9. HYDROLOGY AND WATER QUALITY

This EIR chapter describes existing conditions and potential project impacts associated with hydrology and water quality, including the impacts of project-related changes in peak stormwater runoff on the local storm drainage and pumping system, and potential project effects on water quality in the adjacent Smith Slough tidal channel reach. The chapter also recommends mitigation measures for identified significant or potentially significant impacts.

9.1 SETTING

9.1.1 Bair Island Area Hydrology

(a) General. The approximately 14.13-acre project site is located within the approximately 9.3-square-mile Redwood Creek watershed. The project site is comprised of filled tidal lands along the south bank of a tidal channel tributary to Smith Slough, approximately one-half mile southwest of the slough's confluence with Redwood Creek. The confluence of Smith Slough and Redwood Creek is roughly 2.5 miles upstream of Redwood Creek's confluence with South San Francisco Bay (see previous Figure 3.1). The project site is generally bounded on the north by the Smith Slough tidal channel (including a "Bay Trail" shoreline pedestrian path) and the Bair Island Wildlife Refuge (i.e., Inner Bair Island) on the opposite (north) side of the channel; on the east by Boardwalk Motors and Bair Island Mini-Storage; on the south by East Bayshore Road and U.S. 101; and on the west by Boardwalk Motors and Alan Steel & Supply Company (Boardwalk Motors includes two non-contiguous properties east and west of the project site).

The majority of Redwood Creek is currently maintained as a deepwater shipping channel serving the Port of Redwood City, with maintenance dredging occurring roughly every three years. The dredged maintenance of Redwood Creek significantly influences tidal drainage patterns in the adjacent sloughs that border and separate the Inner, Middle, and Outer units of Bair Island, including the tidal channel tributary of Smith Slough adjacent to the north edge of the project site. In addition to the adjacent tidal channel, which separates the project site from Inner Bair Island, this estuarine system includes Smith Slough, which separates Inner and Middle Bair Islands; Steinberger Slough, which borders Bair Island to the west; and Corkscrew Slough, which separates Middle and Outer Bair Islands. In addition, two Bay tributaries, Pulgas Creek and Cordilleras Creek, discharge to Smith Slough and/or Steinberger Slough, depending on extant tidal and watershed flooding conditions.

(b) Existing Flows. Figure 9.1 illustrates typical tidal drainage divides and patterns in the project's Bair Island vicinity. The exhibit is excerpted from a hydraulic study of existing

Figure 9.1. Bair Island Drainage Divides and Flow Directions at Low Tide.

conditions completed for the *Bair Island Restoration and Management Plan* formulation effort. Except for periods of high creek discharge in Pulgas and Cordilleras Creeks, flows in the upstream reach of Steinberger Slough (i.e., south of Corkscrew Slough) proceed south to Smith Slough. Flows in Smith Slough are conveyed east to Redwood Creek, adjacent to Outer Pete's Harbor.

(c) Local Tidal Restoration Activity. The Bair Island Wildlife Refuge, which includes the Inner Island opposite the project site, Middle Island, and Outer Island, is currently administered by the U.S. Fish and Wildlife Service (USFWS) as part of the Don Edwards San Francisco Bay Wildlife Refuge. As of August 2003, a *Bair Island Restoration and Management Plan* was being prepared for the entire Bair Island complex by the San Francisco Bay Wildlife Society in association with the USFWS (see subsection 9.2.3 herein). Portions of Outer Bair Island (north of Corkscrew Creek) were re-opened to tidal action during the period 1979 to 1983, while the bulk of the remaining leveed, subtidal lands exist as remnant salt evaporators.

(d) Watershed. At the Bay confluence, the Redwood Creek watershed encompasses approximately 9.3 square miles of land. Land uses within the watershed are predominately low- to high-density residential, commercial, and industrial, except for portions of Bair Island that drain toward the mouth of Redwood Creek. Remaining undeveloped lands are comprised of inactive, leveed salt evaporators, naturally restored (via levee breaching) tidal marsh/open water habitats, and some dredged spoil disposal areas adjacent to the Port of Redwood City facilities.

Mean annual rainfall in the project vicinity totals approximately 16 inches,[1] occurring primarily during the winter wet season, which typically extends from November through March. Discharge into Redwood Creek rises during the winter runoff season and peaks frequently in response to runoff-producing rainstorms. Watershed sediment yield and riverine transport of these sediments within the local estuarine system also increases during periods of elevated river discharge. Since the lower reach of Redwood Creek system is tidal, it circulates tidal waters from South San Francisco Bay and transports watershed and Bay sediments.

(e) Local Flooding. Significant episodes of flooding occur in the project vicinity in response to either infrequent, extreme high tides or to major rainstorms over the Redwood Creek watershed (including Pulgas and Cordilleras Creeks), coincident with high Bay tides. High tide levels raise the controlling water surface elevation within the stream system. Backwater influences consequently raise upstream flood elevations, which can overtop levees or creekbanks and inundate adjacent, low-lying lands. Extreme high tides can be influenced by winds, barometric pressure fluctuations, ocean temperatures, and freshwater runoff.

[1]Rantz, S.E. *Mean Annual Precipitation and Precipitation Depth-Duration-Frequency Data for the San Francisco Bay Region, CA*, U.S. Geological Survey Basic Data Contribution 32, 1971.

The Flood Insurance Rate Map (FIRM), published by the Federal Emergency Management Agency (FEMA), delineates the 100-year flood hazard zone in the project vicinity (see Figure 9.2). The 100-year base flood elevation of 107.0 feet Redwood City Datum (RCD) cited on this pre-2000 map has recently (2002) been amended to 107.25 feet.[1] In this zone of tidal flooding, the base flood elevation refers to the water surface elevation reached during a coincident flooding and high tide event and/or storm surge with a recurrence interval of 100 years. Such an event could be expected to occur on average at least once in a 100-year period. The resulting probability of occurrence in any given year is one percent. In the immediate vicinity of the project site and north of U.S. 101, the mapped flood hazard zone includes all of Pete's Harbor and Uccelli Boulevard; the Maple Street area (including the old Redwood City Sewage Treatment Plant, the County Work Furlough Facility and Women's Correctional Center, and the Society for the Prevention of Cruelty to Animals facility) on the south side of Redwood Creek; and developed areas west of Bair Island Road, including the Bayside Gardens project site.[2]

Chapter 41 of the Redwood City Municipal Code, entitled *Floodplain Management*, cites local guidelines governing development in flood-prone areas. Within areas under tidal influence, the guidelines dictate that these areas be filled to six inches above the 100-year flood elevation after settlement. In addition, as per FEMA guidelines, finished floors of structures located in FEMA-designated 100-year flood hazard areas must be at least 1.0 foot above the 100-year flood elevation.

