4.5 WATER RESOURCES

INTRODUCTION

This section of the EIR describes existing surface water and groundwater resources in the area, and evaluates the potential impacts of the project on groundwater quantity and surface water and groundwater water quality. Evaluation of the impact of the project on domestic water supply and distribution is addressed in ***Section 4.11.2, Water Supply and Distribution****.*

ENVIRONMENTAL SETTING

Existing Conditions

Santa Clara-Calleguas Groundwater Basin

The RiverPark Specific Plan Area is situated in the Montalvo Forebay (also referred to as the Oxnard Forebay or the Montalvo basin), a subbasin of the larger Santa Clara-Calleguas groundwater basin (**Figure 4.5-1**). Over the last 15 years, the U.S. Geological Survey (USGS), in cooperation with UWCD, has studied the hydrogeology of the Santa Clara-Calleguas groundwater basin as part of the Southern California Regional Aquifer System Analysis (RASA) Program.[1] The USGS work included the reevaluation of the basin hydrogeology, a data collection program including the installation and sampling of 23 new wells, and the construction of a regional numerical groundwater flow model to evaluate the regional groundwater resources. The findings of their investigation along with the documentation of the numerical groundwater flow model have been compiled in a 1998 draft report, *Simulation of Ground-Water/Surface-Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California*[2] currently under agency review. The USGS report, along with other cited references, serves as the basis for the following discussion on regional groundwater conditions.

The Santa Clara-Calleguas groundwater basin was formed by a series of northeast-trending anticlinal mountains and synclinal valleys in the Transverse Range of southern California. The basin lies within the 2,000-square mile watershed of the Santa Clara River, Calleguas Creek, and associated tributaries.[3] Almost 90 percent of the drainage area is characterized by rugged topography with the

---

1 Martin, Peter. *Southern California Alluvial Basins Regional Aquifer-System Study, in Sun, R.J., Regional Aquifer-System Analysis Program of the U.S. Geological Survey – Summary of Projects, 1978 – 84: U.S. Geological Survey Circular 1002.* 1986. p. 245 – 247.

2 U.S. Geological Survey (R. T. Hanson). *Preliminary Draft, Simulation of Ground-Water/Surface-Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California.* 1998.

3 U.S. Geological Survey (R. T. Hanson). *Preliminary Draft, Simulation of Ground-Water/Surface-Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California.* 1998.

remaining area consisting of valley floor and coastal plain where most of the usable groundwater occurs.[4] The groundwater basin continues offshore where it is dissected by submarine canyons and truncated by submarine cliffs.[5]

The basin can be divided into 12 subbasins based primarily on geologic or hydrogeologic features affecting groundwater levels and/or groundwater flow. Subbasins were first delineated by the California Department of Water Resources in 1933 and the California State Water Resources Board in 1953, and further modified by Mann.[6] Recent work by UWCD has refined the northwestern boundary of the Montalvo Forebay north of the Santa Clara River.

The RiverPark Specific Plan Area is located in the south-central portion of the Montalvo Forebay along the south bank of the Santa Clara River. The Piru, Fillmore, and Santa Paula subbasins are upstream of the Montalvo Forebay in the Santa Clara River valley. Three subbasins in the Los Posas Valley (South, East, and West Los Posas), along with the Santa Rosa, North Pleasant Valley, and South Pleasant Valley subbasins ultimately drain into the Oxnard Plain along the coast.[7]

The Mound subbasin and Oxnard Plain bound the Montalvo Forebay on the northwest and southwest. The Oak Ridge fault forms the basin boundary between the Santa Paula/Mound subbasins and the Montalvo Forebay[8] and partially limits subbasin crossflow. The delineation between the Montalvo Forebay and downgradient Oxnard Plain is based on the zone where shallow sands transition into shallow clay deposits beneath the Oxnard Plain, which result in a change from unconfined groundwater beneath the Forebay to confined groundwater conditions beneath the plain.

Hydrostratigraphy

Aquifers

The unconsolidated sediments beneath the Montalvo Forebay and the project site are composed of both continental and marine deposits of Tertiary and Quaternary age. They contain multiple aquifers of coarse grain sediments with intervening fine grain aquitards. Aquifers have been grouped into an Upper Aquifer System (UAS) and a Lower Aquifer System (LAS) based on changes in geologic structure and

---

4 Mann, John F. Jr. and Associates. *A Plan for Ground Water Management (prepared for United Water Conservation District).* 1959.

5 U.S. Geological Survey (R. T. Hanson). *Preliminary Draft, Simulation of Ground-Water/Surface-Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California.* 1998.

6 Mann, John F. Jr. and Associates.

7 U.S. Geological Survey (R. T. Hanson).

8 United Water Conservation District. *Surface and Groundwater Conditions Report, Water Year 1998.* July 1999.

Figure 4.5-1

Montalvo Forebay Location

separated in many areas by regional layers of low permeability clay. The sediments in the LAS are more structurally complex resulting from folding and faulting. The UAS sediments are relatively flat lying and extend to approximately 400 feet beneath the project site.

The UAS and the LAS have been subdivided into separate aquifer layers in some parts of the basin. Various investigators have delineated at least three distinct LAS aquifers beneath the Oxnard Plain including the Grimes Canyon, Fox Canyon, and Hueneme aquifers. Two UAS coarse grain layers of Pleistocene age and Holocene age are referred to as the Mugu aquifer and the Oxnard aquifer, respectively. Separate aquifers within the LAS and UAS are less easily delineated beneath the Montalvo Forebay subbasin, where continuous clay layers used to define the aquifer lenses are generally absent.

Confining Layers

In the Montalvo Forebay, alluvial sediments in the subsurface are predominantly coarse grain sands and gravels. Fine grain sediments such as silts and clays that act as confining layers in the groundwater system are generally absent or discontinuous.[9] This condition allows for direct recharge of the UAS from the surface and some recharge of the LAS from the UAS in the subsurface.

On the Oxnard Plain, more continuous fine grain layers of silts and clays are present in the subsurface. These fine grain layers retard the vertical movement of groundwater and limit direct surface recharge of deeper aquifers. As such, subsurface inflow from upstream basins including the Montalvo Forebay provides an important source of recharge to the Oxnard Plain.

Aquifer Parameters

Aquifer parameters estimated by Mann[10] and others were compiled by USGS for incorporation into a groundwater flow model.[11] These parameters are used to describe the subsurface soil conditions in relation to their ability to conduct groundwater flow. Beneath the project site, the calibrated model used effective porosity values between 10 percent and 15 percent for the UAS.[12] Estimated transmissivity (T) values used in the groundwater model range from 46,000 square feet per day (ft^2/day) to 74,000 ft^2/day.[13] Assuming an average UAS thickness of 400 feet, an average hydraulic conductivity

---

9 United Water Conservation District. *Surface and Groundwater Conditions Report, Water Year 1998.* July 1999.
10 Mann, John F. Jr. and Associates.
11 U.S. Geological Survey (R. T. Hanson).
12 U.S. Geological Survey (R. T. Hanson).
13 U.S. Geological Survey (R. T. Hanson).

(K) value for the Montalvo Forebay UAS is estimated at 150 ft/day. In the northern portions of the Oxnard Plain subbasin, immediately downgradient of the project site, clay content appears to increase in the UAS and estimated average K values decrease slightly to 75 ft/day with an effective porosity ranging from 5 percent to 10 percent.[14]

Groundwater Levels

Approximately 50 wells in a database compiled by UWCD contain sufficient water level records to characterize water level trends and fluctuations in the Montalvo Forebay. Fifteen of these wells, referred to in this section as "key wells," have been selected as representative of groundwater conditions based on having water level records for a minimum of 8-years and being spatially distributed around the RiverPark Specific Plan Area. Hydrographs showing changing water levels in these wells over time were plotted at consistent scales and used to examine groundwater trends and fluctuations. Summary data for the key wells are presented in **Table 4.5-1**. The fifteen key well locations used for water level data are shown in **Figure 4.5-2** along with additional key wells selected for water quality data. Key well hydrographs covering water level data over the last 20 years are included in **Appendix 4.5-1**.

Table 4.5-1
Key Wells

State Well ID No.	ID Short	Year Constructed	Aquifer Location	Well Use
Level Data Wells				
02N22W12A01S	12A1	1931	Upper	Test
02N22W22H01S	22H1	1940	Upper	Irrigation
02N22W22R01S	22R1	1927	Upper	UWCD Record
Quality Data Wells				
02N21W06P01S	6P1	1930	Upper	Irrigation
02N22W12B04S	12B4	1970	Upper	Domestic
02N22W23B01S	23B1	1955	Upper	Municipal
02N22W12J02S	12J2	1992	Upper	Monitoring
Level and Quality Data Wells				
02N22W12R01S	12R1	1931	Upper	Irrigation
02N22W14P02S	14P2	1955	Upper	Municipal
02N22W23C01S	23C1	1955	Upper	Municipal
02N22W23B02S	23B2	1955	Upper	Municipal
02N22W23C02S	23C2	1955	Upper	Municipal
02N22W23B04S	23B4	1990	Lower	Monitoring
02N22W23B05S	23B5	1990	Lower	Monitoring
02N22W23B03S	23B3	1990	Lower	Monitoring
02N22W23G02S	23G2	1955	Upper	Municipal
02N22W23K05S	23K5	1968	Upper	Municipal
02N22W22M04S	22M4	1953	Upper	Domestic

Data Source: UWCD well database.

14 U.S. Geological Survey (R. T. Hanson).

Figure 4.5-2

Key Well Locations

Wells near the project site indicate that groundwater occurs beneath the central portion of the RiverPark Specific Plan Area at an average elevation of 33 feet mean sea level (msl). The average ground surface elevation on the unexcavated portions of the site is approximately 85 feet msl, resulting in an average depth to water of 52 feet. Groundwater is often exposed in the open pits, which have been excavated below sea level in some areas.

Water levels beneath the Montalvo Forebay fluctuate primarily in response to precipitation, artificial recharge in nearby spreading basins, and agricultural and municipal pumping. Typically, water levels rise during years of high precipitation and fall during years of low precipitation. Over the last 20 years, the water table beneath the RiverPark Specific Plan Area has fluctuated more than 120 feet, ranging from a low of approximately –47 feet msl to a high of approximately 76 feet msl. When using an average ground surface elevation of 85 feet msl, the depth to water has varied from less than 10 feet deep to more than 130 feet beneath the project site.

Historical Trends

Water level data from State Well No. 2N/22W-22R1, located approximately 300 feet southeast of the RiverPark Specific Plan Area, were plotted over a 70-year period to examine historic trends and fluctuations (**Figure 4.5-3**). The fluctuating water levels illustrate portions of five wet and dry periods since 1930. Since the mid-1960's, three drought periods have resulted in water level declines to below –30 feet msl. During wet periods, water levels rise above 60 feet msl resulting in water level changes of more than 90 feet over the 70-year period.

Over the last 20 years, water levels have fallen from near historic water level highs in the early 1980s to historic lows during a drought in the late 1980s/early 1990s and rebounded back to record water level highs in the mid to late 1990s. Both the historic high water level (71.7 feet msl in 1996) and the historic low water level (-36.4 feet msl in 1991) have occurred during the last 10 years in well 2N/22W-22R1 (**Figure 4.5-3**). These water level measurements are based on discrete monitoring well measurements conducted approximately monthly. The observed water level changes generally correlate to precipitation amounts measured at the nearby El Rio station as shown on graphs of annual precipitation and water levels in nearby well 2N/22W-22H1 (**Figure 4.5-4**). Well 2N/22W-22H1 is located on the south central portion of the RiverPark Specific Plan Area (**Figure 4.5-2**).

