No suitable habitat present.
CNPS CALIFORNIA RARE PLANT RANKED SPECIES					
Franciscan onion *Allium peninsulare* var. *franciscanum*	--	--	1B.2	Clay, volcanic, or serpentine substrate in valley and foothill grassland and cismontane woodland. May - June	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site.
Bent-flowered fiddleneck *Amsinckia lunaris*	--	--	1B.2	Coastal bluff scrub, cismontane woodland, and valley and foothill grassland. March – June	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site.
coast rockress *Arabis blepharophylla*	--	--	4.3	Rocky soils in broadleaf upland forest, coastal bluff scrub, coastal prairie, and coastal scrub. February - May	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site.
Montara manzanita *Arctostaphylos montaraensis*	--	--	1B.2	Slopes and ridges in chaparral and coastal scrub. January – March	**Low.** Regional occurrences are restricted to San Bruno Mountain and mountains west of San Mateo.
Carlotta Hall's lace fern *Aspidotis carlotta-halliae*	--	--	4.2	Crevices, outcrops and slopes in chaparral and cismontane woodland, generally in serpentine soils. January - December	**Low.** No suitable habitat present.

TABLE 1 (Continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
CNPS CALIFORNIA RARE PLANT RANKED SPECIES (cont.)					
Nuttall's milkvetch *Astragalus nuttallii* var. *nuttallii*	--	--	4.2	Coastal bluff scrub and coastal dunes, January - November	**Low.** Documented at Fort Funston (GGNRA, 2013) though not previously found in areas considered for use under the proposed project. Potentially suitable habitat present at Avalon Canyon access road site. Potentially suitable habitat present at Lake Merced.
Alkali milk-vetch *Astragualus tener* var. *tener*	--	--	1B.2	Alkali flats, flooded grassland, playas and vernal pools. March – June	**Low.** No suitable habitat present; species presumed extirpated in San Francisco.
Bristly sedge *Carex comosa*	--	--	2B.1	Lake margins, marshes, swamps, coastal prairie, and valley and foothill grasslands. May – September	**Low.** Potentially suitable habitat present at Lake Merced but species not observed there (SFPD, 2011; May and Associates, 2009; Nomad, 2011)
Johnny-nip *Castilleja ambigua* var. *ambigua*	--	--	4.2	Wet sites in coastal bluff scrub, coastal prairie, marshes and swamps, valley and foothill grassland, and at the margins of vernal pools. March - August	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site. Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad, 2011; SFPD, 2011).
Pappose tarplant *Centromadia parryi* ssp. *parryi*	--	--	1B.2	Chaparral, coastal prairie, meadows, seeps, coastal salt marshes and swamps, and vernally mesic, often alkaline, valley and foothill grasslands. May – November	**Low.** No suitable habitat present.
Point Reyes bird's-beak *Chloropyron maritimum* ssp. *palustre*	--	--	1B.2	Coastal salt marshes and swamps. June – October	**Low.** No suitable habitat present.
San Francisco spineflower *Chorizanthe cuspidata* var. *cuspidata*	--	--	1B.2	Sandy terraces and slopes of coastal bluff scrub, coastal dunes, coastal prairie and coastal scrub. April – July	**Moderate.** Robust populations documented at Fort Funston near the proposed staging areas during ESA's June 2015 reconnaissance survey. Two populations documented in 1992 and 2011 within half a mile of the project site along the west side of John Muir Drive west of Impound Lake (CNDDB, 2015 and Nomad, 2011). Documented on the north shore of South Lake Merced (May and Associates, 2009). Potentially suitable habitat present at Avalon Canyon access road site.
Franciscan thistle *Cirsium andrewsii*	--	--	1B.2	Coastal bluff scrub, coastal prairie, coastal mesic scrub, and broadleaf upland forest; sometimes on serpentine soils; often associated with seeps. March – July	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site. Potentially suitable habitat present at Lake Merced but species not observed there (SFPD, 2011; May and Associates, 2009; Nomad, 2011)

TABLE 1 (Continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
CNPS CALIFORNIA RARE PLANT RANKED SPECIES (cont.)					
Compact cobwebby thistle *Cirsium occidentale* var. *compactum*	--	--	1B.2	Coastal scrub, grassland, and dunes; often associated with seeps. April – June	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site. Formerly known from Lake Merced in the same gully as San Francisco gumplant, but not recently observed; may be present in the seedbank. Potentially suitable habitat present at Fort Funston.
Round-headed Chinese-houses *Collinsia corymbosa*	--	--	1B.2	Coastal dunes and coastal prairie. April – June	**Low.** No suitable habitat present; species has not been seen in San Francisco for more than 100 years. Potentially suitable habitat present at Fort Funston.
San Francisco collinsia *Collinsia multicolor*	--	--	1B.2	On humus-covered soil derived from mudstone in closed-cone coniferous forest and coastal scrub. March – May	**Low.** Potentially suitable habitat present in coastal scrub at Lake Merced but species not documented to occur there (May and Associates, 2009; Nomad, 2011).
slender cottongrass *Eriophorum gracile*	--	--	4.3	Acidic soils in bogs, and fens, meadows and seeps, and upper montane coniferous forest. May - September	**Low.** No suitable habitat present.
San Francisco wallflower *Erysimum franciscanum*	--	--	4.2, LS	Coastal scrub and grassland, often on serpentine soils. March – June	**Moderate.** Documented at Fort Funston within areas to the south of the staging area during ESA's June 2015 reconnaissance survey. Occurs on northeastern slope of Impound Lake and suitable habitat is present at the project site (Nomad, 2011). Potentially suitable habitat present at Avalon Canyon access road site.
Fragrant fritillary *Fritillaria liliacea*	--	--	1B.2	On clay, often serpentine derived soils in coastal scrub, grassland, and coastal prairie. February – April	**Low.** No suitable habitat present.
Blue coast gilia *Gilia capitata* spp. *chamissonis*	--	--	1B.1	Coastal dunes and scrub. April – July	**Moderate.** Historically present in suitable habitat around Lake Merced. Present on the northeastern shore of Impound Lake (Nomad, 2011). Potentially suitable habitat present at Avalon Canyon access road site. Present at Fort Funston (GGNRA, 2013) though not previously documented in areas considered for use under the proposed project.
Dark-eyed gilia *Gilia millefoliata*	--	--	1B.2	Coastal dunes. April – July	**Low.** Potentially suitable habitat present at Fort Funston.

