Volume One Unabridged

Watershed Characteristics Report

Summary

Prepared for the
Santa Clara Basin Watershed Management Initiative

by

Watershed Assessment Consultant

Revised August 2003

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Summary

S.1 Introduction

The Santa Clara Basin (the Basin) is defined as the portion of San Francisco Bay (the Bay) south of the Dumbarton Bridge and the 840-square-mile area of land that drains to it. Great strides have been made over the last two decades to reduce pollution levels and sources into the Bay. However, contaminant levels of concern still exist throughout the Bay and its tributary steams. In the Basin, which drains to the South Bay, efforts are being made to address the existing pollution problems, which are derived from numerous diffuse sources as well as pollution "legacies" that were introduced to the Bay decades ago but still persist. Further improvement will depend on putting into effect a management program that takes into account all of the human activities that influence watershed health and aquatic resources, a program that is not limited just to municipal wastewater and urban runoff discharges, which have been the focus of most regulatory attention to date. **The purpose of the Santa Clara Basin Watershed Management Initiative (WMI) is to develop and implement a comprehensive watershed management program, one that recognizes that healthy watersheds mean addressing water quality problems and quality of life issues for the people, animals, and plants that live and work in the watershed.**

In 1996, the WMI was established by the U.S. Environmental Protection Agency, the State Water Resources Control Board, and the San Francisco Bay Regional Water Quality Control Board (Regional Board) as a pilot project for California's Watershed Management Initiative, which is a statewide effort to manage water resources at the watershed scale. The WMI is being guided by a group of stakeholders, that is, individuals and representatives of organizations, which have a stake or interest in the outcome of the WMI. The stakeholders include representatives of local, state, and federal government agencies, business, agricultural and industry associations, and environmental groups. This group is known as the Core Group.

The WMI plans to publish a watershed management plan in four volumes, as well as a number of supporting documents. The four volumes consist of this watershed characteristics report, a watershed assessment report, a watershed action alternatives report, and a watershed action plan. This watershed characteristics report contains an overall description of the Basin's natural, cultural, and regulatory setting.

S.2 Report Preparation Process

This report was developed as a collaborative effort by the stakeholders in the WMI. All decisions regarding the preparation and review process were made by the Core Group – individuals and representatives of public and private organizations with a stake in the outcome of the watershed planning process for the Basin. This group, representing a wide range of views and interests, reviewed and commented on all the material in this volume, which is based on

work prepared by various subgroups of the Core Group and Watershed Assessment Consultant. The work of preparing this report was done by WMI's Report Preparation Team (RPT). An abridged version of this report was also produced for distribution to the general pubic. For reference the abridged version is referred to as "Volume One: Watershed Characteristics Report" and this volume as "Volume One Unabridged."

The Core Group established a number of subgroups to conduct or oversee portions of the WMI's work. The subgroups include the Watershed Assessment Subgroup, Land Use Subgroup, Bay Modeling and Monitoring Subgroup, Regulatory Subgroup, Communications Subgroup, Flood Management Subgroup, Data Management Subgroup, Wetlands Advisory Group, Planning Subgroup, Outreach Subgroup, and Budget and Personnel Subgroup. The membership of the subgroups includes both Core Group members and other stakeholder representatives with expertise or an interest in the topics.

An additional group, the RPT, was established by the Core Group to oversee the preparation of the watershed characteristics, watershed assessment, and watershed action alternatives reports. The RPT created a number of work groups to explore certain issues and submit their findings to the Core Group. The RPT directs the work of the Watershed Assessment Consultant (WAC). The WAC provides technical and production support to the WMI. The Core Group, through the Santa Clara Valley Water District, contracted with URS Greiner Woodward Clyde to serve as the WAC. Analytical work is conducted by subgroups or by the WAC. Each of the products prepared by the subgroups or the WAC is reviewed by the RPT, revised as necessary, and forwarded to the Core Group for review and consideration.

S.3 Cultural Setting of the Santa Clara Basin

S.3.1 History

The Basin has been inhabited for at least 10,000 years. When the Spanish arrived in the Bay region in 1769, the Basin was inhabited by several Native American groups or tribelets with the Ohlone predominant among them. The groups, which consisted of 20 to 200 individuals, were hunter-gatherers subsisting on fish and shellfish and a great variety of plant foods. The native population, always small and widely dispersed, was forced into missions by the arriving Spanish and decimated by diseases for which they had little immunity. Their culture disrupted, the survivors found marginal subsistence on ranches or on the fringes of towns. Nonetheless, many of the Ohlone people retain their cultural identity today.

