9. HYDROLOGY AND WATER QUALITY

This EIR chapter describes existing conditions and potential project impacts associated with hydrology and water quality, including anticipated changes in local, estuarine, intertidal, and subtidal drainage systems resulting from the proposed marina reconfigurations and associated dredging and fill activities, 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 Redwood Creek tidal 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 46.45-acre project site is comprised of filled tidal lands and open water along the west bank of Redwood Creek, roughly 2.5 miles upstream of its confluence with South San Francisco Bay (see previous Figure 3.1). The site is bounded on the north by Smith Slough and Middle Bair Island, on the south by Redwood Creek and U.S. 101, on the east by Redwood Creek and a remnant salt evaporator, and on the west by Smith Slough, Inner Bair Island, multi-family residential development, and commercial development.

The majority of the existing tidal reach of Redwood Creek is currently maintained as a deepwater shipping channel serving the Port of Redwood City. Design depths at the Port facilities, located north of the site, approach 30 feet (elevation = -33.9 feet National Geodetic Vertical Datum [NGVD] or 66.1 feet Redwood City Datum [RCD]), with maintenance dredging occurring roughly every three years. The dredged reach extends from the Redwood City Yacht Harbor, located immediately south of the Port facilities, to the deepwater shipping channel in San Francisco Bay, a distance of 3.5 miles.

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. These sloughs include Steinberger Slough, which borders Bair Island to the west; Smith Slough, which separates Inner and Middle Bair Islands; 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 conditions for the *Bair Island Restoration and Management Plan*. 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. Portions of Outer Bair Island 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. Bair Island is currently administered by the U.S. Fish and Wildlife Service as part of the Don Edwards San Francisco Bay Wildlife Refuge. As of June 2002, an *Administrative Draft 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).

(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 and commercial, except for portions of Bair Island that drain toward the mouth of Redwood Creek. These undeveloped lands comprise 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 also increases during periods of elevated river discharge. Since the lower reach of Redwood Creek is tidal, its hydraulic cross-section forms in response to watershed runoff and base flow (i.e., the low flow that is generated by groundwater and spring discharge in the watershed), circulating tidal waters from South San Francisco Bay, and the transport of 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] *Mean Annual Precipitation and Precipitation Depth-Duration-Frequency Data for the San Francisco Bay Region, CA*, U.S. Geological Survey Basic Data Contribution 32, Rantz S.E., 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 cited 100-year base flood elevation of 107.0 feet RCD has since been amended to

107.25 feet.[2] 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 east 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. Bair Island Road and the majority of the Peninsula Marina property, except for the open water berthing area, lies above the 100-year flood elevation and is outside the FEMA flood hazard boundary.[3]

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.[4] 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

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

[3]Ibid., July 23, 2002.

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

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 RCD to +101.63 feet RCD in 2036. Sea level rise at the Marina Shores Village 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 (HET) in the project vicinity produced a predicted 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.[5]

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 and commercial developments bordering Redwood Creek, and the eastern and western borrow ditches that form the southern border of Inner Bair Island, can also affect water quality in the project vicinity through the input of nutrients and degradation by-products derived 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.

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

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 sampling year include summary listings of trace elements that exceeded the California Toxics Rule (2000) 304(a) Criteria. For Redwood Creek, 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.[6]

(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.[7]

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

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

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

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 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 a siltation rate of approximately 0.08 feet per year (1.0 inch per year).[8] 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 Redwood City Port facilities are nearly a mile downstream of the on-site marinas, the siltation rates estimated for that reach of Redwood Creek are likely slightly higher than those along the project reach. This is due to a reduction in the suspended sediment loading in the incoming tidal waters, as sediment is deposited downstream of the site. Thus, the rate of siltation in the on-site marinas is likely quite low. This contention is supported by the low frequency of required dredging in the existing marinas.

If the rate of sea level rise is held constant, changes to the tidal prism normally occur in response to Bay fill (decrease) or dredging or induced scouring of tidal channels (increase). For example, large-scale reintroduction of tidal action within historically leveed and subsided lands adjacent to a tidal channel network can induce significant channel scouring and cross-section enlargement. This process reverses somewhat over time as progressive siltation within the flooded areas diminishes the depth and volume of actively circulating tidal waters. Siltation rates will eventually reach a reduced, steady state once a tidal drainage network is established and a quasi-equilibrium is reached between tidal sediment supply and the tidal prism. Both of these variables adjust gradually with the increase in sea level.

