CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter presents the general setting of the study area (the PVWMA service area), describes resources in the study area that would be affected by any of the alternatives if implemented, and describes linkages between the resources. The most recent data and information available are used to describe the affected environment. These data establish the baseline for analysis of the environmental consequences of the alternatives, found in Chapter 4.

3.1.1 EIS SCOPING

The statutes and regulations implementing NEPA authorize and encourage an early consultation, or scoping, process to assist in the identification of the range of issues to be considered in the environmental evaluation of projects and to uncover concerns that might otherwise go unrecognized.[1] The scoping process for the Revised BMP Project EIS included three steps: 1) publication of a Notice of Intent to Prepare an EIS in the Federal National Register (September 3, 2001); 2) presentation and discussion of the project at a public scoping meeting; and 3) preparation of a Scoping Report. Publication of the Notice of Intent initiated a 30-day period ending October 2, 2001 during which interested parties were invited to submit written comments on the scope of the EIS. The scoping meeting was held on Wednesday, August 29, 2001, at the Watsonville Senior Center in the City of Watsonville, California. Consistent with recommendations from the Council on Environmental Quality regarding NEPA implementation, a Scoping Report was distributed to all parties that submitted written or oral comment in order to make public the decisions that have been made during the scoping process.

A variety of issues and concerns was raised during the scoping process, described in the Scoping Report. Issues of concern included the following: environmental documentation and coordination, project description and impact analysis, water supply and demand, water rights, environmental needs, documentation of beneficial use, groundwater, shortages, water quality, fish and wildlife, wetlands, air quality, environmental justice, alternatives, economic considerations, and growth inducement potential. These comments were used to help identify issues addressed in the EIS.

The resources and related topics presented in this chapter are:

- Land Use
- Geology, Soils, Seismicity and Hazardous Materials

[1] 40 Code of Federal Regulations (CFR) 1500-1508.

- Water Resources and Water Quality
- Vegetation, Fish and Wildlife
- Cultural Resources
- Indian Trust Assets
- Air Quality
- Environmental Justice
- Socioeconomics

Table 3.1.1 indicates project locations.

TABLE 3.1.1
PROJECT LOCATIONS

Project Component	Location (Jurisdiction)	USGS 7.5-Minute Quadrangle
Service Area	Parts of Santa Cruz, Monterey and San Benito Counties	Watsonville East, Wastsonville West, Moss Landing, Chittenden, Prunedale, San Juan Bautista, and Loma Prieta
Import Pipeline	San Benito, Santa Clara, Santa Cruz and Monterey Counties	San Felipe, Chittenden, Watsonville East, Watsonville West
Integrated Coastal Distribution System	Santa Cruz and Monterey Counties	Watsonville West and Moss Landing
Water Recycling Facility	City of Watsonville	Watsonville West

3.2 LAND USE

EXISTING LAND USES

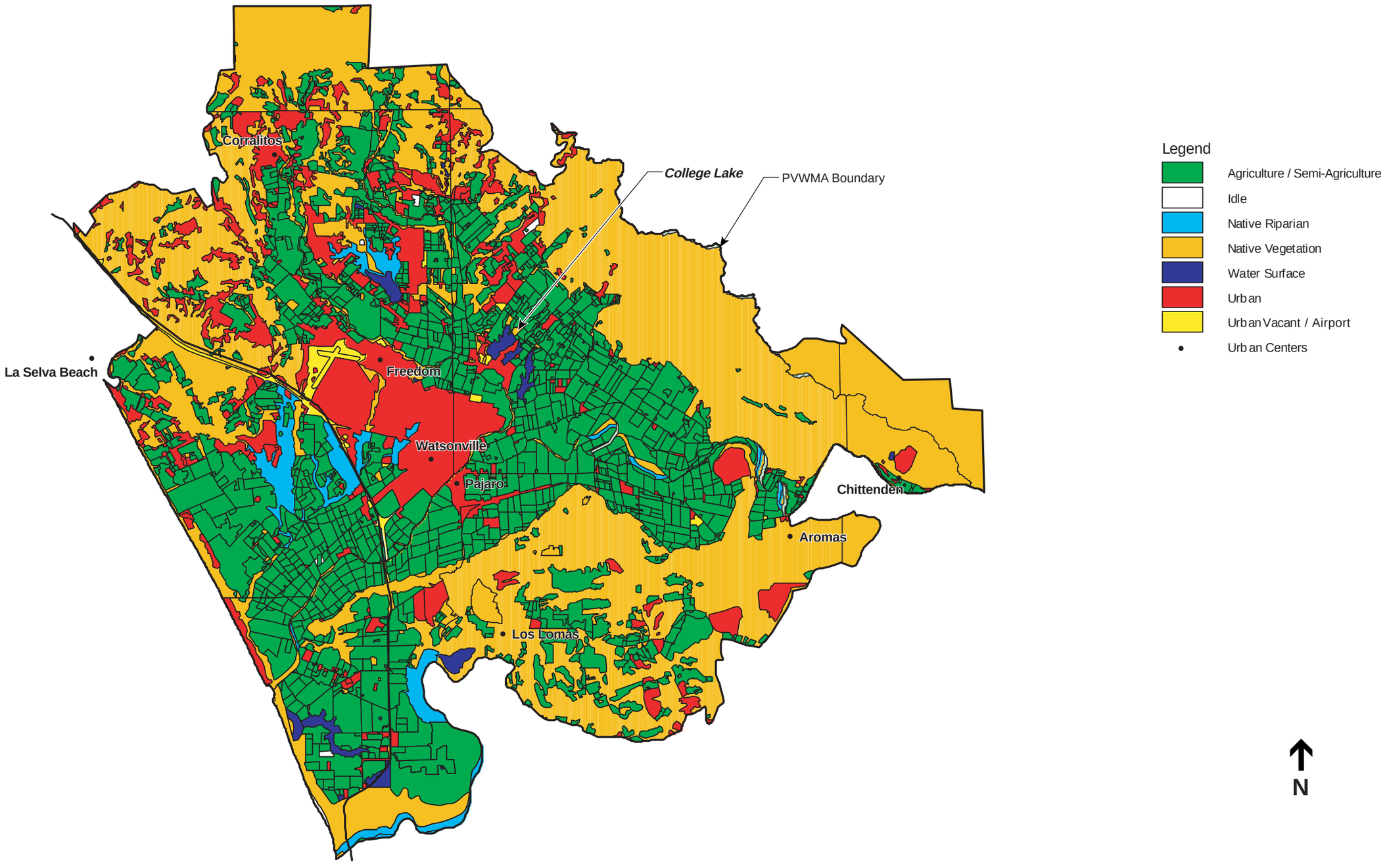
As shown in **Figure 3.2-1**, open space and agriculture are the predominant land uses in the Pajaro Valley. Crops grown in the valley include strawberries, bush berries, apples, flowers, lettuce, artichokes, and other vegetables. While farmhouses are scattered throughout the Pajaro Valley, residential areas within the project area are primarily located near urban centers, such as the City of Watsonville and the neighboring community of Freedom, in inland foothill areas, and along the coast.

The proposed facilities are within five land use jurisdictions, each with separate land use definitions and requirements. The proposed Import Pipeline would extend through unincorporated areas of San Benito, Santa Clara, Santa Cruz, and Monterey Counties along its 22-mile-long alignment. The proposed site of the Water Recycling Facility adjacent to the WWTF is within the incorporated City of Watsonville. The Integrated Coastal Distribution System (ICDS) would extend through unincorporated lands in Monterey and Santa Cruz Counties. **Figure 2.1** in Chapter 2 shows the county boundaries within the PVWMA service area.

IMPORT PIPELINE ALIGNMENT

Land uses along the Import Pipeline alignment are primarily agricultural. From its eastern terminus, the pipeline alignment extends through generally flat, irrigated cropland and is parallel to, and south of, the Pajaro River in San Benito County. Little development exists along this segment of the alignment (see **Figure 2.5** in Chapter 2). At Station 1710, the alignment crosses Miller's Canal, an irrigation ditch, and at Station 1685 it crosses State Route (SR) 25 (Bolsa Road) and the Union Pacific Railroad (UPRR) tracks. The alignment then follows a Pacific Gas and Electric Company (PG&E) power line easement. East of US 101, the alignment is bordered on the south by grassland within the Lomerias Muertas foothills.

At Station 1500/1366 (the stationing changes sequences here), the alignment crosses U.S. 101 (see **Figure 2.5**). Within this area, undeveloped grassland borders the alignment on the west. West of US 101, the alignment extends along Betabel Road. At Station 1300, the alignment follows a private farm road west and crosses the Pajaro River and the Santa Clara County line, and extends along the UPRR right-of-way (see **Figure 2.6**). Little development is present along this portion of the alignment, which is bordered by the UPRR tracks to the south and grass-covered Sargent Hills to the north. At Station 1205, the alignment ascends a steep portion of the Sargent Hills, and then crosses the Santa Cruz County line. The community of River Oaks is located south of the alignment, across the UPRR tracks and SR 129. Land uses in this area include irrigated croplands and scattered houses in the community of Chittenden across SR 129 and the UPRR tracks to the south, and undeveloped grassland and Soda Lake to the north.



SOURCE: Department of Water Resources, 1997; adapted by Environmental Science Associates

Figure 3.2-1
Existing Land Uses in the PVWMA Service Area

At Station 1129, the alignment crosses SR 129, the Pajaro River, and the San Benito County line. The alignment then extends through the Graniterock Company property (see **Figure 2.7**). The alignment extends along the quarry railroad tracks and Quarry Road between quarry lands and irrigated croplands. The community of Aromas is located to the south of the alignment. The alignment then crosses the Monterey County line.

The remainder of the pipeline alignment extends through generally flat agricultural lands. Other uses include the Bolsa de San Cayetano Hills south of the alignment, and industrial development at Watsonville Junction (see **Figures 2.7** and **2.8**). The western terminus of the alignment is located on the west side of SR 1.

SUPPLEMENTAL WELL SITING AREA

The siting area for the supplemental and injection/extraction wells, shown in **Figure 2.2** in Chapter 2, includes agricultural lands east of SR 1, and north and south of the Import Pipeline alignment. The siting area for the supplemental wells includes lands designated Agriculture in the Santa Cruz County General Plan/Local Coastal Program (LCP).

INTEGRATED COASTAL DISTRIBUTION SYSTEM (ICDS)

Land uses in the coastal service area are primarily agricultural uses such as vegetable and strawberry crops. Few sensitive land uses occur within the coastal service area. The Monterey Bay Academy, a private boarding school, is located west of the northern portion of the San Andreas Lateral. Another school, Moss Landing Middle School, is located at the south end of the Springfield Lateral along the east side of SR 1. A trailer park is located along the west side of SR 1, across from Moss Landing School. Residences are located along Struve Road in the same area. The Pajaro Dunes residential community is located along Sunset State Beach, near the westernmost sub-lateral of the San Andreas Lateral. Isolated farmhouses are scattered throughout the project area.

WATER RECYCLING FACILITY (WRF)

The site of the proposed WRF adjacent to the WWTF is within the Watsonville city limits. The predominant land use in the vicinity of the WWTF and the proposed WRF is agriculture, primarily fruit and vegetable croplands. The lands adjacent to the WWTF are considered *Prime Farmland*, specifically Type 3 agricultural lands, which are prime agricultural lands located within the Coastal Zone. The proposed site for the WRF is zoned “Commercial Agriculture” (CA).

IMPORTANT FARMLAND DESIGNATIONS

The California Department of Conservation, Office of Land Conservation, maps important farmland throughout California. Important farmlands are divided into the following four categories based on their suitability for agriculture:

- *Prime Farmland* is land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops when treated and managed.
- *Farmland of Statewide Importance* is land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
- *Unique Farmland* is land that does not meet the criteria for Prime Farmland or Farmland of Statewide importance which has been used for the production of specific high economic value crops.
- *Farmland of Local Importance* is either currently producing crops, or has the capability of production, and does not meet the criteria of the categories above.

SAN BENITO COUNTY (Import Pipeline)

According to the Important Farmland Map for San Benito County, the Import Pipeline alignment extends through lands designated as Prime Farmland and Farmland of Statewide Importance between its eastern terminus and Station 1295+00 (Department of Conservation, 1996). Prime Farmlands are also located along the alignment on the west side of U.S. 101, and between Stations 457+00 and 1000+00 (a distance of approximately 3,500 feet) near Aromas.

SANTA CLARA COUNTY (Import Pipeline)

According to the Important Farmland Map for Santa Clara County, lands along the Import Pipeline alignment between Stations 1190+00 and 1295+00 are designated Grazing Land (Department of Conservation, 1996). This designation is for land on which the existing vegetation is suited to the grazing of livestock. These lands are not considered prime farmlands.

SANTA CRUZ COUNTY (Import Pipeline, Recycled Water Facility, ICDS)

The Santa Cruz County General Plan identifies commercial agricultural lands within the County. Commercial agricultural lands are divided into seven categories. Four of these categories, which are described below, are applicable to the study area for this EIR.

Type 1A – Viable Agricultural Land. Type 1A agricultural lands comprise areas of known high productivity which are not located in any utility assessment district for which bonded indebtedness has been incurred. These lands essentially meet the U.S. Department of Agriculture Soil Conservation Service and the California Department of Food and Agriculture criteria for “prime” and “unique” farmland and “prime” rangeland.

Type 1B – Viable Agricultural Land in Utility Assessment Districts. This type includes viable agricultural lands, as defined above, which are within a utility assessment district for which bonded indebtedness has been incurred, except Agricultural Preserves.

Type 2C – Limited Agricultural Land in Utility Assessment Districts. This type includes agricultural lands with limiting factors which are in a utility assessment district, as of 1979, which has incurred bonded indebtedness.

Type 3 – Viable Agricultural Land within the Coastal Zone. This category includes all of the following lands outside the Urban Services Line and the Urban Rural Boundary, and within the Coastal Zone in Santa Cruz County:

- Land which meets the U.S. Department of Agriculture Soil Conservation or California Department of Food and Agricultural Service criteria for prime farmland or rangeland soils and which is physically available for agricultural use.
- Land which meets the California Department of Food and Agriculture criteria for unique farmland of statewide importance and which is physically available for agricultural use.

According to the Santa Cruz County Agricultural Resources Map, lands along the Pajaro River and the Import Pipeline alignment are designated as Type 1A lands or Type 1A, Agricultural Preserve. The Agricultural Preserve designation identifies lands that are currently under Williamson Act contract. The proposed Water Recycling Facility and the northern portion of the ICDS would be located on Type 3 lands. As stated above, agricultural lands designated as Type 1A or 3 lands meet the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service) criteria for prime and unique farmlands.

MONTEREY COUNTY (Import Pipeline, ICDS)

According to the North County Planning Area Important Farmlands Map, virtually all of the lands along the Pajaro River, the Import Pipeline alignment from Highway 1 to the eastern edge of Monterey County, and the southern portion of the ICDS are designated as prime farmlands (County of Monterey, 1994).

3.3 GEOLOGY, SOILS, SEISMICITY, AND HAZARDOUS MATERIALS

GEOLOGY, SOILS, AND SEISMICITY

This section describes the geology, soils, and seismic conditions in the area of the proposed action. The geology discussion is based on a review of reports and geologic maps including:

- The Final Program EIR for the Pajaro Valley Water Management Agency's (PVWMA) Basin Management Plan (1993);
- The Final EIR for the PVWMA Local Water Supply and Distribution Project (1999);
- Reports published by the U.S. Geological Survey (USGS) and the California Division of Mines and Geology (CDMG);
- County general plans; and
- U.S. Department of Agriculture soil surveys for Santa Cruz and Monterey Counties.

GEOLOGY

The project area is in the Pajaro Valley, a wide plain between the Coast Ranges and Monterey Bay. Northwest-trending mountains and valleys that are often defined by active faults characterize the Coast Ranges. The southern Santa Cruz Mountains, from the vicinity of U.S. Highway 101 (U.S. 101) westward through the Chittenden Pass, consist of Middle and/or Lower Pliocene (5 million years ago) marine sedimentary rocks and Early Miocene (23.5 million years old) marine deposits. A sliver of Mesozoic granite from the Salinian block occurs south of State Route (SR) 129 (at the Graniterock quarry) in the San Andreas rift zone. The Pajaro Valley is underlain by Quaternary alluvium from Aromas to Monterey Bay. The Pajaro Valley separates the southern Santa Cruz Mountains to the north from the Gabilan Range to the south. The Gabilan Range is underlain partly by Pleistocene nonmarine sedimentary rocks.

SOILS

Soils form in a particular location in response to the characteristics of underlying rock formations, slope, drainage, and climate. Soils within the project areas vary from rich agricultural soils in the low-lying, gentle slopes of the southern Santa Clara Valley and Pajaro Valley to thin, eroded soils in the steep slopes of the Santa Cruz Mountains. Some soils contain clay minerals that have expansive properties. These soils expand when wet and shrink when dried.

Soils may also have low pH or high sulfate concentration or other chemical characteristics that can create a corrosive environment to uncoated steel or concrete. Soils within the project area could be moderately to highly corrosive.

The southern Santa Clara Valley is underlain by alluvium, from which good agricultural soils have formed.[1] The southern portion of the valley is currently in agricultural use, supporting a variety of crops and orchards. Soils in the Santa Cruz Mountains are variable. Upland soils are thin and generally do not support agriculture, except for rangeland. Locally flat, alluvial areas within the mountains are cultivated. Soils that have formed within the alluvium of the Pajaro Valley are rich, highly productive agricultural soils that support a variety of vegetable crops as well as berries, flowers, and orchards.

SEISMICITY

The region is characterized by high seismic activity. The San Andreas Fault System, forming the boundary between the North American and Pacific crustal plates, is expressed as a series of northwest-trending faults (Jennings, 1994). These faults include the San Andreas, San Gregorio, Monterey Bay, Hayward, Calaveras, Sargent, Vergales, and Zayante faults (**Figure 3.3-1**). Many individual faults of the San Andreas Fault System have produced strong earthquakes in the past and are expected to do so in the future. The 1989 Loma Prieta earthquake, which was centered in the Santa Cruz Mountains to the northeast of the Pajaro Valley, resulted in deaths, injuries, and widespread damage in the project area.

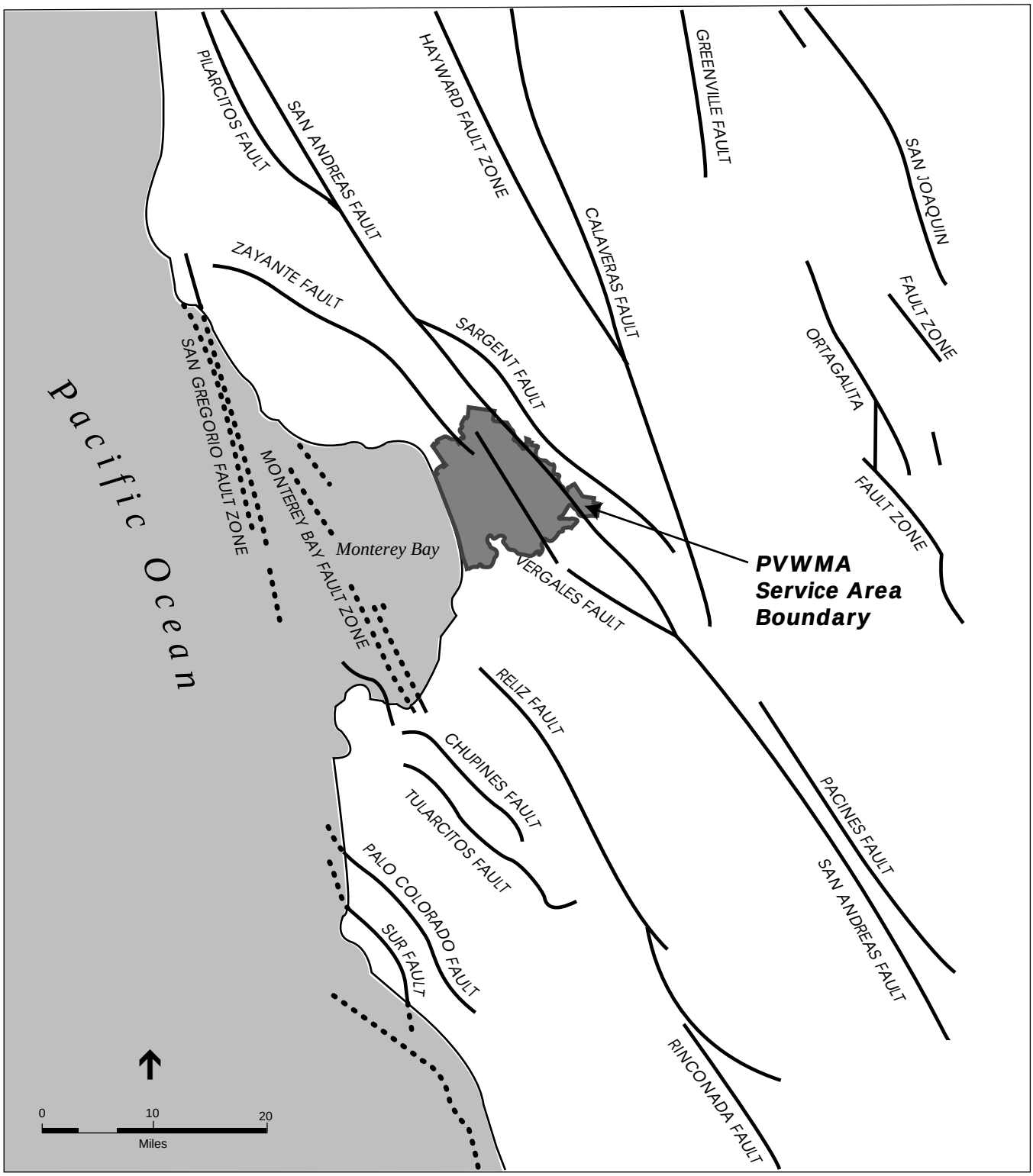
Table 3.3.1 lists the location of regionally significant active faults that could affect project facilities, and the location of the faults, activity status, date of most recent motion, and maximum moment magnitude earthquake (Mw). The Mw is related to the physical size of a fault rupture and movement across a fault. Moment magnitude provides a physically meaningful measure of the size of a faulting event (CDMG, 1997). The following text provides a summary of primary faults most likely to adversely affect the project area.

San Andreas Fault

The San Andreas fault is a major northwest-trending, right-lateral, strike-slip fault. The fault extends for about 600 miles from the Gulf of California in the south to Cape Mendocino in the north. The San Andreas is not represented by a single trace, but by a system of active faults that diverge from the main fault south of San Jose. Regional faults that are subparallel to the San Andreas fault, such as the Hayward, Calaveras, and San Gregorio, are within the broader San Andreas Fault System (**Figure 3.3-1**).

The San Andreas fault has produced numerous large historic earthquakes including the 1906 San Francisco earthquake. That event had an estimated Richter magnitude of 8.3 and was associated with up to 21 feet of displacement and widespread ground failure (Lawson, 1908). In the Watsonville area and to the east, reports of strong groundshaking, toppled chimneys, ground cracks, broken pipes, and twisted and sunken railroad tracks (Lawson, 1908) indicate that groundshaking intensities reached IX on the Modified Mercalli scale (**Table 3.3.2**).

[1] Alluvium is the general term for clay, silt, and gravel or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water.



SOURCE: Environmental Science Associates

PVWMA Revised BMP EIS / 200179 ■

Figure 3.3-1
Regional Fault Map

TABLE 3.3.1
PRIMARY FAULTS IN THE PROJECT SITE VICINITY

Fault	Approximate Distance and Direction from Downtown Watsonville (Miles)	Recency of Movement	Fault Classification[a]	Historical Seismicity[b]	Maximum Moment Magnitude (Mw)[c]
San Andreas	4.8 Northeast	Historic (1906; 1989 ruptures)	Active	M7.1, 1989 M8.25, 1906 M7.0, 1838 Many <M6	7.9
San Gregorio	24 Southwest	Holocene	Active	M5.5-5.9 1869-1931	7.3
Monterey Bay	18 East	Holocene	Active	Microseismicity[d]	7.1
Calaveras (southern)	18 Northeast	Historic (creep, 1861 rupture north of the project) Holocene	Active	M5.6-M6.4, 1861 M4 to M4.5 swarms 1970, 1990	6.2
Sargent	7 Northeast	Historic (creep 1989, triggered by Loma Prieta)	Active	Microseismicity	6.8
Zayante-Vergeles	2.4 Northeast	Holocene	Segments zoned both active and potentially active	Data Limited	6.8

[a] An active fault is defined by the State of California as a fault that has had surface displacement within Holocene time (approximately the last 10,000 years). A potentially active fault is defined as a fault that has shown evidence of surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. Sufficiently active is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997).

[b] Richter magnitude (M) and year for recent and/or large events. Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave.

[c] Moment magnitude is related to the physical size of a fault rupture and movement across a fault. Moment magnitude provides a physically meaningful measure of the size of a faulting event (CDMG, 1997). The maximum moment magnitude earthquake (Mw), derived from the joint CDMG/USGS Probabilistic Seismic Hazard Assessment for the State of California, 1996 (CDMG OFR 96-08 and USGS OFR 96-706).

[d] Microseismicity refers to small earthquakes typically not felt by humans, with a moment magnitude <4.

SOURCES: Jennings, 1994; Hart, 1997

TABLE 3.3.2
MODIFIED MERCALLI INTENSITY SCALE

I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.
III	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.

SOURCE: B. A. Bolt, 1988

Numerous moderate-sized earthquakes (Richter magnitude 5.2) occurred in Watsonville in 1954 and again in 1964 and 1969, causing breakage of irrigation lines, rupture of water mains, and cracking of plaster and stucco (PVWMA, 1993). The Richter magnitude 7.1 Loma Prieta earthquake of October 1989 caused strong groundshaking and ground failure across a wide region. Major damage occurred in downtown and residential Watsonville, Castroville, Gilroy, and Hollister (Wagner, 1990). The Loma Prieta earthquake produced a peak ground acceleration of 0.39g (gravitational acceleration), which was accompanied by groundshaking established at Modified Mercalli intensity VIII in the project area (McNutt and Toppozada, 1990).