(f) Sea Level Rise. The Bay Conservation and Development Commission (BCDC) study of sea level rise and its impacts on San Francisco Bay cited evidence that global sea level rise during the preceding century was about 0.0039 feet per year.[3] For the Redwood City area, the rate of local relative sea level change was equal to 0.013 feet per year. Comparison of this local figure with the rate of 0.0039 feet per year measured at the Presidio reference station indicates that local land elevations in this portion of the South Bay were influenced by higher rates of subsidence during the same period.

Further analysis of sea level rise during a more recent 19-year tidal epoch extending from 1964 to 1982 indicates that global sea level rise had quickened during that period to roughly 0.0072 feet per year. Based on this more recent rate of rise and considering the influence of periodic El Nino effects, the mean sea level between the San Mateo and Dumbarton Bridge stations is estimated to increase from a present elevation of 100.33 feet Redwood City Datum

[1]Charles Csicsman, former Supervising Engineer, Redwood City Engineering and Construction Department, personal communication, May 2002.

[2]Ibid., July 23, 2002.

[3]Moffat & Nichol Engineers and Wetlands Research Associates for BCDC. *Sea Level Rise: Predictions and Implications for San Francisco Bay*, revised October 1988.

Figure 9.2. Bair Island Regional Drainage Map.

(RCD) to 101.63 feet RCD in 2036. Sea level rise within the Smith Slough tidal channel adjacent to the project site would be expected to closely reflect these estimates.

Given the unknowns at work in the generation of sea level rise, BCDC and its consultants propose that a range of 0.005 to 0.05 feet per year be assumed for general planning purposes. Moreover, similar extrapolations applied to the computation of the highest estimated tide in the project vicinity produced a predicted *highest estimated tide (HET) of 108.1 feet RCD in 2036*, an increase of 0.85 feet over the previously cited Corps of Engineers estimate of 107.25 feet RCD.[1]

9.1.2 Bair Island Area Water Quality

(a) General. Surface water quality in the project vicinity is influenced by upstream watershed runoff conveyed by Redwood Creek, tidal waters circulating from San Francisco Bay, local surface runoff and shallow groundwater seepage from the adjacent residential and commercial developments, and atmospheric deposition. The quality of Bay tidal waters in the vicinity is in turn dependent on such significant hydrologic and biological parameters as the timing and magnitude of freshwater Delta outflow, complex circulation patterns in the Bay, wind-driven mixing and resuspension of fine-grained sediments, time-varying salinity gradients and water temperature, and nutrient loading.

(b) Contaminants. Contaminants carried by watershed and tidal flows derive from point or non-point sources. Point sources include easily verifiable discharge points such as sewage treatment plants, industrial outfalls, and marinas. Non-point sources represent diffused contamination over wider areas, including cultivated and urbanized lands. Typical contaminants in such non-point source urban runoff include heavy metals (e.g. mercury, lead, zinc, copper, chromium, nickel), nutrients, pesticides and herbicides, PCBs and related compounds, sediments, and oil and grease.

Local groundwater seepage from the landscaped portions of residential, commercial, and industrial developments bordering Redwood Creek and the borrow ditch (i.e., tidal channel) that form the southern border of Inner Bair Island (and the northern border of the project site) can also affect water quality in the project vicinity through the input of nutrients and degradation resulting from fertilizer, herbicide, and pesticide application and lawn irrigation. To a small extent, trace elements classified as potential contaminants can also be yielded by natural geologic materials.

In May 2000, the U.S. Environmental Protection Agency (EPA) issued the California Toxics Rule, which sets forth numeric water quality criteria for priority toxic pollutants affecting the state's inland surface waters, enclosed bays, and estuaries. The most recently published results of the San Francisco Estuary Institute's Regional Monitoring Program for the 1999

[1]U.S. Army Corps of Engineers, San Francisco District. *S.F. Bay Tidal Stage vs. Frequency Study*, October 1984.

sampling year include summary listings of trace elements that exceeded the California Toxics Rule (2000) 304(a) Criteria. For the Redwood Creek estuarine area, four trace elements were sampled at concentrations higher than the 304(a) Criteria: copper, total polyaromatic hydrocarbons (PAHs), total PCBs, and Total DDTs. Both the copper and Total DDT criteria were exceeded during one of the three sampling dates (February), while the total PAH and total PCB criteria were exceeded during two and three sampling dates (February, April, and July), respectively.[1]

(c) Algae. Water quality problems can also arise in tidal waters due to the proliferation of algae. Elevated concentrations of chlorophyll-a, the indicator constituent of phytoplankton (algal) growth, can reduce water clarity. Extreme algal blooms and subsequent die-off can severely depress dissolved oxygen concentrations and result in fish kills. Water residence time, phytoplankton source(s), nutrient inputs, temperature, and light are the principal factors controlling the growth of algae in tidal waters. Early studies of phytoplankton occurrence and distribution in San Francisco Bay have not reached definitive conclusions regarding the primary source (oceanic or in-situ Bay waters) of phytoplankton in South San Francisco Bay. However, studies have indicated that phytoplankton populations reach a maximum during the spring, as low salinity inflows from the Delta circulate into the South Bay. The resulting stratification in the water column allows light penetration into the shallow surface layer that is sufficient to stimulate rapid phytoplankton growth rates.[2]

9.1.3 Bair Island Area Tidal Channel Siltation

An abundant supply of fine-grained sediments (e.g., silts and clays) is carried up Redwood Creek and Steinberger Slough by tidal waters emanating from South San Francisco Bay. Sediments initially settling along the shallow margins of the Bay are re-suspended during frequent periods of strong wind-generated wave action. These re-suspended sediments and their aggregates (i.e., "flocs" produced by the flocculation process in mixed fresh and saline waters) remain in suspension in circulating tidal waters. These sediments will settle out in areas where circulation is poor and flow velocities are minimal, and in shallow zones when the wind dies down and mechanical circulation is absent. Thus, navigational facilities such as marinas and lagoons at the upstream end of tidal sloughs typically experience high rates of siltation.

To determine local siltation conditions, the Corps of Engineers, San Francisco District, conducted depth soundings for an unmaintained area of Redwood Creek located just upstream of the Port of Redwood City and Redwood Creek shipping channel in May 1995 and September 2001. These data indicated an accretion of 0.5 feet over the six-year period. This translates to

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[1]San Francisco Estuary Institute. *Pulse of the Estuary, Monitoring and Managing Contamination in the San Francisco Estuary 1993-99*, 2001.

[2]Pacific Division, American Association for the Advancement of Science. *Phytoplankton Ecology of the San Francisco Bay System: The Status of Our Current Understanding,* in San Francisco Bay: The Urbanized Estuary, 1979.

a siltation rate of approximately 0.08 feet per year (1.0 inch per year).[1] Siltation rates vary and are a function of both the sediment concentrations in tidal inflows and the bed shear stresses that are generated by tidal flows. A greater "tidal prism" (i.e., the water volume exchanged between higher high and lower low waters) will result in higher tidal discharges and generate higher shear stresses on the channel bed.