9.1.4 Project Site Hydrology

(a) General. The project site consists of two discontiguous parcels, currently occupied by Peninsula Marina (33.24 acres) and Pete's Harbor (13.21 acres). Existing land elevations on the parcels range from +5.0 feet to +10.0 feet NGVD. Access to both parcels is via Bair Island Road/Uccelli Boulevard or via Redwood Creek. The Peninsula Marina's 427 offstream boat berths were removed in November 2001. However, the full complement of berthing facilities at Pete's Harbor, including 147 berths in the "outer harbor" (i.e., on Smith Slough), remain.

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

The peninsula upon which Peninsula Marina and Pete's Harbor are built was filled in stages, with Pete's Harbor dredged (marina) and filled (parking lots) over two decades from the early 1960s through the mid-1980s. The 1973 revised USGS 7.5-minute topographic maps for the Redwood Point and Palo Alto quadrangles indicated that the Peninsula Marina site had been filled; however, the marina was not shown on the map. According to aerial photo evidence, the marina dredging and construction took place sometime between 1975 and 1979.[9]

The approximately 33.24-acre Peninsula Marina property currently includes an open water area of approximately 14.10 acres. The Pete's Harbor property currently includes approximately 2.90 acres of open water marina (inner harbor). Outer Pete's Harbor is not presently included in the development application. That harbor occupies roughly 30 to 40 percent of the slough cross-section along the southernmost 600 to 800 feet of Smith Slough, just upgradient from its confluence with Redwood Creek.

[9]Mark Peppercorn, Glenborough-Pauls, LLC, personal communication, May 2002.

Soils on the project site consist of 5.0 to 9.5 feet of sandy and clayey fill overlying 15 to 22 feet of weak, compressible marine clay (i.e., Bay mud), except at the south end of the site where the Bay mud layer thins to approximately 8 feet.[10] Borehole investigations conducted in May 2001 indicated groundwater depths ranging from 3.0 to 6.5 feet below the local ground surface.

(b) Groundwater. The tidal condition of the adjacent 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. Due to the presence of nearly impervious Bay mud and the tidal zone beneath and adjacent to the project parcels, 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 some ornamental landscaping around the perimeter of the commercial buildings, the Uccelli residence, the fill slope flanking the east side of Bair Island Road, and a narrow band of salt marsh vegetation (e.g., pickleweed and salt grass) along the west bank of Redwood Creek.

(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 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

[10] Treadwell and Rollo. *Preliminary Geotechnical Investigation, Bair Island Road Project* (Project No. 3147.01), June 21, 2001.

(1) Peninsula Marina. According to the project applicant's engineers and the hydraulic flushing study conducted for both site marinas, existing water depths in Peninsula Marina average -8.0 feet NGVD.[11] No records on historical dredging are available for the Peninsula Marina property.[12]

(2) Inner Pete's Harbor. At Inner Pete's Harbor, dredged elevations range from -10.2 to -11.2 feet NGVD at the mouth of the marina to -6.2 to -7.2 feet NGVD in the body of the marina. The last maintenance dredging undertaken at Pete's Inner Harbor was approximately ten years ago and was limited to the marina mouth. This dredged elevation allows boat access to Redwood Creek at all but the lowest tides.

(3) Outer Pete's Harbor. No dredging has been required to maintain navigable conditions in the outer harbor, due to natural scouring along Smith Slough.[13]

(e) Stormwater Drainage. Existing project site stormwater runoff characteristics are as follows:

(1) Local Pump Station. The Bair Island Road system conveys runoff generated over the roadway and parcels flanking it on the north to a 6,400 gallon-per-minute (gpm) stormwater pumping station that is maintained by the City. The pumping station is located immediately south of the junction of Bair Island Road and East Bayshore Road.

(2) Peninsula Marina Property. Stormwater runoff from the Peninsula Marina property discharges to Redwood Creek, either directly via overland flow or by the storm drain system serving the existing commercial complex and parking area. Review of storm drain plat maps on file with the City Department of Public Works confirmed that the storm drain system on the Peninsula Marina property has no link with the Bair Island Road storm drain system.

(3) Pete's Harbor Property. Field observations indicated that all runoff from the Pete's Harbor property flows overland and discharges directly into either the inner harbor, Smith Slough, or Redwood Creek, with no link with the Bair Island Road storm drainage system.

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[11]Moffat & Nichol Engineers. *Hydraulic Flushing Study, Redwood City--Marina Shores Village Development* (M&N File No. 02003), March 29, 2002.

[12]Peppercorn.