TABLE 1 (Continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
CNPS CALIFORNIA RARE PLANT RANKED SPECIES (cont.)					
San Francisco gumplant *Grindelia hirsutula* var. *maritima*	--	--	3.2	Coastal scrub and grasslands. June – September	**Moderate.** Documented at Fort Funston in 2011 (GGNRA, 2013) though not previously found in areas considered for use under the proposed project. Potentially suitable habitat present at Avalon Canyon access road site. Formerly known from Lake Merced but not recently observed and not easily overlooked; may be present in the seedbank.
Diablo helianthella *Helianthella castanea*	--	--	1B.2	On rocky soils in broadleaf upland forest, cismontane woodland, coastal scrub, riparian woodland, and valley and foothill grassland. March – June	**Low.** No suitable habitat present.
White seaside tarplant *Hemizonia congesta* ssp. *congesta*	--	--	1B.2	Grassy valleys and hills, often on fallow fields in coastal scrub. April – November	**Low.** No suitable habitat present.
Short-leaved evax *Hesperevax sparsiflora* var. *brevifolia*	--	--	1B.2	Sandy bluffs and flats in coastal scrub and coastal dunes. March – June	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site and central dune scrub at Fort Funston. Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad, 2011; SFPD, 2011).
Kellogg's horkelia *Horkelia cuneata* ssp. *sericea*	--	--	1B.1	Coastal scrub, dunes, and openings of closed-cone coniferous forests. February – July	**Moderate.** Suitable habitat present; not historically known to Lake Merced (May and Associates, 2009). Potentially suitable habitat present at Avalon Canyon access road site. Potentially suitable habitat present at Fort Funston.
coast iris *Iris longipetala*	--	--	4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps, mesic sites. March - May	**Low.** No suitable habitat present.
Rose leptosiphon *Leptosiphon rosaceus*	--	--	1B.1	Coastal bluff scrub. April – July	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site.
Arcuate bush mallow *Malacothamnus arcuatus*	--	--	1B.2	Gravelly alluvium in chaparral and cismontane woodland. April – September	**Low.** No suitable habitat present.
Marsh microseris *Microseris paludosa*	--	--	1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, and valley and foothill grassland. August – June	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site. Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad, 2011; SFPD, 2011).

TABLE 1 (Continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
CNPS CALIFORNIA RARE PLANT RANKED SPECIES (cont.)					
Northern curly-leaved Monardella *Monardella sinuata* ssp. *nigrescens*	--	--	1B.2	Coastal dunes and scrub, chaparral, lower montane coniferous forest. April - September	**Low.** Suitable habitat present at Fort Funston through species is presumed extirpated from San Francisco.
Choris's popcorn-flower *Plagiobothrys chorisianus* var. *chorisianus*	--	--	1B.2	Mesic sites in chaparral, coastal scrub, and coastal prairie. March – June	**Low.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad, 2011; SFPD, 2011).
Hairless popcornflower *Plagiobothrys glaber*	--	--	1A	Coastal salt marshes and alkaline meadows. March – May	**Low.** No suitable habitat present.
Oregon polemonium *Polemonium carneum*	--	--	2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest. April – September	**Moderate.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad, 2011; SFPD, 2011). Potentially suitable habitat present at Avalon Canyon access road site and in coastal scrub at Fort Funston.
San Francisco campion *Silene verecunda*	--	--	1B.2	Mudstone, shale, or serpentine substrates in coastal scrub, coastal prairie, chaparral and valley and foothill grassland. March – June	**Moderate.** Documented at Fort Funston in 2009 (GGNRA, 2013) though not previously found in areas considered for use under the proposed project. Potentially suitable habitat is found along the Avalon Canyon access road.
Santa Cruz microseris *Stebbinsoseris decipiens*	--	--	1B.2	On sandstone, shale or serpentine derived seaward facing slopes in broadleaf upland forest, closed-cone coniferous forest, chaparral, coastal prairie, and coastal scrub. April – May	**Low.** No suitable habitat present.
Coastal triquetrella *Triquetrella californica*	--	--	1B.2	On soil in coastal bluff and coastal scrub.	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site. Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad, 2011; SFPD, 2011).
San Francisco owl's clover *Triphysaria floribunda*	--	--	1B.2	Grasslands. April – June	**Low.** Though historically known from Lake Merced, this species has not been observed since 1907; may be present in the seed bank.
LOCALLY SIGNIFICANT SPECIES					
California pipevine *Aristolochia californica*	--	--	LS	Chaparral and mixed evergreen forests on streambanks. January – April	**Low.** Occurs on the north side of East Lake (Nomad, 2011).

