4.8 HYDROLOGY AND WATER QUALITY

This section discusses surface waters, groundwater resources, storm water collection and transmission, and flooding characteristics in the plan area. Key sources of information for this section include the San Francisco Bay Basin Water Quality Control Plan (Basin Plan) prepared by the San Francisco Bay Regional Water Quality Control Board (January 2007), the Urban Water Management Plan (UWMP) for the City of Redwood City (2005), and the Unified Stream Assessment in Seven Watersheds in San Mateo County, California by the San Mateo Countywide Water Pollution Prevention Program (August 2008), Kennedy/Jenks/Chilton Consulting Engineers Water, Sewer Storm Drainage Master Plan dated 1986, and Winzler & Kelly’s Bayfront Canal Improvement Project Design Development Alternative Analysis, dated December 2003.

4.8.1 ENVIRONMENTAL SETTING

Hydrologic Conditions

The regional climate of the plan area is typical of the San Francisco Bay Area and is characterized by dry, mild summers and moist, cool winters. Average annual precipitation in the plan area is about 20 inches. About 80 percent of local precipitation falls in the months of November through March. Over the last century for which precipitation records are available, annual precipitation has ranged from an historic low of 8.01 inches in 1976 to an historic high of 42.82 inches in 1983.1

Surface Waters

Figure 4.4-1 (in Section 4.4, Biological Resources) depicts surface water bodies in the plan area, which include Redwood and Cordilleras Creeks and their tributaries. Also shown are bay channels, including Westpoint Slough, Corkscrew Slough, northerly reaches of Redwood Creek, Smith Slough and Steinberger Slough, the Atherton Channel (Marsh Creek), and the Bay Front Canal.

The Redwood Creek system is the largest watershed in the plan area. The watershed, approximately 11.8 square miles in area, includes portions of Redwood City and the Town of Woodside, as well as lands in unincorporated San Mateo County. The major tributary of Redwood Creek within the plan area is known as Arroyo Ojo de Agua. Other branches include the Emerald Branch, the Stulsaft Branch, Kensington, and the Jefferson Branch. Redwood Creek originates in an area immediately west of I-280 and flows northerly towards San Francisco Bay.

Within the plan area, water flows from the upper Emerald Lake area and drains toward San Francisco Bay. Upstream portions of the Redwood Creek system have been dammed to form small lakes, including Lower and Upper Emerald Lakes. Although these lakes are manmade, they provide freshwater marsh habitat, discussed in more detail in Section 4.4, Biological Resources.

Within the upper hills of the Emerald Lake area are several creeks that are a mixture of natural, reinforced, and engineered channels. From Upper Emerald Lake, the water flows through Jefferson Branch and connects with the Stulsaft Branch. From here it continues to where it connects to the Emerald Branch, which originates from Lower Emerald Lake.

Arroyo Ojo de Agua, Redwood Creek’s major tributary, originates above Stulsaft Park in the Farm Hills neighborhood and flows about 4.3 miles northeasterly to its confluence with Redwood Creek near Red Morton Community Park in the Roosevelt neighborhood. Above Alameda de las Pulgas, the banks of Arroyo Ojo de Agua are mainly unmodified; downstream of this road, the banks of this arroyo are hardened or culverted.

The confluence of these creeks and channels flows to the downtown area where it is drains into two reinforced concrete box culverts that flow into the Bradford Pump Station. From the Bradford Pump Station the drainage is pumped within an earthen channel that crosses beneath U.S. 101.

From roughly U.S. 101 to the north, Redwood Creek flows within a channel into the San Francisco Bay. Between Bair Island and the Port of Redwood City, Redwood Creek widens to a small-craft navigable bay channel containing a mix of fresh water flowing from the creek and the salt water of San Francisco Bay.

At the northwestern boundary of the City, bordering the City of San Carlos, is Cordilleras Creek, a man-made waterway, which originates within the Pulgas Ridge Open Space District, north and west of the plan area. Cordilleras Creek flows along the west side of the Emerald Hills neighborhood, flowing easterly toward San Francisco Bay. Canyon, Arlington, and Centennial neighborhoods are within this drainage area. Cordilleras Creek eventually enters Smith Slough, at Bair Island.

The Atherton Channel (Marsh Creek) is located at the eastern edge of the City, bordering the City of Menlo Park and unincorporated areas of San Mateo County. The drainage from Friendly Acres neighborhood in the City along with neighboring communities of Menlo Park, Atherton, Woodside, and portions of unincorporated San Mateo County drains into the Bayfront Canal. The Bayfront Canal collects and discharges stormwater runoff into San Francisco Bay. Refer to the discussion under the heading “Stormwater System” for capacity and drainage information. Flooding in the low lying Friendly Acres area north of U.S. 101 is a common occurrence during heavy intense rainstorms.

Other surface waters in the plan area include bay channels and tidal waters. These include the northern reaches of Redwood Creek, West Point Slough, Corkscrew Slough, Smith Slough, Bay Slough, and Steinberger Slough. These channels are influenced by tidal fluctuations in the San Francisco Bay. Portions of these channels are deep enough to permit navigation by watercraft. Freshwater inflows to these channels include Redwood
and Cordilleras creeks within the plan area and Belmont Creek, Pulgas Creek, and Marsh Creek outside the plan area.

The Redwood Shores neighborhood includes the only lagoon within the plan area and it is used as a storm retention basin during the winter months. The lagoon is an artificial impoundment of water connected to Belmont, Steinberger, and Bay sloughs at six locations. Water levels in the lagoon are controlled during the summer and winter months via intake and discharge facilities to allow for water exchange with San Francisco Bay. The Redwood Shores lagoon is approximately 1.5 miles in length and is of variable widths (the greatest width is about 1,400 feet near its southwestern end).

Salt crystallization ponds are also located within the plan area. These controlled areas are periodically flooded with water from the San Francisco Bay. The pond water has been processed and then is allowed to crystallize into salt for harvest. Approximately 1,400 acres of salt ponds are present in the Bay Front area east of Seaport Boulevard, known as the Cargill Property.

**Other Hydrologic Features**

In addition to surface water bodies, the plan area includes a wide variety of other hydrologic features, some of which are unique vegetative or wildlife habitat areas. These include saltwater marshes, freshwater marshes, open or closed brackish water marshes, mudflats, sandflats, unvegetated seasonally ponded areas, vegetated shallows, estuarine wetlands, sloughs, wet meadows, playa lakes, natural ponds, vernal pools, dikes, baylands, seasonal wetlands, floodplains, and riparian woodlands. Please refer to **Section 4.4, Biological Resources**, for a discussion of these features.