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

(f) On-Site Water Quality Factors. Water quality data for the immediate project vicinity, including Redwood Creek and the on-site marinas, 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 the Bay Conservation and Development Commission (BCDC) as a problem area for high fecal coliform contamination derived from these affiliated water-oriented uses. 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 immediately east of the project site.

(2) Peninsula Marina Property Water Quality Factors. The prior owners of Peninsula Marina did not transfer any documentation of water quality to the current applicant.[14] It is not known whether Peninsula Marina offered on-site sewage pumpout services.

Stormwater runoff from the property is currently discharged directly to Redwood Creek via one of two routes: overland flow or the storm drain system. The bulk of the southern quarter of the Peninsula Marina property is relatively flat, and once local depression storage is satisfied, runoff moves overland to the west bank of Redwood Creek. Minimal filtering of contaminants occurs over this route, due to the predominately compacted, unvegetated condition of the land surface. The remainder of the property is impervious (e.g., buildings and parking lots). The area immediately adjacent to the marina drains overland to the marina, while the bulk of the parking lot areas serving the commercial/office complex drains to a local storm drain system and into Redwood Creek. As with the overland on-site runoff, there are currently no opportunities for trapping or filtering of contaminants conveyed in storm drains to Redwood Creek.

(3) Pete's Harbor Property Water Quality Factors. Pete's Harbor does not maintain records on harbor water quality. However, property owner Mr. Uccelli recalls that either the San Francisco Estuary Institute's Regional Monitoring Program or the RWQCB sampled harbor waters sometime during the 1990s. A sewage pumpout vessel is made available to paying customers at Pete's Harbor upon request. According to Mr. Uccelli, the discretionary service is neglected by some of his tenants/customers.[15]

[14]Peppercorn.

[15]Uccelli.

Aside from a restaurant, harbor offices, and the small Uccelli residence, Pete's Harbor is largely a parking lot. In addition to cars and trucks, several RVs were observed in apparently quasi-permanent occupancy in the marina parking lot. All surface runoff is conveyed over lot surfaces to either Redwood Creek, the inner harbor, or Smith Slough. Along the eastern edge of the harbor parking area, portions of the lot are surfaced in gravel. Elsewhere, the surface is asphalt that slopes toward the adjoining water bodies. As with the Peninsula Marina property, there is currently no filtering of contaminant-laden site runoff prior to its discharge to the receiving waterways.

9.2 PERTINENT PLANS AND POLICIES

9.2.1 Redwood City Plans and Policies

The adopted 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 wetlands and Waters of the United States. 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. Section 404(b)(1) Guidelines limit the Corps to permit only the "least environmentally damaging practicable alternative" and to incorporate all available, practicable measures to avoid and minimize impacts to aquatic habitat. 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."

The Corps also has permitting authority over navigable waters under Section 10 of the Rivers and Harbors Act of 1899. Navigable waters are defined as those waters that are subject to the ebb and flow of the tide and/or are presently, formerly, or may be used in the future to transport interstate or foreign commerce. Activities covered by the Act include construction of instream or other infringing structures (e.g., piers, revetments, breakwaters), or discharge of fill into navigable waterways. Both Redwood Creek and the on-site marinas would likely be classified as navigable waters under provisions of Section 10.

(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. 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. The Agreement stipulates reasonable and practicable measures for protection of instream and riparian habitat, including measures to limit construction impacts on site erosion and stream sedimentation and other potentially adverse effects on fish and wildlife resources. 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.

(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.[16] After several revisions and an extensive public hearing process, the current Basin Plan was adopted in 1995 (1995 Basin Plan).

(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.

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

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

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 was not evaluated in the 1995 Basin Plan; Lower Redwood Creek would expectedly share some of the beneficial uses cited for South San Francisco Bay.

resources and funding priorities. Thus, the absence of 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.

(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 five acres or more must obtain an NPDES permit. NPDES jurisdiction over the Marina Shores Village 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 can not 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.

(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 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.[17] 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.

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

In the Marina Shores Village project vicinity, Smith Slough would represent the southernmost boundary of BCDC's Bay jurisdiction. However, the shoreline band would extend 100 feet inboard (south/east) of both the main stem and southerly arm of Smith Slough, as well as Uccelli Boulevard (Bair Island Road) (see Figure 8.1 in chapter 8, Biological Resources, of this EIR).[18]

(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 *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.[19] 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.[20] As described in the model policies, the RWQCB, which monitors compliance with NPDES requirements, is

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

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

[20]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.

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 incorporate continuous, long-term stormwater treatment measures.[21] Also, the STOPPP and the County's discharge permit are in the process of being amended. The amendments (the so-called "C.3" requirements) will require on-site treatment and storage of stormwater runoff.