TABLE 1 (Continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name *Scientific Name*	Federal Status	State Status	CRPR Ranking	Habitat Description / Blooming Period	Potential to Occur in the Study Area
LOCALLY SIGNIFICANT SPECIES (cont.)					
Wight's paintbrush *Castilleja wightii*	--	--	LS	Northern coastal scrub. March – August	**Moderate.** Potentially suitable habitat present at Avalon Canyon access road site. Occurs on the east side of Impound Lake (Nomad, 2011).
Vancouver wild rye *Eleymus x vancouverensis*	--	--	LS	Coastal strand.	**Low.** Occurs on the north side of East Lake (Nomad, 2011).
Wild cucumber *Marah oreganus*	--	--	LS	Mixed evergreen forest. March – June	**Low.** Occurs on the northwest side of the Mesa in California blackberry scrub (SFRPD, 2006).
Dune tansy *Tanacetum bipinnatum*	--	--	LS	Coastal dunes and clearings in dune scrub. July – October	**Moderate.** Occurs on the southwestern shore of South Lake and suitable habitat is present at the project site (Nomad, 2011). Occurs at Fort Funston outside of the Project site (Forrestel, 2015). Potentially suitable habitat is present at Avalon Canyon access road.
Canyon live oak *Quercus chrysolepis*	--	--	LS	Chaparral and valley grasslands. May – June	**Low.** Occurs on the south side of East Lake; not known to South Lake (Nomad, 2011).
Coastal black gooseberry *Ribes divaricatum*	--	--	LS	Moist coastal understories; streamside thickets. March – May	**Low.** Occurs along southeastern slopes of Impound Lake; suitable habitat is present at the project site (Nomad, 2011).
Thimbleberry *Rubus parviflorus*	--	--	LS	Closed cone pine forest and riparian wetlands. March – May	**Low.** Occurs on the south shore of East Lake (Nomad, 2011).

NOTES:

The "Potential for Effect" category is defined as follows:
High = Species is expected to occur and habitat meets species requirements.
Moderate = Habitat is only marginally suitable or is suitable but not within species geographic range.
Low = Habitat does not meet species requirements as currently understood in the scientific community.

STATUS CODES:
Federal:
FE = Listed as "endangered" under the federal Endangered Species Act
FT = Listed as "threatened" under the federal Endangered Species Act
FPD = Proposed delisted
FD = Delisted

State:
CE = Listed as "endangered" under the California Endangered Species Act
CT = Listed as "threatened" under the California Endangered Species Act
CSC = CDFW designated "species of special concern"
CFP = CDFW designated "fully protected"
SC = CDFW designated "candidate threatened"
WL = CDFW designated "watch list"

California Rare Plant Rank (CRPR):
Rank 1A = Plants presumed extirpated in California and either rare or extinct elsewhere.
Rank 1B = Plants rare, threatened, or endangered in California and elsewhere.
Rank 2A = Plants presumed extirpated in California, but more common elsewhere.
Rank 2B = Plants rare, threatened, or endangered in California, but more common elsewhere.
Rank 3 = Plants about which we need more information – a review list
Rank 4 = Plants of limited distribution – a watch list

An extension reflecting the level of threat to each species is appended to each rarity category as follows:
.1 – Seriously endangered in California.
.2 – Fairly endangered in California.
.3 – Not very endangered in California.

LS = Locally Significant Plant Species for San Francisco County as designated by the CNPS Yerba Buena Chapter

SOURCE: CDFW, 2015b; CNDDB, 2015; CNPS, 2015a; CNPS, 2015b; Forrestel, 2015; GGNRA, 2013; May and Associates, 2009; Nomad, 2011; SFPD, 2011; SFRPD, 2006; USFWS, 2003; USFWS, 2015.

TABLE 2
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
SPECIES LISTED OR PROPOSED FOR LISTING				
Invertebrates				
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	--	Coastal scrub on rocky outcrops with broadleaf stonecrop (*Sedum spathulifolium*)	**Low.** No suitable habitat present in the study area. Three known populations at San Bruno Mountain, Montara, and Pacifica.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	--	Serpentine grasslands.	**Low.** No suitable habitat present in the study area.
Mission blue butterfly *Plebejus icarioides missionensis*	FE	--	Grassland with *Lupinus albifrons, L. Formosa*, and *L. varicolor.*	**Low.** No suitable habitat present in the study area.
Callippe silverspot butterfly *Speyeria callippe callippe*	FE	--	Found in native grasslands with *Viola pedunculata* as larval food plant.	**Low.** No suitable habitat present in the study area.
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE	*	Host plants include *Grindelia hirsutula, Abronia latifolia, Mondardella, Cirsium vulgare, Erigeron glaucus* where found on the San Francisco and Marin peninsulas.	**Low.** Host plants present in the study area. Historically widespread on the San Francisco and Marin Peninsulas, though presently known only to few sites in northern Marin County.
Fish				
Steelhead *Oncorhynchus (=Salmo) mykiss*	FT	--	Spawns and rears in coastal streams between the Russian River and Aptos Creek, as well as drainages tributary to San Francisco Bay, where gravelly substrate and shaded riparian habitat occurs.	**Low.** No suitable habitat present in the study area.
Tidewater goby *Eucyclogobius newberryi*	FE	CSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego Co. to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**Absent.** No suitable habitat present in the study area.
Reptiles				
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE	CE, CFP	Densely vegetated ponds near open hillsides with abundant small mammal burrows.	**Absent.** No record of this species occurring at Lake Merced and is considered likely extirpated from San Francisco. No suitable habitat occurs elsewhere in the study area.
Amphibians				
California red-legged frog *Rana draytonii*	FT	CSC	Freshwater ponds and slow streams with emergent vegetation for egg attachment.	**Low.** Historically present where habitat exists in the study area including several recent CNDDB records in Golden Gate Park; however this species is considered extirpated from Lake Merced