In 1777, Mission Santa Clara was first established on the west bank of the Guadalupe River. Cattle grazing and small-scale farming were the primary economic activities. The discovery of gold in 1849 accelerated the influx of population to California and created a great demand for agricultural products. To meet the demand, large-scale commercial farms were established for the first time on the fertile soils of Santa Clara Valley. For the next 30 years, barley, wheat, and hay were the valley's primary products, but by the 1880s the invention of the refrigerated railroad car enabled many farmers to switch from field crops to more profitable fruit tree crops.

By the 1930s, many of Santa Clara Valley's orchards began to be replaced by homes and businesses. At that time, the Navy established an airbase at Moffett Field that served as a magnet for technology-based enterprises. By the 1960s, the booming electronics industry had taken root and the valley, now nicknamed "Silicon Valley," became one of the fastest growing urban areas in the U.S. Today, the northern portion of the Basin is almost exclusively urban. The southern portion of the Basin remains largely rural and is devoted to cattle ranching, water supply catchments, and scattered low-density residential development.

S.3.2 Population

The current population of the Basin is estimated to be 1.9 million. Population growth is expected to continue in the next 20 years, but at a slower rate than in the recent past. By 2020, the population of the Basin will likely approach 2.2 million.

Most demographic statistics are kept on a countywide basis, making it difficult to separately compile data for the Basin. However, because 86 percent of the Basin's land area and 90 percent of the Basin's population are in Santa Clara County, that county's statistics provide a strong indication of the characteristics of the Basin as a whole. Most county residents dwell in single-family homes and are employed in manufacturing (26 percent), services (31 percent), or wholesale and retail trades (18 percent). Unemployment is currently low and mean household income high, probably in excess of $80,000.

Santa Clara County has an ethnically diverse population. Whites constituted about 70 percent of the population in 1990, the time of the last census, but the proportion of nonwhites has increased since then. In 1990, nonwhite races with significant populations included Asian/Pacific Islanders (15.9 percent), blacks (3.8 percent), Native Americans (0.6 percent), and other races (9.4 percent). Hispanics, a multiracial group, made up about 21 percent of the population in 1990.

S.4 Land Use in the Santa Clara Basin

About one-third of the land surface in the Basin is devoted to urban uses, while the remainder is open space. Residences and commercial and industrial premises occupy 23.4 percent and 11.2 percent of the land, respectively. Most of the open space is forest (33.8 percent) or rangeland (19.6 percent). The remaining open space is occupied by agriculture, parks, wetlands, and open water. A small proportion of the Basin, less than 1 percent, is designated as vacant.

Urban development is expected to continue in the Basin, but at a slower rate than in the recent past. The area of land devoted to urban use is expected to grow from 34.6 percent in 1995 to 36.3 percent in 2020.

S.5 Organizational Setting

The Basin includes about one-half of Santa Clara County and smaller portions of San Mateo and Alameda Counties. Twenty cities lie within the Basin wholly or in part. A number of special

districts exist within the Basin. They include resource conservation districts, transportation districts, and water districts.

Three universities, Stanford, Santa Clara, and California State University at San Jose, and a number of community colleges provide higher education in the Basin. Approximately 350 public elementary, middle, and high schools are also in the Basin.

Many environmental organizations are active in the Basin. Those with a particular interest in streams and wetlands include the Santa Clara Valley Chapter of the Audubon Society, the San Francisco Bay Bird Observatory, the Friends of Stevens Creek Trail, the Peninsula Conservation Center Foundation, CLEAN South Bay, Santa Clara County Streams For Tomorrow, and the Creek Connections Action Group. The Peninsula Conservation Center is administering a coordinated resource management and planning program for San Francisquito Creek watershed, which lies at the northwestern edge of the Basin.

S.6 Regulatory Setting

Water resources management in California occurs within a complex regulatory setting. Instream water quality is regulated pursuant to the federal Clean Water Act and California's Porter-Cologne Act. Removal of water from freshwater bodies is regulated under state water law that recognizes both riparian and appropriative rights. The filling of wetlands is regulated pursuant to the Clean Water Act. Actions that could jeopardize the continued existence of certain plants, animals, and insects are regulated under the federal Endangered Species Act and similar state statutes. Land use, an important influence on instream water quality, is regulated by cities and counties. Finally, the quality of drinking water is regulated pursuant to the federal Safe Drinking Water Act and California's Safe Drinking Water and Toxic Enforcement Act. Although all of the statutes referenced above influence aspects of the WMI, the Clean Water Act and the Porter-Cologne Act are its most important influences.