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

(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. Due to the evolving regulatory environment, the SMDCP has to date not been adopted as the City's formal stormwater ordinance.[22]

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 significant alterations would occur in the characteristics of tidal drainage within Redwood Creek and the major sloughs bordering the Inner, Middle, and Outer units of Bair Island. Among these anticipated altered conditions are a substantial short- to mid-term increase in post-restoration tidal prism volumes in the main sloughs. With the projected increases in tidal prism, the slough channels would scour and increase their cross-sectional areas. The greatest effect would occur during the first few years following the re-introduction of tidal action to the currently inactive salt evaporators. Over a period of 10 to 15 years, these areas will accrete due to tidal sedimentation and the gradual establishment of marsh plants, particularly cordgrass, which slows local ebb velocities and encourages the settling of clay flocs. As the marsh plain elevations rise with sedimentation, the active tidal prism will decrease, until a hydraulic equilibrium is reached for the evolved tidal drainage system.

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 project site;

[22]Phong Du, Senior Civil Engineer, City of Redwood City Engineering and Construction Department, personal communication, May 2002.

(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.

One potentially detrimental side effect noted by the restoration designers/modelers would be a potentially radical increase in tidal velocities in Smith Slough, especially during elevated spring tides. These elevated flow velocities could destabilize boat berths at Pete's Outer Harbor. At the very least, the changed tidal flows would be expected to make boating conditions hazardous during the early stages of each of the tidal recessions in the diurnal tidal cycle.

9.3 IMPACTS AND MITIGATION MEASURES

Comment: new tab grid for indented text underneath boxes--(just the old one with 1.167 added)

This section identifies and describes the potential hydrology and water quality impacts and related mitigation measures associated with the project.

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:[23]

(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;

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

(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 adopted by the City of Redwood City for the purpose of avoiding or mitigating an adverse effect on drainage or water quality.

9.3.2 Proposed Project Grading, Filling, and Drainage Characteristics

(a) Proposed Project Grading and Filling. Project implementation would result in the filling of both the existing non-marina areas and portions of Peninsula Marina and Inner Pete's Harbor to an elevation of roughly 10 feet NGVD. Land uses for the proposed project would include marina, high-density residential, commercial/office, and restaurant-retail.

(1) Peninsula Marina Property. The current approximately 14.10-acre Peninsula Marina property water area would be reduced to a post-project open water area of approximately 3.80 acres, supporting an estimated 50 to 60 boating slips (versus the 427 slips that were removed in November 2001). To increase tidal circulation and improve water quality within the marina, the project proposes to excavate a "flushing channel" extending south from the marina to Redwood Creek. According to preliminary design drawings developed by the applicant's civil engineers, the channel length and width are estimated at 450 feet and 40 feet, respectively. The channel would be dredged to the same depth as the existing marina, roughly -8.0 feet MLLW (-12.4 NGVD).

(2) Pete's Harbor Property. Under the proposed project, Inner Pete's Harbor would be similarly downsized from its present open water area of approximately 2.90 acres supporting 116 boat slips to approximately 1.66 acres of open water and 30 to 40 slips.

While the applicant holds an option on Outer Pete's Harbor and a small portion of Middle Bair Island immediately opposite the outer harbor, these areas are not proposed for development.

(3) Fill Approach. Filling of portions of both marinas would be preceded by the installation of permanent steel sheet piles to segregate the fill operations and the fill itself from the open marina/Bay waters. Once the sheet piles were in place, interior bulkhead walls would be constructed. The areas behind the bulkhead walls would then be dewatered and backfilled.

Fill material would be obtained from the flushing channel excavation. Imported engineered fill would comprise the upper four to five feet of material placed below the finished project grade. No dredging of the marinas is anticipated, although it is expected that if any dredging were required, the dredged material could be re-conditioned and used as fill material behind the bulkhead walls. No provisions are presented in the project description for sampling and testing of the excavated materials to determine contaminant levels. However, a memorandum and

supporting discussion regarding the fill operations prepared by the applicant's civil engineer[24] indicates that the project contractors would implement Best Management Practices (BMPs) to the extent required to minimize water quality impacts, if such measures are requested by the RWQCB. Such measures would likely be required to minimize the immediate local impact of sheet pile installation on turbidity levels in the marina waters.