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
SPECIES LISTED OR PROPOSED FOR LISTING (cont.)				
				(Jones and Stokes, 2007). No suitable habitat occurs elsewhere in the study area.
Birds				
Marbled murrelet *Brachyramphus marmoratus*	FT	CE	Breeds in coniferous forests near the coast with an affinity to old growth, mature stands. Nests on large horizontal branches high in the trees. Winters at sea.	**No nesting potential.** May occur offshore of the study area in winter months.
Western snowy plover *Charadrius alexandrinus nivosus*	FT	CSC	Sandy beaches, salt pond levels and shores of alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Moderate.** Species may occur on beaches north of the study area from July 1 through May 15 (NPS, 2012). Species may appear in the study area on a transient basis during this timeframe; no records of this species nesting on study area beaches.
American peregrine falcon *Falco peregrines anatum*	FD	CFP	Woodlands, coastal habitats, riparian areas, coastal and inland waters, human made structures that may be used as nest or temporary perch sites.	**Moderate.** Suitable nesting habitat is present on the bluffs above study area beaches; no documented nests in the bluffs within the study area. May hunt shorebirds on the beach.
Bald eagle *Haliaeetus leucocephalus* (nesting and wintering)	FD	CE, CFP	Nests and forages on inland lakes, reservoirs, and rivers	**Low.** Nested at Crystal Springs Reservoir, south of the study area, in recent years. Unlikely to nest at Lake Merced or elsewhere in the study area.
California black rail *Laterallus jamaicensis coturniculus*	--	CT	Salt and brackish marshes; also in freshwater marshes at low elevations.	**Low.** Historically known to Lake Merced but not recently observed.
Short-tailed albatross *Phoebastria (=Diomedea) albatrus*	FE	CSC	A pelagic species that spends most of its time at sea and returns to land only for breeding purposes.	**No nesting potential.** Breeds only at one or two sites off the coast of Japan, occasional visitor to California coast and could appear on a transient basis offshore of the study area.
Ridgway's rail *Rallus obsoletus obsoletus*	FE	CE, CFP	Salt marsh wetlands along the San Francisco Bay.	**Absent.** No suitable habitat present in the study area.
Bank swallow *Riparia riparia* (nesting)	--	CT	Vertical banks and cliffs with sandy soil, near water. Nests in holes dug in cliffs and river banks.	**Present.** Nests in bluffs at Fort Funston and forages over Lake Merced.
California least tern *Sterna antillarum browni*	FE	CE	Open beaches free of vegetation along the California coast.	**Low.** May appear in the project area on a transient basis. Nearest breeding colonies are located at the former Alameda Naval Air Station.

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
SPECIES LISTED OR PROPOSED FOR LISTING (cont.)				
Mammals (cont.)				
Southern sea otter *Enhydra lutris nereis*	FT	FP	Shallow coastal areas with kelp between Half Moon Bay and Morro Bay in California.	**Low.** Study area is outside of current known range.
OTHER SPECIAL-STATUS SPECIES				
Invertebrates				
Monarch butterfly *Danaus plexippus*	--	*	Eucalyptus groves (wintering sites).	**Low.** Several records of this species in Golden Gate Park but no wintering sites have been identified within the study area.
Tomales isopod *Caecuditea tomalensis*	--	--	Still-to slow-moving water in vegetated ponds, preferably spring-fed.	**Absent.** Collected in 1984 from the waters of Lake Merced, but SFSU information indicates this species is no longer present (Holzman, 2005).
Reptiles				
Western pond turtle *Emys marmorata*	--	CSC	Ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation. Requires basking sites and suitable upland habitat for egg-laying. Nest sites most often characterized as having gentle slopes (<15%) with little vegetation or sandy banks.	**Present.** This species is known to East Lake Merced. Basking habitat is present in riprap, matted bulrush, abandoned piers, and wood debris; limited upland breeding habitat has been noted.
Birds				
Cooper's hawk *Accipiter cooperii*	--	§3503.5	Nests in riparian areas and oak woodlands, forages at woodland edges.	**Present.** Foraging is known at Lake Merced, though breeding remains undocumented. Large trees in the study area, including eucalyptus and Monterey cypress, could support nests for this species.
Sharp-shinned hawk *Accipiter striatus*	--	§3503.5	Nests in riparian areas and oak woodlands, forages in open areas	**Present.** Large trees in the study area, including eucalyptus and Monterey cypress, could support nests for this species.
Clark's grebe *Aechmophorus clarkii*	--	§3503	Marine subtidal and estuarine waters; large lakes near coast and inland at low elevations.	**Present.** Breeds at Lake Merced.
Tricolored blackbird *Agelaius tricolor* (nesting colony)	--	CSC	Nests in dense colonies within sloughs, swamps, and marshes where tall aquatic vegetation is present. Nests can extend into upland scrub habitat on colony fringes. Nests are constructed of leaves and stems woven tightly into a cup, suspended between two upright vegetative stems.	**Present. I**ndividuals appear in flocks of red-winged blackbirds during annual fall dispersal. Nesting colony is not present at Lake Merced.
Gadwall *Anas strepera*	--	§3503	Interior valleys, wetlands, ponds and streams.	**Present.** Historically bred within San Francisco; now a winter resident at Lake Merced.