**Groundwater**

Redwood City overlies the southern portion of the San Mateo Plain groundwater sub-basin of the Santa Clara Valley Groundwater Basin. The sub-basin is bounded at the base by relatively impermeable bedrock, by the foothills of the Santa Cruz Mountains to the west, and the bedrock outcrop of Coyote Point to the north. The San Mateo Plain sub-basin spans a 75 square mile area roughly from the City of San Mateo southerly to San Francisquito Creek, which forms the boundary between the cities of Menlo Park and Palo Alto. The Santa Cruz Mountains form the western boundary; the eastern boundary is San Francisco Bay. **Figure 4.8-1** depicts the extent of the San Mateo Plain groundwater sub-basin.

The sub-basin contains shallow and deep aquifer systems that are separated by a low-permeability clay aquitard.\(^2\) Areas near the foothills, where a clay aquitard is not present, are most likely recharge zones for the deeper alluvial aquifers that are present in the sub-basin. Closer to the Bay margins, the sub-basin is more clearly divided into the upper and lower aquifer systems. The majority of the groundwater production wells in the sub-basin appear to be completed in the deeper aquifer. The main sources of natural recharge to the

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\(^2\) An impermeable barrier.
local groundwater aquifers include infiltration of water along the streambeds in the upland areas (e.g., San Francisquito Creek, Cordilleras Creek, Redwood Creek, and Arroyo Ojo de Agua) and to a lesser extent, percolation of precipitation and return flows from applied irrigation water.\(^3\)

As noted in Section 4.15, Utilities, groundwater is not currently used as a source of municipal water supply in the plan area. However, certain residential, commercial and institutional properties in the plan area (including the Sequoia Union High School District, Pacific Shores, and the Former RMC Lonestar Cement Company) extract groundwater using private wells. Prior to the introduction of potable water from the San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy System in the mid-twentieth century, groundwater in and around the plan area was extensively extracted for domestic and irrigation use, causing appreciable drops in groundwater levels.\(^4\)

According to the Regional Water Quality Control Board (RWQCB), saltwater intrusion has occurred to groundwater within the San Mateo Plain sub-basin. The DWR found that groundwater quality in the sub-basin contains high concentrations of sodium; samples from wells in the area also found concentrations of nitrates/nitrogen in excess of maximum contaminant levels established by the California Department of Health Services and the United States Environmental Protection Agency.\(^5\)

**Stormwater System**

The Redwood City Public Works Services Department maintains, operates, and repairs Redwood City’s stormwater system. The stormwater system is comprised of 20 pump stations; 2,685 storm drain catch basins, inlets, and siphons; more than 100 miles of storm drain pipe; 82 open culverts; more than 10 miles of creeks, drain ditches, and canals; and 150 acres of storm retention basins in Redwood Shores.\(^6\) The stormwater drainage system is highly regulated as the stormwater eventually flows into the San Francisco Bay.\(^7\) The pump stations, catch basins, inlets, and creeks are cleaned and maintained on an annual basis before October 15 (typically the beginning of the rainy season, which extends to April 15).\(^8\)

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The Bayfront Canal serves as a major stormwater runoff collection and discharge feature. As the Bayfront Canal collects and discharges stormwater runoff from the City and neighboring communities, the current capacity of the Bayfront Canal is inadequate to handle the stormwater from of the drainage area it serves. Drainage from the Atherton Channel (Marsh Creek) is the largest contributor of stormwater runoff to the Bayfront Canal.

The sub-drainage basin at 5th Avenue and Hoover Street within the Friendly Acres neighborhood, one of the smallest sub-basins, lies at the lowest point in the entire drainage area of the Bayfront Canal. During heavy rains, the lack of capacity and topography contribute to stormwater backing up onto properties and streets in the canal basin, including areas south/west of U.S. 101. U.S. 101 actually acts as a barrier in keeping stormwater flows from reaching the San Francisco Bay.

Water Quality

Existing sources of pollutants discharging into surface waters of the plan area may include both point and nonpoint discharges. A point source is any discernible, confined, and discrete conveyance (e.g., a pipe discharge) of pollutants to a water body from such sources as industrial facilities or wastewater treatment plants. These discharges are subject to prohibitions by regulatory agencies, water quality requirements, periodic monitoring, annual reporting, and other requirements designed to protect the overall water quality of the creeks and eventually the San Francisco Bay.

Nonpoint pollutant source are sources that do not have a single, identifiable discharge point but are rather a combination of many sources. A nonpoint source can be stormwater runoff from land that contains, for example, petroleum from parking lots, pesticides from farming operations, or sediment from soil erosion. Pollutants in Redwood Creek eventually flow into the San Francisco Bay.

Water carried through the City’s water distribution system originates in the Sierra Nevada and is delivered from the SFPUC’s Hetch Hetchy system. The City, in coordination with the SFPUC, routinely monitors water quality within the water distribution system to ensure that water quality meets primary and secondary drinking water standards. The City has an approved bacteriological sample plan, dated August 2000, to allow for sampling stations located at key points within the water distribution system. The City also collects water samples for residual disinfectant materials, trihalomethanes, asbestos, lead, and copper, as well as testing for general color, odor, turbidity, and pH measurements. The City has not exceeded water quality action levels since 1993.

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10 Trihalomethanes are chemical compounds found in solvents or refrigerants. Trihalomethanes are also carcinogenic.
Flooding

The National Flood Insurance Program (NFIP) branch of the Federal Emergency Management Agency (FEMA) maintains maps of floodways and floodplains for the United States. FEMA maps these areas on Flood Insurance Rate Maps or FIRMs. A typical FIRM will show specific flood hazard areas, flood risk zones, and floodplains at a local level of detail. In some identified flood hazard zones, certain types of construction and/or uses are prohibited or are required to carry flood insurance. Cities and other jurisdictions use FIRMs to establish zoning districts, buffers, or other regulatory requirements intended to protect people and property from flood damage and minimize the cost of physical flood control mechanisms.

The latest official flood maps for the plan area date from 1982. As of April 2010, FEMA is in the process of updating its map. A review of the 1982 FIRMs indicates that the north and east portions of the plan area are within areas with a propensity for flooding. As shown in Figure 4.8-2, these areas are primarily near San Francisco Bay and Redwood Creek.

Lands near the Port of Redwood City fronting Westpoint Slough and the area within the Centennial neighborhood along the Cordilleras Creek channel are located within the 100-year floodplain (which means that there is a 1 percent chance each year that the area will experience flooding conditions). The entire Redwood Shores neighborhood, portions of Friendly Acres along the Broadway corridor east of Woodside Road, areas within the Centennial neighborhood along the Cordilleras Creek channel, and the central portion of the plan area immediately adjacent to the Redwood Creek tributaries are located within the 500-year floodplain, which means an area has a 0.2 percent chance each year of flooding.