(b) Proposed Project Drainage. Although no detailed design information is available at this planning phase regarding the handling of project stormwater runoff, preliminary plans indicate that the site's entire non-marina area would be drained to Redwood Creek or the downsized marinas via a new storm drain system tailored to the project street and parking configuration. The new system would be constructed in accordance with the City's Engineering Design Criteria, Volume III, Part V, and Part IX, Section C.[25] The existing disconnection between site drainage and the Bair Island Road storm drain system would be maintained. Specific erosion control or water quality protection and treatment measures, typically included in the project Stormwater Pollution Prevention Plan (SWPPP), have not yet been formulated by the applicant. Submittal of a RWQCB-mandated SWPPP would be required with the project Notice of Intent to discharge stormwater directly to the creek; the SWPPP must be filed with the RWQCB prior to permitting of project construction (see section 9.2[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 downstream hydraulic structures due to the direct discharge of site stormwater runoff into either the downsized marinas or the tidal reach of Redwood Creek. 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 Redwood Creek would be ***less-than-significant*** due to the controlling influence of the tide on the floodwater surface profile.

(a) Explanation. The applicant's preliminary, conceptual plan for project stormwater drainage indicates that all of the land areas on the site would be drained by new storm drain systems. A detailed assessment of pre- versus post-project peak flow rates was not supplied by the applicant for review in this EIR. However, the location of the project in the tidal zone of the

[24]Brian Kangas Foulk Engineers, and The Huffman-Broadway Group, Inc. *Discussion of Proposed Dredging Techniques and Sediment (Spoil) Quality*, April 1, 2002.

[25]BKF Engineers, "Marina Shores Village Storm Water System," written communication to Phong Du, City of Redwood City Senior Civil Engineer, December 26, 2002.

Redwood Creek watershed and the conveyance of on-site stormwater runoff directly to either Redwood Creek or Smith Slough negate the necessity for such an analysis.

Based on estimates derived by the applicant's civil engineers and verified by the EIR hydrologist, the post-project impervious surface area for the Peninsula Marina property would increase by approximately 65 percent. Similarly, the impervious surface area for the Pete's Harbor property would increase by approximately five percent. The bulk of the increases for both properties are linked to the downsizing of the marinas.

The resulting increase in post-project peak flow rates for the design 10- and 100-year rainstorms for the Peninsula Marina property would be less than the impervious surface area increase due to the compacted nature of the existing vacant area at the southern end of the site. In significant rainstorms with typically wet antecedent soil conditions, such compacted, fine-textured soils act much like pavement.

Increased peak flow rates notwithstanding, no downstream, off-site hydraulic structures would be affected by the site stormwater discharges from either of the parcels. 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 stormwater drainage system has been identified; no mitigation is necessary.

Project Effects on Groundwater Recharge. The description of existing site conditions noted that the non-open water areas of the site are filled with sandy and clayey sediments obtained by harbor dredging operations. This top layer of fill 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 make its utility for groundwater supplies or other uses marginal. Thus, the loss of groundwater recharge due to an increase in project impervious surface area would affect the quality of stormwater runoff, but its impact on groundwater supplies would be ***less-than-significant***.

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

Flooding Impacts. The project would fill the non-open water areas of the site as well as portions of Peninsula Marina and Inner Pete's Harbor open water areas to an elevation of 110 feet RCD. Chapter 41 of the Redwood City Municipal Code, *Floodplain Management*, requires

that floodplain developments raise pad elevations to a minimum of six inches above the FEMA 100-year flood elevation.[26] Based on the project applicant's geotechnical engineers' estimates of on-site settlement rates (three to four inches per foot of fill over 10 to 20 years),[27] the 110-foot RCD finished grade would potentially settle to an elevation of 108.3 foot RCD. This would slightly exceed the City standards for floodplain development (i.e., the freeboard during the 100-year flood would approach 1.1 feet), eliminating potentials for a significant flooding impact.

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

9.3.4 Project Water Quality Impacts

Long-Term Impact of the Proposed Marina Reconfiguration and Flushing Channel on Harbor Water Quality (i.e., on Tidal Water Circulation Rates). The proposed marina water area downsizing and flushing channel introduction would result in a decrease in the post-project rate of exchange of tidal waters (residence times) within the harbor areas, an associated increase in water circulation efficiency, and a corresponding increase (improvement) in water quality--i.e., a beneficial long-term water quality impact.