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
OTHER SPECIAL-STATUS SPECIES (cont.)				
Birds (cont.)				
Great blue heron *Ardea herodias*	--	§3503	Shallow estuaries and fresh and saline emergent wetlands.	**Present.** Breeds at Lake Merced.
Short-eared owl *Asio flammeus*	BCC	CSC	Open, flat, treeless terrain. Marshes, grasslands, or fields.	**Low.** Marginal habitat is present at Fort Funston in coastal scrub areas.
Western burrowing owl *Athene cunicularia*	BCC	CSC	Open grasslands and shrublands where perches and existing rodent burrows are available.	**Low.** No suitable habitat present in the study area.
Oak titmouse *Baeolophus inornatus*	BCC	§3503	Open, dry oak woodlands.	**Low.** Marginal habitat occurs in the study area though could be present around Lake Merced.
Great horned owl *Bubo virginianus*	--	§3503.5	Riparian, coniferous, chaparral and desert habitats.	**Present.** Large trees in the study area, including eucalyptus and Monterey cypress, could support nests for this species.
Red-tailed hawk *Buteo jamaicensis*	--	§3503.5	Found in nearly all habitats and elevations.	**Present.** Large trees in the study area, including eucalyptus and Monterey cypress, could support nests for this species.
Red-shouldered hawk *Buteo lineatus*	--	§3503.5	Riparian woodlands with swamps and emergent wetlands.	**Present.** Large trees in the study area, including eucalyptus and Monterey cypress, could support nests for this species.
Green heron *Butorides striatus*	--	§3503	Valley foothill and desert riparian habitats; freshwater emergent wetlands, lacustrine and riverine areas.	**Present.** Occurs at Lake Merced.
Red knot *Calidris canutus* ssp. *roselaari*	BCC	§3503	Shoreline mudflats and beaches.	**No nesting potential.** Uncommon winter migrant that could occur on beaches and mudflats of the study area.
California quail *Callipepla californica*	--	§3503	Shrub, scrub, brush, grasslands, open coniferous and deciduous habitats.	**Low.** Reintroduced to Harding Park in 2009. May occur within the study area.
Wilson's warbler *Cardellina pusilla*	--	§3503	Foothill riparian areas, thickets.	**Present.** Breeds in riparian areas surrounding Lake Merced.
Marsh wren *Cistothorus palustris*	--	§3503	Creates a domed nest of grasses and sedges suspended in dense tulle vegetation. Forages in shrubs near marshes.	**Present.** Breeds at Lake Merced.
Olive-sided flycatcher *Contopus cooperi*	BCC	CSC	Forest and woodland habitats.	**Present.** Breeds at Lake Merced.
American kestrel *Falco sparverius*	--	§3503.5	Frequents generally open grasslands, pastures, and fields; primarily a cavity nester.	**Present.** Large trees in the study area, including eucalyptus and Monterey cypress, and excavations in telephone poles could support nests for this species.

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
OTHER SPECIAL-STATUS SPECIES (cont.)				
Birds (cont.)				
San Francisco common yellowthroat *Geothlypis trichas sinuous*	BCC	CSC	Forages in various marsh, riparian and upland habitats. Nests on or near the ground in concealed locations.	**Present.** This species is known to breed in the freshwater bulrush marshes at Lake Merced.
Purple finch *Haemorhous purpureus*	--	§3503	Coastal foothills and lowlands; riparian and coniferous habitats.	**Present.** Breeds at Lake Merced.
Hooded oriole *Icterus cucullatus*	--	§3503	Lower elevation riparian areas, palm oases, urban and cropland areas.	**Present.** Breeds at Lake Merced.
short-billed dowitcher *Limnodromus griseus*	BCC	§3503	Saltwater tidal flats, beaches, and salt marshes during migration.	**No nesting potential.** Common winter migrant that could occur on beaches and mudflats of the study area.
Marbled godwit *Limosa fedoa*	BCC	§3503	Shoreline mudflats and beaches.	**No nesting potential.** Common winter migrant that could occur on beaches and mudflats of the study area.
Alameda song sparrow *Melospiza melodia pusillula*	--	CSC	Salt marshes of eastern and south San Francisco Bay.	**Low.** No suitable habitat present in the study area. Study area is outside of current known range.
San Pablo song sparrow *Melospiza melodia samuelis*	--	CSC	Salt marshes of eastern and north San Francisco Bay.	**Low.** No suitable habitat present in the study area. Study area is outside of current known range.
Long-billed curlew *Numenius americanus*	BCC	WL, §3503	Breeds in upland shortgrass prairies and wet meadows in northeastern California in gravelly soils.	**No nesting potential.** Uncommon winter visitor to sandy beaches and mudflats of the study area.
Whimbrel *Numenius phaeopus*	BCC	§3503	Saltwater tidal flats, beaches, and salt marshes during migration.	**No nesting potential.** Common winter migrant that could occur on beaches and mudflats of the study area.
Black-crowned night heron *Nycticorax nycticorax*	--	§3503	Lowland and foothill areas. Nests in dense emergent wetlands and dense-foliaged trees.	**Moderate.** Locally uncommon; may breed at Lake Merced.
Orange-crowned warbler *Oreothlypis celata*	--	§3503	Chaparral, coastal scrub, foothill riparian.	**Present.** Occurs at Lake Merced; suspected to breed here also.
Osprey *Pandion haliaetus*	--	WL, §3503.5	Habitat varies greatly and usually includes adequate supply of accessible fish, shallow waters, open and elevated nest sites (10-60 feet in height), and artificial structures such as towers. Builds large platform stick nests near or in open waters such as lakes, estuaries, bays, reservoirs, and within the surf zone.	**Present.** Occurs at Lake Merced.

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
OTHER SPECIAL-STATUS SPECIES (cont.)				
Birds (cont.)				
Cliff swallow *Petrochelidon pyrrhonota*	--	§3503	Traditionally build nests on vertical cliff faces however have adapted to man-made structures in urban environments including buildings, bridges, culverts, and overpasses where swallows build their mud nests on vertical walls in groups or colonies.	**Present.** Colonies have been known to nest under bridge between South Lake and Impound Lake within the study area
Double-crested cormorant *Phalacrocorax auritus*	--	WL, §3503	Rookery breeder in coastal areas and inland lakes in fresh, saline, and estuarine waters.	**Present.** Large nesting colonies are present at Lake Merced. Known to nest on the west side of South Lake near the San Francisco Police Department Firing Range which is located northwest of the Project alignment.
Nuttall's woodpecker *Picoides nuttallii*	BCC	§3503	Oak and riparian woodlands.	**Present.** Frequently observed around Lake Merced.
Sora *Porzana carolina*	--	§3503	Fresh and saline emergent wetlands.	**Present.** Occurs at Lake Merced.
Pied-billed grebe *Podilymbus podiceps*	--	§3503	Lacustrine habitats and freshwater emergent wetlands.	**Present.** Breeds at Lake Merced.
Virginia rail *Rallus limicola*	--	§3503	Fresh and saline emergent wetlands.	**Present.** Occurs at Lake Merced.
Allen's hummingbird *Selasphorus sasin*	BCC	§3503	Brush and woodlands.	**Present.** Breeds in the study area.
Yellow warbler *Setophaga petechia*	BCC	CSC	Nests in dense riparian cover and montane chaparral. Breeding distribution includes the coast ranges and western slopes of the Sierra Nevada. Rare to uncommon in lowland areas.	**Present.** Breeds at Lake Merced.
Pygmy nuthatch Sitta pygmaea	--	§3503	Coniferous forests and pinyon-juniper habitats.	**Present.** Breeds in the coniferous forest of the Olympic Club within the study area.
Lawrence's goldfinch *Spinus lawrencei*	BCC	§3503	Open woodlands, chaparral near fields for foraging seeds.	**Low.** Marginal habitat is present in the study area.
American goldfinch *Spinus tristis*	--	§3503	Cismontane foothills; riparian and cropland habitats.	**Present.** Breeds at Lake Merced.
Bewick's wren *Thryomanes bewickii*	--	§3503	Chaparral; also pinyon-juniper woodlands.	**Present.** Breeds at Lake Merced.
Barn owl *Tyto alba*	--	§3503.5	Open areas including chaparral, grassland, riparian, wetlands.	**Present.** Occurs at Lake Merced.
Barn swallow *Hirundo rustica*	--	§3503	Open areas from coastal grassland and shrubland to mixed coniferous forests.	**Present.** Breeds at Lake Merced.