Higher rainfall amounts result in increased water levels not only from direct infiltration (which is expected to be relatively minor), but also from an increased supply of water for artificial recharge. During recent consecutive years of high precipitation and recharge events, water levels have reached historic highs near 75 feet msl beneath the central portion of the site as seen in well 2N/22W-22H1 (**Figure 4.5-4**). This level translates to water level elevations above 80 feet msl beneath the northern portion of the RiverPark Specific Plan Area. According to UWCD analysis of historic storage conditions in the basin, historic high water levels achieved in 1998 represent a full basin.[15] UWCD's recharge operations are typically limited by localized groundwater mounding at the recharge site that reduce the percolation rate of the recharge water. If recharge operations could be increased, leakage from the Montalvo Forebay to the Oxnard Plain Basin would increase, benefiting the downgradient aquifer and it would also provide additional supplies to users on the Oxnard Plain.

Seasonal Fluctuations

Water levels also fluctuate on a seasonal basis in response to rainfall, artificial recharge, and to a large extent, pumping patterns. Average monthly precipitation data available from the El Rio station indicate that more than 88 percent of annual precipitation falls in November through March. The largest streamflow diversions for artificial recharge in the Montalvo Forebay also occur within this time frame. As a result, water levels in the vicinity of the project site have risen more than 25 feet during winter and spring months of some wet years. Seasonal water level highs typically occur between February and May, with most highs recorded in April near the RiverPark Specific Plan Area. If local artificial recharge persists into the dry summer months, seasonal highs can occur as late as July. Seasonal water level lows are typically recorded between October and December.

Current Levels

Since the beginning of the current wet cycle in 1992-93, water levels have fluctuated between 40 feet msl and 75 feet msl beneath the central portion of the site based on measurements in well 2N/22W-22H1 (**Figure 4.5-4**). Water levels in nearby wells and the onsite pits were between 40 and 50 feet msl in October/November 2000.[16]

Because the mine pits have been excavated below the average groundwater elevation in the area, the water table is exposed most of the time in one or more of the four mine pits. Over the last 20 years, the water table was exposed in some portion of the pits for 86 percent of the time (206 months out of 240 months). Only during the dry period from late 1989 to early 1992 was the water table consistently below the lowest elevation of the pits. The uneven topography of the pit bottoms and, to some extent, the slope of the water table, results in a surface area exposure of the water table that varies with

---

15 United Water Conservation District. *Surface and Groundwater Conditions Report, Water Year 1998.* July 1999.
16 WM Holdings, Inc. *Water Level Elevations S.P. Milling Company*. October 27, 2000.

Figure 4.5-3

Hydrograph 2N/22W-22R1

Figure 4.5-4

Annual Precipitation and Water Levels in Well 2N/22W-22H1

water level fluctuations. For example, when water levels are above 65 feet msl in the central portion of the site, the water table is exposed over approximately 150 acres in the pits. When water levels drop to 15 feet msl, the exposure of the water table in the pits covers less than 45 acres.

The elevation of the exposed water surface has been recorded at various times in the pits and compared to water levels in surrounding wells. Some of these comparisons are complicated by the addition of process water into the pits and/or surface water runoff from adjacent properties. In general, pit water levels appear to correlate to levels measured in nearby wells and respond similarly to water level changes over time.[17] Pit levels surveyed on October 27, 2000 ranged from 41.8 feet msl in the Brigham pit to 46.7 feet msl in the Large Woolsey pit.[18] A well close to the pits (2N/22W-15R2) had a water level measurement of 46.6 feet msl a few days later on November 1, 2000.

Groundwater Flow

Regional and Local Groundwater Flow Directions

Regionally, groundwater flows south and southwest beneath the Montalvo Forebay and enters the adjacent Oxnard Plain as subsurface inflow. Groundwater also moves downward under vertical gradients and recharges the LAS, which also contributes to subsurface outflow from the Montalvo Forebay into the Oxnard Plain. Local groundwater flow direction varies within the Montalvo Forebay, controlled by groundwater pumping and artificial recharge.

Groundwater elevation contour maps that cover the Montalvo Forebay are prepared by UWCD on a semiannual basis. Twenty-two contour maps from fall 1985 through spring 1998 were used to analyze groundwater flow directions beneath the RiverPark Specific Plan Area under a variety of hydrologic conditions. In general, the maps indicate a relatively consistent groundwater flow regime for the Montalvo Forebay over time. During this time period, the predominant groundwater flow direction beneath the RiverPark Specific Plan Area was southwest (azimuth 230° to 250°). Flow shifted to the south and southeast during several fall periods (azimuth 110° to 185°), apparently influenced by local groundwater pumping at the nearby El Rio spreading grounds. Southerly to southeasterly flow likely persisted only for a few months because the corresponding spring maps indicate a shift back to the southwest.

---

17 Fugro West, Inc. *Letter from David A. Gardner to Gary Dymesich regarding Saticoy Groundwater Monitoring Program, County of Ventura CUP No. 4843.* October 7, 1997.

18 WM Holdings, Inc. *Water Level Elevations S.P. Milling Company*. October 27, 2000.

Groundwater Flow Model

To simulate groundwater flow in response to pumping from wells and recharge within the Study Area, the USGS regional model was reduced and focused on the RiverPark Specific Plan Area. This process involved:

- reduction of the USGS regional model domain from approximately 1500 square miles to 40 square miles;
- refinement of the regional USGS finite-difference model grid from 60 rows and 100 columns (0.25 square miles per cell) to 52 rows and 60 columns (0.013 square miles per cell) for enhanced resolution;
- relocation of select river cells in the USGS regional model to more accurately represent the location of the Santa Clara River; and
- calibration of the RiverPark model to steady-state conditions representing fall and spring conditions.

All other components of the USGS regional model, as documented by USGS[19] were maintained in the RiverPark model without revisions. Details of model revisions and application are summarized in **Appendix 4.5-2**.

Baseline Conditions

The RiverPark Specific Plan Area is roughly bounded by the Santa Clara River levee to the west, the Ventura Freeway to the south, Vineyard Avenue to the east, and Central Avenue to the north. The Specific Plan area currently consists of a mix of commercial and industrial buildings, agriculture, an aggregate mining operation, and drainage basins. The existing land uses constitute the baseline conditions for comparison with the proposed project and other project alternatives. The following paragraphs describe the pertinent water resource related facilities of the baseline condition.

Stormwater Drainage

The Specific Plan Area is currently occupied by primarily vacant, mining pit and agricultural land uses. The slope of the site is generally less than 0.5 percent, running roughly parallel to the Santa Clara River sloping towards the southwest.

---

19 U.S. Geological Survey (R. T. Hanson). *Preliminary Draft, Simulation of Ground-Water/Surface-Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California.* 1998.

Figure 4.5.5 shows the existing drainage facilities and the drainage areas within, and currently draining to, the Specific Plan Area. The existing drainage areas within the Specific Plan Area and off-site areas that currently drain to the Specific Plan Area are described below.

Drainage Area 1

This drainage area includes RiverPark Area 'A', bounded by the Ventura Freeway, the Santa Clara River, Vineyard Avenue, and the City limits. This area currently consists of agricultural and commercial uses. The two office buildings and streets existing in the southwestern corner of the Specific Plan Area were built in conformance with the City's Oxnard Town Center Specific Plan. Ventura Road and a portion of Town Center Drive were built to support development of these buildings. A large 10-foot wide by 9-foot high reinforced concrete box storm drain was also built at the time Ventura Road and Town Center Drive were built. This facility is commonly referred to as the "Stroube Drain" and currently discharges through the levee to the Santa Clara River approximately 600 feet north of the US 101 Santa Clara River Bridge. As shown on **Figure 4.5-5**, the Stroube Drain currently extends from the western edge of the Specific Plan Area to the end of Town Center Drive. Ventura Road also contains a storm drain that contributes runoff to the Stroube Drain. These facilities drain the existing development in this area.

Most of Drainage Area 1 consists of agricultural fields at this time. Runoff from this agricultural land ponds onsite and eventually percolates or enters the Stroube Drain. An open earth drainage ditch located along the north side of El Rio Drive collects runoff and conveys it to the end of Town Center Drive to the Stroube Drain. There is also an existing storm drain system on the north and west edges of the County El Rio Maintenance Yard that drains to an existing Caltrans drain on the north side of the Ventura Freeway. The small portion of Drainage Area 1 located between the Ventura Freeway, Myrtle Street and Vineyard Avenue drains to Vineyard Avenue.

Drainage Area 2

This drainage area consists of RiverPark Area 'B'. The existing sand and gravel mine occupies the majority of this area. The existing Large Woolsey, Small Woolsey, Brigham and Vickers mine pits occupy the northern and eastern portions of the mine site. The plant and stockpile areas occupy make up the remainder of the mine site. The land uses in this area may be characterized as vacant/open and groundwater-filled mining pits. There are existing drains to the Santa Clara River at the southwest corner of the mine site and at the northwest corner of the mine plant area. An open earth drainage channel along the boundary of River Park Areas 'A' and 'drains to a 48-inch outlet through the levee to the river. At the northwest corner of the plant area there are 48-inch and 36-inch drain outlets through the levee. The topography in this portion of the mine site is varied due to the historic mining operations of cutting, filling, and disposal of tailings. A minor amount of the storm flows from this area drain to the west towards the earth drainage ditch located on the boundary of River Park Areas 'A' and 'B' and discharges to the Santa Clara River. The majority of the flows from these areas flow towards and into the existing Brigham / Vickers mine pit via an earthen ditch and pipe.

Drainage Area 3

Drainage Area 3 is an off-site agricultural and industrial drainage area comprised of the Beedy Street, Lambert Street, Montgomery Street and Carnegie Street areas. Each street's existing stormwater collection system is comprised of minor pipe and overland drainage systems. Stormwater from each separate collection system currently discharges directly to the adjacent Large Woolsey and Small Woolsey mine pits.

Drainage Area 4

This drainage area consists of the agricultural land located east of Vineyard Avenue, north of the El Rio Community and south of Central Avenue. The majority of the northern and western portion of this area currently drains across Vineyard Avenue to El Rio Retention Basins No. 1 and 2. El Rio Retention Basin No. 1 is an approximate 10-acre basin. El Rio Retention Basin No. 2 is an approximate 65-acre retention basin. Drainage from this area is collected in a 78-inch drain located in the vicinity of Lemar Avenue and Vineyard Avenue which discharges into El Rio Retention Basin No. 1. There is an 84-inch outlet from this basin that connects to El Rio Retention Basin No. 2, where the majority of high flow events are stored. These combined basins have 100-year storm storage capacities. Flows are retained in these basins and percolate into the aquifer and / or evaporate into the atmosphere. Any excess runoff from El Rio Retention Basin No. 2 is discharged into the existing earth drainage ditch along the boundary of RiverPark Areas 'A' and 'B' that drains to the Santa Clara River.

Groundwater Recharge and Water Balance

Two types of existing water balances were examined. A water balance is an accounting of water inflows and outflows to determine whether resources and uses are in balance. If outflows exceed inflows, then the balance is negative and if the inflows exceed the outflows, then the balance is positive. If inflows equal outflows, then the balance is in equilibrium. One water balance type is regional, covering the Montalvo Forebay, and provides the regional context for the site analysis; the second type is site-specific, accounting for how existing land use on the RiverPark Specific Plan Area affects groundwater. Both types of water balances estimate inflow and outflow components of the groundwater system over a 20-year period covering water years 1979-80 through 1998-99. Due to data collection frequency for groundwater pumping, a water year is defined as July 1 through June 30 for the purposes of these water

Figure 4.5-5

Site Drainage Area Locations

balances. This definition is consistent with methodology used by UWCD in their annual water balances covering six subbasins including the Montalvo Forebay.[20]

Regional Water Balance

The regional water balance addresses approximately 5,761 acres of the subbasin surrounding the RiverPark Specific Plan Area. The total acreage of the Montalvo Forebay (approximately 6,461 acres) has been adjusted for the regional water balance to exclude the 701 acres of the RiverPark Specific Plan Area, which were examined separately in the site-specific water balances.

The result of inflows minus outflows, as defined in this regional water balance, represents the annual change in storage in the Montalvo Forebay plus subsurface outflow into the adjacent Oxnard Plain subbasin. The balance estimates the regional amount of water moving through the Montalvo Forebay to compare to the local gains and losses beneath the RiverPark Specific Plan Area. The regional water balance is summarized in **Table 4.5-2** and discussed in more detail below.