It is not known if or how new flood zone maps for the plan area (or for any other area adjacent to the San Francisco Bay) might be revised by FEMA to address the potential for sea level rise in the future, which is acknowledged by most climatologists as a likelihood in the event of global warming. The Intergovernmental Panel on Climate Change (IPCC) has released a report on earth’s changing climate and the consequences thereof. One such consequence of the increase in global temperatures is the rise in sea levels due to thermal expansion of warming ocean water and melting of continental ice, including mountain glaciers and land bound polar ice on Greenland and Antarctica. In their report, IPCC analyzed the likely effect on global sea levels that different future emission scenarios would have. The most optimistic scenario, that of a global population peaking mid-century and with rapid changes in economic structures toward a service and information technology, indicates a global sea level rise of 0.18 to 0.38 meters (about 7 inches to 1.25 feet) by the year 2100. The least optimistic scenario, that of rapid economic growth, a

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12 In Figure 4.8-2, the Seaport Center is incorrectly designated as an A1 Flood Zone and should be represented as within the B Flood Zone Designation. Per the Letter of Map Revision (LOMR) approved and submitted by FEMA in September 1985, the B Flood Zone Designation for the Seaport Center property took effect on August 29, 1985. The FIRM map will be updated to reflect this change at a future date.
Areas Subject to Flooding

**Flood Zone Designations**

- **A1** Areas of 100-year flood; base flood elevations and flood hazard factors determined.
- **B** Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from base flood.
- **C** Areas of minimal flooding.
- **V1** Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

**Notes:** This map is intended for general land use planning only. Information on this map is not at a level of detail to serve as a substitute for individual site investigation.
global population peaking mid-century and the continued/intensified use of fossil intensive energy sources, indicates a global sea rise of 0.26-0.59 meters (about 10 inches to nearly 2 feet).

The San Francisco Bay Conservation and Development Commission (BCDC) has developed draft findings and policies on climate change and a background report that reflects the current state of knowledge regarding the potential impacts of climate change on the region. The background report, Draft Staff Report, Living With a Rising Bay: Vulnerability And Adaption in San Francisco Bay And On the Shoreline, April 7, 2009 identifies potential impacts of climate change on public health and safety. According to this report, global warming is expected to result in a 16-inch (0.4 meters) sea level rise in San Francisco Bay by mid-century (2050) and in a 55-inch (1.4 meters) sea level rise by the end of the century (2100). This would result in approximately 180,000 acres of Bay shoreline vulnerable to flooding by mid-century, and 213,000 acres vulnerable to flooding by the end of the century. The area that would be vulnerable to inundation is the area identified today as the 100-year floodplain. Additionally, it is predicted that global climate change would also result in extreme storm events, which in combination with higher sea level, would cause greater flooding.

As portions of the plan area are at elevations as low as sea level, projected sea level rise is an important planning factor. A sea level rise on the higher end of the scenarios could inundate the lowest lying eastern portions of the City and exacerbate existing flood hazard areas. Since global sea level rise is a phenomenon that occurs over decades, flood protection measures can be put in place as the situation warrants. Impacts of sea level rise upon the plan area are identified in Section 4.16, Greenhouse Gas Emissions.

4.8.2 REGULATORY SETTING

Clean Water Act

The Clean Water Act (CWA) was enacted by Congress in 1972 and amended several times since inception. It is the primary federal law regulating water quality in the United States, and forms the basis for several state and local laws throughout the nation. Its objective is to reduce or eliminate water pollution in the nation’s rivers, streams, lakes, and coastal waters. The CWA prescribes the basic federal laws for regulating discharges of pollutants as well as sets minimum water quality standards for all “waters of the United States.” Several mechanisms are employed to control domestic, industrial, and agricultural pollution under the CWA. At the federal level, the CWA is administered by the U.S. Environmental Protection Agency (EPA). At the state and regional level, the CWA is administered and enforced by the State Water Resources Control Board (SWRCB) and the nine RWQCBs. The State of California has developed a number of water quality laws, rules, and regulations, in part to assist in the implementation of the CWA and related federally mandated water quality requirements. In many cases, the federal requirements set minimum standards and policies and the laws, rules, and regulations adopted by the state and regional boards exceed the federal requirements.
CWA Section 303(d) lists polluted water bodies which require further attention to support future beneficial uses. For each listed water body, the State of California is required to establish Total Maximum Daily Load (TMDL) criteria for the pollutant(s) causing conditions of impairment. Within the lan area, San Francisco Bay is on the Section 303(d) list as an impaired water body for several pollutants.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACOE) is a federal agency that serves as a public engineering, design, and construction management agency. The USACOE is responsible for investigating, developing, and maintaining water and environmental resources throughout the nation. The CWA authorizes the USACOE to issue permits for discharges of dredged or fill (collectively referred to as fill) material into “waters of the United States.” Projects for which fill permits are issued must be in compliance with EPA guidelines. The guidelines also prohibit discharges that would cause significant degradation of the aquatic environment or violate state water quality standards. The CWA grants the EPA veto authority over the USACOE if it determines that a project will have an unacceptable adverse effect on municipal water supplies, shellfish beds, and fishing areas.

The USACOE 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 Rivers and Harbor Act include construction of in-stream or other infringing structures, such as piers, revetments13, and breakwaters, or discharge of fill into navigable waterways.

Federal Emergency Management Agency

FEMA is an agency of the United States Department of Homeland Security. The primary mission of FEMA is to reduce the loss of life and property and protect the nation from hazards, including natural disasters, acts of terrorism, and other man-made disasters. FEMA is responsible for the development and implementation of a comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation. As discussed in Section 4.8.1, FEMA also maintains FIRMs that identify floodways and floodplains for the United States. A FIRM highlights the specific flood hazards, flood risk zones, and floodplains at a local level of detail.

Executive Order 11988 – Floodplain Management

Executive Order 11988 (Floodplain Management) requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid and direct indirect support of floodplain

13 A revetment is a facing (such as boulders, masonry, or other hard surface) used to support a creek or stream embankment. The hard surface of a revetment disperses the energy of flowing water, protecting creek or stream banks from excessive erosion.
development wherever there is a practicable alternative. As such, each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural beneficial values served by floodplains.

The Department of Transportation (DOT) Order 5650.2, which implements Executive Order 11988, prescribes policies and procedures for ensuring the proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs, and budget requests.

**Porter–Cologne Water Quality Control Act**

The Porter–Cologne Water Quality Control Act (Porter–Cologne) (California Water Code Sections 13000-14290) entitles the SWRCB and nine RWQCBs the ultimate authority over California water quality policies and rights.14 Under this act, each RWQCB is authorized to regulate the discharge of waste that could affect the quality of the state’s waters, including projects that do not require a federal permit through the US-ACOE. The Porter–Cologne Act also established the responsibility of the RWQCBs for adopting, implementing, and enforcing water quality control plans (Basin Plans), which set forth the state’s water quality standards (i.e. beneficial uses of surface waters and groundwater) and the objectives or criteria necessary to protect those beneficial uses. The NPDES permits must be consistent with the Basin Plans, specifically the San Francisco Bay Basin Water Quality Control Plan for development within the City.