The San Andreas fault has repeatedly provided evidence of large surface fault rupture events and is designated as an earthquake fault zone under the Alquist-Priolo Act. The Peninsula segment of the San Andreas fault is estimated to have a 15 percent probability of producing a Richter magnitude 6.7 earthquake in the period between 2000 and 2030 (USGS, 1999). Because a significant amount of stress was released during the 1989 Loma Prieta earthquake, the Santa Cruz Mountains segment is assigned a 10 percent probability of producing a similar magnitude earthquake in the same 30-year period.

San Gregorio Fault

The San Gregorio Fault Zone is made up of several shorter faults and extends roughly parallel to the coast of California, about 270 miles from the vicinity of Bolinas Bay south to Monterey Bay. The Palo Colorado fault mapped by Jennings (1994) to extend from the center of Monterey Bay about 24 miles to Big Sur may be a segment of the San Gregorio Fault Zone. The San Gregorio continues south through Big Sur and eventually connects with the Hosgri Fault Zone in the south-central portion of the state.[2] Except for two small segments that pass through land, the San Gregorio Fault Zone remains offshore from San Francisco to Santa Cruz, and is about 18 miles offshore at La Selva Beach.

Calaveras Fault

The Calaveras fault, a major right-lateral, strike-slip fault, extends for about 100 miles from Dublin to Hollister, where it merges with the San Andreas fault. The Calaveras fault is most active on the southern segment. The Richter magnitude 6.2 Morgan Hill earthquake (April 1984) originated on the Calaveras fault. Creep has been documented along the fault in the vicinity of Hollister.[3] The Calaveras fault is designated as an earthquake fault zone under the Alquist-Priolo Act.

Sargent Fault

The Sargent fault branches from the San Andreas fault and extends for about 34 miles from the Lexington Reservoir in the north to just north of Hollister in the south. The Sargent fault is a reverse fault that dips steeply to the west and is seismically active (Wagner, 1990). The fault is

[2] The San Gregorio Fault Zone is sometimes referred to as the San Gregorio-Hosgri Fault Zone to include the system of northwest trending faults that parallel the coast from Lopez Point near Lucia to Point Sal near San Luis Obispo.

[3] Tectonic creep is the slow, apparently continuous movement on a fault (Bates and Jackson, 1980).

considered to be capable of surface rupture and is designated as an Alquist-Priolo earthquake fault zone.

Zayante-Vergeles Fault

The Zayante-Vergeles faults are subparallel and about five miles west of the San Andreas fault. The Zayante fault is considered to be a potentially active, Quaternary fault (Jennings, 1994). The Vergeles fault displaces granitic basement rock against Pleistocene-age Aromas sand, but has not been found to display Holocene movement. Some portions of the Zayante fault may be active and some scientists believe its southern section may be indirectly connected to the San Andreas Fault Zone. The connection between these faults in the subsurface beneath the Pajaro River floodplain is inferred in the absence of specific evidence. Recent investigations on the Vergeles fault have resulted in the CDMG designating portions of the fault as a fault rupture hazard zone (USGS Watsonville East and Watsonville West 7.5-minute Topographic Map). However, other portions of the Vergeles are classified as potentially active and are not designated under the Alquist-Priolo Act.

HAZARDOUS MATERIALS

Hazardous materials are substances with certain physical or chemical properties that could pose a substantial present or future hazard to human health or the environment when improperly handled, disposed, or otherwise managed. Title 22 of the California Code of Regulations, Division 4.5, Chapter 11, Article 3 groups hazardous materials into the following four categories based on their properties: toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), and reactive (causes explosions or generates toxic gasses). Hazardous materials have been and are commonly used in commercial, agricultural and industrial applications as well as in residential areas to a limited extent.

A hazardous *waste* is any waste that may (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness, or (2) pose a substantial present or potential hazard to human health or the environment, due to factors including, but not limited to, carcinogenicity, acute toxicity, chronic toxicity, bioaccumulative properties, or persistence in the environment, when improperly treated, stored, transported, or disposed of, or otherwise managed (California Health and Safety Code, Section 25141). If improperly handled, hazardous materials and wastes can result in public health hazards if released to the soil or groundwater or through airborne releases in vapors, fumes, or dust.

TOPOGRAPHY

THE PAJARO VALLEY

The Pajaro Valley plain is a low-lying topographic area that ranges in elevation from sea level to about 200 feet mean sea level (msl) along the perimeter, at the foot of the Coast Ranges. Flat to gently sloping landforms characterize most of the topography, with some moderate to steep slopes along the edges of wide reentrant valleys cut into old marine terraces (e.g., Harkins Slough

and Corralitos Creek) and in the coastal dune areas. Moderate slopes are also present in the Cayetano Range, a dissected low range of hills at the southern edge of the valley.

SOUTHERN SANTA CLARA VALLEY

The southeastern portion of the Santa Clara Valley has a gently sloping topography. Creeks, drainage channels, levees, railroad and roadway grades provide the few topographic features in this area. The valley is underlain by Quaternary alluvium derived from surrounding mountains. Slopes are flat to gently sloping and are generally stable. Steep slopes occur only along creek banks and may be susceptible to slumping and sliding.

SANTA CRUZ MOUNTAINS

The project area includes a portion of the Santa Cruz Mountain foothills in an area of gentle slope along SR 129 and the railroad right-of-way. Elevations in this area vary from about 100 to 200 feet msl. Elevations at the Pajaro Gap range from 100 to 600 feet msl. Slopes in the Santa Cruz Mountain foothills in the project vicinity range in steepness from gently sloping to moderately steep. Slope stability ratings range from generally marginally stable to unstable (Nilsen and Wright, 1979).

GEOLOGY

GEOLOGIC UNITS

The geologic units mapped in the PVWMA service area consist of marine sedimentary bedrock and unconsolidated deposits of alluvial, aeolian, and marine origin. Important differentiations exist among areas underlain by bedrock and areas underlain by various types of sediments. The properties of bedrock and sediments that need to be considered during the planning, design, and construction phases of the project facilities are strength, compressibility, and liquefaction potential (bedrock is not subject to liquefaction). These properties (discussed in the next section) vary for different geologic units and affect their seismic responses and construction uses.

Young Sediments

The beach dunes, basin deposits, and floodplain deposits are the youngest geologic units in the PVWMA service area, being less than about 10,000 years old (the Holocene epoch of the Quaternary geologic period). The dune and beach deposits generally are fine to medium sand with local concentrations of pebbles and cobbles in the beach sands, ranging in thickness from 5 to 80 feet. The basin and floodplain deposits consist of clay, silty clay, and fine sand ranging in thickness from less than 5 to more than 100 feet. The dune sands consist of unconsolidated, well-sorted, fine- to medium-grained quartz sand. The predominantly unsaturated dune sands provide small quantities of water where saturated. The high porosity and permeability of the sands allow for rapid recharge of the lower coastal aquifers. Historically, this condition created a groundwater mound that acted as a natural barrier against seawater intrusion.

Older Alluvial Sediments

The majority of the PVWMA service area is underlain by sedimentary deposits of late Tertiary to Pleistocene age, with some deposits of marine or mixed origin near the coast. These deposits include the Quaternary-aged terrace deposits and the older terrace deposits of Watsonville. The terrace deposits consist of unconsolidated basal gravel, sand, silt, and clay. These terrace deposits represent material eroded from the older rocks and redeposited by ancient streams and/or wind, or reworked by ocean wave action and longshore drift. The thicknesses of individual types of deposits vary from less than 10 feet to more than 200 feet. These deposits are collectively referred to as the alluvial formation in the Revised BMP and are a water-bearing strata underlain by and in good hydrologic connection with the Aromas Red Sands Formation, discussed below (RMC, Inc., 2001).

The alluvial deposits are a highly variable mixture of unconsolidated sand, gravel, and clay that are present in the Pajaro River floodplain and in adjacent smaller river valleys. In the floodplain, a 50-foot-thick basal gravel grades upward into a confining blue clay marker bed. The blue clay is discontinuous for four miles west of the Pajaro Gap before becoming an apparently nearly continuous unit that thickens as it extends to the coast. The basal gravel is hydrologically connected with the Aromas Red Sands and is a major source of water for shallow wells within the Pajaro River floodplain.

Aromas Red Sands Formation

The Aromas Red Sands Formation has a thickness that ranges from 100 feet in the foothills to over 800 feet in the center of the basin. The Aromas Red Sands are also of Pleistocene age, but are older than the overlying alluvial formation. The Aromas Red Sands consist of older fluvial and younger aeolian sand deposits with discontinuous lenses of clay, silt, and gravel. The sands are moderately well-sorted and commonly have a red-brown color. The Aromas Formation is considered to be the primary water-bearing unit of the Pajaro Valley Basin.

Throughout the Aromas Red Sands, thick expanses of sand are separated by discontinuous confining layers of clay that separate the formation into the Lower Aromas (primarily fluvial deposits) and the Upper Aromas (primarily eolian deposits). The confining layer consists of interbedded clay and silty clay in the fluvial part of the Aromas Red Sands. The clay layers tend to be thicker in the west and thin toward the east. Previous investigations suggest the source of the Aromas Red Sands as the granitic rock formations of either the Coast Ranges or the Sierra Nevada.

Purisima Formation

The Purisima Formation underlies the Aromas Red Sands and consists of interbedded sands, silts, clays, and shales of marine origin of Pliocene age (about 2 to 6 million years old). The formation outcrops around the periphery of the basin in the north and the east. Beneath the central Pajaro Valley the Purisima is 1,000 to 2,000 feet thick and grows thinner as it extends to the southeast. East of Corralitos, the Purisima is approximately 4,000 feet thick in the down-dropped block

between the Zayante-Vergales fault and the San Andreas fault. The San Andreas fault separates the Purisima from older rocks to the east.

Previous investigations divide the Purisima into three units. The upper unit is a very fine to fine sand with silt and clay interbeds. The middle unit is a fine to medium sand with clay and silt interbeds and some gravel. The lower unit is a sand with clay and shale interbeds. The middle and lower units tend to have a bluish appearance in freshly exposed sediments. Approximately 600 feet below the top of the lower unit is a 150-foot-thick shale marker bed that is continuous throughout the Pajaro Valley.

SOILS

A variety of soil types are present within the project area. These soil associations are Elder-Conejo, Clear Lake, Watsonville-Elkhorn Pinto, Diablo-Cropley, and Baywood-Pfeiffer and are discussed below.

Soils on alluvial plains and fans and in basin-like areas were developed on unconsolidated deposits derived mainly from sedimentary rocks. Their topography ranges from nearly level to strongly sloping. They are very deep and are well to poorly drained. They occur along the Pajaro River, in the valley of Corralitos Creek, and in Harkins and Elkhorn sloughs, at elevations ranging from about +5 feet msl (5 feet above sea level) to about +300 feet msl. Soil Associations 1 and 2 are in this group.

- The Elder-Conejo soils (Association 1) are generally confined to the valley of the Pajaro River east of Watsonville, and to the valley of Corralitos Creek. These soils are well drained, very deep sandy loams, loams, and clay loams, with nearly level to strongly sloping topography. The principal use of these soils is for irrigated crops, but they also are suitable for building site development. About 95 percent of the Association 1 soils meet the criteria for Prime Farmland as outlined in the U.S. Department of Agriculture's Land Inventory and Monitoring Project for the Santa Cruz and Monterey County Soil Surveys (see Section 3.2, Land Use). Another 3 percent meet the criteria for Farmlands of Statewide Importance.

- Soils of the Clear Lake Association (Association 2) occur along the Pajaro River downstream from Watsonville. These soils are poorly drained, consisting of very deep clays in basin-like areas on nearly level topography. These soils are used mainly for irrigated crops, but also support some minor industrial development. About 95 percent of the Association 2 soils meet the criteria for Prime Farmland. Another 3 percent meet the criteria for Farmlands of Statewide Importance.

Soils on marine terraces, old alluvial fans, and hills generally were developed on marine deposits, old alluvium, or weathered shale. These deep to very deep soils range from nearly level to moderately steep topography, and from well drained to somewhat poorly drained. They occur in an arc from west of Aptos, through Corralitos, south through the lakes, to the Tarpy Road area, and on terraces adjacent to Harkins and Elkhorn Sloughs, at elevations ranging from about +20 to about +600 feet msl. Soil Associations 3 and 4 are in this group.

- Soils of the Watsonville-Elkhorn-Pinto Association (Association 3) are well drained to somewhat poorly drained, very deep loams and sandy loams on marine terraces and old alluvial fans, with nearly level to moderately steep topography. These soils occur mainly along the terraces, in the lower foothills of the Santa Cruz Mountains, and on dissected terraces closer to the coast. They are generally used for irrigated crops and have limited potential as Prime Farmland. Another 45 percent meet the criteria for Farmlands of Statewide Importance. An additional 5 percent of the soils are classified as Unique Farmland.

- The Diablo-Cropley soils (Association 4) occur west and south of Watsonville. They are well drained, deep, and very deep clays on alluvial fans or hills, with gently sloping to hilly topography. These soils are used mainly for rangeland, with some minor housing development. About 15 percent of the Association 4 soils meet the criteria for Prime Farmland. Another 65 percent meet the criteria for Farmlands of Statewide Importance.

Soils on sand dunes, hills, and mountains were formed in aeolian deposits or in residuum derived from sandstone, marine deposits, or granitic rock. These deep or very deep soils range from gently sloping to very steep topography and are well drained or somewhat excessively drained. They occur in the hills west of Corralitos Creek and east of Elkhorn Slough, at elevations ranging from about +100 to about +700 feet msl. Soil Association 5 is in this group.

- The Baywood-Pfeiffer soils (Association 5) occur south of Aptos to Sunset Beach State Park, and east to Freedom Boulevard. These soils are well drained to somewhat excessively drained, very deep and deep loamy sands and gravelly sandy loams on sand dunes, with gently sloping to steep topography. The principal uses are for strawberries, watershed, recreation, and rangeland. About 30 percent of the Association 5 soils meet the criteria for Prime Farmland. Another 10 percent meet the criteria for Farmlands of Statewide Importance.

SEISMICITY AND HAZARDS

Active traces of the San Andreas and Vergales faults have been mapped crossing the PVWMA service area. A discussion of these faults is presented under Geology, Soils, and Seismicity, above. Seismic hazards from local and regional faults are discussed below.

GROUNDSHAKING

Earthquakes in the Monterey Bay area could produce strong groundshaking in the Pajaro Valley. Groundshaking intensity is partly related to the size of an earthquake, the distance to the project facility, and the response of the geologic materials that underlie the site. As a rule, the greater the earthquake magnitude and the closer the fault rupture to the site, the greater the intensity of groundshaking. Violent groundshaking is generally expected at and near the epicenter of a large earthquake. Throughout the Pajaro Valley, intensity of groundshaking reached a Modified Mercalli scale VIII in the 1989 Loma Prieta earthquake and likely reached a similar level in a large earthquake affecting the area in October 1865 (McNutt and Toppozada, 1990). Aftershocks also produced damage following the earthquakes. An intensity of VIII, with average peak ground accelerations of 0.25g to 0.30g (peak ground surface acceleration), is expected throughout the northern part of the Pajaro Valley; an intensity of IX or higher, and with average peak ground

acceleration at 0.50 to 0.55g, is expected in the southern and coastal parts of the valley (McCrory, et al., 1977). However, geologic materials respond differently to earthquake waves. Deep unconsolidated materials amplify earthquake waves. Even when an earthquake epicenter is distant from a site, it can induce strong groundshaking and wave amplification, with severe hazards to people and property. This probably accounted for the severity of damage in Watsonville in the 1989 earthquake as well as associated ground failures, primarily from liquefaction. Besides general intensity of earthquakes, peak ground acceleration is an important consideration in the response of structures to earthquake movements. Considering all potential earthquake sources in the region, the maximum credible ground acceleration in the entire valley is estimated at 0.5g (gravitational acceleration), which is as high a level of acceleration as may be expected in any part of California (Greensfelder, 1974). Because the depths of overlying soils are variable, ground accelerations at the surface are varied. As noted, deep soils may amplify ground movements in some areas.

SECONDARY EARTHQUAKE HAZARDS

Liquefaction is a phenomenon whereby unconsolidated and/or near saturated soils lose cohesion and are converted to a fluid state as a result of severe vibratory motion. The relatively rapid loss of soil shear strength during strong earthquake shaking results in the temporary fluid-like behavior of the soil, and occassionally ground failure. Soils that are most susceptible to liquefaction are clean, loose, uniformly graded, saturated, fine-grained sand, usually at depths of less than 50 feet. In general, upland areas have a low liquefaction potential, except where significant alluvium occurs in creek bottoms or swales. Liquefaction was recorded in areas scattered throughout the Pajaro Valley in the 1989 Loma Prieta earthquake (McNutt and Toppozada, 1990). It is expected that areas bordering the entire Pajaro River in the valley are subject to ground failures in large earthquakes (McCrory et al., 1977). Four kinds of ground failure commonly result from liquefaction: lateral spread, flow failure, ground oscillation, and loss of bearing strength (Association of Bay Area Governments, 1996). A *lateral spread* is a horizontal displacement of surficial blocks of sediments resulting from liquefaction in a subsurface layer. Lateral spread occurs on slopes ranging between 0.3 and 3 percent and commonly displaces the surface by several meters to tens of meters. Lateral spreads of only a few feet damaged every major pipeline that broke during the 1906 San Francisco earthquake. *Flow failures* occur on slopes greater than 3 degrees and are primarily liquefied soil or blocks of intact material riding on a liquefied subsurface zone. *Ground oscillation* occurs on gentle slopes when liquefaction occurs at depth and no lateral displacement takes place. Soil units that are not liquefied may pull apart from each other and oscillate on the liquefied zone. Ground fissures can accompany ground oscillation and sand boils. The *loss of bearing pressure* can occur beneath a structure when the underlying soil loses strength and liquefies. When this occurs, the structure can settle, tip, or even become buoyant and "float" upwards.

Coastal areas of the Pajaro Valley also are subject to tsunamis (often incorrectly referred to as tidal waves). A tsunami may be generated by nearby earthquakes, or earthquakes occurring hundreds of miles from the affected coastline. A 1946 earthquake in the Alaskan Trench of the north Pacific Ocean produced two 12-foot tsunamis in Monterey Bay. A probable wave run-up

for the area between Sunset State Beach and Moss Landing has been estimated between 6.7 feet for the 100-year tsunami and 13.2 feet for the 500-year tusnami (Garcia and Houston, 1975).

GEOLOGIC HAZARDS

Settlement is a function of the compressibility of loose deposits (such as some unconsolidated sands or uncompacted fill) and the weight of overlying fill or structures. For example, the loose and semifluid nature of slough deposits render them subject to compression when loads are placed on them. The load (such as fill or other support structures) will settle, sometimes differentially, during a period of several years before a state of equilibrium is reached. The amount of settlement will vary, depending on the thickness of the deposit, the weight of the load, and rate of loading.

Landslides, earthslips, mudflows, and soil creep are all expressions related to the instabilities created by steep slopes, shallow soil development, the presence of an excessive amount of water, or the lack of shear strength in the soil or at the soil/rock interface. Earthquake activity induces some landsliding in soils, but most slippage results from the weight of rain-saturated soil and/or rock exceeding the shear strength of the underlying material. Erosion of supporting material at the toe of a slope further contributes to instability. Static slope instability is the major cause of landslides throughout coastal California. Although existing soil materials may form the basis of an unstable condition, natural processes and human activities can initiate landslides in otherwise stable areas.

HAZARDOUS MATERIALS

As discussed in Section 3.2, Land Use, open space and agriculture are the predominant land uses in the Pajaro Valley. While farmhouses are scattered throughout the Pajaro Valley, residential areas within the project area are primarily located near urban centers, such as the City of Watsonville, in inland foothill areas, and along the coast. Commercial uses, schools and parks are also concentrated in the city of Watsonville. Commercial, industrial, and agricultural land uses are the most likely to use and store significant quantities of hazardous materials, and hence more likely to be locations of soil or groundwater contamination.

REGULATORY FRAMEWORK

GEOLOGY, SOILS, AND SEISMICITY

Alquist Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law December 1972, requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for

human occupancy across these traces.[4] Although surface fault rupture is not necessarily restricted to areas within an Alquist-Priolo Fault Hazard Zone, cities and counties must regulate certain development projects within the zones, which includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong groundshaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. The CDMG has completed seismic hazard mapping for portions of California most susceptible to liquefaction, groundshaking and landslide, such as the Los Angeles Basin and the portions of the San Francisco Bay Area. The CDMG has not completed mapping for the Watsonville West and Watsonville East 7.5-minute quadrangles, which include the project location.

California Building Code

The California Building Code is another name for the body of regulations known as the California Code of Regulations (CCR), Title 24, Part 2, which is a portion of the California Building Standards Code (CBSC, 1995). The CBSC applies to new construction. CCR Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in CCR Title 24 or they are not enforceable (Bolt, 1988). Published by the International Conference of Building Officials, the Uniform Building Code (UBC) is a widely adopted model building code in the United States. The CBSC incorporates by reference the UBC with necessary California amendments. About one-third of the text within the California Building Code has been tailored for California earthquake conditions (ICBO, 1997).

For a discussion of county and local regulations, goals, and policies, refer to Section 3.2 of the Revised BMP EIR.

HAZARDOUS MATERIALS

Federal, state, and local regulations, with the major objective of protecting public health and the environment, extensively regulate hazardous materials and hazardous wastes. In general, these regulations provide definitions of hazardous substances; establish reporting requirements; set guidelines for handling, storage, transport, remediation and disposal of hazardous wastes; and

[4] A "structure for human occupancy" is defined by the Alquist-Priolo Act as any structure used or intended for supporting or sheltering any use or occupancy that has an occupancy rate of more than 2,000 person-hours per year.

require health and safety provisions for both workers and the public. Regulatory agencies also maintain lists, or databases, of sites that are permitted to handle hazardous wastes or store hazardous substances in underground storage tanks as well as sites where soil or groundwater quality may have been affected by hazardous substances.

Hazardous Materials Management

Federal and state laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and in the event that such materials are accidentally released, to prevent or to mitigate injury to health or the environment. The Federal Emergency Planning and Community Right-to-Know Act of 1986 imposes hazardous materials planning requirements to help protect local communities in the event of accidental release.

Storage of hazardous materials in underground tanks is regulated by the State Water Resources Control Board, which has overall responsibility for implementing all regulations set forth in Title 23 of the CCR. State standards cover installation and monitoring of new tanks, monitoring of existing tanks, and corrective actions for removed tanks. State underground storage tank regulations, including permitting for all hazardous materials storage, are enforced by local fire departments.

Hazardous Waste Management

The California DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste under the federal Resource Conservation and Recovery Act (RCRA) and the state Hazardous Waste Control Law. Both laws impose “cradle to grave” regulatory systems for handling hazardous waste in a manner that protects human health and the environment.

Laws Regulating Hazardous Materials and Wastes

The U.S. Environmental Protection Agency (EPA) regulates the management of hazardous materials and wastes. The primary federal hazardous materials and waste laws are contained in RCRA, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Toxic Substances Control Act (TSCA). These laws apply to hazardous waste management, soil and groundwater contamination, and the controlled use of particular chemicals. In California, EPA has delegated most of its regulatory responsibilities to the state.

The state agencies most involved in enforcing public health and safety laws and regulations include the Cal-EPA DTSC, the California Occupational Safety and Health Administration (Cal-OSHA), the Central Coast Regional Water Quality Control Board, the Monterey Bay Unified Air Pollution Control District, and the California Integrated Waste Management Board.

DTSC enforces hazardous materials and waste regulations in California under the authority of EPA. California’s Hazardous Waste Control Law incorporates the federal hazardous materials and waste standards of RCRA, but California’s regulations are stricter in many respects.

In California, Cal-OSHA assumes primary responsibility for enforcing worker safety regulations such as the federal Hazard Communication Program regulations. Cal-OSHA regulations are found in the CCR Title 8. Although Cal-OSHA regulations have incorporated federal OSHA standards, Cal-OSHA regulations are generally more stringent than those of the federal government.

3.4 WATER RESOURCES AND WATER QUALITY

This section describes the existing hydrologic and water quality resources conditions in the Pajaro Valley. The section draws information from the Revised Basin Management Plan (BMP) (RMC, Inc., 2002) and the State of the Basin Report (PVWMA, 2000b).

SURFACE WATER

PRECIPITATION

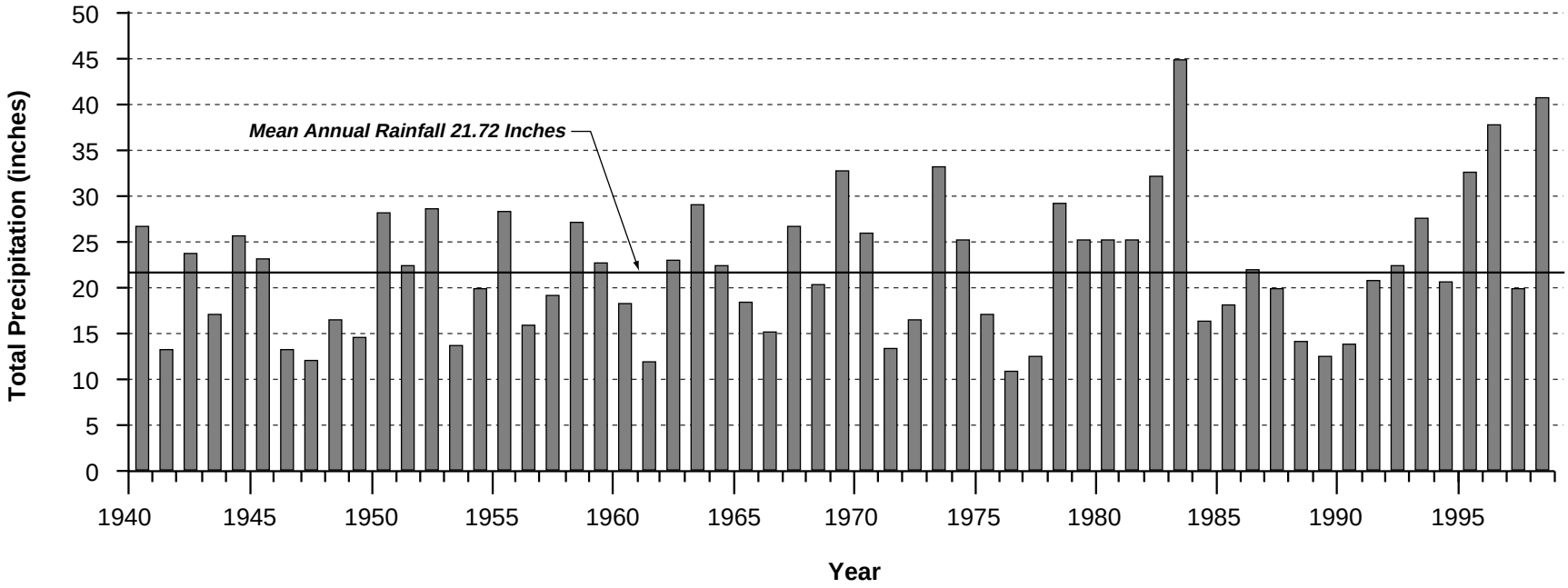
The climate in the Pajaro Valley is mild, with dry summers and wet winters. Temperatures rarely drop below freezing. Nearly 90 percent of the precipitation falls between November and April. Coastal fog is common in the summer and fall months. The mean annual precipitation varies within the project area due to the influence of the coastal mountains, which receive the majority of the rainfall. Precipitation in the region is generally greater at higher elevations, and decreases from north to south. The mean annual precipitation in Watsonville is approximately 22 inches, but varies substantially from year to year, with the minimum recorded precipitation occurring in 1977 (9.7 inches, or 45 percent of normal) and the maximum in 1998 (46.7 inches, or 215 percent of normal). **Figure 3.4-1** shows annual rainfall patterns during the 59-year hydrologic sequence from 1940 to 1999.