Methodology

The regional water balance analysis is based upon the methodology outlined by UWCD.[21] This methodology is used to develop an annual groundwater conditions report that is submitted to the State annually. The balance incorporates precipitation, natural recharge, artificial recharge and return flow as inflow or recharge components and groundwater extraction and phreatophyte consumptive use as outflow or discharge components.[22] Slight departures from the UWCD methodology involve two components: infiltration from rainfall for the entire water balance and infiltration from the Santa Clara River for water years prior to 1992-93, both discussed in more detail below.

Inflow components incorporated into the Montalvo Forebay water balance include the following:

- Infiltration from precipitation;
- Infiltration from streamflow; and
- Artificial recharge in the Saticoy, El Rio, and Noble pit spreading grounds.

---

20 United Water Conservation District. *Surface and Groundwater Conditions Report, Water Year 1998.* July 1999.

21 United Water Conservation District. *Annual Investigation and Report of Groundwater Conditions within United Water Conservation District, A Summary of Findings for the Previous Water Year (1997-98), Current Water Year (1998-99), and Ensuing Water Year (1999-2000).* March 1999.

22 United Water Conservation District. *Annual Investigation and Report of Groundwater Conditions within United Water Conservation District, A Summary of Findings for the Previous Water Year (1997-98), Current Water Year (1998-99), and Ensuing Water Year (1999-2000).* March 1999.

Table 4.5-2
Regional Water Balance - Montalvo Forebay

	Inflow Components			Outflow Components		Forebay Balance
Water Year*	**Precipitation Infiltration (AFY)**	**Streamflow Infiltration (AFY)**	**Artificial Recharge (AFY)**	**Adjusted Pumping** (less return flows) (AFY)**	**Phreat. Uptake (AFY)**	**Change in Storage & Subsurface Outflow (AFY)**
1979-1980	1,237	21,544	81,416	20,394	224	83,578
1980-1981	0	1,079	77,071	20,629	224	57,297
1981-1982	294	2,605	65,178	20,229	224	47,623
1982-1983	3,607	27,549	61,686	19,562	224	73,056
1983-1984	309	3,500	71,232	21,105	224	53,712
1984-1985	0	771	63,205	21,503	224	42,249
1985-1986	1,064	16,505	54,597	21,207	224	50,735
1986-1987	0	0	35,634	22,176	224	13,234
1987-1988	295	2,703	50,752	21,839	224	31,687
1988-1989	0	0	18,017	22,451	224	-4,658
1989-1990	0	0	10,611	23,074	224	-12,688
1990-1991	303	3,178	32,769	21,660	224	14,367
1991-1992	441	11,227	63,255	12,664	224	62,036
1992-1993	2,320	8,082	93,458	19,655	224	83,981
1993-1994	0	7,100	72,670	21,298	224	58,248
1994-1995	2,449	26,878	76,635	18,172	224	87,566
1995-1996	313	1,632	77,148	12,967	224	65,903
1996-1997	332	6,002	56,477	18,554	224	44,032
1997-1998	4,557	46,298	84,126	22,651	224	112,106
1998-1999	0	539	80,546	22,459	224	58,402
Minimum	0	0	10,611	12,664	224	-12,688
Maximum	4,557	46,298	93,458	23,074	224	112,106
20-Year Ave	876	9,360	61,324	20,212	224	51,123

* Water Year is July – June.
** Total pumping in the Montalvo Forebay has been adjusted to reflect return flows from non-exported pumpage. Return flows assumed to be 35 percent of non-exported pumpage. Does not include pumpage from the RiverPark site.
Additional Notes:
Water Balance covers 5,760 acres [Approximate Montalvo Forebay area of 6,461 acres (UWCD, GIS, 2000) less RiverPark area of 701 acres].

Infiltration from precipitation. Precipitation infiltration is the amount of rainfall that percolates through the soil column to recharge groundwater. In general only a small percentage of rainfall (generally less than 25 percent) is available for groundwater recharge due to other processes such as evaporation and runoff. Infiltration is dependent on the amount of rainfall and the amount of moisture in the surficial soils. Water from small rainfall events onto dry soils may be held through capillary forces in the upper soil zone and evaporated. Conversely, large amounts of rainfall onto moist soils may result in a larger percentage of rainfall recharge. For the regional water balance, the estimated amount of rainfall infiltration is allocated on a percentage of precipitation basis from 0 percent recharge for less than 12 inches of annual rainfall to 25 percent recharge for 30 inches or more of annual rainfall.

Annual precipitation data (**Figure 4.5-4**) from the nearby El Rio station were provided by UWCD and used for both the regional water balance and the site-specific water balances. Over the 20-year period, estimates of precipitation infiltration ranged from a minimum of 0 acre-feet per year (AFY) during several years of low precipitation to 4,557 AFY in 1998 when annual precipitation exceeded 35 inches (**Table 4.5-2**).

Infiltration from streamflow. Under certain flow and water level conditions, streamflow along the Santa Clara River recharges groundwater in the Montalvo Forebay. A lack of historic streamflow data at the upstream boundary of the Montalvo Forebay complicates the estimation of this water balance component. UWCD conducted detailed calculations of the upstream flow for their water balances from water year 1992-93 through water year 1998-99, which were used in this study. To estimate streamflow infiltration amounts for years prior to 1992-93, a simple regression analysis relating streamflow infiltration to precipitation was conducted. This resulted in highly variable infiltration amounts over time, which is consistent with the UWCD calculations. It is recognized that this analysis does not account for antecedent water level conditions and contains uncertainty due to its simplicity. However since the Montalvo Forebay water balance is used only for regional context, it is considered sufficient for the purposes of this analysis. Estimates of streamflow infiltration over the 20-year period ranged from 0 AFY during several years of low precipitation to 46,298 AFY in 1998 (**Table 4.5-2**).

Artificial recharge. Surface water diversions and recharge amounts at the Saticoy, El Rio, and Noble spreading grounds are measured directly by UWCD and were provided. Historical artificial recharge for the 20-year period is shown graphically on **Figure 4.5-6**. Artificial recharge represents the largest inflow component in the water balance and ranges from 10,611 AFY in 1989-90 to 93,458 AFY in 1992-93 (**Table 4.5-2**).

Other potential inflows. Additional inflow to the groundwater system includes return flows, which is the amount of water pumped from the basin that is not consumed by users and allowed to infiltrate back into the basin. Examples of return flows include irrigation water that is not consumed by crops or wastewater that is allowed to percolate from septic systems. The Montalvo Forebay water balance accounts for return flows by reducing the reported pumping amounts that are not exported out of the basin by 35 percent. This methodology is consistent with consumptive use estimates used by UWCD in their annual water balance calculations.[23]

Subsurface inflow from adjacent subbasins and bedrock areas are not considered in the water balance. These quantities are difficult to estimate and are likely small compared to the major water balance

23 United Water Conservation District. *Annual Investigation and Report of Groundwater Conditions within United Water Conservation District, A Summary of Findings for the Previous Water Year (1997-98), Current Water Year (1998-99), and Ensuing Water Year (1999-2000).* March 1999.

components. Since the Montalvo Forebay water balance is used only for regional context, ignoring these additional inflows is considered adequate for this analysis.

Outflows. Outflow components of the regional water balance include the following:

- Groundwater pumping; and
- Phreatophyte uptake.

Groundwater pumping. Groundwater is pumped from the Montalvo Forebay for agriculture and municipal use. Pumping is metered and reported to UWCD on a semi-annual basis. Both UWCD and Fox Canyon GMA provided electronic databases of pumping amounts for use in this analysis. These data are summarized on a water-year basis on **Figure 4.5-7**.

During the 20-year study period, pumping has ranged from 17,485 AFY to 29,354 AFY (**Figure 4.5-7**). Approximately one-half of the pumping is used locally and one-half is exported from the Montalvo Forebay to provide water supply to users in areas affected by seawater intrusion. Pumpage for export occurs from 8 wells located at the El Rio spreading grounds.

With the exception of the El Rio pumping, all water is assumed to be used within the Montalvo Forebay and, to some extent, subject to return flows. As previously stated, 65 percent of non-exported pumping is assumed to be consumed and 35 percent is assumed to be returned to the basin, consistent with UWCD methodology. In addition, pumpage on the RiverPark Specific Plan Area has been removed from the regional balance and accounted for separately on the site-specific water balances. Accounting for these adjustments, the pumping outflow component used in the regional water balance ranged from 12,664 AFY in 1991-92 to 23,074 AFY in 1989-90 (**Table 4.5-2**).

Phreatophyte uptake. Phreatophyte uptake is the amount of water consumed by deep-root plants primarily located along the Santa Clara River. This outflow component is estimated by UWCD to be 3.5 AFY per acre along the Santa Clara River channel.[24] Assuming 64 acres of phreatophyte acreage in the Montalvo Forebay subbasin,[25] the phreatophyte uptake is estimated at 224 AFY in each year of the balance (**Table 4.5-2**).

---

24 United Water Conservation District. *Annual Investigation and Report of Groundwater Conditions within United Water Conservation District, A Summary of Findings for the Previous Water Year (1997-98), Current Water Year (1998-99), and Ensuing Water Year (1999-2000).* March 1999.

25 United Water Conservation District. *Annual Investigation and Report of Groundwater Conditions within United Water Conservation District, A Summary of Findings for the Previous Water Year (1997-98), Current Water Year (1998-99), and Ensuing Water Year (1999-2000).* March 1999.

Figure 4.5-6

Artificial Recharge Montalvo Forebay

Figure 4.5-7

Total Pumpage Montalvo Forebay

Based on these data and assumptions, the regional water balance for the Montalvo Forebay has been summarized for the last 20 years (**Table 4.5-2**). Because subsurface outflow to the Oxnard Plain has not been incorporated as a separate outflow component, the difference between the inflows and outflows represents any change in storage in the Montalvo Forebay as well as subsurface outflow to the Oxnard Plain. Positive numbers reflect water level rises and increased outflow into the Oxnard Plain, and negative results reflect water level declines in the Montalvo Forebay and decreased outflow to the Oxnard Plain.

As shown on **Table 4.5-2**, the water balance indicates a range of storage change (plus subsurface outflows) from –12,688 AFY in 1989-90 when outflow exceeded inflow to 112,106 AFY in 1997-98 when large volumes of artificial and natural recharge occurred due to increased rainfall. The 20-year average storage change plus subsurface outflow is 51,123 AFY. Because water levels are similar at both the beginning and end of the period, no net storage change has apparently occurred over the 20-year period. Therefore, it is assumed that the average result from the water balance, 51,123 AFY, represents an average annual subsurface outflow from the Montalvo Forebay into the Oxnard Plain.

RiverPark Specific Plan Area Water Balance

Site-specific water balances were conducted on the existing conditions to determine the site's interaction with the groundwater system to compare to the project water balances. The result of inflows minus outflows in the existing conditions balances represent the net loss or gain to the groundwater beneath the 701-acre RiverPark Specific Plan Area resulting from existing conditions. The existing conditions at the site involve the current physical setting as required by CEQA.

Four separate water balances were performed over the 20-year period for portions of the RiverPark Specific Plan Area based on existing land use conditions. These land uses are illustrated by a schematic cross-section on **Figure 4.5-8** and summarized below:

- Undeveloped open space – 209.5 acres;
- Agricultural acreage – 208.0 acres (includes 154.5 acres in RiverPark Area 'A', 2.8 acres in RiverPark Area 'B', 15.7 acres adjacent to El Rio Drainage Basin No. 2 in RiverPark Area 'B', and 350 acres in El Rio Drainage Basin No. 2 in RiverPark Area 'B');
- Stormwater detention basins – 29.3 acres (includes 64.3 acres of detention basins less 35 acres of agriculture covering a portion of one detention basin);
- Existing mine pits – 213.1 acres (includes the Large Woolsey, Small Woolsey, Vickers, and Brigham mine pits).

In addition, an estimate of onsite industrial pumping that is lost from the groundwater system was also incorporated into the site's existing conditions analysis.