**National Pollutant Discharge Elimination System**

The CWA has nationally regulated the discharge of pollutants to the waters of the U.S. from any point source since 1972. In 1987, amendments to the CWA added section 402(p), which established a framework for regulating nonpoint source (NPS) stormwater discharges under the NPDES. The Phase I NPDES stormwater program regulates stormwater discharges from industrial facilities, large and medium-sized municipal separate storm sewer systems (those serving more than 100,000 persons), and construction sites that disturb five or more acres of land. Under the program, the project sponsor is required to comply with two NPDES permit requirements.

The NPDES General Construction Permit Requirements apply to clearing, grading, and disturbances to the ground such as excavation. Construction activities on one or more acres are subject to a series of permitting requirements contained in the NPDES General Construction Permit. This permit requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) to be implemented during project construction. The project sponsor is also required to submit a Notice of Intent (NOI) with the SWRCB Division of Water Quality. The NOI includes general information on the types of construction activities that will

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occur on the sites. It is the responsibility of the property owner to obtain coverage under
the permit prior to project area construction.

Assembly Bill 162
Assembly Bill 162 (AB 162) was signed into law in October 2007 and regulated the way in
which individual cities’ general plans must address the issue of flood management. AB
162 is intended to help ensure that local planning agencies consider and plan for the risks
of floods as they prepare their general plans. Such planning is intended to complement
the investments that California is making in levee reinforcements and related flood
prevention capital projects.

Safe Drinking Water Act
The Safe Drinking Water Act (SDWA) and subsequent amendments authorize the EPA to
set health-based standards for drinking water to protect public health against both
naturally occurring and man-made contaminants. The EPA administers the SDWA at the
federal level and establishes standards for bacteriological, inorganic, organic, and
radiological contaminants. The Cal/EPA administers and enforces the drinking water
program and has adopted its own SDWA, which incorporates the federal SDWA
requirements including some requirements specific only to California.

The California Office of Environmental Health Hazard Assessment (OEHHA) is initiating
evaluation for several chemicals for which new standards have been promulgated by the
EPA, which triggers a requirement that OEHHA prepare a Public Health Goal (PHG)
designed to define the level of pollutant at which no adverse health effect is expected to
occur. PHG levels are concentrations of chemicals in drinking water that are not
anticipated to produce adverse health effects follow long-term exposures. These goals are
advisory but must be used as the health basis to update the state’s primary drinking water
standards by the California Department of Public Health.

Regional Water Quality Control Board – 401 Certification
Pursuant to Section 401 of the CWA and EPA 404(b)(1) guidelines, in order for a USACOE
federal permit applicant to conduct any activity that may result in discharge into navigable
waters, the applicant must provide a certification from the RWQCB that such discharge
will comply with State water quality standards. The RWQCB has a policy of no-net-loss of
wetlands and typically requires mitigation for all impact to wetlands before it will issue
water quality certification. To meet RWQCB 401 Certification standards, it is necessary to
address all hydrologic issues related to a project, including:

- Wetlands;
- Watershed hydrograph modification;
- Proposed creek or riverine related modifications; and
- Long term post-construction water quality.
Additional considerations regarding 401/404 certification are discussed in Section 4.4, Biological Resources.

San Francisco Bay Conservation and Development Commission

The BCDC is a California state agency that has regulatory jurisdiction over the San Francisco Bay and its shoreline. BCDC's jurisdiction generally extends to all areas of the San Francisco Bay that are subject to tidal action, including sloughs and marshlands, to a 100-foot shoreline band surrounding the Bay, to salt ponds and managed wetlands as defined in the CWA, and certain designated waterways. Specifically, BCDC has jurisdiction over marshlands lying between mean high tide and five feet above mean sea level; tidelands (lying between mean high tide and mean low tide); and submerged lands (lands lying below mean low tide). Any improvements proposed for the plan area that would be located in BCDC's jurisdictional area would require separate approval from BCDC in addition to any required City of Redwood City approvals.

San Mateo Countywide Water Pollution Prevention Program

Although the majority of communities within San Mateo County have a population that is less than the NPDES population threshold of 100,000, the County is still required to develop, implement, and maintain a control program to prevent the increase of pollutants in stormwater discharges. Under this program the County, each of its incorporated cities and towns, and the Flood Control District (collectively called San Mateo Permittees) share a common municipal NPDES permit. The San Mateo Permittees are currently subject to a host of NPDES Permits to discharge stormwater runoff from storm drains and water courses within their jurisdictions. On February 11, 2009, the San Francisco Bay RWQCB issued, for public comment, a revised Tentative Order to NPDES Permit No. CAS6 12008 to implement a new Municipal Regional Stormwater Permit (MRP) for all Bay Area communities, including the San Mateo Permittees. Additionally, as of July 1, 2010, the SWRCB will require that all dischargers obtain a Construction General Permit, which would also apply to San Mateo County.

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), formerly known as the San Mateo Countywide Stormwater Pollution Prevention Program (STOPPPP), combines the countywide program and local programs while providing regional support and oversight for the local programs. The SMCWPPP was established to reduce pollutant discharge in stormwater runoff so as to minimize pollution of surface water resources (local creeks, San Francisco Bay, the Pacific Ocean). As part of this program, the comprehensive plan includes guidance on pollution reduction activities for construction sites, industrial sites, illegal discharges, and illicit connections, new development, and municipal operations. The program also includes public education

16 Construction General Permit Order 2009-0009-DWQ.
efforts, target pollutant reduction strategies, and a monitoring program. These local programs are now in force in all major cities in San Mateo County.

In May 2001, the Technical Advisory Committee for the SMCWPPP approved new policies to govern new and redevelopment projects within its jurisdiction. The document discusses subjects such as erosion and sedimentation reduction, general stormwater pollution prevention, post-construction best management practices and controls incorporation, impervious surface minimization, sensitive area restoration and protection, and watershed planning.

In June 2002, the Redwood City Council adopted these new policies and associated implementing measures in order to maintain the City’s ongoing compliance with the SMCWPPP and NPDES permits. 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 best management practices and source controls be implemented for new and redevelopment projects.

The series of permit amendments issued by the San Francisco Bay RWQCB imposed new requirements on the San Mateo Permittees, including new policies that govern new and redevelopment projects within its jurisdiction. The requirements address subjects such as erosion and sedimentation reduction, general stormwater pollution prevention, post-construction best management practices and controls incorporation, impervious surface minimization, sensitive area restoration and protection, and watershed planning.