HYDROLOGY

The Pajaro Valley is part of the Central Coastal Basins area that extends from Santa Cruz to Santa Barbara. Mountainous terrain and rolling hills generally characterize the Central Coastal Basins.

The boundaries of the Pajaro Valley divide drainage between the Pajaro River and Elkhorn Slough (defined by the Los Carneros Hills) to the south, and the Santa Cruz Mountains to the east and north. The western boundary of the basin is Monterey Bay (the Pacific Ocean). The Pajaro River is the largest stream in the Pajaro Valley, draining approximately 1,190 square miles above the gauge at Chittenden. Streams tributary to the Pajaro River include the Corralitos, Salsipuedes, Brown's Valley, Green Valley, Casserly, and Pescadero Creeks, which drain the southern slopes of the Santa Cruz Mountains in the area. Tributaries to the Pajaro River that are outside of the Pajaro Valley include the Uvas and Llagas Creeks (draining the eastern slope of the Santa Cruz Mountains), and Pacheco Creek, and the San Benito River in San Benito County.

The U.S. Geological Survey (USGS) has recorded daily streamflows for the mainstem Pajaro River at Chittenden since October 1939. Median daily streamflows for the Pajaro River are greater than 40 cubic feet per second (cfs) from about February 1 through the first week in April (1956-1991). Median daily flows historically have declined to less than 20 cfs after early May and less than 10 cfs after mid-June. Flows then begin to increase in early November, becoming greater than 20 cfs after mid-January.



SOURCE: R.M.C., Inc.

Figure 3.4-1

Hydrologic Variability in the Pajaro River Basin
Based on Annual Rainfall at
Watsonville Station, for 1940-1999

Streamflows in the Pajaro River show a much greater variability than does rainfall, ranging from nearly zero to over 500 percent of normal. Streamflow averaged 124,640 acre-feet per year (afy) for the period of record, with a minimum of 766 afy in 1977 and a maximum of over 653,900 afy in 1983. The last 20 years included some of the wettest and some of the driest years on record. In addition, data analysis indicates that multiple dry years are a regular occurrence over the period of record.

WATER QUALITY

Surface water quality data are limited. The USGS has monitored water quality in Pajaro River at Chittenden since the 1950s. Total salt loads have varied between 200 and 3,100 milligrams per liter (mg/L). Increased salt loads have been attributed to natural, agricultural, and urban sources. Boron levels have been measured at 0.2 to 2.6 mg/L, and average sulfate and nitrate concentrations have increased over time. Both nitrate and boron levels typically increase as river flow increases, suggesting a surface runoff source. At low river flows, total dissolved solids (TDS) are high, and at these times concentrations of heavy metals, including mercury, lead, chromium, and cadmium, have been measured in excess of municipal drinking water standards.

Water quality data for other streams in the valley are limited and vary according to land use in the surrounding watershed. For example, in areas where agricultural uses are adjacent to a stream, runoff into the stream likely contains sediments and contaminate nutrients (from fertilizers, pesticides, and livestock). In areas characterized by urban development (residential, commercial, and industrial uses, roadways, parking lots, and landscape areas), runoff likely contains elevated levels of oil, grease, nutrients, sediments, and heavy metals.

AGRICULTURAL RUNOFF QUALITY

Chemical constituents found in agricultural runoff vary during a storm event, from event to event at a given site, and from site to site within a given area. Variances in constituent levels can be the result of differences in rainfall intensity and occurrence, geographic features, and the land use of a site. Runoff from disturbed lands can contribute sediments, pesticides, fertilizers, and other pollutants to receiving waters. Other sources of nonpoint-source pollutants to receiving waters within the Pajaro Valley include City of Watsonville urban runoff and sediment from the Graniterock quarry.

GROUNDWATER

GROUNDWATER HYDROLOGY

Nearly 100 percent of water supplies for agricultural and municipal use within the Pajaro Valley come from groundwater sources. The boundaries of the Pajaro Valley groundwater basin are approximately (but not entirely) the same as the Pajaro Valley described above. The service area boundary of the PVWMA does not coincide precisely with either the groundwater basin boundaries or the surface drainage boundaries of the Pajaro River, but it corresponds

approximately to both. The entire Pajaro Valley basin is quite complex and composed of many hydrogeologic units, but is geologically interconnected and functions as a single basin. The groundwater aquifers are primarily composed of continental and marine deposits and are the principal aquifers found throughout Santa Cruz and northern Monterey Counties. Three major water-bearing strata exist in the basin:

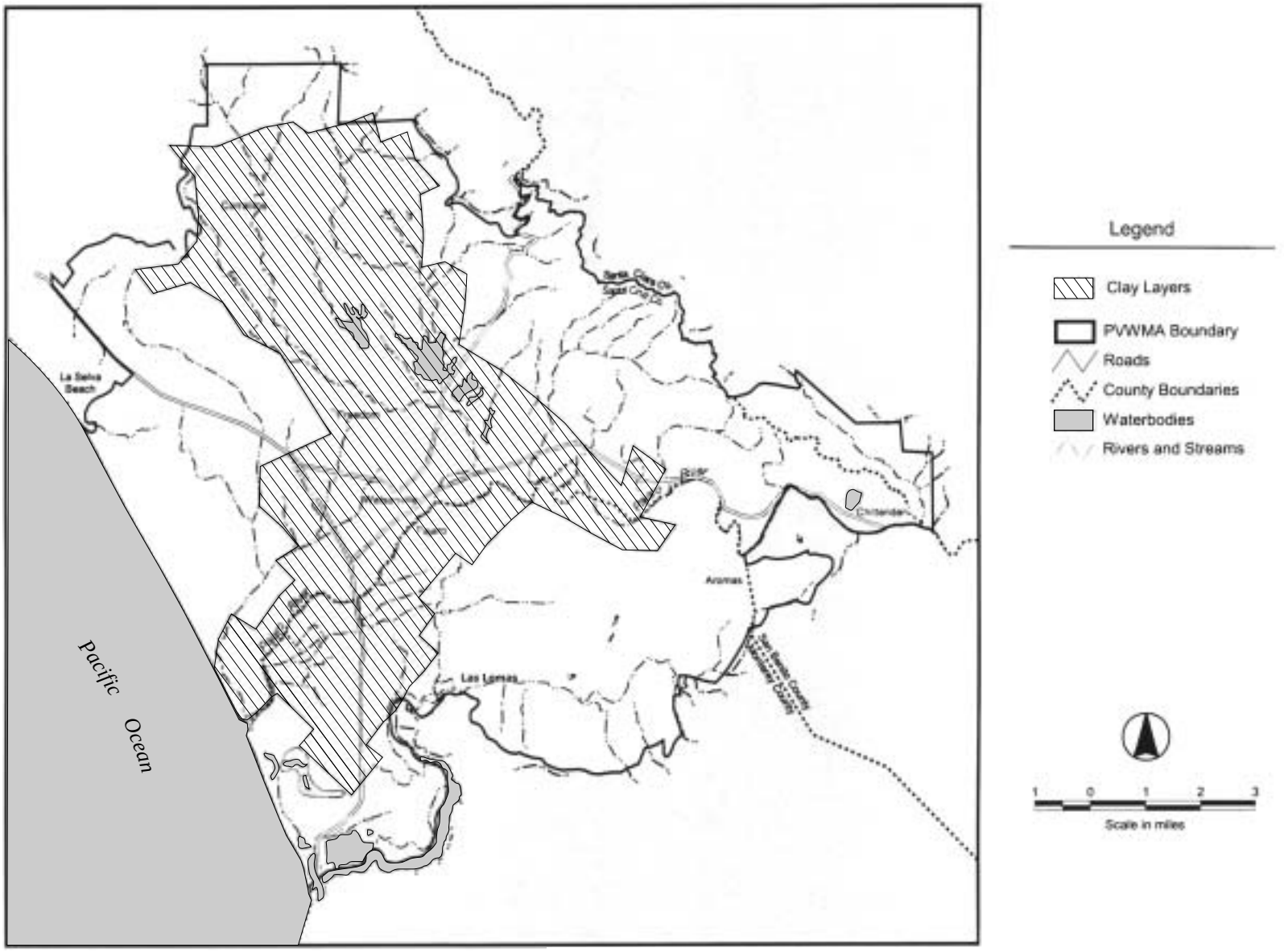
- Alluvium formation, consisting of terrace deposits, alluvium deposits, and dune sands;
- Aromas Red Sands Formation; and
- Purisima Formation.

The Aromas Red Sands and Purisima water-bearing formations are overlain by layers of blue clay which act as a confining layer, inhibiting the free vertical movement of the groundwater. The groundwater basin can store great quantities of water, but it is also connected to the ocean, with no physical barriers to the landward migration of seawater. The following discussion summarizes the three major water-bearing formations.

- *Alluvium Formation*. The alluvium formation consists of terrace deposits, alluvial deposits, and dune sands that average approximately 50 to 300 feet in thickness. A 50-foot-thick basal gravel bed deposit is located in the floodplain and in the blue clay layer. The blue clay is discontinuous for approximately four miles west of the Pajaro Gap, before becoming a continuous unit that thickens as it extends to the coast (see **Figure 3.4-2**). The basal gravel and sands appear to have a good hydrologic connection (water movement between formations) with the underlying Aromas Red Sands, and are a major source of water for the shallow wells in the Pajaro River floodplain.

- *Aromas Red Sands Formation*. Underlying the alluvium formation are the older Aromas sands, which are thought to have originated from the granitic rock formations of either the Coastal Range or the Sierra Nevada. The Aromas Red Sands Formation is considered to be the primary water-bearing unit of the basin. It ranges in thickness from 100 to 800 feet and consists of fluvial and aeolian sand deposits with discontinuous layers of clay, silt, and gravel. The upper portion of the Aromas Red Sands Formation is approximately 100 to 200 feet below sea level, and the lower portion extends to approximately 900 feet below sea level. The confining clay can be found primarily in the fluvial part of the Aromas sands. The clay layers tend to be thicker in the west and thinner towards the east.

- *Purisima Formation*. The Purisima Formation underlies the Aromas Red Sands and consists primarily of three units of marine origin. The upper unit is a very fine to fine sand with silt and clay interbeds. The middle unit is a fine to medium sand, with clay and silt interbeds and gravel. The lower unit is a sand with clay and shale interbeds. Approximately 600 feet below the top of the lower unit is a 150-foot-thick shale bed that is continuous throughout the valley. The formation can be seen on the surface at the northern and eastern boundaries of the basin. Beneath the central Pajaro Valley, the formation is 1,000 to 2,000 feet thick, and it thins to the southeast. East of Corralitos, the formation is 4,000 feet thick in the down-dropped block between the Zayante-Vergales fault and the San Andreas fault.



SOURCE: State of the Basin Report, 2000

Figure 3.4-2
Clay Layers in the Pajaro Groundwater Basin

GROUNDWATER RECHARGE

Aquifer recharge within the basin occurs through natural mechanisms, including infiltration of streamflow through bed and channel deposits, direct percolation of rainfall, and irrigation return flows. There are no major upstream reservoirs on the Pajaro River to regulate winter flows, and thus the system depends on natural runoff processes. The rate of recharge varies greatly from year to year, based on both the seasonal distribution of rainfall and the total annual precipitation. Generally, mild storms of extended duration or relatively frequent storms provide the greatest opportunity for groundwater recharge.

The capability of an overlying formation to provide a pathway for recharge depends on numerous factors. For example, recharge from direct percolation depends on the characteristics of the overlying soil, and on the presence of near-surface confining and semiconfining clay layers that can impede the downward flow of water. A clay layer near the Pajaro River and the lower portion of Corralitos Creek impedes recharge of the alluvium aquifer in that area, as do the semiconfining or confining clay layers in the upper terrace deposits to the west of Watsonville. An area with high recharge potential includes the coastal dunes (located north and south of the Pajaro River), where sands exist and there is no confining clay layer. The Corralitos Creek streambed down to north of the Watsonville Airport also has high recharge potential due to alluvial deposits and the absence of a clay layer.

Most recharge occurs during the wet winter months and is highly variable, while most of the demand occurs during the summer and is relatively constant. This seasonal offset of supply and demand means that groundwater storage is depleted in the summer, potentially lowering the groundwater table to below sea level, thereby creating the circumstances for the inland migration of the freshwater/seawater interface. In addition, there has historically been more water withdrawn from the basin on an annual basis than is replaced, which has resulted in an overdraft condition.

GROUNDWATER LEVELS AND FLOW

A groundwater basin is much like a surface water reservoir: when water is removed from storage, the water level drops until the supply can be replenished by inflow or recharged by rainfall or streamflow. Much like a stream, groundwater generally flows downhill from areas of high elevation (or pressure) to areas of low elevation; when water is extracted from the basin, the system attempts to restore its equilibrium by drawing new water into the groundwater reservoir.

Before extensive pumping began in the Pajaro Valley, the regional water table sloped from inland areas toward the coast. Since the 1940s, hydrogeologic studies have shown a regional decline in the water table during the summer months, with a recovery during the winter recharge months. Many wells in the valley show relatively stable water levels, recovering to near sea level. However, the Pajaro Valley is hydraulically connected to the ocean, thus providing a constant source of both pressure and direct recharge. Therefore, if the groundwater table drops to elevations below sea level, seawater will be drawn in until equilibrium is restored. Pumping in

the entire basin has an effect on seawater intrusion, but the adverse effects associated with seawater intrusion are most noticeable in the coastal portion of the basin.

In the coastal and central portion of the Pajaro Valley, groundwater elevations are regularly below sea level during the summer season, and some wells are chronically below sea level throughout the year. Water-level data collected from Pajaro Valley wells indicate that the direction of groundwater flow is from the ocean to inland areas. The drought conditions from 1987 to 1992 lowered the water table further, thereby resulting in an increased rate and volume of seawater intrusion. The general pattern of water levels across the basin has remained stable over the past few years.

GROUNDWATER QUALITY

Seawater Intrusion

The greatest and most immediate threat to groundwater supplies in the Pajaro Valley is from seawater intrusion in the coastal areas. Other groundwater quality issues to be addressed include nitrate contamination and elevated boron concentrations.

The nature and extent of seawater intrusion in coastal areas of the Pajaro Valley region have been extensively evaluated since the problem was first detected in the late 1940s. These investigations indicate that the majority of seawater intrusion in the region is occurring in two aquifers associated with alluvium formation gravels in the interval between 100 and 200 feet below sea level and within the Aromas sands in the 300- to 600-foot interval.

Groundwater quality within the Pajaro Valley is influenced by several factors, including hydrology, geochemistry, well construction, groundwater pumping patterns, and land use. In general, groundwater in the Pajaro Valley is of high quality and suitable for agricultural and municipal use, with some degradation resulting from agricultural activities, landfills, and septic tanks, as well as seawater intrusion caused by groundwater overdraft.

The interpretation of water quality data from existing production wells is complicated by the fact that the production wells were constructed to maximize water production, not to monitor conditions in specific aquifers. Many wells are constructed and screened through multiple aquifers. Thus, water quality measurements reflect a composite of many aquifers, complicating data interpretation. In addition, many wells that were historically used to evaluate water levels and quality have been abandoned due to seawater intrusion, resulting in the loss of the well as a monitoring location and a lack of continuity in the data.

Chloride concentrations in groundwater are commonly used to monitor seawater intrusion, because chloride in seawater is chemically stable and moves at the same rate as the intruding water. The average chloride concentration in seawater is about 19,000 mg/L; chloride levels exceeding approximately 100 mg/L in coastal wells indicate that seawater is present in the aquifer. High-quality drinking water generally contains chloride concentrations below 50 mg/L,

and irrigation water quality guidelines suggest chloride concentrations should not exceed 142 mg/L. Water with over 250 mg/L of chloride is generally unsuitable for use. Potential routes for inland seawater intrusion include:

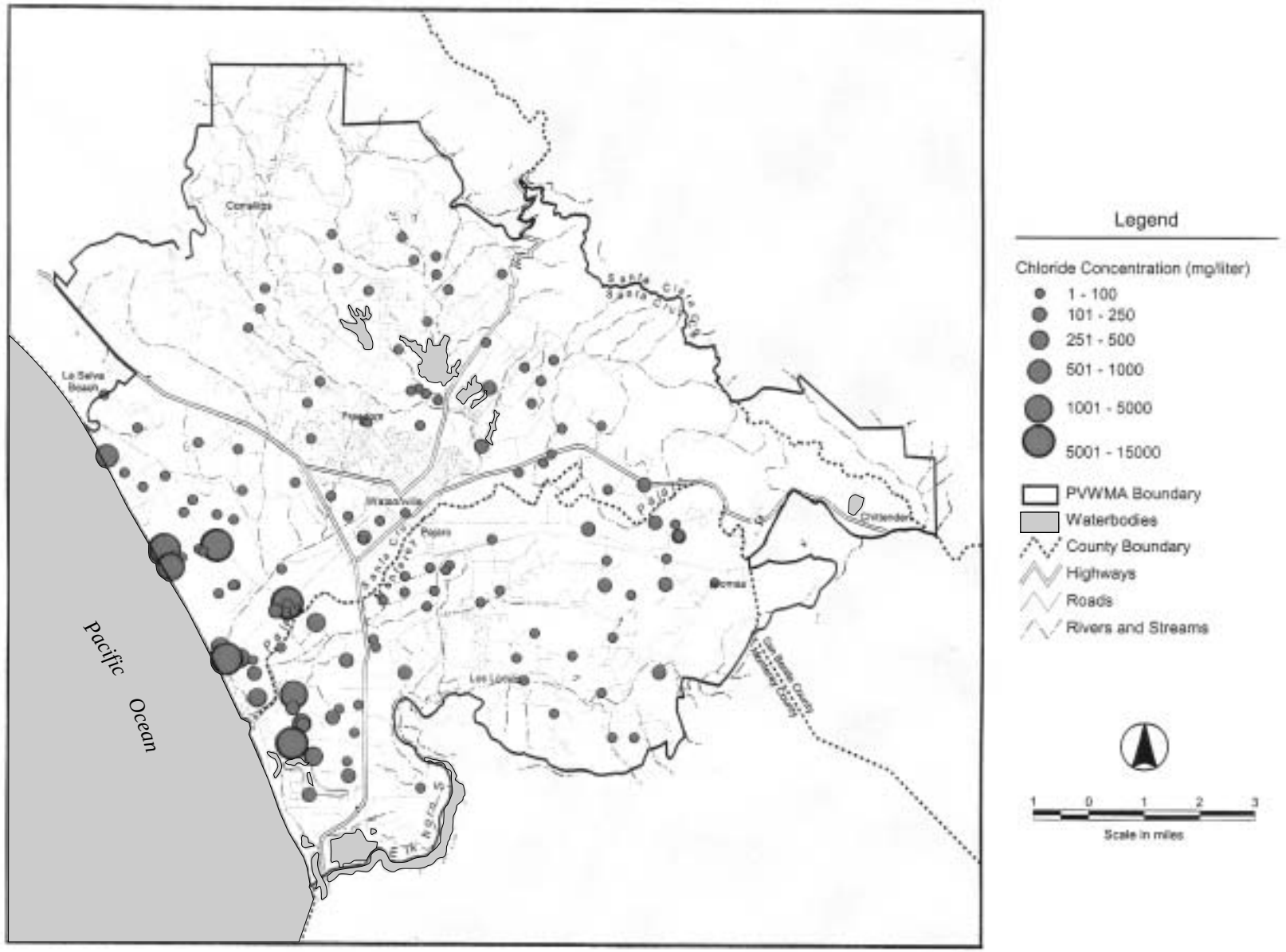
- Horizontal inland migration through the layered aquifers;
- Leakage between geologic layers through natural gaps in the confining layers or through wells that are improperly sealed between formations or are improperly abandoned;
- Vertical leakage downward from the Pajaro River estuary or Elkhorn Slough; and
- Upward migration from lower aquifers where seawater has been trapped for many years.

Previous investigators have documented the presence of seawater intrusion in both the shallow alluvial aquifer and the lower Aromas sands aquifer and described the complexity of analyzing the distribution of seawater throughout discrete layers of the different aquifer units. Recent (1998) data generally indicate that inland saline conditions are more extensive than previously reported. In the La Selva Beach area, the size of the existing intruded area is larger than in 1979, extending approximately 0.75 mile inland and 2 miles in width. The intrusion zone north of the Pajaro River extends inland approximately 1.5 miles and is 3 miles wide. A number of deeper wells show recent substantial increases in chloride concentrations, indicating that the volume of fresh water displaced in the intruded aquifer is increasing. Chloride levels are generally highest in the deeper Aromas sand aquifer, with chloride values ranging from 200 to 8,500 mg/L; shallow wells generally contain lower chloride levels (50 to 500 mg/L), with a number of neighboring wells showing marked differences in chloride levels. **Table 3.4.1** presents summary statistics for chloride concentrations in all wells for pre-drought (1979-1986), drought (1987-1992), and post-drought (1993-1998) periods. The data indicate that average values are similar for drought and post-drought periods. **Figure 3.4-3** shows current chloride concentrations in the PVWMA service area.

TABLE 3.4.1
AVERAGE SUMMARY STATISTICS FOR CHLORIDE IN ALL WELLS

Period	Well Count	Chloride Concentration, mg/L		
		Average Minimum	Average	Average Maximum
Pre-drought (1979-1986)	166	60	70	80
Drought (1987-1992)	186	330	420	500
Post-drought (1993-1998)	198	370	450	550

SOURCE: RMC, Inc., 2002



SOURCE: State of the Basin Report, 2000

Figure 3.4-3
Chloride Concentrations in the PVWMA Service Area

Nitrates

Nitrates are common groundwater contaminants in many agricultural areas. Nitrate sources include agriculture, septic tanks, urban runoff, and percolation from surface sources. Nitrates can also occur in groundwater through the conversion of naturally occurring or introduced organic nitrogen or ammonia. Nitrate contamination is a major concern in drinking water sources because it is a threat to human and animal health, as it can cause acute illness and can have adverse long-term health impacts resulting from prolonged exposure (RMC, 2002). The primary drinking and food-canning water quality standard for nitrate is 45 mg/L NO_3-N. Nitrates are converted to nitrites in the intestines and inhibit the body's ability to absorb oxygen.

Ingestion of nitrates in high concentrations causes methemoglobinemia in infants (the "blue baby" syndrome). Nitrate is generally expressed as NO_3 (nitrate) or NO_3-N (nitrate-nitrogen). The U.S. Environmental Protection Agency (EPA) has set a maximum contaminant level (MCL) of 10 mg/L NO_3-N, or the equivalent 45 mg/L NO_3 (EPA website).

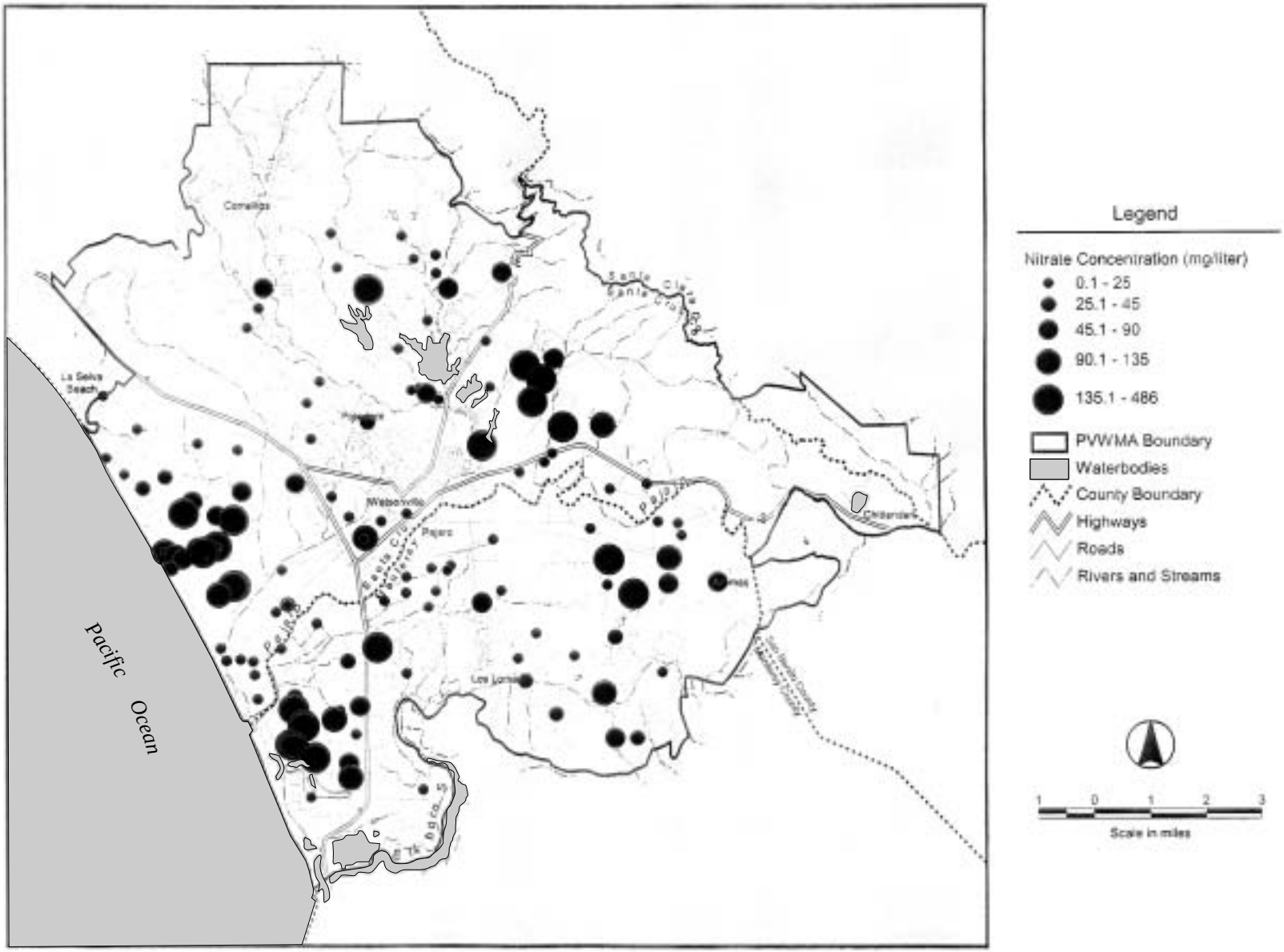
Most fertilizers contain high concentrations of nitrogen, so basin soils in agricultural areas such as the Pajaro Valley can contain nitrate. Nitrates are highly soluble and can leach into groundwater or can travel with surface waters from agricultural runoff. Transport of nitrates in groundwater is generally limited by aquitards that separate the aquifer levels.