Since the Port of Redwood City facilities are nearly a mile downstream of the confluence of Redwood Creek and Smith Slough, the siltation rates estimated for that reach of Redwood Creek are likely slightly higher than those closer to the project site. This is due to a reduction in the suspended sediment loading in the incoming tidal waters, as sediment is deposited downstream of the project vicinity.

9.1.4 Project Site Hydrology

(a) General. Existing land elevations on the 14.13-acre project site range from +4.0 feet to +7.5 feet NGVD (104.0 to 107.5 feet RCD). The project site was historically marshland (see chapter 14, Cultural and Historic Resources, herein). Soils on the project site consist of 7.0 to 11.0 feet of clayey fill, with thin sand and gravel lenses, overlying 4.5 to 9.5 feet of weak, compressible marine clay (i.e., Bay mud).

(b) Groundwater. The tidal condition of the nearby reach of Redwood Creek results in relatively stable and shallow on-site groundwater elevations; mid-winter groundwater elevations could rise somewhat closer to the ground surface. Cone penetration tests conducted in July 2001 indicated groundwater depths ranging from 6.6 to 11.2 feet below the ground surface.[2] Due to the presence of nearly impervious Bay mud beneath the project site, and the adjacent tidal zone, the perched groundwater underlying the site does not represent a significant groundwater resource. The thin veneer of fill materials and the close proximity of saline water mean that no drinking water supplies could be extracted from the project site.

(c) Vegetation. Vegetation on the project site is limited to ornamental landscaping on the East Bayshore Road frontage, in the parking lot, and along the 50-foot-wide trail/easement at the northern edge of the project site, and to scattered non-native grasses in the less-than-one acre vacant, unlandscaped area at the northeast corner of the site.

(d) Tidal and Siltation Characteristics (Marina Hydrography). Tidal benchmark data for the project vicinity are published by the National Oceanic and Atmospheric Administration (NOAA). The closest benchmark station to the project site is NOAA Station 9414523, located at Wharf 5, Redwood City, San Francisco Bay. Pertinent tidal benchmark data from this station are listed

[1]Jim Delorey, Staff Engineer, Corps of Engineers, San Francisco District, personal communication, May 2002.

[2]Treadwell & Rollo. *Preliminary Geotechnical Investigation, 557 East Bayshore Boulevard*, Project No. 3195.01, August 7, 2001.

below:

Tidal Plane	Elevation (Feet Mean Lower Low Water)
Mean Higher High Water (MHHW)	8.11
Mean High Water (MHW)	7.49
Mean Sea Level (NGVD datum)	4.37
Mean Tide Level (MTL)	4.33
Mean Low Water (MLW)	1.17
Mean Lower Low Water (MLLW)	0.00

At the confluence of Redwood Creek and Smith Slough, approximately one-half mile upstream of the project site, no dredging has been required to maintain navigable conditions in Outer Pete's Harbor marina, due to natural scouring along Smith Slough.[1]

(e) Stormwater Drainage. Stormwater runoff from the project site currently flows via a series of on-site, subsurface pipes ranging from 8 to 36 inches in diameter, an on-site pump station, and a force main that discharges to the Smith Slough tidal channel. The on-site system collects stormwater from the 14.13-acre project site as well as the adjacent approximately 0.9-acre Boardwalk Motors property on the west and 0.3-acre East Bayshore Road street frontage on the south.[2]

(f) Local Water Quality Factors. Water quality data for the immediate project vicinity, including Redwood Creek and Smith Slough, are limited. However, on navigable waterways such as Redwood Creek, illicit discharges from marinas and houseboat communities can cause significant impairment of local water quality.

(1) Redwood Creek Water Quality. According to the 1991 report entitled *Hydrology, Water Quality and Floodplain Analysis: Blomquist Street Extension and East Bayshore Road Alignment, Redwood City, California* (WESCO, 1991), Redwood Creek was identified by BCDC as a problem area for high fecal coliform contamination derived from affiliated water-oriented uses (marinas and houseboat communities). In addition to fecal coliform bacteria, vessel wastes can degrade water quality by introducing suspended solids, nutrients, oils and grease, biochemical oxygen-demanding substances, and toxic soap residues into receiving waters. Independent water sampling and testing conducted by WESCO in association with the 1991 study confirmed high levels of fecal streptococcus bacteria in the vicinity of Docktown Marina, located approximately 1,000 feet southeast of the project site.

(2) Project Site Water Quality Factors. Stormwater runoff from the project site is currently

[1]Pete Uccelli, owner of Pete's Harbor property, personal communication, May 2002.

[2]BKF et al., p. 6.

discharged via a series of subsurface pipes ranging from 8 to 36 inches in diameter, an on-site pump station, and a force main that discharges to the adjacent Smith Slough tidal channel. Minimal filtering of contaminants occurs, due to relatively unvegetated condition of the overall site; approximately 80 percent (11.3 acres) of the site is impervious (i.e., buildings and pavement). There are currently no opportunities for trapping or filtering of contaminants conveyed via the underlying project site storm drains into the adjacent Smith Slough tidal channel.

9.2 PERTINENT PLANS AND POLICIES

9.2.1 Redwood City Plans and Policies

The Redwood City Strategic General Plan *Open Space, Conservation*, and *Safety Elements* (adopted in 1990) contain the following objectives and policies related to hydrology and water quality, pertinent to consideration of the environmental impacts of the proposed project:

- *Preserve and restore the natural characteristics of San Francisco Bay and adjacent lands and recognize the role of the Bay's vegetation and water area in maintaining a favorable climate and good air and water quality.* (Conservation Objective 2, page 10-4)

- *New development should be designed to provide protection from potential impacts of flooding during the 100-year flood.* (Safety Policy S-8, page 12-3)

- *Existing levees which protect residential communities and commercial areas should be upgraded to protect against the 100-year flood.* (Safety Policy S-14, page 12-4)

9.2.2 Federal and Regional Water Quality Regulations

(a) U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA). Section 404 of the Federal Pollution Control Act (commonly referred to as the Clean Water Act [CWA]) of 1972 regulates the discharge of dredged or fill material to Waters of the United States, which generally include tidal waters, lakes, ponds, rivers, streams and wetlands. Joint oversight responsibility for implementation of the provisions of the Act rests with the Corps and the EPA. Section 404(a) authorizes the Corps to issue permits for discharges of dredged or fill (collectively referred to as fill) material into Waters of the U.S. Section 404(b) requires that the projects for which fill permits are issued be in compliance with EPA guidelines, referred to as Section 404(b)(1) Guidelines. The guidelines also prohibit discharges that would cause significant degradation of the aquatic environment or violate state water quality standards. Section 404(c) of the CWA grants the EPA veto authority over the Corps if it determines that the project "will have an unacceptable adverse effect on municipal water supplies, shellfish beds, and fishing areas." In the case of the proposed project, no discharge of dredged or fill material into Waters of the U.S., including the adjacent tidal channel, is proposed, no Corps permit for impacts to jurisdictional waters would be necessary, and thus no section 404 or section 7

consultation with the USFWS would be necessary.