The water balance covers 660 acres of the 701-acre RiverPark Specific Plan Area, with the remaining 41 acres containing existing offices that will be unchanged by the RiverPark Specific Plan. The water balances estimate the net groundwater gain or loss on a monthly basis over the 20-year period 1979-80 through 1998-99, the same period as the Montalvo Forebay water balance. The net impact to groundwater for each of the balances is then combined for the total existing conditions impact to groundwater beneath the site. Similar project balances have also been prepared for comparison to the existing conditions balances to estimate the impact of the project on groundwater quantity.

The purpose of the 20-year analysis is to examine existing conditions under a wide variety of hydrologic conditions rather than to re-create historic conditions. As such, current conditions of the mine pits and site drainage configuration were held constant over the 20 years, with the progression of mining over time purposefully excluded. Consistent with this approach, current conditions at the Ventura County stormwater detention basins, including current agricultural activities inside the basins, were assumed constant for the entire period, even though the stormwater detention basins were not constructed until 1997 and agricultural activity was not present in the detention basins until June 2000.[26] Historical hydrological data were incorporated including 20 years of monthly precipitation, evaporation, groundwater pumping, and water levels. Assumptions, data, and methodology incorporated into each of the four site water balances are summarized below. Complete existing conditions water balance calculations are included as Attachments 1 through 4 in **Appendix 4.5-3**.

Methodology

With the exception of the Agricultural Acreage water balance, each site water balance evaluates changing soil moisture conditions with varying precipitation, evaporation, and surface water runoff in order to estimate recharge to groundwater. Specific data and sources used in the balances are summarized below:

- Monthly precipitation data measured at El Rio Precipitation Station 239E;
- Monthly pan evaporation data from El Rio Station 1985-1999 (monthly averages are used for 1979-1985 in the absence of time-specific data); and
- Soil moisture holding capacities on the RiverPark Specific Plan Area from the Ventura County Soil Survey.[27]

---

26 Keith Filegar, Ventura County. Personal communication. February 6, 2000.

27 United States Department of Agriculture, Soil Conservation Service (in cooperation with University of California, Agricultural Experiment Station. *Soil Survey, Ventura Area, California.* April 1970.

Figure 4.5-8

RiverPark Pre-Project Water Balances

The Agriculture Acreage water balance incorporates a more simplistic approach that assumes an irrigation efficiency of 80 percent and applies 20 percent of irrigation pumping to groundwater recharge as return flow, consistent with methodology applied by the County of Ventura. Since irrigation pumping is from onsite wells, and 20 percent is assumed to be recharge from return flows, it follows that 80 percent of the pumpage is the amount lost from the system as a result of agricultural activities or runoff.

Additional assumptions and methodology for each of the existing conditions site water balances are presented below.

Existing Mine Pits

The current pit configuration covering 213.1 acres of pit walls, bottoms, and perimeter drainage areas was used in the existing mine pits water balance. A 1997 topographic map was the most reliable source available for the current limits of excavation, but the map was judged unreliable for pit bottom topography since the pit bottoms were under water during the time of mapping. A 1992 topographic map was judged to be the most reliable of the pit bottoms because water levels were lower in 1992 and the pit bottoms were exposed. Therefore, acreages from the two maps were combined, using the 1997 map for elevations above 60 feet msl, the 1992 map for elevations below 50 feet msl, and a linear interpolation for elevations between 50 and 60 feet msl. Specific acreages for the total pit area as well as acreages associated with certain pit elevations were calculated by TetraTech ASL Consulting Engineers using electronic versions of the two topographic maps.

The area within certain pit elevations was used to estimate the area of groundwater exposed in the pits during each month of the 20-year period. Water levels were estimated in each of the four pits by adjusting water levels measured in nearby well 2N/22W-22H1. To estimate evaporative loss from the water surface or soil zone, pan evaporation data were adjusted with a typical lake factor of 0.75 when the water table was exposed, or a typical dry soil factor of 0.35 when the water level was completely below the pit bottom. These factors are commonly applied to account for lower site-specific evaporative conditions than measured in a shallow pan.[28]

Surface water runoff combines with precipitation as an additional source of water into the pits. Currently, runoff from an adjacent property is diverted onto the RiverPark Specific Plan Area and into the mine pits. Runoff from about 170 acres of industrial area flows onsite through several storm drains.

---

28 Dunne, Thomas and Leopold, Luna B. *Water in Environmental Planning.* 1978.

Monthly runoff volumes were calculated by applying a runoff factor to precipitation based on the amount of impervious acreage and consistent with Ventura County methodology. Precipitation that falls within the 213.1 acres of the pits is conserved within the balance; no runoff is assumed to flow away from the pit area.

The Existing Mine Pits water balance is included in **Appendix 4.5-3** as Attachment 1. Water balance results estimate net gains and net losses on an annual basis to the groundwater system. Net gains representing recharge to groundwater in and below the existing mine pits are as high as about 372 AFY. Net losses, (represented in the water balance by a negative number), result predominantly from evaporation of exposed groundwater and were as much as –416 AFY. Water balance results are summarized on **Table 4.5-3**.

Table 4.5-3
RiverPark Site Water Balances - Existing Conditions Analysis

	Individual Site Water Balances and Industrial Use - Existing Conditions					Water Balance
Water Year	**Existing Gravel Pits (AFY)**	**Drainage Basins (AFY)**	**Open Space (AFY)**	**Agricultural Acreage (AFY)**	**Industrial Use (AFY)**	**Existing* Conditions(AFY)**
1979-1980	33	212	159	-57	-132	216
1980-1981	-320	84	14	-107	-132	-461
1981-1982	-228	84	0	-604	-132	-880
1982-1983	214	256	175	-928	-132	-414
1983-1984	-282	86	11	-1,172	-132	-1,489
1984-1985	-291	69	0	-805	-132	-1,160
1985-1986	80	180	99	-682	-132	-455
1986-1987	-202	45	0	-896	-132	-1,185
1987-1988	-77	79	0	-655	-132	-785
1988-1989	-35	49	0	-550	-132	-668
1989-1990	10	20	0	-481	-132	-583
1990-1991	198	100	63	-745	-132	-516
1991-1992	306	155	113	-469	-132	-28
1992-1993	358	228	205	-523	-132	136
1993-1994	-161	76	13	-648	-132	-852
1994-1995	275	239	214	-497	-132	99
1995-1996	-218	99	47	-576	-132	-780
1996-1997	-236	112	58	-669	-132	-867
1997-1998	372	340	280	-516	-132	343
1998-1999	-416	58	0	-640	-132	-1,130
Minimum	-416	20	0	-1,172	-132	-1,489
Maximum	372	340	280	-57	-132	343
20-Year Ave	-31	129	73	-611	-132	-573

* Existing Conditions = Sum of the water balances and industrial use.

Stormwater Drainage Basins

Ventura County operates El Rio Drainage Basins No. 1 and 2 covering 64.3 acres on the RiverPark property. Approximately 35 acres of the 64.3 acres are used for agriculture (strawberries), leaving 29.3

acres designated as dedicated drainage basin land use. The basins hold and recharge diverted stormwater runoff from an offsite, adjacent 330-acre agricultural property for flood control. The drainage basins are generally above 75 feet msl. Groundwater elevations from a nearby well reach a high of 74.9 feet msl indicating that the water table may have risen close to the basin bottom for a brief period, but it is not predicted to remain exposed for a length of time that would substantially impact the water balance. Therefore, for the purposes of this analysis, a simplifying assumption was made that groundwater levels do not rise above the drainage basin bottom, and changing acreages of groundwater exposure do not complicate the water balance. The basins were originally sized to handle a 100-year storm, and as such, it is assumed that the basins do not overflow, conserving precipitation and other water sources within the balance. Water balance results are summarized on **Table 4.5-3**.

Precipitation and adjusted pan evaporation data used in the other balances are also used in the Drainage Basins water balance. Surface water runoff into the basins was calculated as a factor of precipitation based on the amount of impervious acreage on the adjacent property where the runoff is generated. A soil moisture holding capacity was used from the Ventura County Soil Survey,[29] which was consistent with observed infiltration rates at the detention basins by County personnel.[30]

The Drainage Basins water balance is included in **Appendix 4.5-3** as Attachment 2. During the 20-year period, annual groundwater recharge beneath the basin ranges from 20 AFY during the drought year 1989-90 up to 340 AFY during the high precipitation events of 1997-98.

Undeveloped Open Space

The existing conditions water balance for the existing open space on the site is a more straightforward application of a soil moisture balance without the complicating factors of exposed water tables or diverted surface water runoff. Precipitation and evaporation data are the same as used in previous balances. Also consistent with the other balances, a dry soil evaporation factor of 0.35 was applied to the pan evaporation data to account for the rapid infiltration and lower evaporation than occurs in a shallow pan. A soil moisture holding capacity was applied from the Ventura County Soil Survey.[31] For simplicity, one soil permeability value was applied to the entire open space area, and the presence of lower permeability fill material was not incorporated. This is considered conservative, given that

---

29 United States Department of Agriculture, Soil Conservation Service (in cooperation with University of California, Agricultural Experiment Station. *Soil Survey, Ventura Area, California.* April 1970.

30 Hugh Clabaugh, Ventura County Flood Control District. Personal communication. June 13, 2000.

31 United States Department of Agriculture, Soil Conservation Service (in cooperation with University of California, Agricultural Experiment Station. *Soil Survey, Ventura Area, California.* April 1970.

the use of a higher permeability overstates the amount of recharge to groundwater from existing conditions.

Surface water runoff from the Open Space balance was estimated by applying a runoff factor to precipitation that incorporates the pervious nature of the site's open space and is consistent with methodology applied by Ventura County. Calculated runoff was subtracted from precipitation to remove runoff volumes from the water balance so that groundwater recharge could be estimated.

The Open Space water balance is included in **Appendix 4.5-3** as Attachment 3. During the 20-year period, annual groundwater recharge beneath the basin ranges from no recharge during several years when annual precipitation was generally below 12 inches up to 280 AFY during the high precipitation events of 1997-98.

Agricultural Acreage

Agricultural acreage on the RiverPark Specific Plan Area includes four strawberry fields:

- 154.5 acres on RiverPark Area 'A';
- 2.8 acres on RiverPark Area 'B' along Vineyard Avenue;
- 35.0 acres in El Rio Drainage Basin No. 2 in RiverPark Area 'B'; and
- 15.7 acres adjacent to El Rio Drainage Basin No. 2 in RiverPark Area 'B'.

Each of the four parcels is irrigated by onsite wells.

For the 154.5-acre and 2.8-acre parcels, the Agricultural Acreage water balance is based on irrigation pumping records and an assumed irrigation efficiency to estimate an annual groundwater recharge. UWCD and Fox Canyon GMA provided irrigation well data. An irrigation efficiency of 80 percent (return flows of 20 percent) was used, consistent with efficiencies applied to other projects by Ventura County.[32] Irrigation efficiency of 80 percent means that 80 percent of the water pumped for irrigation is consumed and lost from the system. Therefore, 80 percent of the pumping totals from irrigation wells (represented as a negative number to indicate a loss) represents the annual balance for these two parcels.

32 Lowell Preston. Ventura County Public Works Agency, Water Resources Division. Personal communication. May 22, 2000.

For the 35.0-acre and 15.7-acre parcels, the Agricultural Acreage water balance is based on annual applied irrigation rates (AF/acre) for the 154.5-acre and 2.8-acre parcels and the assumed 80 percent irrigation efficiency to estimate an annual groundwater recharge. Historical irrigation data for the 35.0 and 15.7-acre parcels were not available, because agricultural activity did not exist on these parcels until June 2000.

The simple application of return flows into the water balance provides an estimate of annual net losses from the agricultural acreage considered adequate for the purposes of estimating the existing condition.

A table summarizing the consumptive use of the existing RiverPark agricultural acreage to compare to the other site water balances is included in **Appendix 4.5-3** as Attachment 4. Combined groundwater usage on the agricultural acreage is also summarized on **Table 4.5-3**. Groundwater losses from irrigation (less return flows) change with annual reported irrigation and range from -57 AFY to –1,172 AFY (Attachment 4 and **Table 4.5-3**).