Elevated nitrate concentrations are commonly found in shallow wells. The large majority of deep wells in the Pajaro Valley (those screened at least 125 feet below the water table), including city wells, contain nitrate concentrations that do not exceed the drinking water standard. **Table 3.4.2** presents summary data of nitrate concentrations during pre-drought, drought, and post-drought periods. Average values from the post-drought period are over 10 mg/L higher than those during drought and pre-drought periods. **Figure 3.4-4** shows current nitrate concentrations in the PVWMA service area.

TABLE 3.4.2
AVERAGE SUMMARY STATISTICS FOR NITRATE IN ALL WELLS

Period	Well Count	Nitrate Concentration (mg/L NO_3)		
		Average Minimum	Average	Average Maximum
Pre-drought (1979-1986)	134	14	23	34
Drought (1987-1992)	183	15	25	37
Post-drought (1993-1998)	196	26	36	47

SOURCE: RMC, Inc, 2002



SOURCE: State of the Basin Report, 2000

Figure 3.4-4
Nitrate Concentrations in the PVWMA Service Area

Boron

Boron can be toxic to crops if present in sufficiently elevated concentrations. Recommended irrigation water quality guidelines for boron are below 0.5 mg/L, while concentrations greater than 2.0 mg/L are considered to pose severe restrictions. **Table 3.4.3** presents summary data for boron; these data indicate that there is no readily apparent increasing or decreasing trends over time, and average values are well within the range considered suitable for irrigation. Values are generally higher in the eastern portion of the basin, resulting from local recharge of Pajaro River water into the shallow aquifer. Average maximum values have historically exceeded irrigation water quality guidelines; however, the average maximum values during the post-drought period have decreased to within the lower range of acceptable concentrations.

TABLE 3.4.3
AVERAGE SUMMARY STATISTICS FOR BORON IN ALL WELLS

Period	Well Count	Boron Concentration (mg/L)		
		Average Minimum	Average	Average Maximum
Pre-drought (1979-1986)	59	0.1	0.2	0.7
Drought (1987-1992)	52	0.1	0.3	0.9
Post-drought (1993-1998)	24	0.1	0.2	0.4

SOURCE: RMC, Inc., 2002

Groundwater Budget

A groundwater budget helps to explain how the basin operates as an integrated unit on a continuous basis during the period of record. The groundwater basin is an interrelated combination of many pieces that function as a whole, and the water budget describes how these many factors interact.

Preparation of a groundwater budget through analysis of available data allows for the preparation of a numerical model to account for and describe how components of the hydrologic system interact over time and space. Models account for all system inputs and outputs, and use mathematical equations that track how water moves through the system over time and throughout the basin. The Pajaro Valley groundwater basin is a dynamic system, and its water budget (or water balance) is best understood by using and applying the groundwater model. There is a degree of inherent uncertainty in any model, but modeling is the only way to represent the entire physical system, and to examine probable future conditions or analyze a range of potential management alternatives.

Modeling results indicate that more freshwater has been removed from storage than has been put back into storage in the groundwater basin during the past 25 years. Even in years when more freshwater was put back into the system than was taken out (during wet periods), seawater still intruded into the basin, because the aquifers are connected to the ocean and the recharge for pumping at the coast comes from the nearest available source, which is the ocean. Over the past 25 years, over 150,000 acre-feet (af) of mixed fresh and seawater are estimated to have migrated inland across the coast, resulting in seawater replacing freshwater in the aquifer. Unless corrective steps are taken, this situation is expected to worsen in the future.

Water Use and Overdraft Estimate

Chapter 1, Purpose and Need, presents a discussion of current water use and overdraft conditions in the Pajaro Valley groundwater basin.

WATSONVILLE WASTEWATER TREATMENT FACILITY

The WWTF includes full secondary treatment. The WWTF discharges treated wastewater to the Pacific Ocean via a 7,350-foot outfall/diffuser system that terminates in approximately 64 feet of water. The WWTF is adjacent to the north bank of the Pajaro River, as shown in **Figure 2.2**.

WATER QUALITY

Table 3.4.4 shows the quality of the water from the WWTF, with the current advanced secondary treatment process. Recycled water from the WWTF is estimated to have the same electrical conductivity (EC) value of 1.4 micromhos per centimeter (μmhos/cm) as is currently discharged, with an average total dissolved solids (TDS) concentration of 900 mg/L. **Table 3.4.5** presents water quality data for metals in the secondary effluent from the WWTF. The WWTF is in compliance with the applicable effluent limitations, and metals levels generally are within drinking water maximum contaminant levels (MCLs). The City of Watsonville has an effective industrial pretreatment program that limits the introduction of metals into the sewer system. Metals levels in recycled water would be lower than levels shown in **Table 3.4.5** due to the additional (tertiary) treatment process.

REGULATORY SETTING

Please see Appendix C for a description of regulatory setting for water resources.

TABLE 3.4.4
WWTF RECYCLED WATER QUALITY

Constituent	Value (milligrams per liter mg/L)	Constituent	Value (milligrams per liter mg/L)
pH (units)	6.9 - 7.9	Bicarbonate	470 (maximum)
EC (μmhos/cm)	1.2 – 1.7 (range) 1.4 (expected)	Sodium	210 (expected)
Total Dissolved Solids	780 – 1,300 (range) 900 (expected)	Boron	3.10 (maximum)
Ammonia (mg-N/L)	1.8 – 13 (maximum)	Chloride	190 (expected)
Nitrate (mg-N/L)	0.5 – 13	Sodium Adsorption Ratio (units)	5.7

Values are in milligrams per liter (mg/L), except where noted.
mg-N/L = milligrams nitrogen per liter.

SOURCE: RMC, Inc., 2002

TABLE 3.4.5
WWTF WATER QUALITY (METALS) SUMMARY (mg/L)

Element	Daily Maximum[a]	Drinking Water MCL	Average Concentration[b]
Arsenic	2.74	0.05	0.022
Cadmium	0.34	0.005	0.0023
Chromium (total)	0.68	0.05	0.0079
Copper	0.86	1.0	0.0089
Lead	0.68	0.015	0.021
Mercury	0.0136	0.002	N/D (0.0003)
Nickel	1.7	0.10	0.034
Selenium	5.1	0.05	N/D (0.023)
Silver	0.225	0.10	N/D (0.00083)
Zinc	6.13	5.0	0.025

[a] As contained in the City's Waste Discharge Requirements (WDRs)
[b] "N/D" = Not Detected; the detection limit was assumed for averaging. Samples collected 10/5/98, 4/20/99, 10/19/99, 4/17/00, and 10/24/00. For values "N/D" in all five samples, the average of the detection limits is presented.

SOURCE: City of Watsonville, 1998, 1999, and 2000; RWQCB, 1998.

3.5 VEGETATION, FISH AND WILDLIFE

This discussion is based on available environmental impact reports, studies of regional biological resources, recent biological surveys, field reconnaissance, and discussions with responsible and trustee agencies. A wildlife habitat assessment was done by combining field observations and mapping from aerial photographs.

APPROACH TO DESCRIBING STUDY AREA AND HABITATS

For this assessment of biological resources, the "project area" is defined as 500 feet surrounding any proposed pipeline routes and facilities (see Chapter 2: Alternatives). A larger area (the "study area"; see below) was investigated where potential impacts could extend beyond this corridor or where special-status resources may be present near the project area.

"Special-status resources" are defined as animal species, plant species, or natural communities that have some rarity, endangerment, or protection status conferred by a state, federal, or statewide conservation organization (see Regulatory Framework section, below).

Wildlife habitats are the primary focus of the resource descriptions and impact assessments. The description of biological resources presented herein is based on the California Department of Fish and Game's (CDFG) Wildlife Habitat Relationships (WHR) System (Mayer and Laudenslayer, 1988). This classification system uses a set of 48 terrestrial and aquatic habitats in California and models the distribution, life history, and habitat needs for individual wildlife species. This EIS also relies on the California Natural Diversity Database (CNDDB) (2002) and *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland, 1986), which maintains a more detailed inventory of terrestrial natural communities based on the dominant plant species present. This system describes 250 different natural communities and is used as a basis for inventorying rare as well as common habitat types in California. A cross-reference table (**Table 3.5.1**) was created to link the WHR System to the CNDDB for resources found in the study area.

The EIS process has involved several opportunities to solicit approach and impact information from the relevant resource agencies. An interagency coordination meeting was held February 12, 1997 to solicit agency concerns. More specific informal consultation was held with U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and CDFG to discuss particular issues regarding special-status wildlife species and fisheries resources. Formal consultation with USFWS and NOAA Fisheries under Section 7 of the Federal Endangered Species Act has been initiated.

TABLE 3.5.1
COMPARISON OF TERMINOLOGY FOR
VEGETATION TYPES IN WILDLIFE HABITAT RELATIONSHIPS AND
NATURAL COMMUNITIES OCCURRING IN THE STUDY AREA

California Department of Fish and Game Wildlife Habitat Relationships (Mayer and Laudenslayer, 1988)	**California Natural Diversity Database Natural Communities** (Holland, 1986)
Valley foothill riparian	Central coast riparian forest
Coastal oak woodland	Coast live oak woodland
Coastal scrub	Central coastal scrub
Annual grassland	Non-native grassland
Fresh emergent wetland	Coastal and valley freshwater marsh Coastal brackish marsh
Vernal pool	Hardpan/claypan vernal pool (undetermined)
Cropland, orchard, and vineyard	n/a
Urban/developed	n/a

SOURCE: Environmental Science Associates, 2002c

LITERATURE REVIEW

Sources used in the preparation of this assessment include information gained from previous field surveys and records from the biological literature (e.g., Munz and Keck, 1970; Hickman, 1993; Holland, 1986; Skinner and Pavlik, 1994; Jennings and Hayes, 1994), federal and state-listed species for each county (CDFG, 2002), and the CDFG CNDDB (2002). CNDDB reports occurrences of special-status species using U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles. The area potentially affected by this project is located on parts of five USGS 7.5-minute quadrangles: Watsonville West, Watsonville East, Moss Landing, Chittenden, and San Felipe. U.S. Department of Agriculture, Natural Resources Conservation Service (formerly Soil Conservation Service) soil surveys were reviewed for potential wetland areas (SCS, 1976, 1978). The CNDDB was consulted for the study area, a five-mile envelope surrounding these five quadrangles.

Based on the review of these information sources, a list was compiled of special-status biological resources known to occur in the study area. During the habitat assessment, habitats that potentially contain special-status species were surveyed using field techniques appropriate for the particular species.

VEGETATION, WILDLIFE, AND FISHERIES SURVEYS

WILDLIFE HABITAT ASSESSMENT

The Habitat Restoration Group (HRG) and ESA conducted a habitat assessment of the entire study area from March 23 through May 5, 1997 to identify habitat types. Several subsequent site assessments were performed by ESA, including in September 1997, March 1999 (ESA, 1997a; ESA, 1999a), and June and July 2001. Further habitat-specific surveys were conducted for species of particular interest, including a site assessment for the California red-legged frog (*Rana aurora draytonii*) and other sensitive amphibian and reptile species (ESA, 2002a), and a site assessment for the San Joaquin kit fox (*Vulpes macrotis mutica*) (ESA, 2002b). Global positioning system (GPS) receivers were used to locate approximate habitat type center points, which were recorded using Universal Transverse Mercator (UTM) coordinates. For each mapped unit, four types of information were recorded: (1) presence of special-status species, either as breeding residents or regular winter visitors; (2) presence of suitable habitat for these species; (3) occurrence of other unique or important biological resources; and (4) WHR habitat types present, as well as notes on predominant plant species present. The information was recorded on standardized data sheets, and ESA photographed specific areas and collected plant samples as needed to supplement the data sheet information.

VEGETATION SURVEYS

Table 3.5.2 lists the habitat, distribution, and flowering period of 16 special-status plant species known to occur in the study area.

All of the proposed facility locations were visited. Areas of natural habitat (classified as nonurban and nonagricultural) in the study area were covered on foot during the survey period, and all plant species present were recorded. Any plants belonging to a genus containing a special-status plant known from the region were identified to species. Appendix E lists the plant species observed within the study area.

Natural communities were mapped as part of the habitat assessment. These habitats were recorded as WHR habitat units (see preceding section). In addition, any natural communities listed by CNDDB as "sensitive" were considered a special-status natural community. The location, extent, and condition of these resources were specifically noted and mapped.

WETLANDS

Areas within the study area that might meet the criteria for "wetlands" or "waters of the United States" were mapped as part of the habitat assessment. (See the Regulatory Framework, below, for definitions of these terms.) A wetland delineation was prepared and submitted to the U.S. Army Corps of Engineers for verification in March, 2003 (ESA, 2003). This wetland delineation covered all aspects of the proposed action. The U.S. Army Corps of Engineers verified the delineation on April 21, 2003.

TABLE 3.5.2
SPECIAL-STATUS PLANT SPECIES KNOWN FROM THE REGION OF THE PAJARO VALLEY WATER MANAGEMENT AGENCY REVISED BASIN MANAGEMENT PLAN PROJECTS

***Scientific* and Common Name**[a]	**Listing Status USFWS/ CDFG/CNPS**[b]	**Habitat**	**County Distribution**[c]	**Flowering Period**	**Suitable Habitat Present in Study Area**
		FEDERAL OR STATE THREATENED OR ENDANGERED SPECIES			
Chorizanthe pungens var. *pungens* Monterey spineflower	FT/--/1B	Coastal dunes and coastal scrub	MNT, SCR	Apr-Jun	Unlikely
Chorizanthe robusta var. *robusta* Robust spineflower	FE/--/1B	Coastal dunes, coastal scrub, openings in hardwood forest	ALA*, MNT, SCL*, SCR, SMT*	May-Sep	Unlikely
Gilia tenuiflora ssp. *arenaria* Sand gilia	FE/CT/1B	Coastal dunes, coastal scrub, in sand	MNT	Apr-May	No
Holocarpha macradenia Santa Cruz tarplant	FT/CE/1B	Coastal prairie, valley and foothill grassland, in clay soils with coastal influence	ALA*, CCA, MNT, MRN*, SCR	Jun-Oct	Large population exists at Watsonville Airport
Piperia yadonii Yadon's piperia (= Yadon's rein orchid)	FE/--/1B	Endemic to Monterey County; on sandstone and sandy soil in coastal bluff scrub, chaparral, and closed-cone conifer forest	MNT	May-Aug	No
		FEDERAL OR STATE CANDIDATE SPECIES, SPECIES OF CONCERN, OR OTHER PROTECTED SPECIES			
Arctostaphylos andersonii Santa Cruz manzanita	FSC/--/1B	Openings, edges, hardwood and conifer forests, chaparral	SCL, SCR, SMT	Nov-Apr	No
Arctostaphylos hookeri ssp. *hookeri* Hooker's manzanita	--/--/1B	Sandy soils, coastal scrub, chaparral, closed-cone conifer forests	MNT, SCR	Feb-Apr	No
Arctostaphylos pajaroensis Pajaro manzanita	FSC/--/1B	Sandy soils in chaparral	MNT, SCR*	Dec-Mar	No
Atriplex joaquiniana San Joaquin saltbush	FSC/--/1B	Chenopod scrub, alkali meadow, valley and foothill grassland	SBC	Apr-Oct	Unlikely
Centromadia parryi ssp. *congdonii* Congdon's tarplant	FSC/--/1B	Alkaline places in valley foothill grasslands	ALA*, CCA*, MNT, SCL(*?), SCR*, SLO, SOL*	Jun-Nov	Unlikely; suitable habitat eliminated
Erisimum ammophilum Coast wallflower	FSC/--/1B	Sandy openings in maritime chaparral, coast dunes, coastal scrub	SCR, MNT	Feb-June	No

TABLE 3.5.2 (Continued)
SPECIAL-STATUS PLANT SPECIES KNOWN FROM THE REGION OF THE PAJARO VALLEY WATER MANAGEMENT AGENCY REVISED BASIN MANAGEMENT PLAN PROJECTS

Scientific and Common Name[a]	Listing Status USFWS/ CDFG/CNPS[b]	Habitat	County Distribution[c]	Flowering Period	Suitable Habitat Present in Study Area
FEDERAL OR STATE CANDIDATE SPECIES, SPECIES OF CONCERN, OR OTHER PROTECTED SPECIES					
Horkelia cuneata ssp *sericea* Kellog's horkelia	FSC/--/1B	Coastal scrub and closed cone pine forests	SCR, MNT	Apr-Sept	Unlikely; suitable habitat largely eliminated
Pedicularis dydleyi Dudley's lousewort	FSC/--/1B	Deep, shady woods of redwood forest, although often in openings such as old skid trails; maritime chaparral and grasslands in coastal region	MNT, SLO, SMT	Apr-June	No
Penstemon rattanii var *kleei* Santa Cruz Mountains beardtongue	--/--/1B	Chaparral and lower montane conifer forest, sometimes in transition zone, sandy shale slopes	SCR, SCL	April-Sept	No
Plagiobothrys glaber Hairless popcorn flower	--/--/1A	Meadows, seeps, marshes, swamps	SBC	Mar-May	No. Presumed extinct in California.
Streptanthus albidus ssp *peramoenus* Most beautiful jewel-flower	FSC/--/1B	Chaparral, valley and foothill grassland, cismontane woodland; serpentine outcrops	SCL	Apr-Jun	Unlikely; suitable habitat largely eliminated

NOTES:

[a] Abbreviations are as follows: ssp. = subspecies; var. = variety.

[b] Listing status codes are as follows:

USFWS=U.S. Fish and Wildlife Service
FE=Listed as Endangered by the Federal Government
FT=Listed as Threatened by the Federal Government
FPE=Proposed for Listing as Endangered
FC=Candidate for Federal listing
FSS=Former Category 2 Candidate for Federal listing
FSC=Federal Species of Concern

CDFG=California Department of Fish and Game
CE=Listed as Endangered by the State of California
CT=Listed as Threatened by the State of California
SC=California species of concern

CNPS=California Native Plant Society
List 1A=Plants presumed extinct in California
List 1B=Plants rare, threatened, or endangered in California and elsewhere
List 2= Plants rare, threatened, or endangered in California but more common elsewhere
List 3= Plants about which more information is needed
List 4= Plants of limited distribution

[c] County Distribution: County codes follow California Department of Transportation three-letter abbreviations, as follows: ALA = Alameda; CCA = Contra Costa; MNT = Monterey; MRN = Marin; SCL = Santa Clara; SCR = Santa Cruz; SLO = San Luis Obispo; SMT = San Mateo; SOL = Solano; SBC = San Benito.

Asterisk after county code indicates species is presumed extirpated in that county.

SOURCE: Environmental Science Associates, 1997a,b; 2001; 2002a,b,c

WILDLIFE SURVEYS

Table 3.5.3 lists the habitats and recorded occurrences of 23 special-status wildlife species known to occur or to potentially occur in the study area.

Most of the project areas are thoroughly cultivated and contain limited natural habitat. Surveys for special-status nesting bird species were carried out during the spring of 1997 in a variety of habitats in the PVWMA service area (ESA, 1997b). Site assessments were conducted within the study area for the California red-legged frog (a federal threatened species) using methods required by the February 18, 1997 USFWS survey protocol for this species (ESA, 1997a; ESA, 1999a; ESA, 2002a). The site assessments also included the Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), a state and federal endangered species (ESA, 1999a; ESA, 2002a). This species has been identified in McCluskey Slough (CNDDB, 2002) and is thus presumed to be present in this location. Other species included in the site assessments were the western pond turtle (*Clemmys marmorata pallida*) and the California tiger salamander (*Ambystoma californiense*). ESA also conducted a site assessment for the San Joaquin kit fox (a federal Endangered and California Threatened species) (ESA, 2002b).

FISHERIES SURVEYS

Pajaro River and Salsipuedes Creek

Passage conditions for steelhead constitute the primary habitat factor for fisheries resources potentially affected by the proposed action. Passage conditions were evaluated in 1997 (HRG, 1997) by establishing depth transects in Salsipuedes Creek and in the Pajaro River at shallow riffles (rocky shoal or sandbar lying just below the water surface) that were most likely to impede steelhead upstream or downstream migration. It should be noted that these same riffles and their configurations may not exist from year to year, but were probably typical of riffles that present the most difficulty for steelhead migration in most years. (For a detailed discussion of these fishery passage surveys and results, see Appendix G).

Transects were established at three riffles on Salsipuedes Creek in April 1997. Smolts typically migrate to the Pacific Ocean in April and May. Depths at one of the riffles (a “typical” rather than a critical/difficult passage riffle) were recorded at 1-foot increments across the riffle three times between April 25 and May 9, at flows of 15.1, 4.7, and 2.0 cubic feet per second (cfs). Depths at two other riffles, which represented very difficult “critical” passage, were recorded five times between April 25 and May 29 (measurements were taken with the above flows and with flows of 0.9 and 0.4 cfs). The last two flows were far below those needed for passage, but provided information on how depth changed with flow and with algal growth. The two critical riffles were the only difficult riffles in the creek in 1997, and both had wide, diagonal gravel bars producing the riffles. The most difficult riffle stretched over 80 feet across, where the main channel was about 30 feet wide. The upstream to downstream length of each riffle was short; the length of difficult passage was less than 5 feet.