(b) U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). Under the auspices of the Federal Endangered Species Act (ESA), Section 7, other federal agencies with permitting authority are required to consult with USFWS or the NMFS if federally listed threatened or endangered species may be affected by a permit decision. In the case of the proposed project, no federal permits would be required and thus no section 7 consultation with the USFWS or NMFS would be required. USFWS responsibilities with respect to the proposed project would be limited to any mitigation involvement identified under CEQA (i.e., this EIR), based on significance criteria set forth in the CEQA Guidelines. For a more detailed explanation of the consultative roles of USFWS and NMFS in the permitting process, see chapter 8 (Biological Resources) of this EIR.

(c) California Department of Fish and Game (CDFG). Pursuant to Fish and Game Code Sections 1601-1603, the CDFG regulates activities that remove materials from the bed and banks of a stream channel, or divert, obstruct, or change the natural flow of any river, stream, or lake. Projects involving such activities are required to obtain a Streambed Alteration Agreement from CDFG. In addition to its 1601-1603 permitting authority, the Fish and Wildlife Coordination Act grants CDFG a reviewing role in the issuance of Section 404 permits, and in providing comments to the Corps regarding environmental impacts. In the case of the proposed project, no Streambed Alteration Agreement with the CDFG and no Corps Section 404 permit would be required. CDFG responsibilities with respect to the proposed project actions would be limited to any mitigation involvement identified under CEQA (i.e., in this EIR), based on significance criteria set forth in the CEQA Guidelines.

(d) California Regional Water Quality Control Board (RWQCB). Addressing its legal mandates from the U.S. Environmental Protection Agency (EPA) and the state's Porter-Cologne Act, the San Francisco Bay Regional Water Quality Control Board (RWQCB, or Regional Board) developed and adopted the first *Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan) in 1968. After several revisions and an extensive public hearing process, the current Basin Plan was adopted in 1995 (1995 Basin Plan).[1]

(1) "Beneficial Uses." The 1995 Basin Plan describes "beneficial uses" that the RWQCB will protect, and water quality objectives required to achieve these beneficial uses.

Beneficial uses are categorized for the principal streams, lakes/reservoirs, and embayments within the San Francisco Bay Region, including those identified in South San Francisco Bay. Table 9.1 lists the "existing" beneficial uses and one "potential" beneficial use for the South Bay. Regional Board staff indicated that "potential" and "limited" beneficial uses were not investigated fully in the Basin Plan due to inadequate resources and funding priorities. Thus, the absence of

[1]California Regional Water Quality Control Board, San Francisco Bay Region. *Water Quality Control Plan--San Francisco Bay Basin (Region 2)*, June 1995.

a "potential" designation in Table 9.1 does not necessarily preclude the potential for enhancing or restoring a particular beneficial use.

(2) RWQCB Certification for Section 404 Permits. Section 401 of the Clean Water Act (CWA) prohibits discharge of dredged or fill material that violates state water quality standards. As part of the federal-state permitting process, dischargers are required to obtain a 401 Water Quality Certification from the RWQCB. Department of Army Section 404 Permits are not valid until the applicant has the certification of compliance with state water quality standards. However, as explained previously, no Corps Section 404 permit, or associated RWQCB Section 401 certification, would be required for the proposed project.

(3) National Pollution Discharge Elimination System (NPDES) Permits. The CWA, as amended in 1987, also prohibits the discharge of pollutants into waters of the United States unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Section 402(p) of the 1987 amendments established a framework for regulating municipal, industrial, and construction stormwater discharges under the NPDES program. In California, NPDES permits are issued through the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs). To date, communities with populations over 100,000, high-risk industries identified by the U.S. EPA, and *construction projects of one acre or more of impervious surface* must obtain an NPDES permit. NPDES jurisdiction over the Bayside Gardens project resides with the San Francisco Bay RWQCB located in Oakland.

In August 1999, the SWRCB reissued the General Construction Activity Storm Water Permit (Water Quality Order 99-08-DWQ, referred to as General Permit). As the result of subsequent litigation (*San Francisco Bay Keeper et al. vs. State Water Resources Control Board*), the Monitoring Program and Reporting Requirements section of the current General Permit was modified in April 2001 (SWRCB Resolution 2001-46). For all construction projects conducted after this date, project applicants (i.e., dischargers) are instructed to design and implement a *Stormwater Pollution Prevention Plan* (SWPPP) that includes sampling and analysis (i.e., monitoring) of stormwater in two instances:

- where site stormwater discharges directly to a water body that is designated as impaired for sedimentation/siltation or turbidity by the SWRCB on its Section 303(d) List; or

- where other pollutants that are known or should be known by permittees to occur on construction sites and that cannot be visually observed or detected in stormwater discharges could result in or contribute to exceedance of water quality objectives in receiving waters.

The modified provisions documented in Resolution 2001-46 cover the implementation schedule for the new regulations and the identification of pollutant sources and Best Management Practices (BMPs), as well as monitoring program and reporting requirements.

Table 9.1
SAN FRANCISCO BAY BASIN PLAN IDENTIFIED "BENEFICIAL USES" FOR SOUTH SAN FRANCISCO BAY

Existing Beneficial Uses:

Estuarine Habitat
Fish Migration
Industrial Service Supply
Navigation
Ocean, Commercial, and Sport Fishing
Preservation of Rare and Endangered Species
Shellfish Harvesting
Water Contact Recreation
Water Non-Contact Recreation
Wildlife Habitat

Potential Beneficial Use:

Fish Spawning

Categories of Beneficial Use Not Identified for South San Francisco Bay:

Agricultural Supply
Cold Freshwater Habitat
Freshwater Replenishment
Industrial Process Supply
Marine Habitat
Municipal and Domestic Supply
Warm Freshwater Habitat

SOURCE: RWQCB, 1995 Basin Plan.

Note: Redwood Creek and Smith Slough were not evaluated in the 1995 Basin Plan; Lower Redwood Creek and Smith Slough would expectedly share some of the beneficial uses cited for South San Francisco Bay.

(4) New Federal Total Maximum Daily Loads (TMDL) Criteria. In addition to the revised NPDES stormwater regulations, San Mateo County and its member municipalities will soon be required to comply with new federal water quality criteria for total maximum daily loads (TMDLs) designated for several high-priority stormwater contaminants, including mercury and PCBs, and the pesticide diazinon. The TMDL process requires identification of contaminant inputs to a water body and prescribes how much a receiving water can assimilate before its beneficial uses become significantly impaired.