Redwood City Municipal Code
Chapter 27A (Stormwater Management and Discharge Control Program) contains the City of Redwood City’s policies intended to govern the quantity and quality of stormwater discharge produced within the City limits. This program discusses exempted activities, illicit discharge prohibitions, broad watercourse protection objectives, and best management practices for new and redevelopment projects.

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18 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),” 2002.
22 California Regional Water Quality Control Board, San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (Final Tentative Order R2-2009-0074, NPDES Permit No. CAS612008) issued October 14, 2009 and effective December 1, 2009
As an implementation tool, the City of Redwood City has designed an “NPDES Permit Requirements Checklist” to help with implementation of its own SMCWPPP. This checklist sets forth specific design requirements and provisions for all construction activities, since new construction and redevelopment projects are a significant source of pollutants in municipal stormwater discharges.

Chapter 18, Article IX (Filling of Bay Lands) requires variance approval of any proposal filling or reclaiming of land from the San Francisco Bay, in addition to all state and federal permits that would be required.

Chapter 41 (Floodplain Management) sets forth numerous standards applicable to construction within designated special flood areas (as defined on FEMA’s FIRM maps, incorporated into the ordinance by reference).

Chapter 44 (Redwood City Harbor Administration) includes rules applicable to the Redwood City Harbor, which is defined in the chapter as Redwood Creek, Steinberger Creek (an arm of Redwood Creek), Boundary Slough, and all waterways tributary thereto and situated in the City. The chapter prohibits dumping of waste materials in the harbor and sets forth a mooring/anchoring permit program for watercraft that wish to permanently anchor in the harbor area.

Redwood City Zoning Ordinance

Section 32.12 of the City’s Zoning Ordinance provides requirements related to stormwater treatment. The purpose of these requirements is to provide zoning standards that minimize the quantity of runoff and associated pollutants in stormwater runoff from developed sites to creeks, the stormdrain system, and ultimately, to the San Francisco Bay. According to the City’s Zoning Ordinance, enhanced stormwater quality can be achieved through reduction of impervious surfaces, the protection of watercourses and riparian vegetation, providing for infiltration of stormwater on-site through vegetation and soils, and with engineered treatment systems. This section also requires that all new development, additions, and reconstruction are subject to the provisions of Chapter 27A of the City’s Municipal Code.

Project Consistency Analysis

Relevant federal, state, regional and local requirements would be implemented for specific development projects within the plan area at the time of submittal of development proposals. As such, future development applicants will be required to produce a stormwater management and discharge control program and a SWPPP, including relevant BMPs, that will prevent pollution from affecting downstream waterways during construction.

Specifically, New General Plan policies and implementation programs require the preparation of a SWPPP and the City requires preparation of an erosion control plan for new developments within the City boundaries and coordination with San Mateo County for developments within the City’s sphere of influence within the plan area.
Impacts to water quality from construction and post-construction activity would be further addressed through the City’s review of any project’s proposed improvements to existing water infrastructure as well as the City’s verification that projects adhere to the NPDES requirements contained in the NPDES permit held jointly by the City and San Mateo County. Implementation of these measures would be consistent with the 401 certification requirements of the RWQCB. The New General Plan would also, by law, comply with the CWA and, thus, the permitting regulations of the USACOE. Further, Program NR-26 of the New General Plan requires development to comply with all provisions of the NPDES permit and support regional efforts by the RWQCB to improve and protect water quality.

New General Plan policies and implementation programs within the Public Safety Chapter include requirements and measures for reducing flood hazards, representing consistency with FEMA and Executive Order 11988. Policies PS-7.2 and PS-7.4, detailed in Appendix A, prioritize improvements to the City’s storm drain system that are prone to flooding and consult with upstream jurisdictions to reduce runoff into these areas. Programs PS-27, PS-32, PS-35, PS-48, PS-49, and PS-57 require new development to be designed to provide protection from impacts of flooding; update the City’s emergency operations plan to better address flooding and emergency preparedness; upgrade existing levees to FEMA standards; and pursue coordination with other jurisdictions to limit stormwater runoff. Additionally, Policy NR-5.5 restricts new development, except for floating homes communities, marinas, and infrastructure necessary for marinas, on lands located within a 100-year floodplain, unless construction or other methods to minimize potential damage from flooding are implemented. Through its inclusion of the best-available flood related information, the New General Plan is consistent with the requirements of AB 162.

Drinking water in the plan area is provided from outside sources, in particular through the SFPUC, as discussed in further detail in Section 4.15, Utilities. As the water purveyor in the plan area, compliance with the SDWA rests with SFPUC. Should the City elect in the future to supplement potable water supplies with locally produced groundwater, compliance with provisions of the SDWA shall be required.

New General Plan policies and implementation programs, such as Program NR-38, related to adherence to BCDC’s permits and regulations regarding development along the Bay’s shoreline, also demonstrate consistency with the intent of the BCDC’s authority. The New General Plan policies and implementation programs support the SMCWPPP and the Redwood City Municipal Code requirements. Specifically, New General Plan Policies NR-5.1 through NR-5.5, NR-6.5, NR-7.1, NR-7.2, and BE-24.8 support runoff pollution prevention measures, establish creek setbacks for new construction, and implement designs to reduce flood hazards. Thus, the New General Plan would be consistent with the SMCWPPP and the Redwood City Municipal Code.

4.8.3 THRESHOLDS OF SIGNIFICANCE

The City has not established local California Environmental Quality Act (CEQA) significance thresholds as described in Section 15064.7 of the State CEQA Guidelines.
Therefore, significance determinations utilized in this section are from Appendix G of the CEQA Guidelines. A significant hydrology and water quality impact could occur if development allowed by the New General Plan would:

a) Violate any water quality standards or waste discharge requirements.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

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

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

e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

f) Otherwise substantially degrade water quality.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

h) Place within a 100-year flood hazard area structures, which would impede or redirect flood flows.

i) 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.

j) Expose people or structures to a significant risk of inundation by seiche, tsunami, or mudflow.

4.8.4 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issues Not Discussed Further

Substantially Deplete Groundwater Supplies

Groundwater is not used as a source of municipal water supply. Future new development allowed under the New General Plan would obtain municipal water from the Hetch Hetchy regional water system operated by the SFPUC and recycled water for non-potable uses. Thus, potential development allowed by the New General Plan should not result in a depletion of groundwater supplies, as such a type of water source is not utilized within the
plan area. For a complete discussion of municipal water supply impacts, refer to Section 4.15, Utilities.

Further, the New General Plan focuses allowable new development largely in the form of infill development within existing largely urbanized areas. As a result, such allowable new development would not establish a substantial increase in impervious ground cover beyond what currently exists. For a discussion of impacts related to groundwater recharge, refer to Impact 4.8-2.