TABLE 3.5.3
NAME, STATUS, HABITAT, KNOWN LOCALITIES AND LIKELIHOOD OF OCCURRENCE IN THE STUDY AREA FOR SPECIAL-STATUS WILDLIFE SPECIES

Scientific Name	Common Name	USFWS/ CDFG Status[a]	Habitat	Localities Reported by CNDDB in the Region of the Project[b]	Likelihood of Occurrence in Study Area
			FEDERAL OR STATE THREATENED OR ENDANGERED SPECIES		
Branchinecta conservatio	Conservancy fairy shrimp	FE/--	Vernal pools or other areas capable of ponding water seasonally	Not reported by CNDDB	Low due to quality of vernal pool habitat in the project area
Branchinecta longiantenna	Longhorn fairy shrimp	FE/--	Vernal pools or other areas capable of ponding water seasonally	Not reported by CNDDB	Low due to quality of vernal pool habitat in the project area
Branchinecta lynchi	Vernal pool fairy shrimp	FT/--	Vernal pools or other areas capable of ponding water seasonally	Not reported by CNDDB	Low due to quality of vernal pool habitat in the project area
Cicindela ohlone	Ohlone tiger beetle	FE/--	Coastal terraces supporting remnant patches of native grassland habitat in Santa Cruz County.	No reported occurrences in study area.	Low due to lack of suitable habitat in study area
Eucyclogobius newberryi	Tidewater goby	FE[c]/CSC	Occurs in shallow waters of bays and estuaries	Pajaro River, Salinas River, and Elkhorn Slough, all from mouth to 1 mi upstream	Present only near and downstream from State Route (SR) 1
Onchorhynchus mykiss	South-central California coast steelhead	FT/CSC	Rivers and creeks with permanent water for spawning and rearing; other habitats may serve as migration routes	Pajaro River, Salsipuedes and Corralitos Creeks watersheds.	Present in Pajaro River along the length of the project; also in Pescadero, Salsipuedes and Corralitos Creeks
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	FE/CE	Wet meadows near sea level in a few restricted locales in Santa Cruz and Monterey counties. Aquatic larvae prefer shallow (<12 inches) freshwater, using clumps of vegetation or debris for cover. Adults use mammal burrows.	Ellicott Pond and vicinity, 4 mi W of Watsonville; Bennett Slough/Struve Slough, 1.5 mi NNE of Moss Landing; McCluskey Slough, 2 mi N of Moss Landing; 1.25 mil N of Moss Landing, Seascape Pond, Calabasas Pond, Merk Road, 0.6 miles E of White Road/Freedom Blvd., Moro Cojo Slough.	Moderately high due to appropriate habitat in various sloughs and location of reported individuals

TABLE 3.5.3 (Continued)
NAME, STATUS, HABITAT, KNOWN LOCALITIES AND LIKELIHOOD OF OCCURRENCE IN THE STUDY AREA FOR SPECIAL-STATUS WILDLIFE SPECIES

Scientific Name	Common Name	USFWS/ CDFG Status[a]	Habitat	Localities Reported by CNDDB in the Region of the Project[b]	Likelihood of Occurrence in Study Area
			FEDERAL OR STATE THREATENED OR ENDANGERED SPECIES (cont.)		
Rana aurora draytonii	California red-legged frog	FT/CSC	Mostly in lowlands and foothills in/near permanent sources of deep freshwater, but will disperse far during and after rain. Prefers shorelines with extensive vegetation. Requires 11-20 weeks of permanent water for larval development.	Just E of Zmudowski Beach State Park, 2 mi NNW of Moss Landing; Pacheco Creek, at the Hwy. 156 crossing, 0.75 mi N of Fairview Road, East branch of Hanson Slough, 2 mi W of Watsonville, McCluskey Slough, Warner Lake, Ellicott Pond, crossing of San Miguel and San Juan Road, Bennett Slough, Struve Pond, Gallighan Slough, Tequisquita Slough, Tick Creek, Pajaro River.	High due to the proximity of reported occurrences and the presence of suitable habitat within the study area
Charadrius alexandrinus nivosus	Western snowy plover	FT/CSC	Sandy beaches, shores of alkali lakes, other areas of sandy, gravelly, friable soil.	Pajaro River mouth and Palm/Sunset State Beach; Salinas River State Beach; Zmudowski State Beach; Salinas River mouth; Salinas River just S of Moss Landing; Moss Landing State Beach; Moss Landing Salt Works.	Low due to lack of suitable habitat in study area
Rallus longirostris obsoletus	California clapper rail	FE/CE	Salt water marshes traversed by tidal sloughs, associated with abundant growths of pickleweed, but feeds in open areas on molluscs obtained from mud-bottomed sloughs.	Elkhorn Slough	Moderately low due to lack of habitat within the study area

TABLE 3.5.3 (Continued)
NAME, STATUS, HABITAT, KNOWN LOCALITIES AND LIKELIHOOD OF OCCURRENCE IN THE STUDY AREA FOR SPECIAL-STATUS WILDLIFE SPECIES

Scientific Name	Common Name	USFWS/ CDFG Status[a]	Habitat	Localities Reported by CNDDB in the Region of the Project[b]	Likelihood of Occurrence in Study Area
			FEDERAL OR STATE THREATENED OR ENDANGERED SPECIES (cont.)		
Riparia riparia	Bank swallow	--/CT	Colonial nester; nests primarily in riparian and other lowland habitats. Requires vertical banks or cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	Mouth of Pajaro River, near Bluff and Trafton Roads; Moss Landing; Betabel Rd., Santa Clara Co.	Low due to lack of suitable habitat within the study area
Vireo bellii pusillus	Least Bell's vireo	FE/CE	Low riparian, either near water or in dry river bottoms	LLagas Creek between Hwy 152 and its confluence with the Pajaro River east of Gilroy	Moderate – this species mostly found in S. Calif., but could be found in riparian habitats near the eastern portion of the project
Vulpes macrotis mutica	San Joaquin kit fox	FE/CT	Annual, open grasslands, sometimes with shrubby vegetation	Area surrounding Hollister north to Gilroy; south past Pacines	Moderate, especially in the grassland areas on the eastern end of the project
			FEDERAL OR STATE CANDIDATE SPECIES, SPECIES OF CONCERN, OR OTHER PROTECTED SPECIES		
Coelus globosus	Globose dune beetle	FSC/--	Inhabitant of undisturbed coastal sand dune habitat, from Bodega Head in Sonoma County south to Ensenada, Mexico. Inhabits foredunes and sand hummocks, burrowing beneath the sand surface and is most common beneath dune vegetation.	Palm Beach access, at the end of Beach Road, Sunset State Beach, 1 mile N of the mouth of the Pajaro River; Potrero Road access point to Salinas River State Beach.; Manresa State Beach	Low due to lack of suitable habitat within the study area
Tryonia imitator	Mimic tryonia (= California brackishwater snail)	FSC/--	Coastal lagoons and salt marshes from Sonoma County to Ensenada, Mexico. Inhabit variety of subtidal sediment types and are capable of withstanding wide range of salinities.	Bennett Slough, 0.1 mi NW of tide gate at Jetty Road; Parson's Slough, SE edge of Elkhorn Slough; Moro Cojo Slough at Hwy 1 crossing	Low; known to occur near project area and potentially in brackish parts of Watsonville Slough and the Pajaro River estuary

TABLE 3.5.3 (Continued)
NAME, STATUS, HABITAT, KNOWN LOCALITIES AND LIKELIHOOD OF OCCURRENCE IN THE STUDY AREA FOR SPECIAL-STATUS WILDLIFE SPECIES

Scientific Name	Common Name	USFWS/ CDFG Status[a]	Habitat	Localities Reported by CNDDB in the Region of the Project[b]	Likelihood of Occurrence in Study Area
FEDERAL OR STATE CANDIDATE SPECIES, SPECIES OF CONCERN, OR OTHER PROTECTED SPECIES (cont.)					
Ambystoma californiense	California tiger salamander	FC/CSC	Annual grasslands and grassy understory of valley-foothill hardwood habitats in central and Northern California. Needs underground refuges, especially ground squirrel burrows and vernal pools or other seasonal water sources for breeding.	Ellicott Pond and vicinity, 4 mi W of Watsonville; 1.25 mi N Moss Landing, adjacent to Elkhorn Slough; just W of Route 156, 0.25 S of the Barnheisel Road jct., 4.5 mi NNE of Hollister Municipal Airport, just E of the intersection of Bloomfield Road and HWY 152, numerous sightings NE of Pacheco Pass Road, Carlyle Hills W of SR 101	Moderate; known to occur near study area
Anniella pulchra nigra	Black legless lizard	--/CSC	Sand dunes and sandy soils in the Monterey Bay and Morro Bay regions. Inhabits sandy soil/dune areas with bush lupine and mock heather as dominant plants.	Reported on Moss Landing, Watsonville West quads; location information suppressed	Low due to lack of suitable habitat within the study area
Clemmys marmorata	Western pond turtle	FSC/CSC	Thoroughly aquatic turtle of freshwater ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation. Need basking sites and sandy banks or grassy open fields for egg-laying.	Pinto Lake County Park (N portion of Pinto Lake), Watsonville Slough at Pajaro Dunes, Pajaro R. downstream from McGowan Rd. bridge; Watsonville (vicinity Brewington Ave. and Crestview Dr.), Tequisquita Slough, Anzar Lake	High within freshwater emergent sloughs; the Pajaro River; and Pinto Lake

TABLE 3.5.3 (Continued)
NAME, STATUS, HABITAT, KNOWN LOCALITIES AND LIKELIHOOD OF OCCURRENCE IN THE STUDY AREA FOR SPECIAL-STATUS WILDLIFE SPECIES

Scientific Name	Common Name	USFWS/ CDFG Status[a]	Habitat	Localities Reported by CNDDB in the Region of the Project[b]	Likelihood of Occurrence in Study Area
FEDERAL OR STATE CANDIDATE SPECIES, SPECIES OF CONCERN, OR OTHER PROTECTED SPECIES (cont.)					
Agelaius tricolor	Tricolored blackbird	FSC/CSC	Nest in tule, sedges, or willows. Thistles, large enough to provide cover from predators, have also been used in upland areas. A site large enough for a minimum number of 50 pairs is required.	Sargent Creek, 1.5 mi N and 1.5 mi N of confluence of San Benito River and Pajaro River; Sargent Creek, west bank of Struve Slough, just west of Hwy. 1, one mi south of Hwy. 152 junction; Hanson Slough, 1.1 mi NW of Hwy. 1 Jct. with Hwy. 129 west of Watsonville	Moderate due to suitable habitat present in Hanson Slough and McCluskey Slough
Asio flammeus	Short-eared owl	--/CSC 3503.5	Nests in marshes, grasslands, and irrigated pastures, particularly tall grasses and tules.	Mouth of Salinas River (0.2 mi. S of Moss Landing)	Generally low due to lack of suitable habitat within the study area, but could be found in grasslands areas, esp. in the eastern part of the study area
Athene cunicularia	Burrowing owl	--/CSC 3503.5 (burrow sites)	Low vegetation in grasslands, scrublands, and deserts. Nests in small mammal burrows, esp. those of California ground squirrel.	Dolan Road, approx. 2 mi. N of Castroville.	Moderate; habitat in study area is limited, but could be found in grasslands areas, esp. in the eastern part of the study area
Dendroica petechia brewsteri	Yellow warbler	--/CSC	Nests in riparian woodlands and forests, consisting of cottonwoods, willows, and/or alders, as well as in montane chaparral habitats with substantial amounts of brush or understory.	Not reported by CNDDB	Observed on Pajaro River near Betabel Road, and near Murphy Crossing

TABLE 3.5.3 (Continued)
NAME, STATUS, HABITAT, KNOWN LOCALITIES AND LIKELIHOOD OF OCCURRENCE IN THE STUDY AREA FOR SPECIAL-STATUS WILDLIFE SPECIES

Scientific Name	Common Name	USFWS/ CDFG Status[a]	Habitat	Localities Reported by CNDDB in the Region of the Project[b]	Likelihood of Occurrence in Study Area
			FEDERAL OR STATE CANDIDATE SPECIES, SPECIES OF CONCERN, OR OTHER PROTECTED SPECIES (cont.)		
Ictera virens	Yellow-breasted chat	--/CSC	Nests in low riparian thickets and tangled vegetation, esp. willow, blackberry and wild grape.	Not reported by CNDDB	Moderate; requires low, dense riparian habitat, habitat found in study area is generally narrow or sparse
	Nesting raptors	3503.5	Nest in oak woodland, riparian forest and isolated trees	Not reported by CNDDB	High in areas with suitable trees, including riparian areas and oak woodlands

a **STATUS CODES:**

USFWS: (U.S. Fish and Wildlife Service)
FE=Listed as Endangered by the Federal Government
FT=Listed as Threatened by the Federal Government
FPE=Proposed for Listing as Endangered
FC=Candidate for Federal listing
FSC=Former Category 2 Candidate for Federal listing

CDFG: (California Department of Fish and Game)
CE=Listed as Endangered by the State of California
CT=Listed as Threatened by the State of California
CSC=California species of concern
3503.5= Protected under Fish and Game Code 3503.5

b CNDDB: California Natural Diversity Data Base

c Currently proposed for delisting north of Orange County (Federal Register, 2001).

SOURCE: Environmental Science Associates, 1997a,b; 2001; 2002a,b,c

Transects were placed at four riffles on the Pajaro River: one immediately upstream of Murphy Crossing; two within 1.4 miles downstream of Murphy Crossing; and one 4.1 miles downstream of the Murphy Crossing. The three upstream riffles were diagonal riffles formed in broad portions of the channel that are usually dry in summer or have very little streamflow. The downstream riffle was the only true riffle in the portion of the channel with regular summer surface water, dense streambed vegetation, and a generally narrower low-flow channel (due to the vegetation). Depths were measured at the transects downstream of Murphy Crossing five times from April 18 to June 12, at flows of 65 to 7.6 cfs. Transects were measured twice upstream of Murphy Crossing, on April 25 and May 9, at flows of 50.5 and 21.7 cfs; construction of the crossing inundated this most critical riffle. Substrates at the riffles were predominantly sand and fine gravel deposited by the high January flows. The configurations were not stable, and the deepest portions of the sandy riffles were gradually scoured deeper over the study period. Because of the channel instability, the transects were not a strict test of the relationship between streamflow and riffle depth; 20 cfs in April would not have provided the passage conditions that 20 cfs in late May would have provided.

AFFECTED ENVIRONMENT

Historically, the Pajaro Valley supported a variety of vegetation communities, including extensive riparian forests along waterways, valley oak savanna intermixed with grasslands in the bottomlands, mixed hardwood forests on hillsides, coastal dunes near the ocean, and coastal scrub on rocky sites. Although remnants of these habitats can be seen in isolated patches, much of the valley is now in agriculture.

REGIONAL HABITAT CLASSIFICATION UNITS

Vegetation and Wildlife Habitats

The study area supports eight WHR units (Mayer and Laudenslayer, 1988) that might be adversely affected by project elements. These WHR units are described in the paragraphs that follow.

Valley Foothill Riparian

Valley foothill riparian includes a range of habitats associated with permanent (nonseasonal) water. It may be a dense, multilayered forest of trees and shrubs, or a thicket of dense shrubs. In a natural state, it may span the entire floodplain of a river, giving way to oak savannas or grasslands on adjacent uplands. On the Pajaro River, valley foothill riparian habitat often consists of a dense growth of willows (*Salix* spp.), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and boxelder (*Acer negundo* var. *californica*), with an understory of poison-oak (*Toxicodendron diversilobum*), mugwort (*Artemisia douglasiana*), California blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* sp.). Under a dense canopy or where stream scouring and/or siltation are significant influences, the understory may be sparse.

The coastal streams and tributaries of the Pajaro River also support valley foothill riparian habitat, but most habitat is limited by narrow waterways, and the intermittent presence of flowing water or near-surface water. Corralitos Creek is an unleveed tributary to the Pajaro River; it supports a well-developed band of valley foothill riparian habitat, especially in its upper reaches. Salsipuedes Creek is bounded by levees, and the woody vegetation between the levees is regularly cleared for flood control. As a result, its riparian habitat is very limited.

Wildlife Attributes. Riparian areas provide nesting habitat and diverse insects that are attractive to a variety of migratory birds. Foliage, bark, and ground substrates provide a variety of foraging areas. Birds that forage for insects in the foliage include Bewick's wren (*Thryomanes bewickii*), northern oriole (*Icterus galbula*), and black-headed grosbeak (*Pheuticus melanocephalus*). Bark-insect foraging species occur here, such as downy woodpecker (*Picoides pubescens*), Nuttall's woodpecker (*Picoides nuttallii*), and white-breasted nuthatch (*Sitta carolinensis*). There are a few species that are adapted to foraging for insects in flight, such as black phoebe (*Sayornis nigricans*), western wood pewee (*Contopus sordidulus*), and tree swallows (*Tachicyneta bicolor)*.

Coastal Oak Woodland

This habitat is typically comprised of a dense to sparse cover of coast live oak (*Quercus agrifolia*) with a partial understory of shrubs and grasses similar to the annual grassland type. Within the study area, coastal oak woodland may once have been more extensive on the deeper and more level soils, but is presently limited to sheltered, often north-facing slopes too steep to cultivate. The predominant tree species is coast live oak, although occasionally other species may be found, such as madrone (*Arbutus menziesii*) and California bay (*Umbellularia californica*). The understory includes poison-oak, monkey flower (*Mimulus aurantiacus*), and California blackberry, while the herbaceous understory includes vetch (*Vicia* sp.), mustard (*Brassica* sp.), and bracken fern (*Pteridium aquilinum*).

Wildlife Attributes. Coastal oak woodland provides food and shelter for a variety of bird species, including insect eaters such as chestnut-backed chickadee (*Parus rufescens*), white-breasted nuthatch, and warbling vireo (*Vireo gilvus*). Other species attracted to this habitat include song sparrow (*Melospiza melodia*), quail, rufous-sided towhee (*Pipilo erythrophthalmus*), and brown towhee, which glean insects from the foliage on the ground. Stellar's jay (*Cyanocitta stelleri*) and squirrels (*Sciurus* sp.) are dependent on the acorns during the winter. Anna's hummingbirds (*Calypte anna*) use vines growing around trees for nectar and for insects that are attracted to the nectar. Other species, such as the great horned owl (*Bubo virginianus*), use the trees for roosting and foraging perches. The western gray squirrel (*Sciurus griseus*) and gray fox (*Urocyon cinereoargenteus*) both feed on truffles, mushrooms, fruits, and nuts within the forest. Unlike the riparian habitat, oak forests have a higher density of wintering birds than nesting birds.

Coastal Scrub

This shrub-dominated habitat occupies a rather limited area within the study area. Coastal scrub tends to grow on steep rocky slopes, grading into oak woodland on deeper soils or moister sites. Depending on site-specific factors, including soil depth and slope aspect, coastal scrub in the study area can consist of shrublands dominated by either California sage (*Artemisia californica)*,

poison-oak, monkey flower, and black sage (*Salvia mellifera*) or by coyote brush (*Baccharis pilularis*) and poison-oak growing in dense thickets.

Wildlife Attributes. The sandy soils often associated with coastal scrub habitat provide ideal habitat for reptiles such as western fence lizards (*Sceloporus occidentalis*), which are common in the warm, dry scrub community. Coastal scrub habitat, often interspersed with other habitats, provides foraging and nesting habitat for species that are attracted to edges of plant communities. Bird species that use the scrub canopy for catching insects include dusky flycatcher (*Empidonax oberholseri*) and wrentit (*Chamaea fasciata*). Besides insects, flowering scrub vegetation (e.g., ceanothus) attracts nectar drinkers such as Anna's hummingbird. Mammals, including striped skunk (*Mephitis mephitis*), use this habitat for protection and foraging grounds, feeding off new shoots of plants. Black-tailed deer (*Odocoileus hemionius californicus*) often feed on scrub, but this habitat supports a lower density of deer than occurs in oak savannas. Small mammals that are expected to occur within the scrub include brush rabbits (*Sylvilagus audubonii*), Botta's pocket gophers (*Thomomys bottae*), and deer mice (*Peromyscus maniculatus*). Small mammals attract predators such as long-tailed weasel (*Mustela frenata*), gray fox, and bobcat (*Felix rufus*).

Annual Grassland

This community typically comprises a dense to sparse cover of annual grasses, often associated with numerous species of annual and perennial forbs. These grasslands grow actively during winter and spring and remain dormant during summer and early fall. The presence of this assemblage of non-native, annual grasses originating in the Mediterranean region is a consequence of permanent alterations to the once widely distributed pristine perennial grasslands of California. In the project area, California annual grassland is generally found on fine-textured, clay-rich soils that are too steep to cultivate. This habitat is common and widespread in California and in the project region.

Plant species typical of the area include annual grasses such as farmer's foxtail (*Hordeum murinum* ssp. *leporinum*), soft chess (*Bromus hordeaceus*), ripgut grass (*Bromus diandrus*), foxtail brome (*Bromus rubens*), and wild oat (*Avena barbata*). A number of non-native herbs such as filaree (*Erodium* sp.), field bindweed (*Convolvulus arvensis*), burclover (*Medicago polymorpha*), and cut-leaved geranium (*Geranium dissectum*) frequently occur as subdominants. As is typical of soils with a high clay content, some areas are strongly dominated by mustards, such as London rocket (*Sisymbrium irio*), black mustard (*Brassica nigra*), and wild radish (*Raphanus sativus*). Native forbs commonly interspersed among the grasses include lupine species (*Lupinus* sp.), tarweeds (*Hemizonia* sp.), California poppy (*Eschscholzia californica*), popcorn flower (*Plagiobothrys* sp.), owl's clover (*Orthocarpus* sp.), common fiddleneck (*Amsinckia intermedia*), and blue dicks (*Dichelostemma pulchellum*).

Wildlife Attributes. Grassland habitat, such as non-native grasslands, attract reptiles and amphibians, such as southern alligator lizard (*Gerrhonotus multicarinatus*), western fence lizard (*Sceloporus occidentalis*), and Pacific slender salamander (*Batrachoseps attenuatus*), which feed on invertebrates found within and underneath decaying vegetation within the community. This habitat also attracts seed- and insect-eating birds. California quail, mourning dove (*Zenaida macroura*),

and meadowlarks (*Sturnella neglecta*) are seed eaters that nest in grasslands. Insect eaters such as scrub jays (*Aphelocoma coerulescens*), barn swallows (*Hirundo rustica*), and mockingbirds (*Mimus polyglottus*) use the habitat for foraging only. Grasslands are important foraging grounds for aerial and ground-foraging insect eaters such as bats and a wide variety of small rodents. These in turn attract raptors (birds of prey) such as red-tailed hawks (*Buteo jamaicensis*) and red-shouldered hawks (*Buteo lineatus*). A pair of red-tailed hawks was observed nesting in two coast live oak trees in the Sargent Hills. Black-tailed deer (*Odocoileus hemionus californicus*) use grassland for grazing and, if the grass is tall enough, for bedding at night.

Fresh Emergent Wetland

There are various types of fresh emergent wetlands within the project area, ranging from wetlands dominated by species typical of brackish water environments, such as frankenia (*Frankenia grandiflora*) and pickleweed (*Salicornia virginica*) in man-made drainage ditches, to freshwater ponds with cattails (*Typha* sp.), bulrushes (*Scirpus* spp.), and willows (*Salix* spp.) as dominant species.

Wildlife Attributes. Wildlife that depend on free (open) water visit wetlands regularly, such as coyotes, foxes, raccoons, most rabbits, hares, rodents and many species of birds. A number of species require standing or flowing water for breeding, including all amphibians, such as red-legged frogs (*Rana aurora*), western toads (*Bufo boreas*), and Pacific tree frogs *(Hyla regilla),* as well as western pond turtles (*Clemmys marmorata*), garter snakes (*Thamnophis couchii),* red-winged blackbirds (*Agelaius phoeniceus*), and marsh wrens (*Cystothorus palustris*). In seasonally arid climates as is found in coastal California, the species richness of fresh emergent wetland is very high.

Vernal Pools

Within the annual grassland habitat, vernal pools are surface depressions with a slowly permeable substratum that holds water after winter and spring rains. Claypan pools have a slowly permeable clay layer that holds winter rains, while hardpan vernal pools develop where chemical processes allow for the accumulation of a cemented subsoil layer.

Plants occurring in vernal pools are predominantly native, low-growing, ephemeral annual herbs, but some are perennial. Germination and early growth occur in winter and early spring, often while plants remain submerged. As pools dry out in spring, flowering occurs in bands at the margins of the pools following the receding water level.

A suite of native plant species is typical within vernal pools. These are species adapted to the periodic but somewhat variable cycles of inundation and drying. Unlike the surrounding non-native annual grasslands, intact, undisturbed vernal pools are dominated almost entirely by native taxa.

Due to its patchy distribution and historic habitat loss, this community is considered a high priority for inventory by CDFG. In addition, vernal pools typically qualify as wetlands and as such may be protected under Section 404 of the Clean Water Act.

Wildlife Attributes. Vernal pools provide one of the most diverse habitats within California, providing breeding habitat for California tiger salamander (*Ambystoma californiense*) and winter foraging for waterbirds, including gulls (*Larus* spp.) and snowy egret, and shorebirds, such as western sandpipers (*Calidris mauri*) and black-necked stilt (*Himantopus mexicanus*). Several endangered and threatened vernal pool shrimp species occur only within seasonal vernal pool habitat. However, the vernal pool within the project alignment is too small to provide habitat for larger organisms such as birds, and is not likely to support vernal pool shrimp species. Construction activities will avoid vernal pool habitat.

Cropland/Orchard/Vineyard

The deep alluvial soils along the floodplain of the Pajaro River and coastal areas support a variety of row crops as well as vineyards and orchards. The very mild climate in the project area makes it suitable for row crops such as strawberries, bush berries, lettuce, broccoli, cauliflower, and cut flowers. Agricultural habitats are subject to periodic discing, planting, harvesting, and the application of herbicides, pesticides, and fertilizers which prevent the establishment of natural plant species and communities. A number of weedy plant species, including bristly ox-tongue (*Picris echioides*), curly dock (*Rumex crispus*), and bull thistle (*Cirsium vulgare*), are associated with cultivated lands; many of these are non-native species, and all are adapted to open, bare ground, rapid maturity, and high seed production.

Wildlife Attributes. Agricultural lands of this type may provide occasional habitat for transient mammals, reptiles, and amphibians, and have some value to birds. Small mammals, such as rabbits and rodents, forage on the leaves and grasses and, in turn, may attract small predators, such as hawks or feral cats. Row crops with leveled fields, as are predominant in the study area, are used as travel corridors but support no resident wildlife.

Urban/Developed

Urban development is scattered in the project area. These areas consist of homes, buildings associated with farming, and towns, of which Watsonville is the largest.

Urban and developed areas tend to be landscaped with non-native ornamental plant species, thus displacing native plants. Residential parks and disturbed areas provide little habitat for wildlife except for those species adapted to human habitation, such as skunks, opossum (*Didelphis marsupialis*), starlings, golden-crowned sparrows (*Zonotrichia atricapilla*), and rock pigeons (*Columbia livia*). These areas do not provide habitat for larger mammalian species nor for predators, except possibly raccoons (*Procyon lotor*).

Critical Habitat for California Red-Legged Frog

The project area is within the boundaries of Units 16 and 17 of USFWS-designated critical habitat for the California red-legged frog (final rule dated March 13, 2001, Federal Register 66: 14625-14674). The final designation states that red-legged frogs can use “virtually any aquatic system” provided that a permanent water source is nearby. Upland and riparian habitat associated with breeding sites is also considered essential for the maintenance of red-legged frog

populations. These frogs can be found in streams more than 1.8 miles from their breeding sites, have been found in riparian habitat more than 100 yards from water, and can travel 2.25 miles across upland habitats from nonbreeding to breeding habitat (Federal Register, 2001a).

Specifically, within the critical habitat boundaries, three elements must co-occur for an area to qualify as critical habitat: suitable aquatic habitat, associated uplands, and suitable dispersal habitat connecting aquatic habitats (Federal Register, 2001a). The aquatic habitat must consist either of (1) two or more breeding sites, at least one of which is a permanent water source, within 1.25 miles of each other; or (2) two or more breeding sites and a permanent water source, all within 1.25 miles of each other if none of the breeding sites is a permanent water source (Federal Register, 2001a). Suitable upland habitat consists of all upland areas within 500 feet of the edge of suitable aquatic habitat. If the watershed boundary is less than 500 feet from the aquatic habitat edge, then the watershed boundary forms the edge of suitable habitat (Federal Register, 2001a). Suitable dispersal habitat must provide connectivity between aquatic habitats; it must be at least 300 feet wide and free of barriers to dispersal. These barriers include roads with more than 30 cars per hour as well as "moderate to high" density urban or industrial development (Federal Register, 2001a).

The *Pajaro Valley Water Management Agency Revised Basin Management Plan Projects California Red-legged Frog and Sensitive Amphibian and Reptile Species Site Assessment* (ESA, 2002a) identifies areas within the study area that provide potential habitat for California red-legged frog.

Aquatic Habitats and Resources

Pajaro River

The Pajaro River Valley is an agricultural area drained by the Pajaro River and two of its major tributaries, Salsipuedes Creek and Corralitos Creek, as well as Watsonville Slough. Portions of these watercourses are bounded by levees to control periodic winter flooding. Smaller drainages also are found in the immediate vicinity of the Pacific Ocean.