(a) Hydraulic Flushing Study. Potential concerns regarding the impact of marina downsizing on tidal water circulation rates and water quality in the reconfigured on-site harbors led the applicant to prepare a hydraulic flushing study of Peninsula Marina.[28] Both existing and proposed project conditions were simulated using a one-dimensional hydrodynamic circulation model and a coupled water quality model. The hydrodynamic model computes residence times for harbor waters. The residence time represents the rate of exchange of tidal waters within the harbor in response to the oscillating Bay tide. A higher residence time generally indicates that circulation is less efficient, which results in a corresponding decrease in water quality. The converse is normally true for lower residence times.

Two project scenarios were considered: (1) the proposed project with the proposed flushing channel and (2) the proposed project without the flushing channel. Model hydraulic input data was determined based on scaled aerial photos of the existing Peninsula Marina harbor and on the preliminary project design drawings prepared by the project applicant's civil engineer. A uniform bottom elevation of -8.0 feet NVGD was assumed for both the Peninsula Marina harbor

[26] Csicsman.

[27] Treadwell and Rollo.

[28] Moffat & Nichol Engineers, March 29, 2002.

and the proposed flushing channel, which is within the existing estimated range of bottom elevations at Inner Pete's Harbor.

The results of the model simulations indicated that the proposed Peninsula Marina reconfiguration with the flushing channel would reduce residence times near the marina entrance, in the mid-basin, and in the inner basin by 11 percent, 16 percent, and 21 percent, respectively, relative to existing marina conditions. Under both the existing and project conditions, the overall residence time for marina waters was relatively short, two to three tidal cycles.

For the alternate project condition (without the flushing channel), the computed residence times were determined to be three percent to five percent longer than the project with the flushing channel. Thus, even without the flushing channel construction, the residence times for harbor waters would be shorter with project construction than under the existing conditions. Also, the existing condition configuration included the presence of the former berthing facilities (427 slips), which have been eliminated. If the existing condition modeling had been conducted without the former vessel slips, the residence times for that condition would likely have been slightly shorter, effectively reducing the percentage of decrease cited in the study results. However, in the opinion of the EIR hydrologist, some decrease in the post-project residence times would still have been registered by the hydrodynamic and water quality models.

Mitigation. No significant long-term adverse harbor water quality impact (impact on tidal circulation rates) has been identified; no mitigation is required.

Impact 9-1: Temporary Soil Erosion Increase and Sedimentation Impacts During Project Construction. Project filling, grading, and removal of vegetative cover would cause disturbance of watershed lands and would expose large areas of bared soil surface to erosion with the potential for attendant downstream sedimentation in both the on-site marinas 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, and building construction would extend over most of the non-open water areas on-site. Graded areas not paved or occupied by buildings would expose soil surfaces to rain impact and erosion via overland runoff. Such erosion could convey sediments downslope to roadway gutters and storm drain inlets or directly to the marinas or Redwood Creek. Sedimentation in either of these waterways could increase short-term turbidity levels, water temperature, and biotic productivity, and reduce the available draft for boats. Sedimentation in Redwood Creek could also reduce floodwater conveyance at low tides and hasten the need for channel dredging.

Mitigation 9-1: In accordance with National Pollution Discharge Elimination System (NPDES) regulations, require the project applicant to file a Notice of Intent with the State Water Resources Control Board (SWRCB), Division of Water Quality. The filing shall include 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

(continued)

Mitigation 9-1 (continued):

commence (no grading permit shall 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. 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. 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.[29] 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 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 9-2.*

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

Implementation of *Mitigation 9-1* would reduce project impacts on erosion and downstream 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 9-2: Increased Stormwater Contaminant Loading--Potential Violation of Water Quality Standards. The proposed high-density residential/office, reconfigured marina development, and related landscaping on the project site would result in incremental increases in the stormwater contaminant loading for some heavy metals, as well as oil and grease and pesticide/herbicide residues. Project contaminant input could further impair the already impaired quality of stormwater discharged to Redwood Creek. 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).

The EIR hydrologist performed 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. 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 Redwood Creek 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 on-site marinas and Redwood Creek. While no ready means is available for quantifying the potential for this downstream migration of contaminants, the effect on the receiving waters in the marinas and Redwood Creek could be locally significant.

Mitigation 9-2. Apply the following site-appropriate Best Management Practices (BMPs) or their equivalents as part of the project Stormwater Pollution Prevention Plan (SWPPP), including measures required to comply with the proposed, new C.3 regulations to be adopted as part of the San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP), in order to comply with the requirements of the NPDES General Permit and 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

(continued)

Mitigation 9-2 (continued):

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 Redwood Creek or the marinas, 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. 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.

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

(a) Range of Possible Measures. 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 parking lot drainage design is strongly encouraged for the project.