Inundation by Tsunami

A tsunami is a large tidal wave generated by an earthquake, landslide, or volcanic eruption. Large earthquakes occurring in the Pacific Ocean can generate seismic sea waves, such as tsunamis. The plan area is located approximately 10 miles east of the Pacific Ocean shoreline and is approximately 25 miles south of the Golden Gate, where San Francisco Bay meets the Pacific Ocean. A seismic sea wave generated in the ocean could have effects on lands proximate to the Golden Gate; the energy of such waves would be expected to dissipate with distance from the open ocean. Owing to this distance from the open ocean, the plan area is not within the County of San Mateo Tsunami Evacuation Planning area and is thus not seen as having an elevated risk of inundation by a seismic sea wave. Therefore, the likelihood of the plan area being inundated by a tsunami is remote and this potential effect is not discussed further. However, the Bayside location of the plan area has potential exposure to inundation by a seiche. This potential impact is discussed as Impact 4.8-6.

Project Impacts

Impact 4.8-1: Construction activities associated with development allowed by the New General Plan could disturb surface soils by grading, earthmoving, and vegetation removal, which could result in erosion, sedimentation, and contamination of stormwater runoff, potentially in violation of water quality standards. (Less than Significant)

Construction activities associated with development allowed by the New General Plan would have the potential to contribute additional stormwater runoff pollutants, including sediments from grading activities and contaminants associated with construction materials, construction waste, vehicles, and equipment during construction periods. The disturbance of soil during construction activities would allow for erosion that could temporarily degrade the water quality of surface waters in the plan area.

Increased residential and commercial densification within Downtown and the development of a mixed use waterfront neighborhood as allowed by the New General Plan could have the potential to contaminate stormwater runoff into Redwood Creek and its associated tributaries. Construction associated with the new Mixed Use – Neighborhood

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land uses along El Camino Real near Edgewood Road would also have the potential to affect stormwater runoff into the nearby Cordilleras Creek. Erosion and sedimentation associated with construction activities would be specific for each project development site within the plan area.

The New General Plan would preserve existing development patterns in the Redwood Shores area, which is largely built out. Minor infill development may occur in this area by 2030, potentially resulting in construction related impacts to the Redwood Shores lagoon.

Pursuant to the CWA, impacts related to pollutants associated with construction activities and stormwater runoff could be reduced primarily by implementation of NPDES construction permit requirements and through preparation of project-specific SWPPP and BMPs for construction activities. Through compliance with NPDES requirements, construction within the plan area associated with the allowable development by the New General Plan would not violate water quality standards.

Furthermore, the policies and implementation programs within the New General Plan could reduce construction-related water quality impacts by limiting construction activities within close proximity to existing waterways, support stormwater pollution mitigation measures, and encourage the use of design and landscaping to minimize surface runoff with new development, as described in policies NR-5.2 through NR-5.5, NR-7.1, and NR-7.2. Policy BE-24.8 of the New General Plan could also support building designs to reduce stormwater runoff associated with new development. Programs NR-24, NR-25, NR-26, NR-28, NR-29, and PS-41 could further reduce water quality impacts during construction through the establishment of a Creek Enhancement Ordinance, implementing creek improvements and the SWMPPP, and requiring compliance with the NPDES to protect stormwater and creeks and improve water quality.

In addition to the policies and programs contained in the New General Plan, the City currently requires development applicants within City boundaries to prepare and implement erosion control plans, prior to the issuance of a grading permit. These plans are required to comply with the current RWQCB and City Municipal Code guidelines and include acceptable BMPs for control of sediment and stabilization of erosion on the development sites for the protection of water quality.

The erosion control plans include locations and specifications of recommended soil stabilization techniques. These techniques may include, but not be limited to such measures as placement of straw wattles, use of silt fences, construction of berms, and storm drain inlet protection. Erosion control plan are also required to depict staging and mobilization areas with access routes to and from the site for heavy equipment. The erosion control plan includes temporary measures to be implemented during construction, as well as permanent measures.

With adherence to and implementation of the New General Plan policies, in combination with preparation and implementation of the City required erosion control plan, water quality impacts would be less than significant. Individual developments within the plan area will be required to undergo project-specific environmental review. If significant
Impact 4.8-2: Development allowable under the New General Plan would not substantially increase impervious surfaces in the plan area and would not result in considerable interference with groundwater recharge. (Less than Significant)

Development allowed by the New General Plan would primarily take place as infill development within existing largely urbanized areas and would not establish a substantial increase in impervious ground cover beyond what currently exists. Key exceptions include an approximately 7 acre parcel in the Bayfront area on the southern/eastern shore of Redwood Creek. The New General Plan designates a Mixed Use – Waterfront Neighborhood land use on a portion of a property currently serving as a water basin along the Redwood Creek channel. Future development could therefore be allowed on a site containing surface waters, which could potentially decrease on-site permeability. However, since the majority of land within the plan area designated for urban development is currently developed with residential, commercial, and industrial uses, it is not anticipated that groundwater recharge would be substantially reduced from development allowed by the New General Plan. With the exception of lands designated for open space, vacant lands in the plan area comprise only 0.3 percent of the total plan area. The additional infill development and redevelopment that could occur on this 0.3 percent of vacant land (69 acres) would not substantially reduce the amount of pervious surface and would not be anticipated to significantly interfere with groundwater recharge.

Additionally, the preservation of open space on Bair Island should preserve pervious surfaces within the plan area. The New General Plan would change the land use designation for the southern portion of Bair Island from Future Urban Development to Open Space – Preservation. This change should maintain the open, undeveloped, and pervious nature of Bair Island and would prohibit urban development. Thus, groundwater recharge should not be interrupted in this area.

Moreover, the New General Plan Policy BE-24.8, as detailed in Appendix A, would further reduce potential impacts to groundwater recharge through the support of building designs to preserve and enhance soil permeability. No implementation programs related to groundwater recharge are included in the New General Plan.

With adherence to and implementation of the New General Plan policies, impacts to groundwater recharge would be less than significant. No additional mitigation is required. Individual developments within the plan area will be required to undergo project-specific environmental review. If significant project-level groundwater-related impacts are identified, specific mitigation measures will be required under CEQA.
Impact 4.8-3: Development allowed by the New General Plan could take place within and near existing waterways and drainages, which could alter existing drainage patterns within the plan area. (Less than Significant)

While the majority of development allowed by the New General Plan could occur in existing urban areas, potential future development within and near existing waterways, including creeks, streams, or drainage channels, could alter existing drainage patterns.