S.6.1 Clean Water Act

The Water Pollution Control Act Amendments of 1972 (later referred to as the Clean Water Act) have as their goal the restoration of the physical, chemical, and biological integrity of the nation's waters. The primary mechanism to achieve the goal is the National Pollutant Discharge Elimination System (NPDES). The Clean Water Act requires that parties seeking to discharge pollutants to the waters of the U.S. obtain a permit under the NPDES. A discharge of pollutants from a source with a single readily identifiable point of discharge such as a municipal wastewater outfall is only permitted if it meets certain quality standards, known as effluent limits. Effluent limits are based on available wastewater treatment technology. Municipal wastewater must receive a minimum of secondary treatment before discharge. Industrial wastewater must receive the equivalent of secondary treatment.

In 1987, the Clean Water Act was amended to place more emphasis on the control of pollutants from diffuse sources. Municipalities with populations over 100,000 were required to obtain NPDES permits for discharges of stormwater.

The Clean Water Act calls for the adoption of ambient water quality standards and periodic assessment of the condition of waterbodies to determine whether they are in compliance with the standards. If, after implementation of technology-based effluent limits, ambient water quality in a waterbody still fails to meet applicable standards, then further action is necessary. Studies must be undertaken to determine the total maximum daily load (TMDL) of each pollutant that can be discharged to the waterbody while maintaining compliance with ambient standards. The TMDL is then allocated among pollutant sources. Discharge from each pollutant source must be reduced until it complies with its allocated share of the TMDL.

All municipal and industrial wastewater discharges in the Basin are in compliance with minimum technology-based effluent limits, and best management practices (BMPs) for controlling pollutants in stormwater are being implemented in urban portions of the Basin. But many waterbodies and stream segments do not comply with ambient standards. Two TMDL studies are in progress in the Basin (for copper and nickel in the portion of the Bay south of the Dumbarton Bridge and for mercury in the Guadalupe River watershed). Others are expected in the future.

S.6.2 Porter-Cologne Act

The Porter-Cologne Act was enacted by the California Legislature in 1969. It created an administrative structure and procedures for management of water quality in the state. California's water quality program is administered by the State Water Resources Control Board and by nine regional water quality control boards. The Regional Board is responsible for regulating water quality in the Basin.

The Porter-Cologne Act called for the preparation of comprehensive water quality control plans or "basin plans" for major watersheds in California. For each waterbody, the plans designate beneficial uses and establish the water quality objectives (ambient standards) necessary to support the beneficial uses. The basin plans also outline the actions needed to bring waterbodies into compliance with water quality objectives. The Water Quality Control Plan for the San Francisco Bay Region, including the Basin, was first made public in 1973. It has been amended several times, most recently in 1995.

The regional boards regulate pollutant discharge through the issuance of waste discharge requirements. Waste discharge requirements are similar to the conditions in an NPDES permit. Their issuance fulfills both the Porter-Cologne Act and Clean Water Act requirements.

S.7 Natural Setting

The Basin is located near the northern end of California's South Coast Mountain Range. The Basin is bounded on the west by the Santa Cruz Mountains and on the east by the Diablo Range. Ancient rocks, exposed in the mountain ranges, originated as ocean floor and were thrust upward many millions of years ago as the Pacific Plate was forced under the North American Plate. The

lands between the ranges filled with material eroded from the mountains, forming Santa Clara Valley. All surface streams in the Basin drain to the Bay.

The Basin has a Mediterranean climate, characterized by dry summers and several months of rain in the winter. Annual average precipitation varies with location. Some locations in the Santa Cruz Mountains receive as much as 60 inches annually, whereas the Basin floor near San Jose receives only 13 inches. Precipitation varies considerably from year to year and extended periods of drought occur fairly frequently.

Flow in surface streams reflects the seasonality of precipitation. Before Santa Clara Valley became urbanized, it is likely that most surface streams dried up in the summer months except for the lower reaches of the larger streams that were fed by groundwater. Early Spanish explorers identified the only two streams in the area in which water flowed year-round, Coyote Creek and Guadalupe River. Today, streamflow and groundwater levels are partly controlled by water management activities, as discussed in the following section.

Vegetation and wildlife populations in the Basin have been greatly altered in the last 200 years. Before settlement by Euro-Americans, the floor of Santa Clara Valley was a grassy oak-studded plain. Streams flowing across the plain were lined with dense stands of cottonwoods, willows, and sycamores. The mountains to the west were heavily forested with Douglas fir and redwood of considerable dimension. To the east, grassland covered the Diablo Range, with the exception of densely wooded arroyos and scattered oaks and pines. To the north, large areas of salt and brackish marsh extended along the shore of the Bay.

Today, little of the Basin's native vegetation remains. Most of the valley floor has been converted to urban uses. Native grassland and savanna has been replaced by parks, residential yards, landscaped areas, and impervious surfaces free of vegetation (roads, parking lots, and buildings). Landscaped areas and parks are largely planted with nonnative species. Urban development, agricultural activities, and alteration of stream channels for flood control purposes have greatly reduced the extent of riparian forests. Much of the salt or brackish marsh along the shore of the Bay has been enclosed by dikes and converted to salt ponds.