Within the project vicinity, only South San Francisco Bay has been listed as impaired. South San Francisco Bay is impaired for pesticides Chlordane, DDT, Diazinon, and Dieldrin, dioxin compounds, exotic species, furan compounds, mercury, PCBs, dioxin-like PCBs, and selenium. Of the TMDL pollutants cited on the RWQCB's 1998 California 303(d) List, highest priorities have been assigned to mercury, dioxin-like PCBs, dioxin and furan compounds, and exotic species. The first of these TMDLs, for mercury, is currently being circulated for review and will be issued within the next two years.

Redwood Creek (including its tributary sloughs) was not listed among the impaired water bodies on either the 1998 California 303(d) List or the amended list circulated for public discussion in May 2002. However, Regional Board staff confirmed that Redwood Creek was not included on the list because it was not studied. In San Mateo County, only San Francisquito and San Mateo Creeks were subjected to sampling and assessment for impairing substances.[1] Nearly all of the studied creeks draining urbanized areas of the Bay system are impaired for diazinon. Thus, it is likely that Redwood Creek is also impaired for diazinon, as watershed land uses are similar to those prevailing in other listed watersheds. As of 2000, the EPA reached an agreement with the manufacturer of diazinon to phase out its production by 2004.

(e) San Francisco Bay Conservation and Development Commission (BCDC). The San Francisco Bay Conservation and Development Commission (BCDC) has permit jurisdiction over tidal areas of San Francisco Bay extending to the line of highest tidal action (i.e., mean higher high water) and within a designated 100-foot shoreline band. Pursuant to section 66605 of the McAteer-Petris Act, BCDC is authorized to issue or deny permits for Bay fill or other construction activities within the shoreline band. The McAteer-Petris Act requires that Bay fill can only be authorized if: (a) there is no feasible upland location for the development in question, (b) the fill minimizes harmful effects on the Bay, and (c) the public benefits clearly outweigh the detriments.

In the Bayside Gardens project vicinity, Smith Slough represents the southernmost boundary of BCDC's Bay jurisdiction, including the shoreline band that extends 100 feet inboard (south/east) of both the main stem and southerly tidal channel arm of Smith Slough (i.e., the previously noted "Smith Slough tidal channel") (see Figure 3.1 in chapter 3, Project Description, of this

[1]Habte Kifle, Water Quality Control Engineer, RWQCB, personal communication, May 2002.

EIR).[1] To comply with the BCDC San Francisco Bay Plan, the northern 50-foot-wide edge of the project site, which falls within this 100-foot band and totals approximately one acre, near the tidal channel and Bay Trail path, is currently dedicated as a public access easement/trail in conformance with BCDC Permit #M88-16 (although a 5,075-square-foot portion of the cinema building currently encroaches on the easement). In conjunction with the Bay Trail path along the tidal channel, the on-site easement and trail help connect the pedestrian entrance to the Bair Island Wildlife Refuge to the west with the parking lot adjacent to the Bair Island Marina to the east.

(f) San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP). While most of the communities in San Mateo County currently have populations of less than the NPDES population threshold of 100,000 (see subsection 9.2.2[d][3]), San Mateo County is still required by the 1995 Basin Plan to develop and implement a baseline control program to prevent the increase of pollutants in stormwater discharges. To comply with these requirements, San Mateo County municipalities joined together in the early 1990s to develop a countywide program. The San Mateo Countywide Stormwater Pollution Prevention Program, referred to as STOPPP, encompasses both the countywide program and local programs. The STOPPP provides regional oversight and support for the local programs that are now in-force in all of the major municipalities in the county, including Redwood City. The STOPPP's current program plan and implementation schedule are detailed in its own *Stormwater Management Plan*.

In May 2001, the Technical Advisory Committee for the STOPPP approved new model policies to govern new and redevelopment projects within its jurisdiction.[2] Model policies identified in the document cover the following areas: general stormwater pollution prevention, erosion and sedimentation reduction, post-construction BMPs and controls incorporation, impervious surface minimization, drainage design and watershed planning, and sensitive area (e.g., wetlands/riparian areas) protection and restoration. In June 2002, the Redwood City City Council adopted the new model policies and associated implementing measures in order to maintain the City's ongoing compliance with the STOPPP and NPDES permit.[3] As described in the model policies, the RWQCB, which monitors compliance with NPDES requirements, is promoting incorporation of post-construction stormwater treatment guidelines into the permit process, requiring that construction and post-construction BMPs and source controls be implemented for new development and redevelopment projects. Thus, infill projects *of one acre or more* are required to integrate design-level measures to minimize impervious surfaces and to

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[1]Jenn Feinberg, Analyst, BCDC, personal communication, May 2002.

[2]*San Mateo Countywide Stormwater Pollution Prevention Program New Development Subcommittee: Model Development Policies*, May 2001.

[3]City of Redwood City. *Report to the Honorable Mayor and City Council from the City Manager*, "Approval of Policies and Implementing Measures Related to the Countywide Stormwater Pollution Prevention Program (STOPPP)," adopted June 10, 2002.

incorporate continuous, long-term stormwater treatment measures.[1] Also, the STOPPP and the County's discharge permit have been amended. The amendments (the so-called "C.3" requirements) now require on-site treatment and storage of stormwater runoff.

(g) Redwood City Stormwater Management and Discharge Control Program. The Redwood City Municipal Code, Chapter 27A, describes the Redwood City Stormwater Management and Discharge Control Program (SMDCP). The program outlines exempted activities (e.g., NPDES-permitted discharges), broad watercourse protection objectives, illicit discharge prohibitions, and BMPs for new and redevelopment projects. It also refers to the aforementioned NPDES regulations for stormwater protection and treatment. The SMDCP has been adopted as the City's formal stormwater ordinance.[2]

As noted in the previous item (f) above, the Redwood City City Council has adopted new model policies and implementing measures in order to continue the City's compliance with the STOPPP and NPDES permit.

9.2.3 Bair Island Restoration and Management Plan

The U.S. Fish and Wildlife Service (USFWS), in association with the San Francisco Bay Wildlife Society, is sponsoring the preparation of the *Bair Island Restoration and Management Plan*. Initial results of hydraulic model studies of the potential effects of a large-scale tidal marsh restoration effort in the Bair Island units indicate that several specific hydraulic benefits would accrue from the planned opening of the Bair Island units to full tidal action:

(1) the self-scouring capacity of Redwood Creek would increase, which would reduce the frequency and extent of dredging required to maintain shipping access to the Port, as well as the less frequently maintained reach adjacent to the Bair Island Road peninsula;

(2) the increased hydraulic cross-section of the major sloughs and Redwood Creek would increase the conveyance of these channels during severe flood events that are coincident with a low tide; and

(3) rates of water circulation within the Redwood Creek slough system would increase, thus improving overall water quality.

[1]Kifle; and Wendy Edde, EOA, Inc., personal communication, May 2002.

[2]Phong Du, Senior Civil Engineer, City of Redwood City Engineering and Construction Department, personal communication, November 18, 2003.