The New General Plan would allow Bayfront area development close to the Redwood Creek channel and adjacent tributaries, which could increase the amount of impervious surfaces, which would alter existing drainage patterns. Development allowed as part of the Mixed Use – Waterfront Neighborhood land use designation on a portion of a property currently serving as a water basin along the Redwood Creek channel (Site 3 as shown in Figure 5-3 in Chapter 5.0, Alternatives), could increase the amount of impervious surfaces on this site, as previously undeveloped surface waters/open space would be allowed to convert to urban, developed uses. The increase to impervious surface would change the rate and pattern of runoff on the site.

Relative to existing conditions, the New General Plan would also allow for increased development densities and intensities within Downtown and adjacent neighborhoods within proximity to existing waterways and creeks, such as Redwood Creek and Arroyo Ojo de Agua. This increase in allowable density and intensity could increase the amount of impermeable surfaces in the area, which would have the potential to change the drainage pattern of existing creeks, steams, and/or drainages within the plan area.

Although allowed development within proximity of creeks, streams, and drainages within the Bayfront and upland areas could result in the alteration of existing drainage patterns, the New General Plan includes several policies and implementation programs that would protect and preserve creeks and establish development limitations within proximity of existing waterways. Policies NR-5.3 through NR-5.6 of the New General Plan, as detailed in Appendix A, would establish creek buffer zones for new development and establishes limitations for new developments near existing creeks and streams, with the exception for floating home communities and marinas, which would work to maintain existing drainage patterns within the plan area. Additionally, implementation of Policy BE-22.2 of the New General Plan would also require new development to pay its fair share of the cost of public facilities and services for drainage.

With adherence to and implementation of the New General Plan policies and implementation programs, impacts related to drainage patterns would be less than significant. No additional mitigation is required. Individual developments within the plan area will be required to undergo project-specific environmental review. If significant project-level drainage impacts are identified, specific mitigation measures will be required under CEQA.

Refer to Impact 4.8-1 for a discussion of potential stormwater runoff into existing creeks, streams, and waterways associated with construction activities within the plan area and Impact 4.8-4 for a discussion of potential stormwater runoff in regards to drainage capacity and flooding.
Impact 4.8-4: Existing deficiencies in the stormwater drainage system capacity result in flooding (the overflow of storm drains) within the plan area. Increases in impervious surfaces associated with development allowed by the New General Plan would have the potential to increase stormwater runoff, which could exceed the capacity of existing drainage systems and/or introduce runoff pollutants, with commensurate increases in flooding, or overflows. (Less than Significant)

Future infill and redevelopment within the plan area is not anticipated to substantially increase the amount of existing impervious surfaces, as development allowed by the New General Plan would occur largely within areas currently developed with urban uses, including Downtown, surrounding neighborhoods, and major transportation corridors.

Thus, for any areas currently not prone to flooding due to stormwater drainage capacity, development allowed by the New General Plan would not result in a significant impact to stormwater runoff and would not significantly degrade existing water quality with runoff pollutants. However, some of the areas anticipated to receive new development under the New General Plan are known to have insufficient stormwater drainage capacity and could have the potential to experience flooding with any associated increased runoff.

In and near the Centennial neighborhood, with flood prone areas near Cordilleras Creek, development allowed by the New General Plan would not substantially alter the existing development pattern. The New General Plan retains existing residential and commercial land use designations for this area and would not allow for a substantial intensification of development in this area relative to existing conditions. Thus, adoption of the New General Plan would not introduce additional impervious surfaces that could result in increased stormwater runoff and associated pollutants.

However, in the vicinity of the Friendly Acres neighborhood, where flooding occurs due to a combination of increased runoff throughout the watershed and an aging storm drain system with limited capacity, the development allowed by the New General Plan could include new commercial and high-density residential uses along the Broadway corridor. Since the proposed commercial area currently houses industrial developments, it is not anticipated that the new commercial development would significantly increase the amount of impervious surfaces or result in substantial increases in stormwater runoff or associated contaminants.

While the allowable increase in residential density could increase the amount of impervious surfaces thereby increasing stormwater runoff, the residential development would occur in an existing urbanized area largely impervious in character. Site redevelopment in the Friendly Acres neighborhood (as well as in other neighborhoods within the plan area) allowed by the New General Plan, could also create new pervious surfaces through new landscaping and the use of pervious pavements, which would reduce the amount of runoff and associated pollutants.

The Natural Resources and Public Safety chapters of the New General Plan include a number of related policies and implementation programs that could alleviate potential impacts related to stormwater runoff and water quality through runoff prevention and the
restoration and maintenance of existing waterways. Specifically, Policies NR-5.1, NR-5.6, NR-6.5, and NR-7.3, as described in Appendix A, promote natural stream channel function and restore and enhance existing waterways through the reduction of urban runoff and ecologically enhancing methods. Programs NR-32 through NR-34, NR-36, and PS-51 and PS-57, as shown in Appendix A, would promote community involvement and education in the preservation of natural, pervious space and stormwater runoff reduction techniques and coordinating with other jurisdictions to limit stormwater runoff and contribute to flood-control improvements.

With adherence to and implementation of the New General Plan policies and implementation programs, impacts to stormwater runoff and water quality from development allowed by the New General Plan would be less than significant. No additional mitigation is required. In addition, individual development projects proposed for the plan area will be required to undergo project-specific environmental review. If unique project-level hydrology and water quality impacts are identified, specific mitigation measures will be required under CEQA.

**Impact 4.8-5**: The New General Plan allows for new development within designated FEMA flood hazard areas, as well as the Emerald Lake dam inundation area, which could increase flood hazards within the plan area. (Less than Significant)

**100-Year Flood Zone**: As shown in Figure 4.8-2, the northern and eastern portions of the plan area are located within designated flood hazard zones. Lands immediately adjacent to the Westpoint Slough near the Port of Redwood City are within the FEMA 100-year floodplain. The New General Plan does not, however, allow development that would alter the development patterns and land use designations along Westpoint Slough or within Redwood Shores. Development allowed under the existing land use designations and regulations would remain. Implementation of the New General Plan would not introduce new land use types beyond the existing allowable development to these areas within the 100-year floodplain, or alter existing flood flows.

**500-Year Flood Zone**: Several portions of the plan area are within the FEMA 500-year floodplain as well, including the Redwood Shores area, the Broadway corridor east of Woodside Road, and neighborhoods through the center of the plan area near the Redwood Creek tributaries. Implementation of the higher density residential developments and new mixed use developments within the central plan area allowed by the New General Plan could place new housing and individuals within the 500-year floodplain. These new developments could also contribute to the potential for flood hazards by altering existing runoff and absorption rates as a result of slight increases in impervious surfaces.

Flooding associated with potential future sea level rise is further evaluated in Section 4.16, Greenhouse Gas Emissions.