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
OTHER SPECIAL-STATUS SPECIES (cont.)				
Mammals				
Pallid bat *Antrozous pallidus*	--	CSC	Prefers caves, crevices, hollow trees, or buildings in areas adjacent to open space for foraging. Associated with lower elevations in California.	**Low.** Suitable roosting habitat is available in buildings around Lake Merced. This species was not detected during 2009 surveys in San Francisco parks (Krauel, 2009). Not expected to breed here but may be present on a transient basis.
Townsend's big-eared bat *Corynorhinus townsendii*	--	CSC, SC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings of rocky areas with caves or tunnels. Roosting sites limited. Extremely sensitive to human disturbance.	**Low.** Suitable roosting habitat is available in buildings around Lake Merced. This species was not detected during 2009 surveys in San Francisco parks (Krauel, 2009).
Steller [northern] sea lion *Eumetopias jubatus*	DL	--	This species forages in the open ocean but can also occur in near shore waters and haul out on local beaches to rest, molt, mate, and raise young during breeding season.	**Low.** The closest active rookeries for this species are located at Año Nuevo and the South Farallon Islands. Individuals may occur off shore of the study area or on study area beaches during rare stranding events.(NOAA, 2014)
western red bat *Lasiurus blossevillii*	--	CSC	Roosts primarily in trees, 2-40 feet above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.	**Moderate.** Roosting habitat is available in tree/shrub foliage at Lake Merced and Fort Funston. Documented at Fort Funston during 2004-2005 surveys (Fellers, 2005). In 2009 surveys, this species was found in some San Francisco parks containing water bodies (Krauel, 2009).
hoary bat *Lasiurus cinereus*	--	*	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths; requires water.	**Low.** Roosting habitat is available in large-diameter trees at Lake Merced and Fort Funston. Documented at Fort Funston during 2004-2005 surveys (Fellers, 2005); however, not detected during 2009 surveys in San Francisco parks (Krauel, 2009). May be present on a transient basis.
Yuma myotis *Myotis yumanensis*	--	*	Optimal habitats are open forests and woodlands with water sources to feed over. Roosts in buildings, trees, mines, caves, bridges, and rock crevices. Maternity colonies active May through July.	**Moderate.** Roosting habitat is available in tree/shrub foliage at Lake Merced and Fort Funston. Documented at Fort Funston during 2004-2005 surveys (Fellers, 2005). In 2009 surveys, this species was found in some San Francisco parks containing water bodies (Krauel, 2009).
American badger *Taxidea taxus*	--	CSC	Open grasslands with loose, friable soils.	**Absent.** No suitable habitat present.

TABLE 2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES THAT MAY OCCUR IN THE STUDY AREA

Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Habitat Description**	**Potential to Occur in the Study Area**
OTHER SPECIAL-STATUS SPECIES (cont.)				
Mammals (cont.)				
Point Reyes jumping mouse *Zapus trinotatus orarius*	--	CSC	Upland areas of bunch grass in marshes in Point Reyes.	**Absent.** Study area is south of the known range for this species.

NOTES:
The "Potential for Effect" category is defined as follows:
High = Species is expected to occur and habitat meets species requirements.
Moderate = Habitat is only marginally suitable or is suitable but not within species geographic range.
Low = Habitat does not meet species requirements as currently understood in the scientific community.

STATUS CODES:
Federal:
FE = Listed as "endangered" under the federal Endangered Species Act
FT = Listed as "threatened" under the federal Endangered Species Act
FSC = NOAA Fisheries designated "species of concern"
FPD = Proposed delisted
FD = Delisted
BCC = Bird of Conservation Concern

State:
CE = Listed as "endangered" under the California Endangered Species Act
CT = Listed as "threatened" under the California Endangered Species Act
CSC = California Department of Fish and Wildlife designated "species of special concern"
CFP = California Department of Fish and Wildlife designated "fully protected"
SC = California Department of Fish and Wildlife designated "candidate threatened"
WL = California Department of Fish and Wildlife designated "watch list"
§3503 = Eggs, Nests, and Nestlings Protected under Section 3503 of the California Fish and Game Code
§3503.5 = Eggs, Nests, and Nestlings of Falconiformes and Strigiformes Protected under Section 3503.5 of the CDFG Code
* = California special animal

Other:
Western Bat Working Group (WBWG):
Low = Stable population
Medium = Need more information about the species, possible threats, and protective actions to implement.
High = Imperiled or at high risk of imperilment.