9.3 IMPACTS AND MITIGATION MEASURES

9.3.1 Significance Criteria

Based on current CEQA Guidelines, the project would be considered to have a significant hydrology or water quality impact if it would:[1]

(1) Violate any adopted water quality standards or waste discharge requirements;

(2) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;

(3) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;

(4) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

(5) Otherwise substantially degrade water quality;

(6) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam; or

(7) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

9.3.2 Proposed Project Grading, Filling, and Drainage Characteristics

(a) Proposed Project Grading and Filling. In order to locate proposed new structures above or away from the Flood Hazard Zone, the finished floors of the structures would need to be raised to an elevation of approximately 109.10 feet RCD (one foot above the designated flood elevation plus predicted sea level rise), or a protective levee and wall would need to be installed around the entire project site.[2]

[1]CEQA Guidelines, Appendix G, items VIII(a, c-f, and i) and IX(b).

[2]BKF Engineers et al., p. 17; and Treadwell & Rollo.

In accordance with the preliminary geotechnical report prepared for the proposed project,[1] all presently landscaped areas to be graded would be cleared of vegetation and stripped of the upper one to two inches of surface soil containing organic matter. Deeper stripping would be required to remove brush and tree roots. Stripped materials would not be used in engineered fills; however, the material may be stockpiled for future use in landscaping if approved by the project landscape architect. The existing asphalt pavement would also be removed prior to placement of fill. The asphalt could be reused as fill, provided its use was approved by the City. Asphalt to be reused would be crushed to less than four inches in greater dimension (with less than 15 percent greater than three inches and less than 50 percent greater than one inch), and mixed with on-site or imported soil to prevent nesting of the particles.

The surface exposed by stripping and/or excavation (if required) would be scarified to a depth of at least eight inches, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. The majority of on-site soil below the stripped layer could be used as fill, provided it is not expansive or otherwise detrimental to the proposed construction.[2] During the final geotechnical investigations (see *Mitigation 11-1* in chapter 11, Soils and Geology, herein), samples of the near-surface fill would be collected to check the expansion potential of the soil and determine the resistance value for pavement section design.

All fill placed at the site, including the on-site soil, would be free of debris and contain no rocks or lumps larger than four inches in greatest dimension, with no more than 50 percent of the fill being larger than one inch. If imported fill is required, it would also be free of rock and debris and have a low expansion potential (defined by a liquid limit of less than 40 and a plasticity index lower than 15). All fill placed at the site would be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction.

(b) Proposed Project Drainage. Although no detailed design information is available at this preliminary project planning phase regarding the handling of project stormwater runoff, preliminary plans[3] indicate that the storm drain system would include a new network of underground gravity lines and inlet structures. Pollution protection measures (e.g., catch basin inserts) would be incorporated into the project site layout. The gravity lines would convey the flow to the existing on-site pump station; the capacity of the pump station would be evaluated and, if necessary, upgraded to provide an adequate pumping rate to the adjacent Smith Slough tidal channel for a 100-year storm.

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[1]Treadwell & Rollo, pp. 11-12.

[2]Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same materials, as determined by the ASTM D1557-91 laboratory compaction procedure. Treadwell & Rollo.

[3]BKF Engineers et al., pp. 15-16.

According to the project engineers,[1] the existing 18-inch diameter outfall structure into the tidal channel has adequate capacity to accommodate the anticipated runoff from the site. As project design is refined, project engineers would complete a detailed drainage report that would establish drainage facility layout, facility sizes, and water quality protection measures to a specification level of detail, all subject to City of Redwood City approval.

The new drainage system would be constructed in accordance with the City's Engineering Design Criteria, Volume III, Part V, and Part IX, Section C. Specific designs for erosion control and water quality protection and treatment measures, typically included in the project *Stormwater Pollution Prevention Plan* (SWPPP), have not yet been formulated by the applicant; however, the applicant has preliminarily identified erosion and sediment control devices such as fiber rolls, settlement ponds, and catch basin inserts as applicable to the project. Submittal of a RWQCB-mandated SWPPP would be required with the project Notice of Intent (NOI) to discharge stormwater directly to the tidal channel; the SWPPP must be filed with the RWQCB prior to permitting of project construction (see section 9.2.2[f] herein).

9.3.3 Project Hydrologic Impacts

Site Peak-Flow Rate Impacts. Peak-flow increases as a result of the proposed project would not affect any off-site, downstream hydraulic structures due to the direct discharge of site stormwater runoff into the Smith Slough tidal channel. Accordingly, the project would not affect the existing City stormwater pump station at the intersection of Bair Island Road and East Bayshore Road. Moreover, the impact of increased site peak-flow rates on flooding characteristics along the Smith Slough tidal channel, Smith Slough, and Redwood Creek would be ***less-than-significant*** due to the controlling influence of the tide on the floodwater surface profile, and the minimal degree of change between existing and post-project peak flow runoff rates.

(a) Explanation. The applicant's preliminary, conceptual plans for project stormwater drainage indicate that the site would be drained by upgraded and new storm drain facilities. The upgraded facilities would still convey on-site stormwater runoff directly to the Smith Slough tidal channel.

Impervious surfaces (i.e., buildings and pavement) currently cover approximately 80 percent of the project site. The remaining approximately 20 percent of existing pervious area includes landscaping along the site's northern and southern boundaries, and less than one acre of exposed ground at the northeast corner of the site. The proposed project conceptual landscape plan (see Figure 3.5 in chapter 3, Project Description, herein) indicates an increase in the project site impervious (buildings and hardscape) areas. A series of new pervious areas (e.g., play lawns, a "bio-basin," etc.) would result in a total pervious area of roughly 10 percent of the site, and a corresponding increase in post-project impervious area. The associated increase in

[1] Ibid., pp. 6 and 16.

peak-flow discharge rates into the adjacent drainage system is not expected to be significant. In any event, regardless of any potential for increased peak-flow rates, no downstream, off-site hydraulic structures would be measurably affected by the change in site stormwater runoff. Moreover, since the receiving waters are tidal, the discharges would not affect upstream flood elevations, which are controlled by the elevation of the extant Bay tide. Therefore, project peak stormwater runoff impacts and associated effects on the existing local, stormwater drainage system would be ***less-than-significant***.

Mitigation. No significant project impact on peak stormwater runoff or on the local, off-site stormwater drainage system has been identified; no mitigation is necessary.

Project Effects on Groundwater Recharge. The description of existing site conditions (subsection 9.1.4) notes that the on-site surface fill layer is comprised of clayey sediments with thin sand and gravel lenses. This fill layer is underlain by incompressible Bay mud, which acts as an impermeable boundary to the vertical progression of infiltrating groundwater. The nominal thickness of the fill layer and its proximity to the higher salinity tidal waters of Redwood Creek and Smith Slough make its utility for groundwater supplies or other uses marginal. The loss of groundwater recharge due to any increase in project impervious surface area would therefore result in a ***less-than-significant*** impact on groundwater supplies.

Mitigation. No significant impact has been identified; no mitigation is required.