**Emerald Lake Dam Inundation Area**: The central portion of the plan area is also located within the Emerald Lake dam inundation area. The Emerald Lake dam inundation area runs in an approximate north-south direction, between Woodside Road and Farm Hill Boulevard/Jefferson Avenue. The dam inundation area extends through
the center of the plan area to the southern portion of Downtown. While the New General Plan proposes no change in allowable development south of El Camino Real within the dam inundation area, the New General Plan would allow new residential and commercial infill developments within the northern tip of the dam inundation zone between El Camino Real and U.S. 101 in Downtown.

As part of the City’s involvement in the National Flood Insurance Program, all new developments within designated flood hazard zones, including both the 100-year and 500-year floodplains, would be required to meet specific flood damage avoidance requirements. These requirements may include, but not be limited to, raising the elevation of habitable space above anticipated flood heights, creating ‘freely communicating’ structures that allow flood waters to pass through lower levels of buildings, and ensuring that site design does not result in a reduction of floodplain areas which could result in increasing flooding conditions downstream.

Additionally, the New General Plan policies and implementation programs within the Public Safety Chapter introduce flood prevention methods to further reduce impacts associated with flooding and flooding hazards in the plan area. Specifically, Policies PS-7.2 and PS-7.4 prioritize improvements to the City’s storm drain system that are prone to flooding and consult with upstream jurisdictions to reduce runoff into these areas. Programs PS-27, PS-32, PS-35, PS-48, PS-49, and PS-57 further reduce impacts associated with flooding by requiring new development to be designed to provide protection from impacts of flooding, including sea level rise; updating the City’s emergency operations plan to better address flooding and emergency preparedness; upgrading existing levees to FEMA standards; implementing strategies to reduce flooding in the Friendly Acres and Centennial neighborhoods; and pursuing coordination with other jurisdictions to limit stormwater runoff.

With adherence to and implementation of the New General Plan policies and implementation programs, impacts related to flooding would be less than significant. No additional mitigation is required. Individual developments within the plan area will be required to undergo project-specific environmental review. If project-level significant flooding impacts are identified, specific mitigation measures will be required under CEQA.

**Impact 4.8-6: Due to the proximity of the plan area to the San Francisco Bay, development allowed by the New General Plan could be located in an area of potential inundation by seismic-related seiche. (Less than Significant)**

A seiche is a tidal change in an enclosed or semi-enclosed water body caused by sustained high winds or an earthquake. Due to the plan area’s proximity to the San Francisco Bay, the plan area could experience seiche or seiche-related effects during seismic activity. The majority of lands immediately adjacent to the San Francisco Bay, which are at a higher risk of seiche, include areas of open space, such as Bair, Bird, and Greco Islands.

The closest developed areas to the Bay include the Redwood Shores area, the Bayfront, and the Port of Redwood City. Infill development and redevelopment allowed as part of the New General Plan would be concentrated within and immediately adjacent to
Downtown, south and east of U.S. 101 and a portion of the Bayfront area centered on Redwood Creek.

Existing and allowed development within the Bayfront area, including the Mixed Use – Waterfront Neighborhood and Port of Redwood City along the Redwood Creek channel and the Redwood Shores area along the Steinberger Slough, would be subject to an elevated risk of seiche. Development in these areas would not, however, be located directly along the San Francisco Bay shoreline, but rather within a recessed area of waterways and islands. Due to this distance from the San Francisco Bay shoreline and buffer of islands, the severity of the seiche energy should be decreased upon reaching the developed portions of the plan area in the Bayfront area, representing a less than significant impact in regards to seiche inundation.

Additionally, any development within the plan area would also be subject to the requirements of the Uniform Building Code (UBC). Several measures required by the UBC which address seismic hazards would help to reduce risk of loss of property or life in the event of a seismic-related seiche. New development and redevelopment of existing buildings within the plan area could reduce seiche related risk, as new properties would be subject to more stringent seismic-related measures, which would assist in reducing seiche related hazards.

The Public Safety Chapter of the New General Plan lists policies and implementation programs related to seismic safety design elements could reduce impacts associated with inundation by seismic-related seiche. As shown in Appendix A, Policies PS-6.1, PS-6.2, and PS-9.1 identify structure and land use types susceptible to such geologic hazards, informing public schools and centers about seismic safety, and promoting inter-jurisdictional cooperation for seismic safety upgrades of dams, levees, and reservoirs. Programs PS-23 and PS-25 require all new developments within the plan area to consider seismic safety issues and to implement the International Building Code seismic safety standards.

Through implementation of the New General Plan policies and implementation programs, adherence to the UBC, and due to the distance between the developed areas of the Bayfront area and the San Francisco Bay shoreline, the New General Plan would result in a less than significant impact related to seiche. No mitigation is required. Individual developments within the plan area will be required to undergo project-specific environmental review. If project-level significant seiche impacts are identified, specific mitigation measures will be required under CEQA.

**Impact 4.8-7: Due to the sloping topography of the hillside areas within the western and southern portions of the plan area, development allowed by the New General Plan could be located in an area of potential inundation by seismic-related mudflow. (Less than Significant)**

Mudflow, also known as a landslide or mudslide, is a flow of dirt and debris that occurs after intense rainfall or snow melt, volcanic eruptions, and earthquakes. The speed of the mudflow is dependent on the amount of precipitation, steepness of slope, and vibration of the ground.
Areas in the Farm Hills neighborhood are identified for having potential for landslides; and could be subject to inundation by mudflows during seismic-related events. As discussed in **Section 4.6, Geology and Soils**, the hills within the Farm Hills neighborhood are mapped as “few or very few landslides,” while the area near Stulsaft Park is identified as “mostly landslide,” indicating potential for slides and mudflows in the area. While new development could occur under the existing land use designations and regulations, the New General Plan does not introduce new land use types or new development patterns to this portion of the plan area. The development is not different than what is currently allowed in the existing General Plan. Refer to **Section 4.6, Geology and Soils**, for further discussion related to seismic-related landslides.

The lower elevations in the eastern and northern portion of the plan area are mapped as flatland with no landslides and would not be subject to inundation by mudflow. Notably, the New General Plan “focus areas” where most new growth is anticipated to occur during the next 20 years, are largely located within these lower elevation flatland areas at negligible risk of mudflow.

Policy PS-6.1 and Program PS-26 within the Public Safety Chapter of the New General Plan would require identification of structural types that are sensitive to seismic activity and would implement geological hazard mapping techniques to evaluate the slope stability hazards associated with new development.

With adherence to and implementation of the New General Plan policies and implementation programs, impacts related to mudflow would be less than significant. No additional mitigation is required. Individual developments within the plan area will be required to undergo project-specific environmental review. If project-level significant impacts are identified, specific mitigation measures will be required under CEQA.