The Pajaro River serves as a migration pathway for adult steelhead (*Oncorhynchus mykiss*) migrating to spawning and nursery habitat in the upper watershed and for steelhead smolts (1-2 year old juveniles) migrating from that habitat to the ocean. In the upper watershed Pescadero, Uvas, Llagas, and Pacheco Creeks and their tributaries, provide potential spawning and rearing habitat. Pescadero and Uvas Creeks provide access, spawning and rearing in all but extreme drought years. Use of Llagas and Pacheco Creeks by steelhead is less frequent and less extensive (HRG, 1997).

The entire Pajaro River watershed provides potential habitat for several fish species and comprises one of the major drainages of the south-central California Evolutionarily Significant Unit (ESU) for coastal steelhead (*Oncorhynchus mykiss*), as defined in the Federal Register, 18 August, 1997 (Federal Register, 1997). Although once present in this area, coho salmon (*O. kisutch*), have not been present in the Pajaro River system since at least the late 1960s.

Other freshwater and brackish water fish species known to occur in the downstream reaches of the Pajaro River watershed include Sacramento sucker (*Catostomus occidentalis*), Sacramento pike minnow (*Ptychochielus grandis*, formerly known as Sacramento squawfish), hitch (*Lavinia exilicauda*), Sacramento blackfish (*Orthodon microlepidotus)*, prickly sculpin (*Cottus asper*) and threespine stickleback (*Gasterosteus aculeatus*) (HRG, 1997).

Watsonville and Harkins Sloughs

To the southwest of Corralitos Creek are the drainages of Watsonville and Harkins Sloughs. The watershed of these two drainages is mostly west of the city of Watsonville and west of SR 1. The confluence of Harkins Slough and Watsonville Slough is near San Andreas Road. From this point, Watsonville Slough flows west for about 1.5 miles, then turns south for about 1.2 miles, where it empties into the Pajaro Lagoon. These sloughs are highly channelized and terminate at flood control walls, which preclude fish passage. Pump stations transfer water downstream at certain times of year.

Pajaro Lagoon

Pajaro River and Salsipuedes Creek, as well as Watsonville Slough, supply freshwater to the Pajaro River estuary. In spring, the freshwater inflow provides a surface wedge of lighter fresh water on top of the seawater in the Pajaro River estuary. This freshwater wedge allows steelhead smolts to move up and down in the water column to aid in gradually adjusting to seawater. When flows are sufficient for passage to the estuary, the inflows are also probably sufficient to provide a good freshwater to seawater transition zone. Migrating steelhead smolts may spend several weeks feeding in the estuary and adjusting to seawater. This transition may not be required, as many central California streams lack good transitional estuaries while sustaining steelhead populations. However, the transition may improve survival of smolts, especially smaller smolts, upon their entering the ocean (HRG, 1997).

Tidewater gobies (*Eucyclogobius newberryi*) are known to occur in the Pajaro Lagoon (HRG, 1997). The tidewater goby is listed federally as an endangered species and is a California Species of Special Concern. However, tidewater goby populations north of Orange County have been proposed for delisting by the USFWS because more recent data collected on the species suggests that the original listing rule overestimated the species' risk of extinction (Federal Register, 2001b).

Critical Habitat for South-central California Coast Steelhead

Critical habitat for south-central California steelhead was designated in February 2000 and included all waterways within the Pajaro River watershed below the Chesbro and North Fork Pacheco reservoirs (Federal Register, 2000). However, on April 30, 2002, The National Marine Fisheries (NMFS, now the National Oceanic and Atmospheric Administration Fisheries) withdrew the critical habitat designation pending further economical impact analysis (NMFS, 2002). Thus, the critical habitat designation for this species is currently not in effect, but may be reinstated by the time construction for the proposed action commences.

IMPORT WATER PROJECT

Maps B1 through **B6** in the Map Appendix present the locations of habitat identified within the project area (a 500-foot-wide corridor centered on the proposed pipeline alignments and facilities).

TERRESTRIAL HABITATS ALONG THE IMPORT PIPELINE ALIGNMENT

The eastern terminus of the proposed pipeline alignment is about 0.5 mile west of SR 152, just south of the Santa Clara-San Benito county line. From this point the alignment extends approximately 2.7 miles south-southwest through cultivated fields. The alignment parallels a narrow, unnamed agricultural drainage ditch that supports a highly degraded example of alkaline-affected fresh emergent wetland. It crosses this ditch as well as a small tributary ditch, which also supports fresh emergent wetland, then continues through agricultural lands. Where the alignment crosses Bolsa Road, a short stretch of weedy, uncultivated vegetation is mapped annual grassland.

From Bolsa Road, the proposed alignment extends southward and parallels the Union Pacific Railroad (UPRR) tracks for about a mile, then turns southwest and skirts the Lomerias Muertas Hills to cross U.S. Highway 101 (U.S. 101). This segment lies entirely within agricultural lands with scattered houses and a network of roads and tracks. For 5,000 feet east of U.S. 101, annual grassland is on the southern side of the proposed alignment, on the steep sideslopes of the hills. In this area, the proposed alignment closely parallels the unpaved road at the base of the hills. Just to the north of this road is a small gully that supports willow-dominated valley foothill riparian habitat. South of the road is a small and highly degraded vernal pool, which is mapped within the annual grassland habitat type (see **Map B1** in the Map Appendix). The pipeline alignment is located south of this vernal pool.

After crossing U.S. 101, the proposed alignment runs west-southwest, following Betabel Road. Some valley foothill riparian habitat extends into the study area, but the proposed alignment remains on Betabel Road. Prior to the westward bend in the Pajaro River, the alignment turns west and then crosses the Pajaro River heading across the Sargent Hills. On the northwest side of the Pajaro River, the proposed alignment follows the UPRR tracks through annual grassland. The route crosses coastal scrub, mostly dominated by coyote brush and poison oak, in addition to Pescadero Creek, Sargent Creek, and two unnamed tributaries to the Pajaro River that support valley foothill riparian. The proposed alignment continues through annual grassland parallel to SR 129, with annual grassland to the north and agricultural lands to the south. The route then crosses an unnamed drainage with Freshwater Emergent Wetland east of Soda Lake.

The alignment extends south west across the Pajaro River through riparian habitat onto Graniterock quarry property. This is one of the widest crossings of this major waterway. From this point, the alignment parallels the river on the south side through the Graniterock Company property. The proposed alignment parallels the UPRR track, Quarry Road and Aromas Road. Although the alignment passes through highly disturbed quarry lands, valley foothill riparian habitat is present in the nearby Pajaro River bed and its tributary, and coastal scrub occurs on the slopes.

A short segment of the proposed alignment crosses some low hills to the north of the UPRR tracks. At the foot of the hills on the eastern side is a modified drainage containing some water and emergent vegetation. Most of the hillside is vegetated with annual grassland, but the alignment crosses two small areas that support coastal oak woodland. The foothills on the east side appear to have some low-lying, somewhat moist places that support rushes (*Juncus* sp.), but the upper slopes and all of the western slopes are rather dry and somewhat weedy. Throughout the area, the soils are rather sandy.

For approximately three miles the proposed alignment again follows the UPRR tracks in a generally westerly direction through agricultural lands. In the last 2,000 feet, the alignment skirts the Cayetano Hills, which are vegetated with coastal scrub and coastal oak woodland. After the alignment skirts the western foot of these slopes following farm roads, the alignment then follows Hayes Road, Trafton Road, and unnamed farm roads west through agricultural lands to Watsonville Junction. The alignment follows farm roads west through agricultural lands crossing Salinas Road and traveling north across the Pajaro River to the western terminus.

SPECIAL-STATUS RESOURCES ALONG THE IMPORT PIPELINE ALIGNMENT

Plants

No special-status plants were found in the project area, and no habitats were identified as supporting potentially suitable habitat for any of the special-status plants known to occur in the region. California has a wealth of native plant species, some highly localized or restricted to unusual combinations of soils, exposure, and hydrologic regime. The project area was notable for its near-complete conversion to agriculture, obliterating most natural plant habitat, and the prevalence of fairly neutral soils that typically support the widespread and common species of plants.

Wildlife

A number of special-status wildlife species known to occur in the region are also known in the project area. The California red-legged frog *(Rana aurora draytonii),* a federally listed threatened species, occurs in the vicinity of permanent water bordered with vegetation. This species has been reported along the Pajaro River between U.S. 101 and Betabel Road and upstream (Westphal, 1997). Habitat assessments carried out as part of this study showed that suitable habitat is present along much of the Pajaro River and its major tributaries. Variations in streambed and vegetation attributes may allow these animals to occupy habitats along the entire length of the Pajaro River, and all such habitat is considered potential habitat for this species. In addition, the USFWS considers all agricultural ponds and reservoirs to be suitable habitat for red-legged frog (Federal Register, 2001a).

The California tiger salamander (*Ambystoma californiense*), a federal candidate for listing and California species of concern, requires the burrows of grassland animals such as California ground squirrels for aestivation and several months of ponded water for breeding. A degraded vernal pool, the unnamed drainage east of Soda Lake, and a pond 750 feet from the eastern

terminus of the proposed alignment provide potential breeding habitat for this species. Grassland habitat surrounding this breeding pond provides aestivation habitat if small mammal burrows are present.

The degraded vernal pool north of the project alignment just east of U.S. 101 also provides low quality habitat for listed fairy shrimp species: federal threatened vernal pool fairy shrimp (*Branchinecta lynchi),* federal endangered conservancy fairy shrimp (*B. conservatio),* and federal endangered longhorn fairy shrimp (*B. longiantenna*). This vernal pool will be avoided by construction activities.

During the nesting bird surveys several occurrences of yellow warbler (*Dendroica petechia brewsteri*) were recorded along the Pajaro River. This species is considered a species of special concern by California Department of Fish and Game. Yellow warblers also were observed in the Pajaro River just downstream from the terminus of the Import Pipeline at SR 1. Potentially suitable habitat is present along the entire Pajaro River, although the best habitat is where the riparian habitat is the most dense. Potentially suitable habitat is also present along the lower portions of Pescadero Creek and other tributaries to the Pajaro River.

A pair of nesting red-tailed hawks (*Buteo jamaicensis*) were observed in the Sargent Hills during surveys by Environmental Science Associates biologists. Individual red-tailed hawks were observed at other times in the vicinity. Suitable nesting habitat may be present along Pescadero Creek and Sargent Creek. This species is protected under Section 3503 of the California Fish and Game Code.

The yellow-breasted chat *(Icteria virens),* a California species of concern, occurs in dense riparian vegetation. Although potential habitat may be present along the most well-vegetated portions of the Pajaro River, no evidence of this species was found during the nesting bird surveys.

Potential habitat for the least Bell's vireo (*Vireo bellii pusillus*) exists along some portions of the Pajaro River riparian corridor and tributaries. This species has been observed in Llagas Creek between SR 152 and its confluence with the Pajaro River (CNDDB, 2002).

The length of the Pajaro River is considered potentially suitable habitat for western pond turtles *(Clemmys marmorata)*. However, the best habitat for this species, which requires permanent water, would be where pools remain throughout the summer and the banks are well vegetated. The western pond turtle is a former candidate for federal listing and a California species of special concern.

Grassland habitat and fallow fields suitable for the federal endangered and California threatened San Joaquin kit fox (*Vulpes macrotis mutica*) are located adjacent to the project pipeline alignment east of U.S 101. Grassland habitat with small mammal burrows in this area and additional grasslands east of Pajaro Gap also provide habitat for burrowing owl (*Athene cunicularia*), a California species of species concern.

No suitable habitat was found within the project area for several of the wildlife species of concern known to occur in the region. The Santa Cruz long-toed salamander *(Ambystoma macrodactylum croceum)*, a federally and state listed endangered species known from Ellicott Pond, breeds in permanent ponds near the coast. No such habitat was found in the vicinity of the proposed pipeline alignment. The bank swallow *(Riparia riparia)*, although reported from a sighting on Sargent Creek, has not been seen in the project area for several decades. The bank swallow is a state listed threatened species. High, extensive eroding riverbanks, the necessary nesting habitat for this species, are not present in the project area. The black legless lizard *(Anniella pulchra nigra)*, a California species of concern that is proposed for federal listing as endangered, requires stabilized sand dunes. Although known to occur in the vicinity of Moss Landing, no suitable habitat was present in the more inland project area. Marshlands, the required habitat for the tricolored blackbird and the California clapper rail, were not present in the project area. Sand dune habitat known to support the globose dune beetle was not present in the study area.

Fisheries

South-central California coast steelhead *(Oncorhynchus mykiss)* are present in the Pajaro River and some of its tributaries, including Pescadero Creek. No studies of adult and smolt steelhead migration timing have been conducted on the Pajaro River system, but, despite drier watershed conditions in the Pajaro, migration periods are believed to be similar to those of streams in Santa Cruz County (HRG, 1997). Upstream migration probably occurs from late December through April, and spawning from January through April. Steelhead are known to spawn in the Pajaro River upstream of Murphy Crossing only. According to Smith (HRG, 1997), one of the most difficult passages for the smolt is the series of riffles at Murphy Crossing, where the stream becomes quite shallow and the best route is difficult for smolt to find.

The south-central California coast steelhead ESU is a federally listed threatened species and a California species of concern. Critical habitat for this and other steelhead ESUs was designated in February 2000 and included all waterways within the Pajaro River watershed below the Chesbro and North Fork Pacheco reservoirs (Federal Register, 2000). However, on April 30, 2002, NMFS withdrew the critical habitat designation pending a further economic impact analysis (NMFS, 2002).

The tidewater goby *(Eucyclogobius newberryi)*, a federally listed endangered species currently proposed for delisting (Federal Register, 2001b), is known to occur at the mouth of the Pajaro River. It does not extend as far upstream as the terminus of the Import Pipeline, and thus does not occur in the immediate vicinity of the Import Pipeline alignment.

Wetlands

Several types of wetlands were found along the proposed alignment. The most prominent wetlands area was identified along the Pajaro River and other major drainages that the proposed alignment crosses. The alignment also parallels and crosses agricultural drainages, such as the unnamed ditch at the beginning of the alignment. Although manmade, they support the characteristics of wetlands, and in some cases are regulated as wetlands by the Army Corps of

Engineers. The third type of wetland, vernal pools, were encountered only in one area, at the base of the Lomerias Muertas Hills within the grasslands to the north of the proposed alignment (see **Map B1** in the Map Appendix).

Natural Communities

Natural communities occurring in the project area that are considered "sensitive" by CNDDB are considered special status in this study. They include riparian forest and vernal pools. Valley foothill riparian, which includes riparian forest, is found along the Pajaro River and its major tributaries, including Pescadero Creek. Though not an example of a sensitive natural community, a highly degraded vernal pool was found just east of U.S. 101 at the base of the Lomerias Muertas Hills.

INTEGRATED COASTAL DISTRIBUTION SYSTEM

TERRESTRIAL HABITATS IN THE ICDS AREA

The ICDS can be divided into two service areas: Santa Cruz and Monterey Counties. The ICDS pipeline in the Santa Cruz Service Area would begin approximately 700 feet west of SR 1 on the north side of the Pajaro River. It parallels the Pajaro River on the outside of the north levee for approximately 0.3 mile in a westerly direction surrounded by agriculture to the north and the Pajaro River Valley Foothill Riparian vegetation south of the levee. The pipeline then proceeds north past the Watsonville Wastewater Treatment Facility and agricultural fields to Beach Road. A main lateral extends west along Beach Road for approximately 2.25 miles, ending at the intersection of Beach Road and Shell Road. Drainage ditches which support patches of freshwater emergent wetland in some locations parallel Beach Road. As indicated on **Map B5** in the Map Appendix, several pipeline segments of the ICDS have been constructed and permitted as part of the Harkins Slough Diversion and Distribution Project.

Two main laterals branch off of the Beach Road Lateral. The Northeast Addition Lateral travels north along a farm road for approximately 1.25 miles. The surrounding habitat is agricultural with the exception of a bore and jack crossing of Hanson Slough, two crossings of Watsonville Slough, and another irrigation ditch crossing. Hanson Slough supports freshwater emergent wetland and willows. Watsonville Slough and the irrigation ditch are channelized at the crossing locations and support Freshwater Emergent Wetland. The North Plateau Lateral branches north off of the Beach Road alignment and follows San Andreas Road for approximately one-half mile across Watsonville Slough, which supports Freshwater Emergent Wetland and willows[1]. From this point, the pipeline parallels the Harkins Slough pipeline and turns west along Dairy Road and extends northwest for about one-half mile to the Harkins Slough recharge basin. From this point, the North Plateau Lateral extends east to San Andreas Road and north along that road for approximately 1.5 miles. Habitat surrounding the alignment is all agricultural with the exception of irrigation ditches and ponds, some of which support degraded Freshwater Emergent Wetland.

[1] The bore and jack crossing of Watsonville Slough has already been constructed as part of the Harkins Slough Pipeline Project.

In addition, the system includes 16 sub-laterals (four along the Beach Road Lateral, four along the Northeast Additional Lateral and 8 along the North Plateau Lateral) to provide service to all parcels of land.

The South Plateau Lateral would service the Monterey Service Area. This lateral extends west adjacent to the south levee of the Pajaro River and valley foothill riparian habitat beyond, and then proceeds south along farm roads. The pipeline follows farm roads for approximately two miles to its western terminus near the Pajaro River through agricultural fields and across irrigation ditches, some of which support degraded freshwater emergent wetland. The Lateral travels south along a farm road across Trafton Road and a steeply sloping area of natural vegetation, primarily coastal scrub and mixed chaparral. The alignment crosses an unnamed drainage within this habitat at the location of a culvert within an existing road and then continues south through agricultural fields. This drainage supports freshwater emergent wetland habitat as well as extensive willows. From this point the pipeline continues south approximately 18 miles, crosses McCluskey Slough through trenchless construction methods, and ends just north of the Struve Road / Giberson Road intersection adjacent to Bennett Slough. Both Bennett Slough and McCluskey Slough support extensive and high-quality examples of freshwater emergent wetland. Numerous laterals branch off of the South Plateau Lateral through agricultural fields lacking natural habitat. Irrigation ponds and ditches which support degraded freshwater emergent wetland and a patch of coastal scrub a few hundred feet south of Jensen Road are also located in the project area.

SPECIAL-STATUS RESOURCES WITHIN THE ICDS AREA

Plants

During field surveys conducted by ESA in 1999, a small population of Monterey spineflower (*Chorizanthe pungens* var. *pungens*) was identified in an old sand pit between Trafton and Bluff roads. The pipeline route does not cross this area and construction activities will not take place within 100 feet of suitable habitat for this species.

Wildlife

The agricultural portions of the ICDS area support little wildlife habitat, but the areas of natural vegetation contain suitable habitat for a number of species. McCluskey Slough is the most notable habitat, since it is a large and well-developed freshwater marsh. McCluskey Slough is a known locality for the Santa Cruz long-toed salamander, and was rated as excellent-quality habitat for the California red-legged frog and western pond turtle. The seeps and drainage south of Trafton Road were noted as being potential habitat for the California red-legged frog. Santa Cruz long-toed salamander, California tiger salamander, and western pond turtle may inhabit suitable areas in Hanson Slough and Bennett Slough. Finally, Watsonville and Harkins Sloughs were considered potential movement corridors for California red-legged frog and western pond turtle. A small drainage parallel to San Andreas Road empties into Watsonville Slough and lies within the project area. Although identified as a Waters of the U.S. (ESA, 1999c), this drainage sustains only ephemeral flow and was not considered to be a movement corridor or temporary habitat for California red-legged frog or western pond turtle.

Fisheries

As discussed above, the Pajaro River provides important migration habitat for steelhead, and the Pajaro Lagoon is known to contain a population of tidewater gobies. With the exception of the lower reaches of Watsonville Slough below the tide gates, which are located outside the ICDS project area, the various sloughs discussed above do not provide habitat for sensitive fish species.

Wetlands

The Pajaro River, McCluskey Slough, Bennett Slough, and Hanson Slough support moderate to high quality wetland habitat. Within the immediate project area, Watsonville Slough and downstream reaches of Harkins Slough are channelized irrigation ditches that support lower quality habitat. Some upstream and downstream reaches of these sloughs maintain more natural features and provide higher quality habitat as a result. Lastly, irrigation ditches throughout the ICDS project area support wetlands with cattail (*Typha* sp.), tule (*Scirpus* sp.), and other wetland indicator species. Habitat in these manmade ditches is degraded due to surrounding agricultural practices. With the exception of manmade irrigation ditches, all of the abovementioned wetland features likely fall under the jurisdiction of the U.S. Army Corps of Engineers.

Natural Communities

Sensitive natural communities are found at McCluskey Slough and other wetlands with moderate to high quality habitat (coastal freshwater marsh), and along the Pajaro River (valley foothill riparian). Manmade irrigation ditches with fragmented wetland habitat are not considered sensitive natural communities.

WATER RECYCLING PROJECT

TERRESTRIAL HABITATS IN THE WATER RECYCLING PROJECT AREA

The proposed Water Recycling Facility (WRF) would be constructed next to the existing Watsonville Wastewater Treatment Facility (WWTF) and would be located in a fully developed, primarily agricultural area. Portions of the property are undeveloped, and contain weedy vegetation typical of disturbed sites. Nearby is the lowest reach of the Pajaro River with a floodplain fully contained by levees.

The WRF would require approximately eight acres of agricultural land adjacent to the WWTF. The proposed action includes a pipeline to connect the WRF to the Import Pipeline north of the Pajaro River, and a pipeline to connect to the ICDS. From the proposed WRF, the pipeline would pass through agricultural lands parallel to and north of the Pajaro River levees. All of the proposed locations for facilities are in agricultural or weedy, disturbed areas. Natural vegetation in the vicinity of SR 1 and the Pajaro River consists of valley foothill riparian habitat that has been somewhat degraded due to agriculture and river channeling activities.

SPECIAL-STATUS RESOURCES WITHIN THE WATER RECYCLING PROJECT AREA

Plants

Other than the vegetation within the Pajaro River riparian corridor, only two native plant species (coyote brush and poison oak) were observed in the vicinity of the WWTF. Maintenance of the facility and surrounding cropland appears to include aggressive weed control that precludes the establishment of most native plant species as well. No special-status plants are located in the Water Recycling Project Area.

Wildlife

In the nearby riparian forest of the Pajaro River, there were a large number and variety of birds observed during biological surveys, including the yellow warbler, a species of concern. Protected raptors are also present in the project area. The California red-legged frog and western pond turtle are likely present in the Pajaro River.

Fisheries

South-central California coast steelhead pass through this portion of the Pajaro River en route to spawning areas farther upstream in the Salsipuedes Creek and upper Pajaro River watersheds. Further downstream, the Pajaro Lagoon supports a population of the federally endangered tidewater goby.

Wetlands

Fringe wetlands associated with the Pajaro River and degraded wetland habitat in an irrigation ditch along Beach Road comprise wetlands resources in the Water Recycling Project Area. This irrigation ditch may be considered jurisdictional by the U.S. Army Corps of Engineers due to the fact that wetland indicator species including common horsetail (*Equisetum arvense*) and cattail (*Typha latifolia*) were observed growing within and along its banks.

Natural Communities

Valley foothill riparian habitat, considered “sensitive” by CNDDB, occurs along the Pajaro River, which is located south of project activities.

REGULATORY FRAMEWORK

The Council on Environmental Quality National Environmental Policy Act (NEPA) guidelines require that an EIS discuss all federal, regional, state and local land use plans and policies that regulate the affected environment.

WETLANDS

Wetlands are ecologically productive habitats that support a rich variety of both plant and animal life. The importance and sensitivity of wetlands have increased as a result of their value as recharge areas and filters for water supplies and widespread filling and destruction to enable urban and agricultural development. In a jurisdictional sense, there are two definitions of a wetland, one definition adopted by federal agencies and a separate definition adopted by the State of California. Both are presented below.

Federal Wetland Definition

Wetlands are a subset of "waters of the United States" and receive protection under Section 404 of the Clean Water Act (CWA). The term "waters of the United States" as defined in Code of Federal Regulations (33 CFR 328.3[a]; 40 CFR 230.3[s]) includes:

1. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

2. All interstate waters including interstate wetlands. (Wetlands are defined by the federal government [CFR, Section 328.3(b), 1991] as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.);

3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce;

4. All impoundments of waters otherwise defined as Waters of the United States under the definition;

5. Tributaries of waters identified in paragraphs (1) through (4);

6. Territorial seas; and

7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6).

8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with EPA [328.3(a)(8) added 58 CFR 45035, Aug. 25, 1993].

California Wetland Definition

Unlike the federal government, CDFG has adopted the Cowardin et al. (1979) definition of wetlands:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface of the land or is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes (at least 50 percent of the aerial vegetative cover); (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

Under normal circumstances, the federal definition of wetlands requires all three wetland identification parameters to be met, whereas the Cowardin definition requires the presence of at least one of these parameters. For this reason, identification of wetlands by CDFG consists of the union of all areas that are periodically inundated or saturated, or in which at least seasonal dominance by hydrophytes may be documented, or in which hydric soils are present.

Regulation of Activities in Wetlands

The regulations and policies of various federal agencies (e.g., U.S. Army Corps of Engineers [Corps], USDA Natural Resources Conservation Service [NRCS], U.S. Environmental Protection Agency [EPA], USFWS, NOAA Fisheries) mandate that the filling of wetlands be avoided unless it can be demonstrated that no practicable alternatives exist. The Corps has primary federal responsibility for administering regulations that concern waters and wetlands for this project. In this regard, the Corps acts under two statutory authorities, the Rivers and Harbors Act (Sections 9 and 10), which governs specified activities in "navigable waters," and the Clean Water Act (Section 404), which governs specified activities in "waters of the United States," including wetlands. The Corps requires that a Section 10 permit be obtained if a project proposes placing structures within navigable waters and/or alteration of waters of the U.S. below the ordinary high-water mark in nontidal waters. The Pajaro River is considered a navigable water under Corps Section 10 only for that section lying downstream of the WWTF. EPA, USFWS, NOAA Fisheries, and several other agencies provide comment on Corps permit applications. The EPA provides the primary criteria for evaluating the biological impacts of Corps permit actions in wetlands.