Impact 9-1: Potential Flooding Impacts. Preliminary plans indicate that the project would fill the site to a finished grade elevation of 108.0 feet Redwood City Datum (RCD). As noted in subsection 9.1.1(f) herein (Sea Level Rise), an increase in sea level of 0.85 feet by the year 2036 has been predicted, resulting in a potential "highest estimated tide" elevation in the project vicinity of 108.10 feet RCD. Based on the project geotechnical engineers' estimates of on-site settlement (ranging from approximately 1.75 to approximately 4.25 inches, or 0.15 to 0.35 feet, across the site),[1] the 108.0-foot RCD finished grade indicated on project preliminary plans would potentially settle over time to an elevation ranging from 107.65 to 107.85 feet RCD. This would be below the computed "highest estimated tide" elevation in the project vicinity of 108.10 feet RCD. This apparent discrepancy between the finished grade elevation indicated on project preliminary plans and the projected vicinity "highest estimated tide" elevation represents a ***potentially significant impact*** (see criteria 6 and 7 in subsection 9.3.1, "Significance Criteria," above).

[1]Treadwell & Rollo, pp. 5-8.

Mitigation 9-1. To the satisfaction of the City Engineer, incorporate adequate allowances for anticipated sea level rise and on-site settlement in the project final grading plan and associated finished grade specifications.

If installation of a protective levee and wall around the project site is ultimately selected as an alternative to raising the finished grade in order to protect the project from a 100-year flood, the levee system would require studies to address system design, embankment and foundation stability, sea level rise, on-site settlement, interior drainage, and operation and maintenance plans, all of which would be subject to approval by the City of Redwood City.

Implementation of these measures would reduce potential project flooding impacts to a ***less-than-significant level***.

After mitigation, the project site still would be listed as being located within a FEMA Flood Hazard Zone A until a Letter of Map Revision is issued by FEMA. This FEMA process includes two steps: (1) a Conditional Letter of Map Revision (CLOMR), and (2) a Letter of Map Revision (LOMR). Based on the flood mitigation proposed, the project applicant would be required to complete a CLOMR application with a description of how the project would be removed from the floodplain. FEMA would review the application and provide comments. If FEMA were to approve the proposed flood protection system, it would issue a CLOMR; FEMA would issue a LOMR after certification of actual construction of the flood protection system.

9.3.4 Project Water Quality Impacts

Impact 9-2: Temporary Soil Erosion Increase and Sedimentation Impacts During Project Construction. Project grading, filling, and removal of vegetative cover could cause disturbance of watershed lands and would expose large areas of bared soil surface to erosion with the potential for attendant sedimentation in the adjacent Smith Slough tidal channel, Smith Slough, and Redwood Creek. This is considered a ***potentially significant impact*** (see criteria 1, 2, 5, and 7 in subsection 9.3.1, "Significance Criteria," above).

Site grading, topographic modifications (e.g., filling), and building construction would extend over most of the site. Graded areas not immediately paved or occupied by buildings would temporarily expose soil surfaces to rain impact and erosion via overland runoff. Such construction period erosion could convey sediments downslope to storm drain inlets or directly to the Smith Slough tidal channel. Sedimentation in the adjacent waterway could increase short-term turbidity levels, water temperature, and biotic productivity. Sedimentation could also reduce floodwater conveyance at low tides and hasten the need for channel dredging.

Mitigation 9-2. In accordance with National Pollution Discharge Elimination System (NPDES) regulations, file a Notice of Intent with the State Water Resources Control Board (SWRCB), Division of Water Quality. Include with the filing a description of erosion control and stormwater treatment measures to be implemented during (including *Start at the Source* measures) and following project construction, as well as a schedule for monitoring of performance. These measures are referred to as Best Management Practices (BMPs) for the control of point and non-point source pollutants in stormwater and constitute the *Stormwater Pollution Prevention Plan* (SWPPP).

Project grading shall not commence (no grading permit will be issued by the City) until an NPDES permit is issued, demonstrating that project erosion control and stormwater treatment measures, including the project SWPPP, meet SWRCB requirements.

Fully implement the erosion control and other water quality measures cited in the SWPPP and monitor these measures during the SWPPP-specified time period following completion of project construction. The RWQCB would be responsible for inspecting these measures, typically on an annual basis, while the sponsor would be responsible for implementing any remedial measures if the Board indicated that site stormwater quality objectives were not being met. (The City Engineering Division would also be responsible for post-construction inspection of all water quality mitigation measures that would eventually become part of the maintained infrastructure of the project, including source control and water quality treatment measures.)

Implementation of these measures would reduce the construction-related soil erosion and sedimentation impacts to a ***less-than-significant level***.

(a) Range of Possible Measures. BMPs for control of pollutant sources during construction and for on-site treatment of project stormwater are described in the California Storm Water Best Management Practice Handbook for Construction Activity.[1] Contaminant source control measures affecting new and redevelopment projects are required to minimize impervious surface areas and increases in site runoff, and decrease opportunities for contaminant migration. Prospective design measures to achieve these objectives are outlined in the Bay Area Stormwater Management Agencies Association (BASMAA) publication *Start at the Source--Design Guidance Manual for Stormwater Quality Protection.* Practicable source control measures are described below in more detail under *Mitigation 9-3.*

Implementation of *Mitigation 9-2* would reduce project impacts on erosion and downstream

[1]California Storm Water Best Management Practice Handbook for Construction Activity, Stormwater Quality Task Force, 1993.

sedimentation and beneficial uses in receiving waters to a *less-than-significant level*. The measures also would ensure incorporation of the best practical measures for site erosion control and enhance the project's eventual prospects for permitting by the RWQCB.

(b) Mitigation Implementation Responsibility and Monitoring. The project applicant and civil engineering consultant(s) would be responsible for incorporating *Start at the Source* stormwater control measures prior to review by the City Engineer. The sponsor also would be responsible for filing a Notice of Intent with the State Water Resources Control Board to obtain an NPDES General Permit. The Redwood City Community Development Department Engineering Division would be responsible for confirming that the applicant had filed the Notice of Intent and for reviewing the SWPPP approved by the state. The project shall be required to fully implement the erosion control and other water quality measures cited in the SWPPP and to monitor these measures during a specified period following completion of project construction. The RWQCB would be responsible for inspecting these measures, typically on an annual basis, while the sponsor would be responsible for implementing any remedial measures if the Board indicated that site stormwater quality objectives were not being met. The City Engineering Division would also be responsible for post-construction inspection of all measures that would eventually become part of the maintained infrastructure of the project, including source control and water quality treatment measures.