Implementation of *Mitigation 9-2* would substantially minimize on-site and downstream water quality impacts, and would reduce the project impact to a less-than-significant level. The component measures contained therein would also represent the best available practical technology for addressing water quality impacts associated with urbanization.

(b) Mitigation Implementation Responsibility and Monitoring. The project applicant and civil engineering consultant(s) would be responsible for preparing the SWPPP and the NPDES Permit application. For further discussion of these requirements, see *Mitigation 9-1*.

Impact 9-3: Temporary Impacts from Proposed Flushing Channel Construction (Dredging) and Marina Filling Operations. Dredging of the flushing channel and the initial installation of sheet piling to facilitate partial filling of Peninsula Marina and Pete's Inner Harbor would disturb marina bottom sediments and would create temporary water quality impacts, resulting in a ***potentially significant impact*** (see criteria 1, 2, and 5 in subsection 9.3.1, "Significance Criteria," above).

The project would result in the dredged disturbance of bottom sediments in the two on-site marinas and on the former, submerged marsh plain along the proposed route of the flushing

channel. Dredging operations in the marinas and at the flushing channel inlet on Redwood Creek would cause temporary impacts to water quality, including increased turbidity and localized releases of trace elements (e.g., heavy metals, PCBs, pesticide-derived contaminants) that are potentially harmful to aquatic life. The impacts would be short-term, as the flushing channel would be formed using the same sheet pile/bulkhead system as the marina. The flushing channel would be opened to tidal action following the completion of marina filling operations.

Mitigation 9-3. Require the following mitigation measures to reduce water quality impacts associated with proposed project flushing channel dredging and marina filling operations:

- As a condition of project approval, require the applicant to apply to the U.S. Corps of Engineers (Corps) for an Individual Department of Army Fill Permit, and abide by any conditions imposed by the Corps and its sister agencies of the Dredged Materials Management Office (DMMO) pertaining to the disposal of dredged sediments.

- Contract with a water quality and sediment testing laboratory certified by the State of California to conduct an updated testing of marina and flushing channel sediments. Flushing channel sediments will have to be drawn as core logs during a pre-project, pre-excavation testing program. Results of the updated testing shall be submitted along with the Department of Army Permit application to the Corps, the Fill Permit from BCDC, and the 401 Water Quality Certification request to the RWQCB.

- Implement the dredging operations utilizing a suction dredge that minimally disturbs adjacent sediments (see *Mitigation 8-1* herein). Confer with the Corps to determine the appropriate method for the site conditions (e.g., sediment characteristics) and the least environmentally damaging method for sheet pile/bulkhead installation and worksite segregation from Bay waters.

Implementation of these measures would reduce the impacts of flushing channel dredging and marina filling operations to a ***less-than-significant level***.

(a) Permit Requirements. The DMMO is a joint program of the Corps, BCDC, RWQCB, EPA, and the State Lands Commission. The State Department of Fish and Game participates in an advisory capacity. The DMMO usually makes determinations regarding projects that propose Bay disposal of dredged sediments. While the proposed Marina

Shores Village project would involve on-site disposal rather than Bay or Pacific Ocean disposal, the RWQCB's contact for DMMO inquiries confirmed that the project applicant would follow the same Tier 1 Decision Process guidelines as prospective Bay/ocean spoil disposers.[30]

The permit application should include all historical and current lagoon (i.e., creek, slough, marina, etc.) water quality and sediment test results in addition to the detailed description of the scope and technologies proposed for both the marina sheet pile installations and the flushing channel dredging. Supplemental information should also include a sediment maintenance and monitoring plan for the marinas and the potentially affected reach of Redwood Creek. The plan shall specify techniques for annual monitoring and documentation of marina bathymetry and sedimentation rates, conditions governing future maintenance dredging, an evaluation of potential spoil disposal sites (both deep water and upland sites) and their regulatory acceptability, and a projection of costs using realistic projections of interest rates and timelines.

Implementation of *Mitigation 9-3* would reduce the temporary impacts of the initial and future lagoon and entrance channel dredging actions to a *less-than-significant level*. This level of performance would be ensured by City enforcement of the permit conditions issued by the Corps, BCDC, and RWQCB, and by regulatory follow-up.