Onsite Pumping

Onsite industrial pumping associated with sand and gravel mining is also considered in the existing condition. In the recent past, onsite pumping was used for sand and gravel washing, which required large pumping volumes. However, most of the water associated with the washing process flowed back into the mine pits or onsite ponds, with only a small percentage lost from the groundwater system. However, current pumping onsite is used only for dust control and concrete production, requiring about 147 AFY of pumped water. A large percentage of the current pumping is typically consumed by concrete production and is assumed to be lost from the system for this reason. As previously stated, the purpose of estimating the existing water balance is not to re-create historic conditions but rather to analyze existing conditions under a wide variety of hydrologic conditions. Therefore, for purposes of the 20-year water balance, current pumping is incorporated into the combined site balance at a constant rate and is assumed to be 90 percent consumed by the concrete making process. This represents a loss of -132 AFY from the groundwater system, based on recent pumping records (**Table 4.5-3**).

Existing Conditions Analysis

Annual results from the four site water balances - Existing Mine Pits, Drainage Basins, Open Space, and Agricultural Acreage - are summarized in **Table 4.5-3**. Positive numbers indicate a net increase in groundwater recharge; negative numbers indicate a net loss of groundwater (from evaporation and/or crop consumption). The table also includes the industrial use pumping that is consumed by the concrete production and lost from the groundwater system. As noted in the text, current pumping is maintained for the entire 20-year period.

When the four water balances and industrial use are combined, the changes to the groundwater system from the existing conditions on the site can be estimated.

As summarized in **Table 4.5-3**, Existing Conditions indicates that the site results in a net loss from the groundwater system during most of the 20-year period (16 of 20 years). Annual gains and losses range from –1,489 AFY net loss to 343 AFY groundwater recharge. The –1,489 AFY represents a net loss from the groundwater system predominantly due to mine pit evaporation and consumptive use from agriculture and industrial water supply. The net recharge of 343 AFY occurs during times of high precipitation, low evaporation, and relatively low agricultural pumping such as during water year 1997-98. The 20-year average impact to groundwater from Existing Conditions is –573 AFY. As seen on **Table 4.5-3**, the Existing Conditions analysis indicates that the site is a net consumer of groundwater under average conditions.

When compared to the average regional water balance for the Montalvo Forebay, the RiverPark Specific Plan Area consumes approximately 1.1 percent of the average annual change in subsurface outflow to the Oxnard Plain under Existing Conditions (-573 AFY, **Table 4.5-3** compared to 51,123 AFY, **Table 4.5-2**).

REGULATORY SETTING

Water quality is addressed by a variety of federal, state and local laws, plans, regulations and policies. An overview of this regulatory setting is provided below.

Federal Water Quality Planning

Federal Pollution Control Act

The Federal Pollution Control Act, commonly known as the Clean Water Act (CWA), was originally enacted in 1948. The Act was amended by the Federal Water Pollution Control Act Amendments in 1972 with the primary purpose of restoring and maintaining the chemical, physical, and biological integrity of the nation's water, to achieve a level of water quality which provides for recreation in and on the water, and for the propagation of fish and wildlife. Section 208 of CWA and the requirements of the Code of Federal Regulations (CFRs) specify general designation procedures, time constraints, grant funding criteria, and minimum content requirements for local water management plans. Preparation of these water management plans has been delegated to the individual states by the U.S. EPA, which is charged with implementing the CWA.

EPA California Toxics Rule

The U.S. Environmental Protection Agency has developed water quality criteria for priority toxic pollutants and other provisions for water quality standards to be applied to inland surface waters, enclosed bays, and estuaries in the State of California. This rule was developed to address a gap in California's water quality standards that was created when the state's water quality control plans containing water quality criteria for priority toxic pollutants was overturned in 1994. The established numerical standards were deemed necessary to protect human health and the environment. The rule includes ambient aquatic life criteria for 23 priority toxic pollutants, ambient human health criteria for 57 priority toxics, and a compliance schedule.

Safe Drinking Water Act of 1974

The passage of the federal Safe Drinking Water Act (SDWA) of 1974 established mandatory nationwide minimum standards to be established and enforced by the US EPA. California adopted its own Safe Drinking Water Act in 1976 that gave California Department of Health Services (DHS) the responsibility for the administration of the federal SDWA in California. Under this program, the US EPA has delegated primary responsibility for setting and enforcing drinking water standards to the DHS. DHS has two approaches to standards for drinking water quality. The first approach is to safeguard public welfare by limiting the level of specific contaminants that can impact public health. These limits are identified as Primary Maximum Contaminant Levels (MCLs) and are specific concentrations that cannot be exceeded for a given constituent. The second approach is a treatment technique that is based on distribution system sampling in comparison to an action level. If the action level is exceeded in more than 10 percent of the samples, then additional treatment is required of the water supplier. Currently, treatment technique limits apply only to copper and lead. DHS also has established Secondary Maximum Contaminant Levels (SMCLs) that regulate constituents that affect water quality aesthetics (such as taste, odor, or color). Generally, DHS uses the SMCL as guidelines. A summary of the MCLs and SMCLs are presented below in **Tables 4.5-4** and **4.5-5**, respectively.

Table 4.5-4
Primary Drinking Water Standards

Constituent	MCL (mg/L)	Constituent	MCL (mg/L)
Inorganic Chemicals		Organic Chemicals	
Antimony	0.006	Acrylamide	(b)
Arsenic	0.05	Alachlor	0.002
Asbsetos	7 million fibers per liter	Atrazine	0.003
Barium	2	Benzene	0.005
Beryllium	0.004	Benzo(a)pyrene	0.0002
Cadmium	0.005	Carbofuran	0.04
Total Chromium	0.1	Carbon tetrachloride	0.005
Copper	1.3 (a)	Chlordane	0.002
Cyanide (as free cyanide)	0.2	Chlorobenzene	0.1
Fluoride	4	2,4,-D	0.07
Lead	0.015 (a)	Dalapon	0.2
Inorganic mercury	0.002	1,2-Dibromo-3-chloropropane (DBCP)	0.0002
Nitrate (as N)	10	o-Dichlorobenzene	0.6
Nitrite (as N)	1	p-Dichlorobenzene	0.075
Selenium	0.05	1,2-Dichloroethane	0.005
Thallium	0.0005	1,1-Dichloroethylene	0.007
Radionuclides		cis-1,2-Dichloroethylene	0.07
Beta particles and photon emitters	4 millirems per year	trans-1,2-Dichloroethylene	0.1
Gross alpha particle activity	15 pCi/L	Dichloromethane	0.005
Radium 226 and Radium 228	5 pCi/L	1,2-Dichloropropane	0.005
Microorganisms		Di(2-ethylhexyl)adiapate	0.4
Giardia lamblia	3-log removal	Di(2-ethylhexl)phthalate	0.006
Heterotrophic plate count	< 500 bacterial colonies per milliliter	Dinoseb	0.007
		Dioxin (2,3,7,8-TCDD)	0.00000003
Total Coliform	<5% pos/month	Diquat	0.02
Fecal Coliform	None detected	Endothall	0.1
Turbidity	< 5 NTU	Endrin	0.002
Virus (enteric)	4-log removal	Epichlorohydrin	(b)
		Ethylbenzene	0.7
		Ethylene dibromide	0.00005
		Glyphosate	0.7
		Heptachlor	0.0004
		Heptachlor epoxide	0.0002
		Hexachlorobenzene	0.001
		Hexachlorocyclopentadiene	0.05
		Lindane	0.0002
		Methoxychlor	0.04
		Oxamyl (Vydate)	0.2
		Polychlorinated biphenyls (PCBs)	0.0005
		Pentachlorophenol	0.001
		Picloram	0.5
		Simazine	0.004
		Styrene	0.1
		Tetrachloroethylene	0.005
		Toluene	1
		Total trihalomethanes (TTHMs)	0.1
		Toxaphene	0.003
		2,4,5-TP (Silvex)	0.05
		1,2,4-Trichlorobenzene	0.07
		1,1,1-Trichloroethane	0.2
		1,1,2-Trichloroethane	0.005
		Trichloroethylene	0.005
		Vinyl chloride	0.002
		Xylenes (total)	10

(a) Action level not to be exceeded in more than 10 percent of samples.

(b) Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the following levels: Acrylamide – 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin – 0.01 percent dosed at 20 mg/L (or equivalent).

Table 4.5-5
Secondary Drinking Water Standards

Constituent	Secondary Standard (mg/L)	Constituent	Secondary Standard (mg/L)
Aluminum	0.05 to 0.2	Manganese	0.05
Chloride	250	Odor, threshold odor number	3
Color, color units	15	pH	6.5 – 8.5
Copper	1	Silver	0.1
Corrosivity	Noncorrosive	Sulfate	250
Fluoride	2	Total Dissolved Solids	500
Foaming Agents	0.5	Zinc	5
Iron	0.3		

State Water Quality Planning

California Porter-Cologne Act

The California Porter-Cologne Act of 1970 is largely responsible for creating the State's extensive regulatory program for water pollution control. As discussed above, preparation of water management plans has been delegated to the individual states by the U.S. EPA. Pursuant to the Porter-Cologne Act, the responsibility for protection of water quality in California rests with the State Water Resources Control Board (SWRCB), which has been divided into nine Regional Water Quality Control Boards (RWQCBs) to regulate the nine hydrologic basins in the state. The Porter-Cologne Act gives the SWRCB and RWQCBs broad powers to protect water quality by regulating waste discharges to water and land, and requiring cleanup of hazardous conditions.

As required by Federal CWA and the California Porter-Cologne Act, water quality control plans have been prepared for each of the state's hydrologic basins. These water quality control plans have been prepared in order to regulate discharges that could affect the quality of State waters. Policies for water quality control adopted by the SWRCB serve as guidelines for the regional boards in the preparation of regional water quality control plans. Together, the policies of the SWRCB and the nine regional water quality control plans form the California Water Plan. The Oxnard Plain is within the Santa Clara River Basin (4A) and falls under the jurisdiction of the Los Angeles Regional Water Quality Control Board (LARWQCB). The water quality control plan for the Santa Clara River Basin is discussed below.

In addition to the responsibilities assigned to the SWRCB and the RWQCBs with respect to discharges into State waters, the Porter-Cologne Act gives the regional boards specific authority to regulate discharges of waste to land, including the management of waste disposal sites. Each regional board is required to adopt classification and waste discharge requirements for each waste management facility under its jurisdiction. Persons operating hazardous waste disposal facilities are also subject to detailed regulations governing water quality monitoring and closure. Further, the SWRCB and the RWQCBs have authority to take a variety of steps to investigate, halt, or order the clean up of waste discharges. These agencies may also obtain court relief or take actions themselves to clean up discharges.

State Antidegradation Policy

The SWRCB adopted the Statement of Policy with Respect to Maintaining High Quality Water in California (Resolution No. 68-16) on October 28, 1968. This policy is generally referred to as the "Antidegradation Policy" and it protects surface water and groundwater where existing water quality is higher than the standards set by the Basin Plan to protect beneficial use of the waters. Under the Antidegradation Policy, any action that can adversely affect water quality in surface water or groundwater:

- Must be consistent with the maximum benefit to the people of the state;
- Must not unreasonably affect present and anticipated beneficial use of such water; and
- Must not result in water quality less than that prescribed in water quality plans and policies.

Safe Drinking Water Act in 1976

California adopted its own Safe Drinking Water Act in 1976 that gave California Department of Health Services (DHS) the responsibility for the administration of the federal SDWA in California. The first approach is to safeguard public welfare by limiting the level of specific contaminants that can impact public health. These limits are identified as Primary Maximum Contaminant Levels (MCLs) and are specific concentrations that cannot be exceeded for a given constituent. The second approach is a treatment technique that is based on distribution system sampling in comparison to an action level. If the action level is exceeded in more than 10 percent of the samples, then additional treatment is required of the water supplier. Currently, treatment technique limits apply only to copper and lead. DHS also has established Secondary Maximum Contaminant Levels (SMCLs) that regulate constituents that affect water quality aesthetics (such as taste, odor, or color). Generally, DHS uses the SMCL as guidelines. A summary of the MCLs and SMCLs are presented in **Tables 4.5-4** and **4.5-5**, respectively.