The state's authority in regulating activities in wetlands and waters in the project area resides primarily with the CDFG and the State Water Resources Control Board (SWRCB). The CDFG provides comment on Corps permit actions under the Fish and Wildlife Coordination Act. CDFG is also authorized under the Fish and Game Code Sections 1600-1607 to develop mitigation measures and enter into a Streambed Alteration Agreement (SAA) with applicants that propose a project that would obstruct the flow or alter the bed, channel, or bank of a river or stream in which there is a fish or wildlife resource, including intermittent and ephemeral streams. The SWRCB, acting through the nine Regional Water Quality Control Boards (RWQCB), must certify that a Corps permit action meets state water quality objectives (Section 401, Clean Water Act). The Central Coast Region RWQCB will be reviewing this project.

SPECIAL-STATUS SPECIES

As discussed below, several species known to occur on or in the vicinity of the project site are accorded "special-status" because of their recognized rarity or vulnerability to various causes of habitat loss or population decline. Some of these receive specific protection defined in federal or state endangered species legislation. Others have been designated as "sensitive" on the basis of adopted policies and expertise of the CDFG or organizations with acknowledged expertise, such as the California Native Plant Society. These species are referred to collectively as "special-status species" in this EIS, following a convention that has developed in practice, but that has no official sanction. The various categories encompassed by the term, and the legal status of each, are summarized below.

Regulation of Special-Status Species

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Pursuant to the requirements of FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed threatened or endangered species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under FESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3], [4]). Therefore, project-related impacts to these species or their habitats would be considered significant.

The USFWS also publishes a list of candidate species. Species on this list receive special attention from federal agencies during environmental review, although they are not protected otherwise under FESA. The candidate species are taxa for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened. Project impacts to such species would be considered significant in this EIS.

Species listed under FESA that are known to occur in the study area and that may be affected by this project include vernal pool fairy shrimp, longhorn fairy shrimp, conservancy fairy shrimp, Santa Cruz long-toed salamander, tidewater goby, south-central California coast steelhead, California red-legged frog, least Bell's vireo, and San Joaquin kit fox (**Table 3.5.3**).

California Endangered Species Act

Under the California Endangered Species Act (CESA), CDFG has the responsibility for maintaining a list of threatened species and endangered species (California Fish and Game Code 2070). The CDFG also maintains a list of "candidate species," which are species that the CDFG has formally noticed as under review for addition to the threatened or endangered species lists. The CDFG also maintains lists of "species of special concern," which serve as watch lists. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its

jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species. In addition, CDFG encourages informal consultation on any proposed project that may impact a candidate species. Project-related impacts to species on the CESA endangered list and threatened list would be considered significant. Impacts to species of concern would be considered significant under certain circumstances, discussed below.

Species listed under CESA that are known to occur in the study area and that may be affected by the proposed project include Santa Cruz long-toed salamander, least Bell's vireo, and San Joaquin kit fox. Species considered "of special concern" by CDFG that may be affected by the proposed action include tidewater goby, South-central California coast steelhead, California red-legged frog, California tiger salamander, yellow warbler, yellow-breasted chat, tricolored blackbird, burrowing owl, and western pond turtle (**Table 3.5.3**).

Other Statutes, Codes, and Policies Affording Limited Species Protection

Migratory Bird Treaty Act. The federal Migratory Bird Treaty Act (16 USC, Sec. 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. Birds of prey are protected in California under the State Fish and Game Code, Section 3503.5, 1992. Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "taking" by the CDFG. Any loss of fertile eggs, nesting raptors, or any activities resulting in nest abandonment would constitute a significant impact. Project impacts to these species would not be considered significant unless they are known or have a high potential to nest in the project area or to rely on it for primary foraging. ESA's spring birding surveys in the project area established the presence of, and potential impact to these species (ESA, 1997b). These species are listed in **Table 3.5.3**.

California Native Plant Society Designation. Vascular plants listed as rare or endangered by the California Native Plant Society (CNPS) (Skinner and Pavlik, 1994), but which have no designated status or protection under federal or state endangered species legislation, are defined as follows:

List 1A. Plants Believed Extinct.

List 1B. Plants Rare, Threatened, or Endangered in California and elsewhere.

List 2. Plants Rare, Threatened, or Endangered in California, but more numerous elsewhere.

List 3. Plants About Which More Information is Needed - A Review List.

List 4. Plants of Limited Distribution - A Watch List.

In general, plants appearing on CNPS List 1 or 2 are considered to meet CEQA's Section 15380 criteria and impacts to these species are considered significant in this EIS.

A number of special-status plants meeting these criteria are known to occur within the PVWMA service area. However, due to the disturbed and agricultural nature of the project area, no special-status plant species are likely to occur in the project area or be affected by the proposed action.

CURRENT MANAGEMENT OF THE PAJARO LAGOON TO PROTECT TIDEWATER GOBY HABITAT

The 1993 Pajaro River Lagoon Management Plan (Management Plan) was prepared for Santa Cruz County to address flooding and sandbar breaching activities (Mitchell Swanson and Associates, 1993). In that plan, sandbar breaching protocols were developed to avoid adverse water quality conditions (including severe changes in salinity) in the lagoon in order to protect fish species. The Management Plan recommended the following considerations when artificially breaching the sandbar:

- Delay artificial breaching in the fall (September to early December) as long as safely possible to avoid situations where the sandbar is breached in response to a brief, early storm.

- To the extent possible, do not breach the sandbar until seasonal rains are sufficient to maintain an open sandbar during the winter.

- In the event of high lagoon water levels after sandbar formation in late spring (April to June), allow the sandbar to remain when safely possible, to prevent prolonged stratification after the bar re-forms and to prevent a delay in conversion to freshwater.

- If a late spring artificial breach of the sandbar becomes necessary, attempt a "controlled" breach. Attempt to partially open the bar to lower the lagoon water level and close the opening to prevent substantial tidal inflow. This will lessen the opportunity for lagoon stratification.

3.6 CULTURAL RESOURCES

This section summarizes the information from a cultural resources survey and literature review for prehistoric and historic resources conducted by Pacific Legacy, Inc (1997, 1999, 2002). This action partially fulfills the requirements of 36 CFR 800.4(a) in identifying the area of potential effects and determining if any data gaps exist. Because of the sensitivity of cultural resources, specific details regarding the location and nature of identified cultural resources are kept confidential.

ARCHAEOLOGY

Archaeological context for project components is derived from research in the southern Santa Clara Valley region and the Monterey Bay region. Prehistoric characteristics of these areas are described below.

SOUTHERN SANTA CLARA VALLEY REGION

Research and investigations performed by King and Hickman (1973) and Hildebrandt and Mikkelsen (1993) provide a general description of prehistoric habitation characteristics in the southern Santa Clara Valley region of the project area. Based on a database of approximately 50 prehistoric sites, King and Hickman identified the following sequence for subsistence and settlement patterns for the prehistoric inhabitants of the region:

> **Millingstone Period (7000-4000 years before the present [B.P.]):** This period consists of initial settlement of the project area.
>
> **Middle Period (4000-1500 B.P.):** This period is considered the peak of sedentary settlement development with reliance on a subsistence economy, using storage of foods such as acorns, and with interregional exchange, warfare, and population pressure.
>
> **Protohistoric Period (1500-400 B.P.):** The Protohistoric Period consists of an adaptive shift to more mobile settlement patterns and the dissemination of population concentrations.

Recent research performed by Hildebrandt and Mikkelsen (1993) has resulted in the general development of the following cultural chronology:

> **Early Period (4500-2500 B.P.):** This period is characterized by a high degree of mobility and a wide array of faunal remains in the coast and inland areas.
>
> **Middle Period (2500-850 B.P.):** The Middle Period is identified by a lower degree of mobility with fewer marine shells, more structures and indications of year-round occupation, and a higher variety of tools.
>
> **Late Period (post 850 B.P.):** This period is characterized by a reduction in territorial base, a lack of marine shell, and more usage of local resources.

MONTEREY BAY REGION

Breschini and Haversat (1992) have proposed two archaeological population patterns within the Middle Period for the Monterey Bay region: the Sur Pattern (appears by 3000 B.P.) and the Monterey Pattern (after 2450 B.P.). The Sur Pattern is thought to correspond with "Hokan" ancestors of the Esselen and represents an early "forager" subsistence strategy. The Monterey Pattern corresponds with "Penutian" ancestors of historic Costanoan and represents a "collector" subsistence strategy pursued by Costanoan speakers.

In addition, investigations by Dietz and Jackson (1981) identified the existence of two different subsistence strategies. The first population was identified as foragers that utilized the project area approximately 4,000 years ago. The second population was identified as collectors that utilized temporal and seasonal residential bases and camps. Archaeologically, the two populations represent a distinct shift in settlement, subsistence, and use of the region through time.

ETHNOGRAPHY

The ethnographically documented aboriginal inhabitants of the project area were part of the Ohlone, or Costanoan, language group, which extended from the San Francisco Bay area south to the southern Monterey Bay and lower Salinas River areas. Ethnographic information regarding people in this group is obtained from records of early Spanish explorers, documents maintained at missions, the works of ethnographs and linguists, and from Native American descendants.

The Ohlone/Costanoan languages belong to the Utian family, of the Penutian language stock (Shipley, 1978). Ohlone/Costonoan languages were spoken in a large area extending from the San Francisco Bay area, southward along the coast to Point Sur, and inland to the Diablo Range and portions of the northern San Joaquin Valley. Four groups are noted within the project area: Tiuvta, Unijaima, Motsun, and Ausaima (Milliken et al., 1993). The Tiuvta were a tribelet within the Calendruc tribe that occupied the Pajaro River, Elkhorn Slough, and lower Salinas River areas. The Unijaima lived in the mountains and plains of southwestern Santa Clara Valley, north of the Pajaro River, while the Motsun lived in the San Juan Valley and in the mountains southwest of the valley. The Ausaima lived in the eastern portion of the San Felipe Sink and the hills on the west side of Pacheco Pass.

HISTORICAL OVERVIEW

The history of the Monterey Bay and the southern Santa Clara Valley regions can be divided generally to three periods: Spanish arrival and colonization, Mexican independence and the ranchos, and Anglo-American expansion.

SPANISH ARRIVAL AND COLONIZATION

Colonization by the Spanish in what was then known as Alta California occurred in the late 1700s. Captain Gaspar de Portola led the earliest land expedition along the coast in 1769 (Hoover et al., 1990), followed by Pedro Fages in 1770 and 1772, Fernando Javier de Rivera in

1774, and Juan Bautista de Anza in 1776. All except Portola's expedition traveled on the east side of the Santa Cruz Mountains, along a route later to become known as El Camino Real.

Soon after the first of these expeditions, Missions San Carlos de Borromeo (1770), Santa Clara (1777), and Santa Cruz (1791) were founded. The mission closest to the project area, San Juan Bautista, was founded in 1797. The mission system was an important institution in the colonization process of Alta California. The purposes of the system were to Christianize native people and inculturate them into the Hispanic lifeways of the colonizers. A process of culture change occurred that brought most of the native peoples in the area into the mission system by 1810. At the expense of traditional skills, the neophytes were taught the horticultural and pastoral skills of the Hispanic tradition.

MEXICAN INDEPENDENCE AND RANCHOS

A process of land granting was instituted soon after the mission system began (the first grant was made in 1775) (Hoover et al., 1990). Granting of land, called ranchos, continued throughout the Spanish Period and created the beginning of the cattle industry in California. Within a few years, ranchos occupied large tracts in the vicinity of the missions, and a pastoral economy involving the missions, the rancheros, and the neophytes was established.

With the declaration of Mexican independence in 1821, Spanish control of Alta California ceased. Political change did not begin in earnest until mission secularization in 1834, when the native peoples were freed from missionary control, and mission lands were granted to private individuals.

During this time period, cattle hides and tallow were the medium of exchange in local business transactions and with international trading ships. The Mexican population continued to grow and the native population continued to decline. Anglo-Americans began to settle in Alta California, often marrying into Mexican families, becoming Mexican citizens, and receiving land grants.

ANGLO-AMERICAN EXPANSION

After the Mexico-U.S. War, the 1848 Treaty of Guadelupe Hidalgo formalized Mexico's capitulation, and Alta California was annexed by the United States. News of the gold strike in the Sierra Nevada mountains that same year sparked a huge migration into California, beginning the Anglo-American occupation of California. Due to a combination of Gold Rush-related immigration and land ownership disputes resulting from the transition from Mexican to U.S. authority, the project area began to change rapidly.

The latter half of the 19th century saw a continued Anglo-American immigration into the project area, and consequent changes in the culture and economy of the area. Anglo-American culture steadily became the predominant culture in California, though the Hispanic culture continued to exist. Dispersed farmsteads slowly replaced the immense Mexican ranchos. The farming of wheat, sugar beets, and other specialized crops slowly replaced cattle ranching as the primary economic activity in the project area.

With the coming of the railroad to the project area in the late 1800s and the mechanization of farming with steam-driven machinery, agricultural activities in the region were altered. Larger tracts of land were farmed, often on land reclaimed from the sloughs and lowlands adjacent to the Pajaro River. Tar and asphalt were commercially exploited during the 1860s, while granite mining was started in 1900 in the Pajaro Gap area. By the 20th century, farming activities predominated both the Pajaro Valley and southern Santa Clara Valley.

IMPORT PIPELINE

An archaeological survey of the Import Pipeline alignment was conducted by Pacific Legacy in July 1997 (Pacific Legacy, Inc., 1997) with supplemental surveys conducted in October 2002. A revised report is currently being prepared. The archaeological survey identified seven cultural resources sites.

For purposes of the cultural resource analysis, the proposed Import Pipeline alignment was divided into the following reaches described below.

STATIONS 1820+00 TO 1680+00

The survey identified the presence of one cultural resource site (CA-SBN-191H) along this portion of the Import Pipeline alignment. CA-SBN-191H consists of an unlined historic canal between San Felipe Lake and the Pajaro River. The historic canal possibly served as a water source for cattle driven from the San Joaquin Valley to the Santa Cruz Valley in the late 1800s. CA-SBN-191H has been determined to be ineligible for the National Register of Historic Places (Terhorst et al, 1991).

STATIONS 1680+00 TO 1232+00

Four cultural resource sites (CA-SBN-149H, CA-SBN-187, CA-SBN-188, and CA-SCL-579) were identified in this area. CA-SBN-187 and CA-SBN-188 can be described as prehistoric lithic scatters with sparse to moderate density chert debitage, flaked stone and ground stone. Both of these sites were the subject of archaeological excavations by Archaeological Resources Management (ARM) in 1990. The subsurface investigations did not find significant deposits and the integrity of the deposits appears to have been compromised by agricultural activities. However, both of these sites are located in what was once marshland, within the floodplain of the Pajaro River. Thus, there is the potential for deeply buried deposits. ARM recommended that these sites be monitored during construction. While the sites have been subject to limited subsurface evaluation, neither site has been formally evaluated for the National Register of Historic Places or the California Register of Historical Resources.

CA-SBN-149H is a historic site known as the Sanchez Adobe Site. The site is within an existing trailer park and was subjected to subsurface investigations on two occasions (Cartier, 1985 and 1995). While not deemed a property eligible for the National Register of Historic Places, Cartier recommended further excavation and monitoring prior to construction of the trailer park (Cartier, 1990). The deposit described by Johnson and Cartier (1985) during the initial recording of the

site was not located during the Pacific Legacy survey of the Import Pipeline alignment. During the 1997 Pacific Legacy survey, a single piece of debitage was noted in the reported location of the site.

STATIONS 1232+00 TO 1153+00

One cultural resource site (CA-SCR-318H) has been recorded. CA-SCR-318H consists brick scatter, wood timber, concrete foundation with associated oil-saturated soils, and three large Portland concrete blocks with threaded steel studs and two blocks of mortared brick. This site was newly discovered during this survey, and therefore its eligibility for listing on the National Register has not yet been determined.

STATIONS 1153+00 TO 455+00

No cultural resources were identified in this area.

STATIONS 455+00 TO 248+00

No cultural resources were identified in this area.

STATIONS 248+00 TO 52+00

No cultural resources were identified in this area.

INTEGRATED COASTAL DISTRIBUTION SYSTEM (ICDS)

Cultural resources identified adjacent to the ICDS are divided between resources occurring in the Santa Cruz Service Area and the Monterey Service Area.

SANTA CRUZ SERVICE AREA

Five previously recorded prehistoric cultural resources (CA-SCR-60, CA-SCR-61, CA-SCR-102, CA-SCR-130, and CA-SCR-154) are located along or adjacent to the proposed laterals within the Santa Cruz Service Area of the ICDS. CA-SCR-60 consists of a large flaked-stone and shell scatter, while CA-SCR-61 is a large prehistoric habitation site with extensive shell midden and ground-stone tool scatter. CA-SCR-102, CA-SCR-130, and CA-SCR-154 all generally consist of flaked-stone scatter with shell deposits.

In addition to the prehistoric sites, three properties listed as Santa Cruz County historic places are also located along or adjacent to the proposed laterals within the Santa Cruz Service Area of the ICDS. These sites consist of two large concrete water tank towers (constructed in 1912) and the Thurwachter Road Marker (constructed in 1934). None of these sites are considered eligible for the National Register of Historic Places (Holson, 1997). These sites were avoided during construction.

Proceeding under the terms of the 2000 Programmatic Agreement between the U.S. Army Corps of Engineers and the California State Historic Preservation Officer for the PVWMA Local Water Supply and Distribution Project, CA-SCR-60 and CA-SCR-130 were the subject of subsurface investigations prior to construction of the Harkins Slough project. Both sites contain deep stratified deposits and human remains, and thus were determined eligible for the National Register of Historic Places. Analysis of the materials and reporting will be completed in Spring 2003. Subsurface probing at CA-SCR-61 suggested that the site is located outside of the pipeline alignment. Monitoring was conducted at this site during pipeline construction. CA-SCR-154 and CA-SCR-102 were outside of the pipeline alignment.

MONTEREY SERVICE AREA

Three previously identified cultural resources (CA-MNT-638, CA-MNT-618/1328, and CA-MNT-228) are located along the proposed laterals within the Monterey Service Area of the ICDS. CA-MNT-638 and CA-MNT-228 consist of shell deposits, flaked-stone debris, and historic trash, while CA-MNT-618/1328 is a severely disturbed habitation site consisting of shell midden, hearth features, and a flaked-stone scatter (Pacific Legacy, 1999).

WATER RECYCLING PROJECT

Archaeological surveys of the proposed Water Recycling Facility site around the Watsonville Wastewater Treatment Facility (WWTF) were conducted by Pacific Legacy in November 1997 and March 1999. No cultural resources were identified or recorded in or near this area. However, based on surveys completed in the general project area, construction activities could reveal presently unknown cultural resource sites.

NATIVE AMERICAN CONSULTATION

Native American consultation for the Import Pipeline and Water Recycling Project components of the proposed alternatives was initiated on October 11, 2002 by Pacific Legacy. At their request, the Native American Heritage Commission (NAHC) in Sacramento conducted a search of the Sacred Lands Inventory to identify any areas of concern to local Native American groups. Their search included San Benito, Santa Clara, Santa Cruz and Monterey counties. On October 24, 2002, the NAHC replied that a record search of their files failed to indicate the presence of Native American resources in the project area and provided Pacific Legacy with a list of potential interested parties to contact.

On October 24, 2002, letters requesting consultation were sent to the following interested parties: Ella Rodriquez, Jakki Kehl, Katherine Perez; Linda Yamane, Charles Higuera and Marion Martinez of the Ama San Juan Band; Michelle Zimmer and Irene Zwierlein of the Amah/Mutsun Tribal Band; Tony Cerda of the Coastanoan Rumsen Carmel Band; Anne Marie Sayers of the Indian Canyon Mutson Band of Costanoan; Louise Rameriz and Rudy Rosales of the Ohlone/Coastanoan-Esselen Nation; Andrew Galvan of the Ohlone Indian Tribe; Thomas and

Howard Soto; and Ramona Garibay of the Trina Marine Ruano Family. Included in the letters were a project description, maps and a self-addressed, stamped reply envelope.

On October 30, 2002, Anne Marie Sayers met with John Holson of Pacific Legacy to discuss the project. Ms. Sayers expressed an interest in the project, and in particular the avoidance of prehistoric cultural resources. She also indicated that she would like to be kept informed of the project including review of any cultural resource reports.

Native American consultation for the Integrated Coastal Distribution System is proceeding under the terms of a Programmatic Agreement between the U.S. Army Corps of Engineers and the California State Historic Preservation Officer issued in 2000. In accordance with the Programmatic Agreement, Native American monitors were present for the evaluation and data recovery excavations at CA-SCR-60, CA-SCR-61 and CA-SCR-103 and were consulted regarding the level of effort and analysis. A report on the findings for the San Andreas Lateral is currently being prepared by Pacific Legacy.

3.7 INDIAN TRUST ASSETS

The United States has a trust responsibility to protect and maintain rights reserved by or granted to American Indian (Indian) tribes or Indian individuals by treaties, statutes, and executive orders. This trust responsibility requires that all Federal agencies, including Reclamation, take all actions reasonably necessary to protect Indian Trust Assets (ITAs). ITAs are legal interests in property held in trust by the United States for Indian tribes or individuals, or property that the United States is otherwise charged by law to protect. Examples of resources that could be ITAs are lands, minerals, hunting and fishing rights, water rights, and instream flows. ITAs cannot be sold, leased, or otherwise alienated without the approval of the federal government.

Secretarial Order 3175 and Reclamation ITA procedures require Reclamation to assess the impacts of its projects, and projects requiring Reclamation approval, on identified ITAs. Reclamation, in cooperation with American Indian tribes affected by a given project, must inventory and evaluate assets, then mitigate or compensate for adverse impacts to the assets held in trust for federally recognized American Indian tribes or Indian individuals.

Reclamation is responsible for ensuring that its actions do not adversely affect ITAs. Reclamation's Indian Trust Asset Policy states that Reclamation will carry out its activities in a manner which protects ITAs and avoids adverse impacts when possible. When adverse impacts cannot be avoided, appropriate mitigation must be provided.

To date, no ITAs have been identified within the project area.

3.8 AIR QUALITY

The primary factors that determine air quality are the locations of air pollutant sources and the amounts of pollutants emitted. Meteorological and topographical conditions, however, are also important. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants.

The project site is in the North Central Coast Air Basin (NCCAB). The NCCAB is comprised of Monterey, Santa Cruz, and San Benito Counties. The Pajaro Valley Water Management Agency (PVWMA) lies within the northern portion of the NCCAB. The PVWMA service area is bounded by the Santa Cruz range to the north and northeast, the Pacific Ocean to the west, and the Salinas Valley to the south.

The semipermanent high-pressure cell over the eastern Pacific Ocean is the basic controlling factor in the climate of the air basin. In the summer, the high pressure cell is dominant and causes persistent west and northwest winds over the entire California coast. The onshore air currents pass over cool ocean waters and bring fog and relatively cool air into the coastal valleys. The warmer air aloft acts as a lid to inhibit vertical air movement.

The generally northwest-southeast orientation of mountainous ridges tends to restrict and channel the summer onshore air currents. Typically during the fall, when surface winds become weak, north or east winds develop and transport pollutants from either the San Francisco Bay Area or the Central Valley into the NCCAB.

During the winter, the Pacific high-pressure area has less influence on the air basin. Air frequently flows in a southeasterly direction out of the Salinas and San Benito valleys, especially during night and morning hours. Northwest winds are still dominant in the winter, but easterly flow is more frequent. The absence of deep, persistent inversions and the occasional storm systems usually result in good air quality for the basin as a whole in winter and early spring.

REGULATORY CONTEXT

Regulation of air quality is achieved through implementation of national and state ambient air quality (concentration) standards and enforcement of emissions limits for individual sources of air pollutants. The federal Clean Air Act required the U.S. Environmental Protection Agency (EPA) to identify national ambient air quality standards (NAAQS) to protect public health and welfare. NAAQS have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter (PM_{10}), and lead. These pollutants are called “criteria” air pollutants because the corresponding ambient standards satisfy criteria specified under the Clean Air Act. The State of California has established its own ambient air quality standards (SAAQS), which are generally more stringent than their national counterparts.

The federal Clean Air Act required U.S. EPA to designate air basins, or portions thereof, as either "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the national standards have been achieved. The California Clean Air Act, patterned after the federal Clean Air Act, also required that areas be designated as attainment or nonattainment, but with respect to the state standards rather than the national standards. The NCCAB is currently designated as nonattainment for state ozone and PM_{10} standards (California Air Resources Board [CARB], 2000). Based on monitoring data from the 1970s and 1980s, the NCCAB was designated as nonattainment for the national ozone standard, but has been redesignated as attainment when EPA approved the region's Maintenance Plan (62 Federal Register 2597, January 19, 1997).

Under the federal Clean Air Act, air basins designated as nonattainment were required to prepare air quality plans that set forth a strategy to attain the standards. The plans and programs developed for a given state are referred to as State Implementation Plans (SIPs). California's SIP is comprised of plans developed at the regional or local level. Federal actions conducted in air basins out of attainment of the federal ozone standard (such as the Bay Area Air Basin) must demonstrate conformity with the SIP. Conformity to an SIP is defined in the CAA as meaning conformity to an SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. EPA has published a rule (referred to as the General Conformity Rule) that indicates how most federal agencies are to make such a determination (Federal Register, 1993).

Under the California Clean Air Act, air basins designated as nonattainment with respect to the state standards must prepare plans to achieve the standards or that, at a minimum, implement all feasible measures. The Monterey Bay Unified Air Pollution Control District (MBUAPCD) regulates the North Central Coast Air Basin. The MBUAPCD prepared and adopted the 1991 *Air Quality Management Plan for the Monterey Bay Region* (1991, AQMP). The 1991 AQMP addressed planning requirements related to the state ozone standard and recommended adoption of 20 measures to control emissions of reactive organic gases (ROG) from stationary sources, 5 measures for stationary sources of nitrogen oxides (NO_X), and 8 transportation control measures. In 1994, the AQMP was updated to include a revised design value that reduced emission reductions needed to obtain the state ozone standard from 30 percent to 20 percent. The 1997 AQMP update includes current air quality data, current population forecasts, revised emission inventory and emission forecasts, and revised Transportation Control Measures (TCM).