SOURCE: CDFW, 2015a; CNDDB, 2015; eBird, 2015a; eBird, 2015b; Fellers, 2005; Holzman, 2005; Jones and Stokes, 2007; Krauel, 2009; NOAA, 2013; NPS, 2012; SFFO, 2003; USFWS, 2015.

Vegetation Change Analysis Methodology Associated with Lake Merced Water Level Changes

Appendix D summarizes the Lake Merced vegetation change analysis conducted by ESA for Vista Grande Drainage Basin Improvement Project which addresses the effects of water level increases on shoreline vegetation.[1] Building upon prior studies, ESA updated a GIS vegetation layer created by Nomad Ecology in 2010[2]. Using ArcGIS, ESA overlaid the 2010 vegetation data on a high resolution 2011 aerial photograph and then ground-truthed the resulting imagery in the field in May 2012. In general, the 2010 data correlated well with aerial signatures of the various vegetation types on the 2010 aerial photo and conditions on the ground. All discrepancies were mapped in the field and the 2010 vegetation layer was updated using the annotated field maps and aerial interpretation comparing the 2008 and 2011 aerials. To reduce the complexity of modeling vegetation change in response to water level management, many of the distinct vegetation types mapped by Nomad Ecology (2011) were combined with similar types. Table 3.4-5 in the Approach to Analysis: Operational Impacts – Lake Level Management subsection of the Biological Resources Operational Impacts section presents the results of the vegetation mapping update, along with results from 2002, and 2010, for comparative purposes. See Figure 3.4-6 in the same subsection for the updated Lake Merced vegetation map.

A GIS database was constructed using Light Detection and Ranging (LIDAR) (Foxgrover and Barnard, 2012) surface topographic data, and bathymetric data supplied by the San Francisco Public Utilities Commission (SFPUC) (Sea Survey/Entrix, 1987; Talavera & Richardson, 2001). The two data sets differ substantially in precision and vertical control, such that the bathymetric data were adjusted by hand to conform more closely with the greater vertical precision of the LIDAR data[3] as well as current aerial photos (USGS, 2011). For example, in many cases, overlays of vegetation mapping and the bathymetric data resulted in the appearance of certain species or vegetation types occurring in much deeper water than field observations would support.

A set action of “action rules” was developed to predict the response of different vegetation types to changing inundation levels. Action rules were drawn from previous modeling efforts specific to Lake Merced (Stillwater Sciences, 2009; EDAW, 2004) and Lower Crystal Springs Reservoir (ESA, 2009), available literature on vegetation tolerance to inundation, and field observations. The action rules (see Table 3) are based on the following general principles:

1 The same vegetation change analysis methodology for Lake Merced has previously been applied to the San Francisco Groundwater Supply Project and the Groundwater Storage and Recovery Project EIRs, both of which have the potential to result in lake level decreases and the Groundwater Storage and Recovery Project has the potential to result in lake level increases. The analysis supporting these EIRs assessed effects of both lake level increases and decreases on shoreline vegetation.

2 The 2010 GIS vegetation layer was created by Nomad (2011) using heads up digitizing on a 2008 aerial photo base and then verifying the results in the field.

3 The original bathymetric data created by Sea Survey and Entrix in 1987 was digitized from a scanned image and adjusted to “fit” a 2001 orthophoto background by Talavera & Richardson in 2001. Upon comparing the bathymetric data with April, 2011 aerial imagery it was clear that the data did not fit within the confines of lake as shown in the current aerial imagery. ESA adjusted the bathymetry again to fit the current imagery. The accuracy of the bathymetric data affects the amount of vegetation impacted with decreasing water surface elevation, which may be overestimated or underestimated.

TABLE 3
VEGETATION MODEL ACTION RULES

Class/Vegetation Type	Remove:	Add:	Replacer Status	Conflict Rule for Adding:
Class1[a]				
Bulrush wetland	<-5	0 to -5	Primary Replacer	In areas of replacement overlap, the adjacent replacer wins. In areas where both replacers are adjacent, bulrush wins. In areas of no replacer adjacency, bulrush wins.
Cattail	<-3	0 to -3	Secondary Replacer	
Knotweed wetland	<-2	0 to -2	Secondary Replacer	
Class 2[a]				
Arroyo willow	<0	1 to 0	Primary Replacer	In areas of replacement overlap, the adjacent replacer wins. In areas where both replacers are adjacent, willow wins. In areas where no adjacency, willow wins.
Rush meadow	<-1	1 to 0	Secondary Replacer	
Giant vetch	<-1	na	na	
Class 3[a,b]				
Coastal scrub	<1	na	na	
Dune scrub	<1	na	na	
Oak woodland	<1	na	na	
Non-native forest	<1	na	na	
Non-native herbaceous	<1	na	na	
Annual grassland	<1	na	na	
Perennial grassland	<1	na	na	

NOTES: Seasonal variation is 1 foot higher than average in wet season and 1 foot less than average in dry season.
Elevations are relative to modeled water surface elevation.

[a] **Class 1 - Tolerant:** Can survive permanent inundation at depths equal to or less than 5 feet below average annual WSE.
Class 2 - Moderately Intolerant: Survives inundation up to 3 months during dormant season.
Class 3 - Intolerant: This class is generally unable to survive inundation for more than two consecutive weeks.

[b] Upland vegetation types would not replace others as WSE rises.

SOURCE: ESA, 2012

The lower limit of both woody and herbaceous upland vegetation is determined by the maximum water surface elevation (WSE). The lower limit of upland vegetation is determined by inundation frequency and duration, a principal that also is applied in the federal method for determining the boundary between wetlands and non-wetlands for jurisdictional purposes. Observations of current conditions at Lake Merced, coupled with previous mapping and descriptions (SFRPD, 2006; May and Associates, 2009; Nomad Ecology, 2011) indicate that the lower limit of upland woody vegetation is above the maximum WSE, which restricts upland plant species lacking adaptation to prolonged inundation or soil saturation. Upland woody vegetation will occur, but not persist, at the mean water level, and will be replaced by opportunistic wetland vegetation dominated by bulrush and knotweed. The lower limits of upland herbaceous communities also extend down to the maximum WSE, and would be replaced by wetlands if the water level rises.