Los Angeles Region Water Quality Control Plan

The Basin Plan for the Santa Clara River Basin was adopted on March 3, 1975 by the LARWQCB and approved on March 20, 1975 by the SWRCB. An updated version of the Basin Plan, *Water Quality Control Plan, Los Angeles Region (4)*, prepared by the LARWQCB, was approved in June of 1994. The objective of the *Water Quality Control Plan*, or Basin Plan, is to preserve and enhance water quality, protect the beneficial uses of all regional waters, and implement the CWA. Specifically, the plan designates beneficial uses for surface water and groundwater, sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and to conform to the State's anti-degradation policy, and describes implementation programs to protect all waters in the Region. In order to be considered consistent with the Basin Plan, the proposed project must be in compliance with water quality objectives and may not cause a deterioration of beneficial uses.

The surface water flows of the Santa Clara River, located on the north side of the proposed project, have been designated with the following beneficial uses in the Basin Plan:

- Potential municipal supply;
- Existing agricultural supply;
- Existing industrial process supply;
- Existing industrial service supply;
- Existing groundwater recharge source;
- Existing freshwater replenishment source;
- Existing water contact recreation;
- Existing non-contact water recreation;
- Existing warm freshwater habitat;
- Existing cold freshwater habitat;
- Existing wildlife habitat;
- Existing rare, threatened, or endangered species habitat;
- Existing migration of aquatic organisms; and
- Existing wetlands.

The LARWQCB previously proposed to remove the potential municipal supply designation for surface water flows associated with the Santa Clara River. This proposal was not successful and the LARWQCB staff is working to develop an alternative designation, perhaps using some other standard such as the California Toxics Rule to develop numerical criteria.

The groundwater of the Oxnard Forebay (Montalvo Forebay in this document) has been designated with the following beneficial uses:

- Potential municipal supply;
- Existing agricultural supply;
- Existing industrial process supply; and
- Existing industrial service supply.

The Basin Plan standards for surface waters in the Santa Clara River Watershed between the Freeman Diversion Structure near Saticoy and the Ventura Freeway Bridge are listed in **Table 4.5-6**. The Basin Plan standards for groundwater in the Montalvo Forebay are listed in **Table 4.5-7**.

Table 4.5-6
Basin Plan Surface Water Quality Objectives

Constituent	Water Quality Objective
TDS, mg/L	1,200
Sulfate, mg/L	600
Chloride, mg/L	150
Boron, mg/L	1.5
Nitrate, mg/L	45
Ammonia, mg/L	1.30 (1)
Oil and Grease, mg/L	10 (2)

Notes:
(1) Ammonia objective estimated for a temperature of 15C and a pH of 8.1 for waters designated as COLD.
(2) Oil and Grease objective is qualitatively called out as "a visible film or coating on the surface of the water or on objects that cause nuisance, or that otherwise adversely affect beneficial uses." This objective has been conservatively estimated at 10 mg/L.

Table 4.5-7
Basin Plan Groundwater Quality Objectives

Constituent	Water Quality Objective
TDS, mg/L	1,200
Sulfate, mg/L	600
Chloride, mg/L	150
Boron, mg/L	1.0
Arsenic, mg/L	0.05
Beryllium, mg/L	0.004
Cadmium, mg/L	0.005
Chromium (total), mg/L	0.05
Mercury, mg/L	0.002
Nickel, mg/L	0.1
Selenium, mg/L	0.005

Waste Load Allocations

In addition to the development of its Basin Plan, each RWQCB is responsible for the development of Total Maximum Daily Loads (TMDLs) for each “impaired” surface water body within the region’s boundaries. CWA Section 303(d)(1)(A) requires states to identify impaired surface waters within their boundaries where numeric or narrative water quality objectives are not being maintained and/or beneficial uses are not fully protected after application of technology-based controls. Each state is also required to establish a priority ranking for such waters, considering the severity of the pollution and the beneficial uses of the waters. For those surface water bodies identified and prioritized in the aforementioned list, Section 303(d)(1)(C) requires that each state establish TMDLs for those pollutants identified under CWA Section 304(a)(2) as suitable for TMDL development correlated with the achievement of water quality objectives.

A TMDL is a numeric target intended to result in the attainment of water quality standards. The TMDL includes allocations (e.g., allowable pollutant loading) for both point and nonpoint sources. The loadings are established with consideration given to seasonal variations of pollutant loadings and a margin of safety, which considers any lack of knowledge concerning the relationship between effluent limitations and water quality. Each TMDL is first developed by the governing RWQCB, and then implemented through National Pollutant Discharge Elimination System (NPDES) permits (for point sources) and/or through a wider range of authorities and programs (for nonpoint sources), including the use of applicable State enforcement authorities (e.g., California Toxics Rule, water quality-based effluent limitations). TMDLs are formalized via their adoption as amendments to a RWQCB’s Basin Plan.

The Santa Clara River Estuary is a 303(d) listed impaired surface water body downstream the RiverPark Specific Plan Area. The Estuary is listed as impaired for coliform, ChemA (a class of historically-used chlorinated pesticides, including aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH, endosulfan and toxaphene) and toxaphene. The RWQCB is in the process of developing TMDLs for each of the Estuary’s listed impairment. These TMDLs are expected to be completed by 2006/07.[33] Once finalized, waste load allocations for each targeted pollutant will be distributed among point and nonpoint dischargers upstream of the impairment.

33 Los Angeles Regional Water Quality Control Board (LA RWQCB). Watershed Management Initiative Chapter. 2000.

Local Water Quality Planning

Ventura County Municipal Stormwater NPDES Permit

The Ventura Countywide Stormwater Quality Management Program encompasses the Ventura County Flood Control District, the County of Ventura, and the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura, Santa Paula, Simi Valley, and Thousand Oaks. These co-permittees are jointly covered by California Regional Water Quality Control Board, Los Angeles Region Order No. 00-108 (NPDES Permit No. CAS004002), Waste Discharge Requirements for Municipal Stormwater and Urban Runoff Discharges within Ventura County Flood Control District, County of Ventura, and the Cities of Ventura County. The permit covers all areas within the boundaries of the cities as well as the unincorporated areas of Ventura County defined as urban by the U.S. Census Bureau. Discharges to the Santa Clara River fall under the coverage of the permit. The Permit incorporates the Stormwater Quality Urban Impact Mitigation Plan (SQUIMP), which includes a series of provisions that are intended to effectively prohibit non-stormwater discharges and reduce the discharge of pollutants from stormwater conveyance systems to the maximum extent possible.

Additionally, amendments to the Basin Plan intended to implement TMDLs developed by the RWQCB, once promulgated, will establish waste load allocations to point and nonpoint source dischargers tributary to 303(d)-listed impaired surface water bodies. The Santa Clara River Estuary, downstream of the RiverPark Specific Plan location, is listed as impaired for coliform, ChemA and toxaphene. These TMDLs are expected to be completed by 2006/07.[34] Once finalized, these waste load allocations, developed for each targeted pollutant, will be distributed among point and nonpoint dischargers upstream of the listed impairment. These allocations are then applied to dischargers within the watershed via NPDES permits, revised to be consistent with the approved TMDL.

As part of an investigation for a recent Basin Plan amendment, Resolution No. 99-13 (El Rio Septic Prohibition), the LARWQCB conducted a regional water quality study of the mine pits and nearby groundwaters. As a result of this investigation, the pits may become eligible for listing in the 2002 revised 303(d) list of impaired surface waters. Should the pits become listed, TMDLs would be determined for listed impairments, and waste load allocations would be developed for all dischargers tributary to the pits. According to the proposed RiverPark stormwater management program, these dischargers would include the uses proposed in RiverPark Areas 'A' and 'B' as well as the off-site industrial and agricultural areas.

---

34 Los Angeles Regional Water Quality Control Board (LA RWQCB). Watershed Management Initiative Chapter. 2000.

United Water Conservation District Resolution No. 2000-19

The Board of Directors of the UWCD adopted Resolution No. 2000-19 in December 2000 containing recommendations for the use and management of the existing mine pits in the Specific Plan Area to protect local groundwater quality. Specifically this resolution addresses water quality issues associated with storm runoff entering the pits. This resolution recommends that any stormwater treatment system for runoff that will enter the pits be designed to accommodate flows from up to a 10-year storm event. In addition, this resolution recommends that any runoff entering the pits contain concentrations of chemical contaminants below the lower of State and Federal primary drinking water standards or the ambient levels in the underlying groundwater. To ensure removal of pathogens in the runoff, this resolution recommends that runoff water flow either vertically through an unsaturated zone at least 10 feet above historic high water level, through a mechanical filter, or horizontally in the aquifer if the horizontal filtration distance is equivalent to a 10-foot vadose zone.

Fox Canyon Groundwater Management Agency Resolution No. 01-01

In April 2001, the Board of Directors of the Fox Canyon Groundwater Management Agency (FCGMA) adopted a resolution similar to the UWCD Resolution described above. The FCGMA Resolution addresses the use and management of water bodies, deep pits and excavations in the forebay. This resolution also recommends that any stormwater treatment system for runoff that will enter water bodies in the forebay be designed to accommodate flows from up to a 10-year storm event and that any runoff entering the pits from storms up to a 10-year storm event be treated to meet State and Federal Drinking Water Standards or the ambient levels in the forebay, whichever is lower. In addition, the FCGMA recommends that any water bodies in the forebay be managed by a public agency.

Water Quality

Groundwater Quality

UWCD maintains an extensive database of water quality in the Montalvo Forebay and Oxnard Plain Subbasins. The database covers both surface water and groundwater quality and represents an aggregation of sources – California Department of Health Services, California Department of Water Resources, City of Oxnard, U.S. Geological Survey, Ventura Regional Sanitation District, Ventura County Water Resource Agency, and private well owners - in addition to UWCD's own sampling program. The database provides information on general minerals, trace organics, trace inorganics, and limited microbial constituents. Although the majority of the data is from the past two decades, some records date from the mid-1920s. This database represents the bulk of the information used in the analysis of ambient water quality.

The available groundwater data was reviewed to develop a profile of the existing groundwater in the vicinity of the project site. Because existing runoff influences localized groundwater quality in the mine pits, use of on-site well data was not deemed appropriate to characterize the ambient groundwater quality. Due to the impact that UWCD's El Rio Spreading Ground operations exert on local groundwater quality, it was decided that ambient quality is best characterized by wells from the El Rio facilities screened in the UAS. These include wells 2N22W14P2, 2N22W23B1, 2N22W23B2, 2N22W23C1, 2N22W23C2, 2N22W23G2, 2N22W23G3, 2N22W23K1, and 2N22W23K5. Since the water from these wells is used for domestic consumption and there is sufficient data to establish trends, this approach was deemed conservative. By way of comparison, a water quality profile was also derived for the Saticoy Spreading Grounds, upgradient of the project, based on data for well 2N22W12J1. **Figure 4.5-9** shows the location of these wells relative to the site and **Table 4.5-8** summarizes the ambient water quality data for both sets of wells.

This groundwater quality review examines water quality in three areas - the Saticoy spreading basin portion of the Montalvo Forebay, the El Rio spreading basin portion of the Montalvo Forebay, and the production drinking water wells near or at the City of Oxnard Yard. The Saticoy spreading basin portion is located upstream of the project site and is more reflective of the background water quality. The El Rio spreading basins, located closer to the project but downstream of the Saticoy Spreading Grounds, have substantial groundwater extraction wells and the water quality from these wells is generally more reflective of the recharged water quality. City of Oxnard wells were also reviewed, as they are the largest municipal water supplier downstream of the project.

Water quality data were reviewed from 1979 to 1999. Since groundwater quality is affected by the amount of recharge, the review period was divided into a "dry" period (January 1987 to December 1990) and a "wet" period (January 1998 to December 1998). The groundwater levels were very responsive to the amount of water recharged and based on this observation, the groundwater quality analysis did not require a study period adjustment to account for recharge and mixing.