Impact 9-3: Increased Stormwater Contaminant Loading--Potential Violation of Water Quality Standards. The project will replace an existing urban use (the 12-screen cinema complex) with a new urban use (residential/retail complex). Presumedly, measures to minimize stormwater contaminant loading from the extensive existing cinema parking area and from the limited existing cinema landscaped areas were incorporated into the previous development (1990). The proposed new high-density residential/retail project would include longer parking durations, more landscaped area, and increased use of fertilizers, pesticides and herbicides. As a result, the project could result in incremental increases in the stormwater contaminant loading for some heavy metals, as well as possible increases in oil and grease and fertilizer/pesticide/herbicide residues. The incremental contaminant increase could further impair the already impaired quality of stormwater discharged to the Smith Slough tidal channel. This possible project effect is considered a ***potentially significant impact*** (see criteria 1, 4, 5, and 7 in subsection 9.3.1, "Significance Criteria," above).

A cursory water quality assessment for existing land use conditions in the Redwood Creek watershed, including a review of water quality data obtained by the Regional Monitoring Project (RMP) of the San Francisco Estuary Institute, was recently performed for the nearby Marina Shores Village Project Draft EIR (February 2003). Based on the reported RMP data and water quality data compiled by BASMAA for other Bay Area counties, the assessment concluded that existing stormwater quality in the Redwood Creek estuarine system is likely

impaired. The BASMAA compilation of water quality data indicated that Bay Area watersheds with 70 percent or more urbanization experience periodic water quality impairment. The impaired status indicates that water quality objectives published by the USEPA and the RWQCB for national waterways and for San Francisco Bay are occasionally to frequently violated in the project's South Bay location. Thus, the additional loading of urban contaminants that would occur due to project development would potentially increase the frequency and/or severity of contaminant loading.

While some heavy metal contaminants can be transported in dissolved form, most are conveyed in particulate form. Metals also can be adsorbed onto sediment particles which become entrained in stormwater runoff. Thus, on-site control or treatment of particulate-laden runoff is critical in minimizing the contaminant loading of stormwaters discharging from the project site.

Ornamental landscaping in the vicinity of buildings and parking lots normally is maintained with significant amounts of irrigation water and chemical inputs (such as fertilizer, herbicides, and pesticides). Over-watering of chemically maintained turf and shrubs could result in transport of chemical residues in surface runoff that can reach the adjacent Smith Slough tidal channel, especially through the force main that discharges to the tidal channel. While no ready means is available for quantifying the potential for this migration of contaminants, the effect on the receiving waters in the Smith Slough tidal channel could be locally significant.

Mitigation 9-3. Incorporate the following site-appropriate Best Management Practices (BMPs), or their equivalents, into the project stormwater drainage system design and *Stormwater Pollution Prevention Plan* (SWPPP) in order to comply with the requirements of the NPDES General Permit and anticipated imminent updating of the Municipal Stormwater Permit for Redwood City:

- Integrate start-at-the-source measures for stormwater control and treatment into the project stormwater drainage design. Such measures could include pervious parking lots, infiltration basins, vegetated (grass) swales ("bioswales"), or other measures designed to minimize stormwater runoff (through maximization of local infiltration and detention storage), settle out fine sediments, and filter contaminants. Oil/grease traps, sand filters, or similar in-line filtration systems for storm drain systems should also be considered. Such traps, filters, or separators must be accompanied by a clean out/maintenance program that ensures acceptable trap efficiencies, specifies appropriate disposal procedures, and reduces the risk that the traps become sinks for pollutants.

- Institute a regular schedule of street and parking lot sweeping. The frequency of cleaning shall be higher (twice monthly) during the winter rainy season, yet maintained year-round. Regular cleaning of paved surfaces reduce the “first flush” phenomenon wherein the highest concentration of contaminants are flushed off the surfaces during the early portion of a runoff event. Cleaning practices may have to be modified if porous pavement systems are employed.

- Where bioswales are incorporated in site development plans to convey stormwater from paved surfaces to the adjacent Smith Slough tidal channel, implement design guidelines described in *Start at the Source: Design Guidance for Stormwater Quality Protection*, including the following:

  - Swale lengths should be a minimum of 100 feet to provide effective filtering; and

  - If swale slopes exceed two percent, check structures should be installed at appropriate intervals along the length of the swale to slow flow velocities and to increase infiltration opportunities.

- Revegetate all disturbed areas at the onset (October) of the first winter rainy season following the completion of construction, and at a similar time during the next one to two years as required to fully revegetate the site. Use of an erosion control grass and forb mixture, favoring native species, is best suited to this task.

(continued)

Mitigation 9-3 (continued):

In addition, install biodegradable surface erosion protection (e.g., natural mulch, jute netting, erosion control blankets, punched straw) to reduce the erosive energy of incoming raindrops for at least the first winter season following construction. If project construction spans two consecutive winter seasons, these erosion protection measures shall be implemented at the beginning of each winter season, unless there is successful establishment of vegetal cover after the first year.

- Install silt fencing along the construction perimeter prior to the start of construction, and keep the fencing in-place until construction is completed and erosion-control winterization measures are implemented.

- Prepare and implement an irrigation scheduling and chemical management plan governing the application of irrigation water and chemical amendments to landscaped areas adjacent to buildings and within or adjacent to parking lot facilities. Components of such a plan likely would include an irrigation schedule linked to soil moisture levels or related variables (such as temperature, humidity, and wind speed). Specific chemical inputs proposed for application to vegetation shall be among those tested and cleared by the USEPA. Frequency and scheduling of these chemical inputs also shall be indicated based on site-specific characteristics (such as soil and vegetative cover and rates of uptake) and the acknowledged sensitivity of downstream receiving waters.

Also, incorporate into the project storm drainage plan and/or SWPPP any additional measures required to comply with the new C.3 regulations adopted as part of the San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP).

Implementation of these measures would reduce the water quality impacts of the proposed project to a ***less-than-significant level***.

Since the objective of erosion control and water quality treatment measures is to reduce contaminant loading to the extent practicable with implementation of the best available technologies, the BMPs recommended above are not fixed. Other measures could be applied as long as the applicant can demonstrate that those measures can provide equivalent levels of reduction in contaminant loading. Given the proposed extent of fill, integration of bioswales into the project storm drainage system design is strongly encouraged for the project.

Impacts of Fill Materials Within U.S. Army Corps of Engineers (Corps) and EPA Jurisdiction. As discussed previously in subsection 9.2.2(a), the Corps and EPA regulate the

discharge of fill material to Waters of the United States, which include the Smith Slough tidal channel adjacent to the project site. The project does not propose adding any fill to the tidal channel nor to any area beyond the existing property boundaries.

Nevertheless, the Corps, in its response to the Notice of Preparation/Initial Study for the proposed project, included an application for Corps authorization, anticipating that an Individual Department of Army Fill Permit might be required for the project. Although the requirement for a Corps permit is not anticipated, the project applicant will prepare the application and abide by any conditions on the project imposed by the Corps within its jurisdiction. This process would ensure that any potential water quality impacts associated with fill materials within Corps and EPA jurisdiction would be ***less-than-significant.***

Mitigation. No significant impact has been identified; no mitigation is required.