The 1991 and 1994 AQMPs relied on implementation of Trip Reduction Ordinances (TROs) to meet California Clean Air Act requirements to reduce the rate of increase in passenger vehicle trips and miles traveled per trip in particular urbanized areas. Since mandatory TROs are now prohibited by law and must be removed, the remaining TCMs no longer meet this requirement and have been updated in the AQMP. Although it has surpassed the CARB's 20 percent reduction in ROG and NO_X, the District continues to exceed the state ozone standard. To progress toward attainment of the standard, the AQMP outlines a list of programs for implementation. These programs include enforcement of existing rules and regulations, improvements to existing regulations, implementation of updated TCMs, review of all environmental documents, evaluation of data, and implementation of public education programs.

The CARB, California's state air quality management agency, regulates mobile emissions sources and oversees the activities of air pollution control districts and air quality management districts. CARB indirectly regulates local air quality by having established state ambient air quality standards and vehicle emission standards, by conducting research activities, and by planning and coordinating activities.

The MBUAPCD is the regional agency empowered to regulate air pollution emissions from stationary sources in the NCCAB. MBUAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review activities. MBUAPCD operates air quality monitoring stations that provide information on ambient concentrations of criteria air pollutants.

The Association of Monterey Bay Area Governments (AMBAG) does not regulate emissions directly, but develops transportation control measures and employment and population forecasts that are used in developing the AQMP. For projects that would lead directly or indirectly to an increase in population in Monterey, Santa Cruz, or San Benito Counties, AMBAG determines whether the increase in population would be consistent with the population assumptions that were used to develop the AQMP. If consistent with those assumptions, a project is regarded as included in the AQMP, and as such, is consistent with the strategies included in the AQMP to improve regional ozone concentrations. If it is not consistent with those assumptions, then the project is deemed to contribute to a significant adverse cumulative effect on regional ozone concentrations.

EXISTING AIR QUALITY

MBUAPCD's air quality monitoring stations provide information on ambient concentrations of criteria air pollutants. **Table 3.8.1** is a five-year summary of the highest annual criteria air pollutant concentrations. The ozone data shown in **Table 3.8.1** are a compilation of data from all of the monitoring stations in the NCCAB, since ozone is a regional pollutant. Pollutant data for carbon monoxide (CO) and PM_{10} were collected at the air quality monitoring station at 1270 Natividad Road in Salinas. CO and PM_{10} are more local in character than ozone, and the Salinas monitoring station is the closest station to the project site where both CO and PM_{10} are monitored. In **Table 3.8.1**, air pollutant concentrations are compared with the state ambient air quality standards, which are generally more stringent than the corresponding national standards. The major criteria air pollutants are described below.

OZONE

Ozone is not emitted directly into the atmosphere but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving volatile organic compounds (VOC) and oxides of nitrogen (NO_x).[1] VOC and NO_x are known as precursor

[1] Federal air quality laws refer to "volatile organic compounds" (VOC) while BAAQMD-recommended CEQA significance criteria refer to "reactive organic gases" (ROG). Each of these terms encompasses substantially the same compounds.

TABLE 3.8.1
SALINAS AIR POLLUTANT SUMMARY, 1995-1999[a]

Pollutant	Standard[b]	1995	1996	1997	1998	1999
Ozone						
Highest one-hour average, ppm[c]	*0.09*	**0.14**	**0.12**	**0.11**	**0.12**	**0.11**
Number of standard violations[d]		8	16	1	10	3
Carbon Monoxide						
Highest eight-hour average, ppm	*9.0*	2.1	2.6	1.8	2.2	1.8
Number of standard violations		0	0	0	0	0
Particulate Matter (PM_{10})						
Highest 24-hour average, $\mu g/m^3$ [c]	*50*	50	50	**59**	**52**	50
Number of standard violations[e]		0	0	1	1	0
Annual Geometric Mean, $\mu g/m^3$	*30.0*	17.7	17.2	19.6	16.1	18.1

a As a regional pollutant, ozone data represent basinwide values based on data from all of the monitoring stations. During the 1995-1997 period, ozone exceedances were recorded at the following monitoring stations: Pinnacles, Scotts Valley, Hollister, Watsonville, Monterey, and Carmel Valley. Pollutant data for CO and PM_{10} were collected at MBUAPCD's Salinas monitoring station, 1270 Natividad Road.
b State standard, not to be exceeded.
c ppm - parts per million; $\mu g/m^3$ - micrograms per cubic meter.
d Refers to the number of days (in a given year) during which violations of the applicable standard were measured.
e Typically measured every sixth day.

NOTE: Values in **bold type** are in excess of applicable standard.

SOURCE: California Air Resources Board, 1995-1999.

compounds for ozone. Significant ozone production generally requires about three hours in a stable atmosphere with strong sunlight. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production, and high ozone concentrations can occur miles away from the source of the precursors. Motor vehicles are generally the major source of ozone precursors.

Short-term exposure to ozone can damage the lungs, decrease pulmonary function, and impair immune mechanisms (MBUAPCD, 2000). These changes have been implicated in the development of chronic lung disease as the result of longer-term exposure. Symptoms of ozone irritation include shortness of breath, chest pain when inhaling deeply, wheezing, and coughing. In addition, effects on vegetation have been documented at concentrations below the standards. On-road motor vehicles contribute approximately 30 to 40 percent of the VOC and NO_x emitted in the NCCAB (CARB, 1995).

As shown in **Table 3.8.1**, the state standard for ozone is violated on an average of approximately eight days per year within the region. During the 1995 to 1999 period, exceedances of the state ozone standard were recorded at the following monitoring stations: Pinnacles, Hollister, Scotts Valley, Watsonville, Monterey, and Carmel Valley. Approximately 69 percent of the station-hours over the state standard that were recorded in the air basin over the 1995 to 1999 period were recorded at the Pinnacles monitoring station. The monitoring stations at Scotts Valley and Hollister account for the remaining 31 percent of the exceedances. No exceedances of the state standard have been recorded at the Watsonville, Monterey, and Carmel Valley monitoring stations since 1995.

CARBON MONOXIDE

CO is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. Ambient CO concentrations normally correspond closely to the spatial and temporal distributions of vehicular traffic. CO concentrations also are influenced by wind speed and atmospheric mixing. Under inversion conditions, CO concentrations may be distributed more uniformly over an area out to some distance from vehicular sources.

When CO combines with hemoglobin in the blood, the oxygen-carrying capacity of the blood is reduced and the release of oxygen is inhibited or slowed (MBUAPCD, 2000). This condition places fetuses, angina patients, persons with other cardiovascular diseases or with chronic obstructive lung disease, asthma, or anemia at risk. Symptoms of exposure may include headaches, dizziness, sleepiness, nausea, vomiting, confusion, and disorientation. The state standards for CO have not been violated at the monitoring station in Salinas over the past five years.

PARTICULATE MATTER

PM_{10} consists of particulates 10 microns (a micron is one one-millionth of a meter) or less in diameter, which can be inhaled and cause adverse health effects. Particulates in the atmosphere result from many kinds of dust- and fume-producing industrial and agricultural operations, combustion, and atmospheric photochemical reactions. Agricultural activities, such as tilling, disking and field burning, are major sources of particulates in rural areas, while vehicle/equipment travel and demolition and construction activities are major sources of particulates in urban areas. Natural sources of particulates include wind erosion from exposed surfaces. Particulate concentrations near residential sources generally are higher during the winter, when more fireplaces are in use and meteorological conditions prevent the dispersion of directly emitted contaminants. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Particulates also can damage materials and reduce visibility. State 24-hour PM_{10} standards have been violated on rare occasions over the past five years at the monitoring station in Salinas.

3.9 ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (February 11, 1994), requires agencies to identify and to address disproportionately high and adverse human health or environmental effects of their actions on minorities and low-income populations and communities, as well as the equity of the distribution of the benefits and risks of their decisions. Environmental Justice addresses the fair treatment of people of all races and incomes with respect to actions affecting the environment. Fair treatment implies that no groups of people should bear a disproportionate share of negative impacts from an environmental action.

DEMOGRAPHICS

The minority population in the Revised BMP project area and vicinity is based on an analysis of race and ethnicity population data from the 2000 U.S. Census for the four counties that approximate the area of potential impact from the proposed action: San Benito, Santa Clara, Santa Cruz, and Monterey Counties. Population data are summarized by five racial categories: White, Black, Asian, American Indian/Eskimo/Aleut, Pacific Islander, and Other. Persons of Hispanic origin may be of any race, so this ethnic category is summarized separately (see **Table 3.9.1**).

Racially, the project area varies in comparison to state demographics: in general, Black and Asian populations are under-represented, while American Indian and Pacific Islander populations are proportionately higher. In comparison to the California state demographics, the project area in Santa Clara and Santa Cruz Counties is proportionately lower in Hispanic population, while the project area in San Benito and Monterey Counties is proportionately higher in Hispanic population (32.4 percent). Hispanic is the largest minority population in the project area, except in Santa Clara County where Asian is the largest minority group.

Low income populations in the project area are identified by several socioeconomic characteristics. Specific characteristics used in this description, reported in the 2000 U.S. Census, include persons below the poverty level and unemployment rates. **Table 3.9.1** shows the latest (1999) percent population living at or below the poverty level. The national average was 12.4 percent, while California had 14.2 percent living below poverty. All four counties had an overall lower percentage of population living at or below the poverty level than the statewide average. The unemployment rate in the project area is similar to the statewide rate. The unemployment rates reported in the census for the counties range from 2.6 to 5.2 percent, compared to the statewide rate of 4.3 percent.

TABLE 3.9.1
DEMOGRAPHIC CHARACTERISTICS OF COUNTIES IN THE PROJECT AREA BASED ON 2000 CENSUS

Demographic	Percent of Total Population				
	California	San Benito County	Santa Clara County	Santa Cruz County	Monterey County
Total Population	33,871,648	53,234	1,682,585	255,602	401,762
White	59.5	65.2	53.8	75.1	55.9
Black	6.7	1.1	2.8	1.0	3.7
Asian	10.9	2.4	25.6	3.4	6.0
American Indian	1.0	1.2	7.0	1.0	1.0
Pacific Islander	0.3	2.0	3.0	1.0	4.0
Other	21.6	28.1	7.8	18.5	29.4
Hispanic	32.4	47.9	24.0	26.8	46.8
Population in Poverty	14.2	10.0	7.5	11.9	13.5
Unemployment Rate	4.3	4.5	2.6	4.1	5.2

SOURCE: U.S. Bureau of the Census, 2000.

3.10 SOCIOECONOMICS

The Pajaro Valley consists of approximately 120 square miles of rich, loamy soils that are well suited to agricultural production. The valley's commercial center is the City of Watsonville and agriculture is the area's principal economic activity. The combination of Pajaro Valley's unique marine climate and its fertile soils makes the area one of the most productive agricultural regions in the world. Annually, the valley produces on average over $530 million in vegetable, berry and ornamental crops (in 2001 dollar terms) on over 30,000 acres of agricultural acreage (Santa Cruz County, 1998). The gross revenue per cultivated acre averages more than $17,600 per acre.

REGIONAL ECONOMY

Pajaro Valley is located within northern Monterey and southern Santa Cruz Counties. A small portion of the valley is also located within San Benito County. Due to the importance of the area's agricultural industry and due to the scope and nature of the proposed action, the affected region is defined as the two-county area of Monterey and Santa Cruz Counties. The discussion of the economic environment provides a description of the combined regional economy of Monterey and Santa Cruz Counties.

A socioeconomic profile was prepared for each county to provide a general characterization of their recent demographic and economic conditions, and to present the baseline statistics to be used in the impact analysis of the alternatives. The baseline serves as a measure of the region's economic environments and is used to evaluate the magnitude of potential impacts on the counties from implementation of the proposed alternatives. Unless otherwise noted, all figures are presented in 2001 dollars. (When necessary, the figures were adjusted into 2001 dollars using the U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers.)

MONTEREY COUNTY

Monterey County occupies 3,324 square miles and includes 100 miles of California's coast. Historically, Monterey's economy has been centered on agriculture and tourism. Monterey County is the third-highest agricultural producing county in California and one of the nation's leading vegetable-producing areas. The County's tourism industry attracts business year round as visitor destinations such as Monterey Bay, Big Sur and the Ventana Wilderness offer a variety of recreational and cultural opportunities.

The services, agriculture and government industries dominated Monterey County employment in 2000. Together these three industries accounted for almost 63 percent (103,300) of the County's total employment (165,100). Agricultural production is estimated by the California Economic Development Department to account for approximately 35,500 jobs in the County – accounting for approximately 21.5 percent of the County's employment. The County's average unemployment rate in 2000 was 9.7 percent. The state's unemployment rate in 2000 was 4.9 percent. Typically,

in counties such as Monterey where agriculture and tourism are factors in the economy, there is substantial seasonal employment and, as a result, higher unemployment rates.

Future nonagricultural wage and salary employment in Monterey County is projected to increase by approximately 17,100 jobs (13.6 percent) from 1999 to 2006. Employment in all County industrial sectors is projected to experience growth (except mining). Over 40 percent of this growth is expected to occur in the service industry. EED provides no projections of future agriculture employment due to the numerous factors affecting future production (California Economic Employment Department, 2002).

SANTA CRUZ COUNTY

Santa Cruz is the second smallest county in California with approximately 440 square miles of land. However, the County also includes over 30 miles of Pacific coastline. While Santa Cruz County's economy is largely dependent on tourism, retail trade and government constitute a large part of the County's economy. In 2000, services accounted for more than 28 percent of all employment and retail trade contributed to 20.2 percent of total employment. Agriculture is estimated by the California Economic Development Department to account for approximately 8,800 jobs in the County – accounting for approximately 6.6 percent of the County's employment. The County's average unemployment rate in 2000 was 5.6 percent – slightly higher than the state average of 4.9 percent.

Future nonagricultural wage and salary employment in Santa Cruz County is projected to increase by approximately 10,100 jobs (10.7 percent) from 1999 to 2006. Employment growth is expected to occur in the construction, trade, service and government sectors, with the greatest employment growth in the service industry (4,900). Future employment in manufacturing is expected to decline by 1,100 jobs (California Economic Employment Department, 2002).

POPULATION

In 2000, the total population of the affected two-county region was approximately 657,000. Monterey County is the more populated county with approximately 402,000 residents – the greatest proportion of which live southeast of the Pajaro Valley in Salinas (approximately 151,000). Watsonville (the second largest city in Santa Cruz County) has a residential population of nearly 44,300.

EMPLOYMENT

The employment figures include all waged and salaried positions in each county. Self employed workers are not included. The employment figures include both full-time and part-time workers. According to EDD, Labor Market Information Division estimates, the total civilian labor force residing in the Monterey-Santa Cruz region in 2000 was 335,100, of which approximately 308,400 were employed. Both counties have unemployment rates above the national and state averages. The region's average rate of unemployment in 2000 was 9.2 percent.

Table 3.10.1 provides total county employment estimates by sector showing the jobs *located within* the region. These figures are used as the baseline for employment conditions.

TABLE 3.10.1
2000 EMPLOYMENT BY MAJOR INDUSTRY

Industry Sector	Monterey	Santa Cruz	Total[a]
Agriculture	35,500	8,800	**44,300**
Construction & Mining	6,500	4,800	**11,300**
Manufacturing	9,800	10,100	**19,900**
Transportation, public utilities	5,100	3,000	**8,100**
Trade	33,900	26,100	**60,000**
Finance, insurance, real estate	6,500	3,800	**10,300**
Services	37,400	30,000	**67,400**
Government	30,400	19,400	**49,800**
Total[a]	**165,100**	**106,000**	**271,100**

[a] Totals may not add due to rounding.

SOURCE: "County Snapshot," California Economic Development Department, 2001. (www.calmis.ca.gov/htmlfile/county.htm)

A recent economic development study of the Salinas and Pajaro Valley estimated that the cluster of agricultural industries (such as production, agricultural services, food processing and agricultural supplier sectors) in 1997 accounted for 64,500 jobs or 30.9 percent of the industrial employment in the region (excluding government jobs). Based on the government employment for 2000, this would be roughly equivalent to 25 percent of the county's total employment (Applied Development Economics, 2001).

INCOME

The role of different industry sectors in the region's economy can be represented using data collected by the U.S. Census Bureau. The most recent data is the 1997 Economic Census. The Economic Census provides a detailed portrait of the nation's economy every 5 years, from the national to the local level that estimate the number of business, employment, payroll and sales on a county by county basis. In addition, censuses on agriculture and government are conducted at the same time. However due to privacy concerns some regional data is not reported.

Industry payroll information reflects the personal income to employees in the area (although self-employed workers are not represented by this data). **Table 3.10.2** provides the most recent payroll or income data for the principal industry sectors in the region adjusted into 2001 dollar terms (agricultural payroll information is not collected in the Census of Agriculture).

TABLE 3.10.2
2000 ESTIMATED ANNUAL PERSONAL INCOME BY MAJOR INDUSTRY
(in millions)[a]

Industry Sector	Monterey	Santa Cruz	Total
Manufacturing	$247	$348	**$595**
Trade	$886	$393	**$1,279**
Finance, insurance, real estate	$43	$30	**$73**
Services	$1,052	$518	**$1,569**

[a] In 2001 dollar terms

SOURCE: U.S. Bureau of the Census, 2001b.

INDUSTRY SALES

Table 3.10.3 provides the most recent sales data for the principal industry sectors adjusted into 2001 dollar terms. Due to the differences between industrial sectors and the "value added" by their production processes, comparisons between industries is difficult. For example, trade sales are much greater than agricultural receipts, however since most of this sectors activity involves reselling, there may have been limited additional economic value generated by the business transaction. Nonetheless, the data does provide useful information for evaluating the magnitude of spending changes within specific sectors of the economy.

AGRICULTURAL PRODUCTION

The PVWMA service area incorporates a majority of the Pajaro Valley. While the reported cultivated in Pajaro Valley averages approximately between 32,000 and 33,000 acres, the total agricultural area within the PVWMA service area is estimated to be 30,349 acres (including over 1,200 acres of pasture land). The PVWMA service area more precisely represents the agricultural production potentially impacted by future PVWMA irrigation water management changes. **Table 3.10.4** provides summary information on the agricultural land use within the PVWMA service area. This represents the baseline agricultural production conditions to be used by the agricultural impact analysis. This data was also used as baseline information in the hydrology modeling.

Fruits and berries account for approximately half of the total production value in the Valley, with strawberries accounting for approximately 80 percent of the value produced by this category. Vegetable crops (primarily mushrooms and lettuce) account for about a third of total production, while greenhouse and field ornamentals account for most of the remainder.

TABLE 3.10.3
2000 ESTIMATED ANNUAL SALES AND RECEIPTS BY MAJOR INDUSTRY
(in millions)[a]

Industry Sector	Monterey	Santa Cruz	Total
Agriculture	$1,931	$276	**$2,207**
Manufacturing	$1,466	$2,355	**$3,821**
Trade	$11,925	$3,875	**$15,800**
Finance, insurance, real estate	$260	$183	**$444**
Services	$3,051	$1,868	**$4,914**

[a] In 2001 dollar terms

SOURCE: U.S. Bureau of the Census, 2001a and 2001b

TABLE 3.10.4
CURRENT AGRICULTURAL PRODUCTION IN THE PVWMA SERVICE AREA

Crop	Average cultivated acreage
Strawberry	6,940
Vine (primarily Raspberries)	1,640
Vegetable Row Crops	9,724
Irrigated Fallow[a]	4,174
Field Crops	645
Deciduous (primarily Apples)	3,891
Nursery (Outdoor)	1,475
Nursery (Indoor)	632
Pasture	1,228
TOTAL CULTIVATED ACREAGE	30,349

[a] Irrigated Fallow acreage represents agricultural lands that were not in production (e.g. land unplanted during the transition between crop rotations) when the land use survey was performed.

SOURCE: WRIME, 2002.

Strawberries and lettuce are the leading crops grown in the valley in terms of field crop production. Although production levels can fluctuate significantly on annual basis, during the last ten years the acreage planted to strawberries has been increasing steadily in Santa Cruz County. According to local agricultural specialists strawberry production has become increasingly prevalent in Pajaro Valley. In recent years, apple production has been in steady decline as many orchards have gradually been removed and planted to other crops such as strawberries. While the

acreage planted to head lettuce has been declining over the last ten years, head lettuce still accounted for over a fifth of the agricultural acreage within Santa Cruz county. Furthermore, nearly all of the decrease in head lettuce cultivation has been replaced by increases in leaf lettuce production, reflecting trends in market demand. Combined lettuce production in Santa Cruz County accounted for over 30 percent of the cultivated acreage between 1996 to 2000.

Greenhouse production has been declining in recent years as a result of increase foreign competition; this trend is expected to continue.

CURRENT AGRICULTURAL PRODUCTION METHODS

Based on the past agricultural production and trends, the following crop rotations were selected to represent agricultural production in Pajaro Valley:[1]

- A one year strawberry crop,
- A two year rotation consisting of one year of strawberry production followed by two head lettuce crops in the second year, and
- A one year rotation consisting of two head lettuce crops and one broccoli crop.

A detailed analysis of the current production conditions in the Pajaro Valley and the impacts of the proposed augmentation and delivered water charges are included in Appendix H. However, the following section outline the key factors affecting the net returns estimates associated with the current agricultural production within the PVWMA.

AGRICULTURAL WATER DEMAND AND SUPPLY

According to the water modeling analysis performed for the Basin Management Plan, current agricultural water demand in the PVWMA is 59,300 afy. Growers within the PVWMA meet their irrigation water needs primarily through groundwater pumping. The average applied water needs for the crops were assumed to be unchanged from those estimated for the PVWMA Local Water Supply and Distribution EIR (1999). Specifically, the average applied water need for strawberries was assumed to be 2.6 af and the annual water needs for vegetable production were estimated to be 2.1 af for the net returns analysis. These water use estimates are generally consistent with the results of the PVWMA Crop Water Use Study (1998) which was also used to develop the average agricultural net water use estimate of 2.1 af/ac used for the hydrological analysis. Strawberry producers in Pajaro Valley (like the rest of Monterey County's berry production) almost exclusively use drip irrigation. For vegetable production, over 60 percent of the acreage is currently irrigated with a combination of sprinkler and furrow irrigation (MCWRA, 2000).

[1] These crop rotations are the same as the main cultivation practices used in the PVWMA Local Water Supply and Distribution EIR (1999). Strawberry production is very comparable to raspberry and bushberry production and therefore is used to represent their production, net returns and impacts. Similarly, broccoli production is comparable to other row crop vegetable production (such as cauliflower, celery and brussel sprout production). Therefore it is used in the agricultural analysis to represent the agricultural production for other similar vegetable crops.

CROP PRODUCTION INPUT COSTS

Current Water Prices

The current augmentation charge for pumped groundwater is $80 per foot. In addition, it is estimated that growers incur an average additional utility cost of approximately $40/af. Therefore, currently the average groundwater cost is $120 (not including irrigation well costs).

Land Costs

Land rental prices are a major cost element affecting the profitability of agricultural production in Pajaro Valley. Unfortunately, there is little publicly available information on land prices and lease rates within Pajaro Valley since properties are rarely sold and the land lease terms between landowners and leases are confidential.

In the *Revised Basin Management Plan*, the average land lease cost was estimated to be $1,500 although it was also noted that "in the coastal area the annual cost to lease land is approximately $2,500 to $3,000 per acre"(PVWMA, *Revised Basin Management Plan*, 2002). Discussions with local growers and agricultural specialists suggest that rents for high quality agricultural land in Pajaro Valley most suitable for strawberry and lettuce production average about $2,200/acre.[2]

CROP YIELDS AND PRICES

Agricultural production is generally a cyclical business in which prices, yields and, in some cases, costs may vary significantly between years and also during the production season. The precise timing of the harvest and delivery of the crop to market can be important for determining the prices received by growers for higher value and perishable crops. These fluctuations tend to average out over time, and average prices and yields will provide a more typical representation of likely crop revenues. Therefore, whenever possible, 10-year historical yields and inflation adjusted price information for Monterey County was collected and used to project future prices and yields. The following per acre yield and price assumptions have been used to represent typical crop production revenues:

Broccoli: 645 cartons/acre, $7.25/carton, carton = 22-23 lbs

Head Lettuce (wrapped): 970 cartons/acre, $9.19/carton, carton = 42 lbs

Strawberries: 4,720 cartons/acre, $7.15/carton, carton = 12 lbs

[2] This higher land lease cost was used to be conservative in the agricultural impact analysis by not overestimating the profitability of current local agricultural production.

ESTIMATES OF NET RETURNS FOR AGRICULTURAL PRODUCTION

The net returns for each of the representative crop rotations have been estimated as follows (see **Table 3.10.5**):

One year strawberry crop: Average annual net returns were estimated to be $4,675/acre. The total cost of production was determined to be $29,075/acre. Therefore the return on investment for strawberries was estimated to be approximately 16 percent.

Two year rotation of one strawberry crop and two lettuce crops: Average annual net returns for strawberries were estimated to be $4,675/acre. The total cost of production was determined to be $29,075/acre. Average annual net returns for wrapped head lettuce were estimated to be $1,855/acre. The total cost of production was determined to be $15,975. Therefore the average annual net returns are $3,265 with an average cost of production of $22,525. The return on investment for the two year strawberry and lettuce rotation was estimated to be approximately 14 percent.

One year vegetable rotation of two lettuce crops and one broccoli crop: Average annual net returns for wrapped head lettuce were estimated to be $2,640/acre. The total cost of production was determined to be $15,190. Average annual net returns for broccoli were estimated to be $385/acre. The total cost of production was determined to be $4,290. Therefore, the overall average net returns for the rotations were estimated to be $3,025 with a total cost of production of $19,480. The return on investment for the vegetable rotation was estimated to be approximately 16 percent.

TABLE 3.10.5
ESTIMATED NET RETURNS FOR AGRICULTURAL PRODUCTION

Crop Rotation	Average Total Production Cost (/ac)	Average Revenue (/ac)	Net Returns (/ac)	Return on Investment
1 Year – Strawberry	$29,075	$33,750	$4,675	16%
2 Year – Strawberry & Lettuce (x2)	$22,525	$25,790	$3,265	14%
1 Year – Lettuce (x2) & Broccoli	$19,480	$22,505	$3,025	16%

Totals may not add up due to rounding.