Review of the groundwater data from the Montalvo Forebay indicated that all of the major cations and anions except nitrate behave in the same manner as total dissolved solids (TDS), e.g., the ratio of calcium to TDS on a weight basis is relatively constant and when TDS rises, the calcium rises proportionately. This trend is also true for sodium, magnesium, chloride, sulfate, and alkalinity. As a result, TDS was used to describe the general baseline water quality for the groundwater. Chloride, sulfate, boron, and nitrate are regulated by the RWQCB's Basin Plan and are discussed separately in this analysis. Similarly trace organics and metals, covered by the SDWA, are also discussed separately.

Figure 4.5-9

Ambient Water Quality Well Locations

Table 4.5-8
Ambient Groundwater Quality Range

Constituent	Units	El Rio Wells (1)	Saticoy Wells (2)
TSS	mg/l	NA	NA
MINERALS			
Sulfate	mg/l	255 - 740	330 - 560
Chloride	mg/l	21 - 102	36 - 54
TDS	mg/l	572 - 1710	926 - 954
Boron	mg/l	0.4 - 1.0	0.5 - 0.7
NUTRIENTS			
Nitrate	mg/l	0.4 - 140	2 - 27
Ammonia	mg/l	NA	NA
METALS			
Arsenic	mg/l	<0.0005 - <0.05 (3)	NA
Beryllium	mg/l	<0.0002 - <0.001 (3)	NA
Cadmium	mg/l	<0.0002 - <0.001 (3)	NA
Chromium, total	mg/l	<0.001 - <0.01 (3)	NA
Chromium VI (5)	mg/l	<0.0005 - <0.005	NA
Copper	mg/l	<0.01 - <0.05 (3)	<0.05
Iron	mg/l	<0.05 - 0.13	<0.05 - 0.42
Lead	mg/l	<0.0002 - <0.005 (3)	NA
Manganese	mg/l	<0.01 - 0.03	<0.030
Mercury	mg/l	<0.00001 - <0.001 (3)	NA
Nickel	mg/l	<0.001 - 0.003	NA
Selenium	mg/l	0.002 - 0.009	NA
Silver	mg/l	<0.0005 - 0.01	NA
Zinc	mg/l	<0.02 - 0.05	<0.050
PESTICIDES			
ChemA	mg/l	NA	NA
Lannate	mg/l	<0.005	NA
HYDROCARBONS			
Oil/Grease	mg/l	NA	NA
MTBE	mg/l	<0.005	NA
MICROORGANISMS			
Total Coliform	MPN/100 ml	<1.1 - 9.2 (4)	NA
Fecal Coliform	MPN/100 ml	<1.1 - <2 (4)	NA
Fecal Streptococci	MPN/100 ml	NA	NA
Giardia (6)	Cysts/100 L	<1.6	NA
Cryptosporidium (6)	Oocysts/100 L	<1.6	NA

Notes:
NS - No Standard
NA - Not available
(1) El Rio water quality is based on data from wells nos. 2N22W14P2, 2N22W23B1, 2N22W23B2, 2N22W23C1, 2N22W23C2, 2N22W23G2, 2N22W23G3, 2N22W23K1, and 2N22W23K5 from 1991 to 1999
(2) Saticoy water quality is based on data from well no. 2N22W12J1 from 1991 to 1999.
(3) Upper end of range is an older non-detect result. This occurs as a result of historic sampling which utilized analytical procedures and equipment having higher detection limits than are currently achievable.
(4) Pathogen Indicator Data for Ambient Groundwater: For Total Coliform, 2 samples were determined to have ">23 MPN/100ml" present; as a conservative approach, these are not included in the range because of their rare occurrence. For Fecal Coliform, all data were reported as non-detect with detection limits of 1.1 and 2, except for a single multi-sampling episode on March 23, 2000 which determined a maximum of 9.2 MPN/100 ml; as a conservative approach, these are not included in the range because of their rare occurrence. Also for Fecal Coliform, the upper end of the constituent range is defined as the detection limit. This occurs as a result of historic sampling which utilized analytical procedures and equipment having higher method detection limits than are currently achievable.
(5) Ambient groundwater concentrations for chromium VI are not available, but are assumed to be 50 percent of the total chromium concentration.
(6) Giardia and Cryptosporidium concentrations are based on samples collected from wells 2N22W21H2 and 2N22W22G1.

The Montalvo Forebay groundwater quality is highly influenced by the water quality of UWCD recharge water. Santa Clara River water quality data from the Freeman Diversion was used to characterize the water that was recharged using the Saticoy and El Rio spreading basins.

Because the City of Oxnard wells are far from the recharge area of the Montalvo Forebay, their water quality parameters appear to behave in a different manner. These wells were analyzed as a separate group of wells in this baseline analysis.

Baseline TDS

Table 4.5-9 summarizes the maximum, minimum and average concentrations for TDS at the Freeman Diversion, the Saticoy and El Rio spreading basins, and the City of Oxnard Wells. The reported concentrations are divided into three time frames - the overall study period (1979-1999), a "dry" cycle (1987 – 1990), and a "wet" cycle (1998). Currently, TDS levels occasionally exceed Basin Plan Groundwater Objectives at each location under the various hydrologic conditions analyzed.

Table 4.5-9
Summary of Existing Total Dissolved Solids Conditions

	Total Dissolved Solids, mg/L									
	Basin Plan Limit	Study Period 1979 – 1999			"Dry" Cycle 1987 - 1990			"Wet" Cycle 1998		
Location		**Max**	**Min**	**Ave**	**Max**	**Min**	**Ave**	**Max**	**Min**	**Ave**
Freeman Diversion	1,200	1,680	722	1,219	1,620	1,040	1,461	1,070	791	931
Saticoy		2,110	564	1,070	1,850	664	1,137	1,400	700	1,014
El Rio		2,460	530	1,034	1,680	908	1,213	1,030	760	913
City of Oxnard Wells		1,800	352	976	1,200	352	888	1,500	960	1,213

The Freeman Diversion values are generally lower than the two spreading basins. From a TDS perspective, the Saticoy and El Rio basins are relatively similar. The TDS trends follow a more conventional analysis. During "dry" cycles, the average TDS increased when compared with the "wet" cycle. This trend was observed at the Freeman Diversion and at the Saticoy and El Rio spreading basins.

The City of Oxnard wells were generally lower in TDS and appeared to behave differently. The average TDS during the "dry" cycle was much lower than the "wet" cycle, which was the opposite of the trend observed in the Montalvo Forebay. A possible explanation is that during the "dry" cycle, the water levels are lower than the upper zones that contain more dissolved minerals (higher TDS) resulting in a lower observed TDS for the City's wells. During a "wet" year, the higher groundwater levels may rise into these shallower zones that were previously unsaturated during a "dry" cycle. Based on a mass balance analysis, it is unlikely that the lower TDS observed during the "dry" cycle could be from recharging lower TDS water in the Montalvo Forebay.

Baseline Chloride

The baseline conditions for chloride are summarized in **Table 4.5-10**. All the chloride levels in the Freeman Diversion samples, including the maximum values for the study period, were below Basin Plan limits. The averages for the "dry" cycle were higher than the "wet" cycle for all four locations, in contrast to higher "wet" cycle TDS values in the City of Oxnard wells. Based on these data, the chloride parameter appears to be behaving slightly differently than TDS downgradient of the Montalvo Forebay.

Table 4.5-10
Summary of Existing Chloride Conditions

	Chloride, mg/L									
	Basin Plan Limit	Study Period 1979 – 1999			"Dry" Cycle 1987 - 1990			"Wet" Cycle 1998		
Location		Max	Min	Ave	Max	Min	Ave	Max	Min	Ave
Freeman Diversion	150	136	5	55	106	49	87	58	9	37
Saticoy Area Wells		200	23	59	104	41	68	71	27	49
El Rio Area Wells		468	1	56	84	47	64	49	30	40
City of Oxnard Wells		112	43	63	104	48	69	69	43	56

Baseline Sulfate

The baseline conditions for sulfate are summarized in **Table 4.5-11**. In some samples from the Freeman Diversion, maximum sulfate levels were above Basin Plan limits. The average concentration for the Freeman Diversion samples were all below Basin Plan limits except during the "dry" cycle. However, the nearby wells of both spreading basins had average sulfate concentrations during the "dry" cycle below the Freeman Diversion and Basin Plan limits indicating that there was no immediate impact of higher average sulfate concentrations in the surface water. Averages for the "dry" cycle were higher than the "wet" cycle except at the City of Oxnard wells where average sulfate concentrations behaved similar to the TDS with higher "wet" cycle values. Because sulfate is such a large component of TDS (between 40-50 percent), its behavior has a strong influence on the TDS. It is likely that the behavior of sulfate in the upper zones during the "wet" and "dry" cycle is one of the causes for TDS behavior.

Table 4.5-11
Summary of Existing Sulfate Conditions

Location	Basin Plan Limit	Sulfate, mg/L								
		Study Period 1979 – 1999			"Dry" Cycle 1987 - 1990			"Wet" Cycle 1998		
		Max	Min	Ave	Max	Min	Ave	Max	Min	Ave
Freeman Diversion	600	763	227	487	722	440	640	560	250	394
Saticoy Area Wells		1,140	180	505	813	180	525	649	310	468
El Rio Area Wells		1,000	48	470	797	411	525	477	342	409
City of Oxnard Wells		990	55	496	483	55	328	710	440	573

Baseline Nitrate

The baseline nitrate data were partitioned in the same manner as the TDS data to characterize the "wet" and "dry" cycles over the study period as indicated in **Table 4.5-12**. The nitrate data have a larger range between maximum and minimum. Nitrate concentrations from the Saticoy and El Rio area wells, measured under the various hydrologic conditions, have occasionally exceeded Basin Plan groundwater quality objectives (which are equivalent to federal primary drinking water standards). The water from the Freeman Diversion that is being spread in the two areas is lower in nitrate than in the Montalvo Forebay. The average nitrate concentrations in the Saticoy spreading basins area do not change between "dry" and "wet" periods unlike in the El Rio spreading basin. During the "dry" cycle average nitrate concentrations in the El Rio spreading basin were higher than the Saticoy area wells. The City of Oxnard wells do not exhibit the same wide range between nitrate maxima and minima as groundwater from the spreading basins. This is likely a result of longer travel and mixing times for the recharge water to blend, causing a dilution effect.

Table 4.5-12
Summary of Existing Nitrate Conditions

Location	Basin Plan Limit	Nitrate, mg/L								
		Study Period 1979 – 1999			"Dry" Cycle 1987 - 1990			"Wet" Cycle 1998		
		Max	Min	Ave	Max	Min	Ave	Max	Min	Ave
Freeman Diversion	45	23	0.2	7	20	6	13	8.7	2.8	5
Saticoy Area Wells		288	0.05	16	288	0.1	15	130	0.8	13
El Rio Area Wells		306	0.1	27	306	6	31	43	1.6	13
City of Oxnard Wells		51	1	15.9	16	1	8.2	24	11	17

The same trend of lower "dry" cycle when compared the "wet" cycle that was observed for TDS was also observed for nitrate in the City of Oxnard wells. The same potential explanation to describe the TDS behavior can be used to explain the nitrate behavior.

Baseline Boron

The baseline conditions for boron are summarized in **Table 4.5-13**. All the boron levels, except for the maximum values for the study period and "dry" cycle in the surface samples from the Freeman Diversion, were below Basin Plan limits. Boron data was not available for all of the groundwater wells during the "dry" cycle. The average for the "dry" cycle was higher than the "wet" cycle at the Freeman Diversion location. Because there was no groundwater data available during the "dry" cycle, a comparison with the "wet" cycle cannot be made. Generally, all the averages for boron are below Basin Plan limits and were similar. The average boron level for City of Oxnard wells was slightly higher than the Freeman Diversion and the recharge basin wells. These data suggest that the native geological formation may be responsible for a small increase in the boron concentration as water travels from the Montalvo Forebay to the City's wells.