The upper and lower limits of wetland vegetation depend on depth of inundation and inundation tolerance. For example, most herbaceous wetlands fringing Lake Merced occur no higher than one foot above the projected existing conditions mean WSE of 5.7 feet and at assumed depths no greater than two feet below WSE. The wetland species that make up

these communities do not require year-round inundation. In contrast, bulrush wetlands require at least nine months inundation or soil saturation, readily tolerate permanent inundation, and are found at elevations no more than one foot above the seasonal high water elevation, and no greater than five feet lower than mean WSE.

Vegetation was categorized into three classes associated with water inundation tolerance. Inundation tolerance is largely a function of seasonal fluctuations in lake levels. Monthly water levels increase up to one foot above the annual average during winter (February through May), declining to one foot below average annual water level towards the end of the growing season (August through November) (Stillwater, 2009). Class 1 includes vegetation types that are extremely tolerant and can survive permanent inundation. Class 2 vegetation is somewhat tolerant and can survive partial inundation due to seasonal variations. Class 3 vegetation is intolerant and cannot survive seasonal inundation. ESA developed action rules based on this classification that determined how vegetation would die or establish as WSE rises.

Replacement criteria not only took elevation relative to WSE into account but also adjacency of vegetation types. Overlapping depth tolerance among different wetland types requires complex rules for resolving conflicts when two wetland types have the potential to occupy the same elevation zone. For the purposes of the analysis, therefore, these conflicts were resolved by creating action rules that restrict the amount of overlap. The action rules also govern interactions between vegetation types for projected WSE that would cause the loss of one type and its replacement by one or more other type. For example, bulrush and knotweed have a somewhat overlapping tolerance to inundation. Priority rules for replacement instruct the GIS-based analysis to replace a “drowned” vegetation type with bulrush or knotweed (the most aggressive “replacer” types) based on the elevation of the replaced vegetation and its proximity to the nearest replacer type.

The GIS-based analysis was conducted to estimate vegetation response to changes in lake levels over time using the newly updated vegetation data, topography, bathymetry, slope, output from the water level models (Kennedy/Jenks, 2012), and the action rules for vegetation change. For the purposes of the vegetation change analysis, the initial baseline estimates for existing vegetation acreage are those which would occur at a mean annual water surface elevation of 6 feet City Datum. This is slightly higher than the baseline water surface elevation of 5.7 feet used for the Kennedy Jenks hydrologic modeling but was necessary in order to correspond to the topographic data, which was created at one foot elevation intervals. The 2012 vegetation mapping update was based on an April 2011 aerial photograph, at which time, according to historic water surface elevation data (SFPUC, 2011), Lake Merced water surface elevation was at about 7 feet City Datum, and field observations made in May, 2012. The acreages given for the 6-foot WSE were obtained by running the receding WSE model on the 2012 vegetation data. In addition, the analysis only included vegetation at or below 13 feet City Datum, since this is the maximum possible lake water level due to the existing spillway height and therefore, elevation, at which vegetation change would be expected due to changes in WSE. Therefore, for the upland vegetation types and for arroyo willow riparian scrub, acreage located above the 13 foot elevation, as mapped in Figure 3.4-6 in the Biological Resources Operational Impacts section, Approach to Analysis: Operational Impacts – Lake Level Management subsection, would remain unchanged.

To determine impacts to vegetation associated with water surface elevation change it is necessary to have an accurate topographical representation of the area. For elevation above the surface of Lake Merced, ESA obtained a high resolution LIDAR derived digital elevation model (DEM) to provide accurate elevation data. Past Lake Merced inundation studies used 1 foot photogrametically created elevation contour data derived from flights of the area in 1996. The LIDAR derived elevation data were used in place of the photogrammetry data because they are considerably more current (2010) and determined to be a better representation of current conditions[4]. From the DEM, ESA created 1 foot elevation contour polygons so that areas could be calculated for each elevation range. For bathymetric topography ESA used contour data provided by the SFPUC. These contours were originally created from depth soundings of the lakes in 1987; the data was subsequently adjusted in 2001 to fit current aerial photos of that time. Visual analysis of the contour data compared to current aerial photos (2011) revealed inconsistencies along the shoreline. It was therefore necessary to modify the bathymetric data to match the aerial photos and surface DEM to create an accurate topographical representation. The adjusted bathymetric data was converted to a Triangular Irregular Network (TIN) which in turn was used to produce 1 foot contour polygons by interpolating elevation gaps in the original contour data. The 1 foot bathymetric elevation contours and the 1 foot DEM derived surface elevation contours were then combined to create a complete elevation dataset of the area. This finished elevation dataset was intersected with the vegetation data to determine distribution of vegetation by elevation ranges.

Two different approaches were used in this methodology to determine impacts to vegetation associated with increasing and decreasing water surface elevation at Lake Merced. As the Vista Grande Drainage Basin Improvement Project would contribute to lake level increases over time, only the approach for determining impacts to vegetation from increasing WSE are discussed. A GIS approach similar to past inundation studies was used to asses impacts associated with an increase in water surface elevation. As described above, action rules were established for each vegetation type dictating how vegetation would respond to increasing water surface elevation. Once the action rules were established for a relative water surface elevation, they were applied to every 1 foot contour up to the 13 foot spillway elevation. The resulting vegetation statistics were used to determine impacts to vegetation types due to increase in water surface elevation.

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4 LIDAR tends to be superior when there is dense vegetative cover. ESA compared aerial photos where the historic WSE was known with the LIDAR and the photogrammetry derived elevation data and the LIDAR was a better match relative to the shoreline, which represents the WSE.

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