In the foothills, the native grassland and savanna have been largely replaced by nonnative grassland. The Santa Cruz Mountains remain forested but most of the large, very old trees have been removed. Throughout the Basin, invasive nonnative plant species are displacing native species with a consequent reduction in wildlife habitat value.

Before settlement by Euro-Americans, the Basin supported a very diverse fauna that included grizzly bears, elk, pronghorn, black-tailed deer, sea otters, and harbor seals. Waterfowl were extraordinarily abundant, including such species as snow goose, Ross' goose, canvasback, green winged teal, Canada goose, northern pintail, and American widgeon. Bald eagles and California condors were common.

Changes in terrestrial and aquatic habitats brought about by human activities in the Basin have reduced wildlife populations and diversity. Most of the large mammal species no longer exist in

the Basin. Ninety taxa of animals, birds, reptiles, insects, and amphibians have declined sufficiently in numbers to be listed by state and federal agencies as deserving special protection and monitoring. A few species have probably benefited from changes in habitat. For example, the conversion of marsh to salt ponds has increased populations of white pelicans, Caspian terns, Forster's terns, snowy plovers, and several other bird species.

Currently, the known fish fauna of flowing streams in the Basin consists of 11 native species and 19 nonnative species. Most native species are intolerant of disturbance caused by human activities and have declined as a result. Six native fish species are extinct within the Basin. California roach and Sacramento sucker are the most abundant of the native species. Remnant steelhead and salmon runs exist in Coyote Creek, Stevens Creek, San Francisquito Creek, and Guadalupe River. A small run of anadromous Chinook salmon occurs in the Guadalupe River.

S.8 Water Management in the Santa Clara Basin

Water in the Basin is managed intensively to meet human needs. The natural distribution and circulation of surface waters and groundwaters are manipulated to supply water to homes, businesses, and farms, and to minimize flooding. Surface runoff is impounded in reservoirs, treated and supplied to customers, or released to recharge basins where it percolates into the ground. Water is also supplied to customers from wells that extend into the deep aquifer that underlies much of the Basin. Because the water resources of the Basin are insufficient to meet local needs, water is imported. Imported water is conveyed to the Basin from the Sacramento-San Joaquin River Delta, via the state-owned South Bay Aqueduct and the federally owned San Felipe Project, and from the Tuolumne River in the Sierra Nevada, via the city of San Francisco's Hetch Hetchy system. Approximately 60 percent of the water used in the Basin is imported.

About 40 percent of the water supplied to homes and businesses is used outside, primarily for landscape irrigation. Most of the other 60 percent of the water is discharged to municipal wastewater collection systems. Municipal wastewater is treated at one of several wastewater treatment plants and discharged to the waters of the Bay. Currently, about 3 percent of the municipal wastewater produced in the Basin is treated and recycled, primarily for landscape irrigation. The proportion of municipal wastewater that is recycled is expected to grow rapidly in the next 20 years with a corresponding reduction in the proportion discharged to the Bay.

Urban development has altered the hydrology of the Basin and increased flood hazard. Permeable soils have been replaced by impermeable surfaces such as roads, parking lots, and the roofs of buildings. As a result, the amount of water percolating into the soil has decreased and the rate and volume of stormwater runoff increased. Furthermore, development has encroached upon the floodplains of the Basin's rivers and creeks. Before development, floodwaters could overflow creek banks and spread across the land without adverse consequences. Now, if the increased volumes of stormwater cannot be contained within the creek banks, property damage usually ensues. Severe flooding has occurred many times as the Basin has developed. Although flood management projects have been built on most of the Basin's rivers and creeks, damaging

flooding continues to occur. In the last 3 years the Guadalupe River, Coyote Creek, and San Francisquito Creek have all flooded.

To prevent overbank flooding, creek channels have been modified to accommodate much larger flows than they did under natural conditions. Creeks have been straightened, enlarged, and lined with concrete and rock and confined within levees and floodwalls to increase their capacity to convey floodflows without damage.

Until relatively recently, stormwater management in urban areas was largely a matter of preventing loss of life or property during floods. Urban stormwater was viewed as less contaminated than municipal and industrial discharges and little effort was made to control its quality. Now it is widely accepted that urban stormwater is a contaminated waste stream that needs to be managed. Several programs are being implemented in the Basin to reduce the discharge of pollutants in urban stormwater runoff. They involve the adoption of a wide range of BMPs that reduce the mass of pollutants entering the urban storm drainage system or remove pollutants from stormwater before it is discharged to creeks and the Bay.