Table 4.5-13
Summary of Existing Boron Conditions

	Boron, mg/L									
	Basin Plan Limit	Study Period 1979 – 1999			"Dry" Cycle 1987 - 1990			"Wet" Cycle 1998		
Location		**Max**	**Min**	**Ave**	**Max**	**Min**	**Ave**	**Max**	**Min**	**Ave**
Freeman Diversion	1	1.3	0.2	0.8	1.3	0.7	1	0.6	0.3	0.5
Saticoy Area Wells		0.7	0.5	0.6	–	–	–	0.6	0.5	0.5
El Rio Area Wells		0.7	0.5	0.6	–	–	–	0.6	0.5	0.6
City of Oxnard Wells		0.9	0.6	0.8	–	–	–	0.9	0.6	0.8

– Indicates no data available.

Baseline Trace Organics

There were no trace organics data for the Freeman Diversion sample location. No comparison can be made at this time with the Santa Clara River and the groundwater basin due to the lack of this data. Generally, the Montalvo Forebay is free of trace organics. Trace organics were detected in only four of the 78 wells tested. Two parameters were found, 1,1,1-trichloroethane (1,1,1-TCA) in one well and total trihalomethanes (THMs) in three wells. All levels were below the MCL for their respective chemical. The well with 1,1,1-TCA was north of the Santa Clara River and is outside the project study area. THMs are a disinfection byproduct and are typically formed when chlorinating drinking water. The three wells with detectable amounts of THMs were drinking water wells and the samples are reflective of having sampled treated (chlorinated) water rather than untreated water.

The City of Oxnard wells did not have any trace organics other than THMs. There were 21 samples out of 31 (~68 percent) that contained one or more of the THMs. All the total THM levels were below the MCL of 80 µg/L. In fact, the highest total THM value detected was 41 µg/L. These wells are also drinking water wells and the positive THM samples are also reflective of sampling treated water.

Baseline Metals

The metals sampled for at the Freeman Diversion are summarized in **Table 4.5-14**. Of the metals tested, only four were positive. These four metals have secondary SMCLs indicating that there are only aesthetic concerns when these levels are exceeded, rather than human health concerns. Maximum and average iron and manganese levels exceeded their respective SMCLs. Typically, these metals would be in the oxidized form in surface runoff and would be removed by sedimentation in the recharge basin or removed by filtration through the unsaturated zones as the water percolates to groundwater. Generally, metal concentrations in wells within the Montalvo Forebay are below the respective MCLs. Metals were detected above the respective MCLs in only one of 31 wells tested from the Montalvo Forebay. This potable supply well was located near the El Rio spreading basin and had one sample exceeding the MCL for aluminum, lead, and cadmium. This sporadic occurrence for each metal was equivalent to an exceedance frequency of 10 to 15 percent.

Table 4.5-14
Summary of Existing Metal Concentrations at Freeman Diversion

Metal (1)	Units	SMCL	Max	Min	Number of Samples	Number of Samples Above Detection Limit	Percentage with Detectable Result
Copper	mg/L	1	0.1	<0.050	60	2	3%
Iron	mg/L	0.3	12.5	<0.050	59	48	81%
Manganese	mg/L	0.05	0.56	<0.030	59	32	54%
Zinc	mg/L	5	0.11	<0.050	60	6	10%

(1) Metals sampled at the Freeman Diversion are limited to the listed metals.

Table 4.5-15 below summarizes the metals data for the City's wells. No average metal concentration exceeds the corresponding MCL or SMCL. Selenium (exceeds MCL) and iron (exceeds SMCL) are the only parameters whose observed maximum concentrations exceeded their corresponding regulatory limits. Although manganese is not included in the City well testing results, it may be also be above the SMCL because manganese concentrations in groundwater are often elevated when iron concentrations are elevated. For all the other metals, even the maxima are below the MCL.

Table 4.5-15
Summary of Existing Metal Conditions for City of Oxnard Wells

Metal	Units	MCL or SMCL	Concentration (1)		Number of Samples	Number of Samples Above Detection Limit	Percentage with Detectable Result
			Minimum	Maximum			
Aluminum	mg/L	1	0.01	0.5	19	10	53%
Arsenic	mg/L	0.05	0.002	0.005 / <0.030	23	4	17%
Barium	mg/L	1	<0.02	0.19	23	11	48%
Cadmium	mg/L	0.01	<0.001	0.005	23	1	4%
Chromium (Total)	mg/L	0.05	0.002	0.003 / <0.030	23	5	22%
Copper	mg/L	*1*	0.004	0.009 / <0.050	75	5	7%
Iron	mg/L	*0.3*	<0.05	1.8	68	26	38%
Lead	mg/L	0.05	0.00004	0.001 / <0.030	32	8	25%
Nickel	µg/L	-	0.003	0.006	5	5	100%
Combined Radium 226 and Radium 228	pCi/L	5	0.1	1	19	8	42%
Selenium	mg/L	0.01	0.002	0.022	106	82	77%
Uranium	µg/L	-	3	17	18	18	100%
Zinc	mg/L	*5*	<0.050	0.35	4	3	75%

Notes:
(1) Because detection limits have decreased over time, some of the older data reports non-detects at detection levels higher than either the reported minima or maxima of more recent data. In cases where non-detects exceeded reported minimum values, the minimum detected value is reported. In cases where non-detects have exceeded the maximum reported concentration, both values are reported.

Surface Water Quality

Baseline Santa Clara River Quality

Tables 4.5-9 through **4.5-14** include water quality sampling summaries for the Santa Clara River at the Freeman Diversion. Data from this sampling is available for many of the general minerals including TDS, chloride, sulfate, nitrate, and boron, and some metals including, copper, iron, manganese and zinc. TDS has exceeded Basin Plan surface water quality objectives for reach 2 of the Santa Clara River

(Freeman Diversion to the Ventura Freeway). Iron and manganese have exceeded their respective Secondary Maximum Contaminant Levels, on occasion.

Baseline Project Stormwater

Runoff sampling has not been conducted for stormwater drainage from the agricultural and urban areas immediately north of the Ventura Freeway that drain to the Santa Clara River via the Stroube Drain. However, based on estimates of stormwater quality, existing runoff from agricultural and urban sources likely exceed Basin Plan Surface Water Quality objectives for fecal coliform (an impairment to downstream reaches of the River) and ammonia. Additionally, copper, mercury, and selenium—likely exceed California Toxics Rule maximum freshwater criteria. Furthermore, although applicable water quality criteria do not exist for total coliform and fecal streptococci, runoff concentrations likely exceed their respective maximum ambient River concentrations.

Water Quality Influences from Surrounding Uses

Currently, untreated stormwater from areas located to the northeast of the Specific Plan Area. Tributary flow to the pits consists of runoff from industrial and agricultural land uses in Drainage Area No. 3. Untreated runoff from these areas drains to the Large Woolsey and Small Woolsey Mine Pits.

A preliminary assessment of these surface runoff discharges was prepared in December 1999[35] for Hanson Aggregates, the owner of the mine site. This assessment noted that a number of the industrial facilities located in the area that drains to the pits store and use hazardous materials, generate hazardous waste or operate underground storage tanks. Surface runoff from these industrial storage yards and other operations currently enters the existing storm drain systems, which discharges into the pits.

All industrial sites in this area are using private septic systems for discharge of sanitary and industrial wastewater. No evidence was found of pre-treatment systems in place to separate oils or solids from waste streams generated. Any improper discharge of contaminants to these private septic systems could create a potential for their migration via groundwater into the pits, impacting water quality.

---

35 West Coast Environmental and Engineering. *Surface Drainage and Industrial/Agricultural Discharge Study, Hanson Aggregates/S.P. Milling Co. – El Rio Facility, Oxnard, California.* December 14, 1999.

This study also identified several leaking underground storage tank sites under investigation in the area. As of October 25, 2001, there are three known active leaking underground storage tank sites in the industrial areas to the north of the Specific Plan Area. These sites consist of:

- Poole Oil Company, 3885 E. Vineyard Avenue. Contamination from this site has reached groundwater and the extent of the contamination is being characterized. Originally contamination on this site was thought to be from an leaking underground storage tank. Further assessments determined that while the tanks were not leaking some onsite gas pumps had leaked. Elevated levels Benzene and MTBE have been found in groundwater samples on the site. The County is requiring monitoring wells be installed off-site to the southwest to determine the extent of groundwater contamination. Active remediation with a pump and treat system has also been approved and will begin in the next 60 days.[36]

- Ventura Oil, 3815 E. Vineyard Avenue. Contamination from this site has been limited to the soil and is being actively remediated.

- Sparkletts / McKesson, 210 Beedy Street. Contamination from this site has been limited to the soil and a preliminary site assessment is underway.

Attempts to characterize the runoff from the adjacent industrial area resulted in the preparation of a runoff sampling program by Hanson Aggregates and verbal approval of the program by the LARWQCB. Two rounds of runoff sampling were conducted, one in January 2000 and one in April 2000. Additionally, the City of Oxnard initiated a water quality sampling program in 1997 that has been continued by the UWCD to sample water directly in the pits. The location of the sampling points for these programs is presented in **Figure 4.5-10**. The range of the sampling results is presented below in **Table 4.5-16**. The sampling results indicate that pit water quality is similar to that of the unexposed groundwater in the area, although it is unclear how representative these samples are due to the uncertainty in the timing of sample collection relative to the duration of the sampled storm event. Sampling conducted in the pits has indicated that sulfate levels have consistently exceeded the Basin Plan groundwater quality objectives and the SMCL, but fall within the ambient ranges established by the El Rio wells; total dissolved solids has consistently exceeded the SMCL and on one occasion exceeded the Basin Plan objective, but also fall within the ambient range established by the El Rio wells; iron exceeded the SMCL two times out of 30 samples; and manganese has exceeded the SMCL once out of 30 samples.

---

[36] Craig Kline. Ventura County Environmental Health Department, LUFT Program. Personal communication. November 19, 2001.

Because of the limited runoff sampling data, several other sources of runoff data were also reviewed. These include data from UWCD,[37] Santa Monica,[38] Los Angeles County,[39] Fresno,[40] and Ventura County.[41] Based on these sources, profiles of probable runoff water quality characteristics for each major land use type (agricultural, industrial, commercial, and residential) were developed with preference given to local, analogous data. The runoff from the different sources were combined on a volume-weighted basis to develop a composite runoff profile for an average storm. A quality profile corresponding to a larger storm event (greater than 10-year return frequency) was also developed to support analysis of the project as proposed. This profile reflects the inverse relationship between concentration and storm event magnitude. The land use-based stormwater quality profiles are presented below in **Tables 4.5-17** and **4.5-18**.

Based on the stormwater quality profiles developed, existing stormwater discharges (consisting entirely of industrial discharges) to the pits for storms with less than a 10-year return frequency are anticipated to exceed secondary drinking water standards for iron and manganese; and ambient groundwater concentrations for cadmium, iron, lead, manganese, nickel, zinc, and all bacterial indicator classes.

---

37 United Water Conservation District. *Runoff Sampling Results for Jones Strawberry Fields for April 6, May 24, June 11, and November 1, 1999.* 1999.

38 Woodward-Clyde. *Santa Monica Bay Area Municipal Stormwater/Urban Runoff Pilot Project – Evaluation of Potential Catch Basin Retrofits. Prepared for Santa Monica Cities Consortium.* 1998.

39 Los Angeles County Department of Public Works. *Los Angeles County 1994 to 2000 Integrated Receiving Water Impacts Report.* 2000.

40 Oltmann, R.N. and Shulters, M.V. *Rainfall and Runoff Quantity and Quality Characteristics of Four Urban Land-Use Catchments in Fresno, California October 1981 to April 1983. U.S. Geological Survey Water-Supply Paper 2335.* 1989.

41 Ventura Countywide Stormwater Quality Management Program. *Ventura Countywide Stormwater Quality Management Plan: Application for Reissuance of Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit.* 1999.

Figure 4.5-10

Surface Water Runoff and Pit Sampling Locations