(b) Mitigation Implementation Responsibility and Monitoring. The project applicant and civil engineering consultant(s) shall be responsible for preparing a dredging and spoil material disposal plan--including dredging and sheet pile/bulkhead installation techniques, water and sediment chemistry analyses, and tidal water quality protection measures--for the joint command entities of the DMMO. The applicant shall consult with the Corps and the RWQCB during the plan preparation process. The same entities shall also be responsible for preparing the appropriate permit applications and supplemental information requested by the regulatory agencies. The applicant and civil engineering consultant(s) shall be responsible for preparing and implementing the maintenance and monitoring program. The Corps and BCDC would be responsible for permit application review and issuance, and for consultation and follow-up inspections during the dredging and materials disposal process. The RWQCB would be responsible for review of any water or sediment chemistry data and feedback via the water quality certification process.

Impact 9-4: Project Impacts on Marina and Creek Sedimentation and Associated Creek/Bay Water Quality Impacts. Project implementation, including an approximately 11.54-acre reduction in marina open water area, would reduce the tidal prism (the water volume exchanged between higher high and lower low waters) which functions to scour tidal sediments from the marina entrances and

[30]Beth Christian, RWQCB--Oakland, personal communication, May 2002.

from the lower reaches of Redwood Creek. Consequently, rates of siltation within these water bodies would increase, although to an uncertain degree. Thus, future dredging and spoils disposal could be required at higher than existing frequencies, resulting in more frequent water quality disturbances and higher costs to the City. This constitutes a ***potentially significant impact*** (see criteria 1, 2, and 5 in subsection 9.3.1, "Significance Criteria," above).

(a) Tidal Prism Reduction. The project would reduce the effective tidal prism operating to maintain a self-scouring condition in the re-configured lagoon entrance channel. To a progressively lesser extent, the local reduction in the tidal prism would reduce this same self-scouring potential within lower Redwood Creek (downstream of the project site) and in San Francisco Bay. The reduction in tidal prism due to marina bulkhead construction and backfilling would only be partially offset by the increase in tidal prism associated with the flushing channel construction. Based on local tide characteristics and area estimates for the existing and downsized marinas, the EIR hydrologist has computed the post-project reduction in the on-site tidal prism at 95 acre-feet.

According to BCDC staff, the marina areas (i.e., Peninsula Marina and Inner Pete's Harbor) of the project site lie outside of its designated Bay jurisdiction; only the 100-foot-wide band of land inland from Smith Slough is under BCDC jurisdiction (see Figure 8.1 in chapter 8, Biological Resources, herein). Therefore, the agency would not deny a fill permit on the basis of lost tidal prism. However, the self-maintaining capacity of Redwood Creek upstream of BCDC jurisdiction (i.e., from Peninsula Marina to the Smith Slough confluence) could be reduced. The decreased tidal prism in the project vicinity could lead to an increase in siltation rates in the marina entrance channels and through the project reach of Redwood Creek. This could affect the frequency and long-term costs of dredging to the City within the project reach. Once the planned Bair Island tidal restoration is implemented, the self-scouring capacity of Redwood Creek downstream of the project reach will increase dramatically, regardless of whether or not the Marina Shores Village project is constructed as proposed.

(b) Habitat Reduction. The partial filling of the former and existing on-site marinas would also eliminate approximately 11.54 acres of open water habitat. For a more detailed discussion of the biological impacts associated with marina downsizing, see chapter 8, Biological Resources, of this EIR.

Mitigation 9-4. Require the following mitigation measures to reduce potential siltation impacts on the marina inlet channels and the project reach of Redwood Creek (extending to the Smith Slough confluence), corresponding dredging needs, and associated water quality impacts:

- Require the applicant to conduct additional hydraulic analyses to verify to the satisfaction of the City Engineer that the marina inlets will operate at close to a self-

scouring condition. If the analyses do not verify probable maintenance of such a condition, the project design shall be adjusted accordingly.

- Require the applicant to conduct additional analysis utilizing data on the hydraulic geometry of tidal marshes to determine the effect of a reduction in the Redwood Creek tidal prism on the channel geometry (e.g., depth, cross-sectional area) of Redwood Creek through the project reach. If the computations indicate loss of effective depths and channel cross-sections, the applicant shall determine the increased volume and frequency of dredging required to maintain navigability in Redwood Creek. The applicant and the City shall then negotiate to determine an equitable fee structure for project residents to compensate for the additional costs of channel maintenance.

Implementation of the above mitigation measures would reduce project impacts on siltation rates and dredging frequencies and costs to a ***less-than-significant level***.

(a) Mitigation Implementation Responsibility and Monitoring. The additional hydraulic analyses would be the responsibility of the applicant and civil engineering consultant(s). Engineers with the Redwood City Community Development Department, Engineering Division, or their consultants would be responsible for reviewing the hydraulic analyses and evaluating amendments to the project design, if required.