# NOTICE OF AVAILABILITY

## DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT FOR THE NORTH PLEASANT VALLEY GROUNDWATER TREATMENT FACILITY

### SCH No. 2013091065

**Project Title and Lead Agency:**

North Pleasant Valley Groundwater Treatment Facility
City of Camarillo
601 Carmen Drive
Camarillo, California 93010
Contact: Ms. Lucia McGovern

**Location**: The proposed Groundwater Treatment Facility and new wells would be located in Ventura County, west of the Las Posas Road/Lewis Road intersection. Proposed pipelines would be primarily located within the City limits, but would also extend to proposed facilities.

**Project Details**: The project consists of the construction and operation of a groundwater treatment facility and two new wells to treat up to 9,000 acre-feet/year of brackish groundwater and provide up to 7,500 acre-feet/year of treated water to the City Water Division's service area. Reverse osmosis would be used to treat the water, with the resulting brine discharged to the Calleguas Regional Salinity Management Pipeline. The facility site and both proposed well sites are located outside the City's municipal boundaries (but within the City's Area of Interest). The facility site is proposed for annexation to the City.

**Environmental Review Findings**: On May 27, 2015, the Camarillo City Council certified the Final Environmental Impact Report (EIR) for the subject project pursuant to the State Guidelines for the Implementation of the California Environmental Quality Act (CEQA). The Final EIR identified significant effects on the environment (noise, cultural resources, hazardous materials, water resources and transportation). Subsequently, the proposed well locations were modified and the water resources analysis was revised, and these changes to the project are the subject of this Draft Supplemental EIR.

**Document Availability**: The Draft Supplemental EIR may be reviewed at the City offices located at 601 Carmen Drive, Camarillo, California. Draft documents are also available for review at the Camarillo Library at 4101 Las Posas Road, Camarillo, California.

**Purpose of Review**: The purpose of this review is to provide the opportunity to affected public agencies and interested members of the public to make comments, share expertise, disclose agency analysis, check for accuracy, detect omissions, and discover public concerns pursuant to State CEQA Guidelines Sections 15087 (Public Review of Draft EIR) and 15105 (Public Review Period for a Draft EIR).

**How to Comment**: The City of Camarillo is soliciting comments on the adequacy and completeness of the Draft Supplemental EIR. Consistent with the State CEQA Guidelines, reviewers should limit the scope of their comments to the information provided in the Draft Supplemental EIR, and not issues that were resolved in the Final EIR. Comments should be provided to the Project Manager, Lucia McGovern at City of Camarillo, City Hall, 601 Carmen Drive, Camarillo, CA 93010 prior to the close of the public comment period on **April 22, 2016** at 5:00 p.m. Comments may also be submitted by e-mail at lmcgovern@cityofcamarillo.org. You will receive notice of the dates of future public hearings to consider project approval or denial.

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

# DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT ENVIRONMENTAL ASSESSMENT FOR THE NORTH PLEASANT VALLEY GROUNDWATER TREATMENT FACILITY

**SCH NO. 2013091065**

Lead Agency:

**March 2016**

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# DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT ENVIRONMENTAL ASSESSMENT FOR THE NORTH PLEASANT VALLEY GROUNDWATER TREATMENT FACILITY

Prepared for:

**City of Camarillo**
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March 2016

Project No. 1502-3102

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# 1.0 INTRODUCTION

## 1.1 ENVIRONMENTAL DOCUMENTATION BACKGROUND

### 1.1.1 2014 Draft EIR/EA

The City of Camarillo prepared an Initial Study (IS) and Notice of Preparation (NOP) in April 2008 for a very similar project. The IS and NOP were distributed to responsible and trustee agencies and the State Clearinghouse, and the project was assigned State Clearinghouse no. 2008041159. Comments were received from the Ventura County LAFCO, Ventura County Resource Management Agency, Ventura County Public Works Agency, Ventura County Air Pollution Control District, Ventura County Watershed Protection District, California Department of Toxic Substances Control, Native American Heritage Commission, and California Department of Fish and Game. In June 2008, the City initiated preparation of an environmental impact report for the project, but it was never completed.

Following preparation and distribution of a new NOP in September 2013, a Draft EIR/EA was prepared and circulated for review by public agencies and interested members of the public from March 31 through May 16, 2014.

### 1.1.2 2015 Recirculated Draft EIR/EA and Final EIR/EA

Based on comments received from the Fox Canyon Groundwater Management Agency (FCGMA) and its consultants, the City determined that the water resources impact analysis presented in the 2014 Draft EIR/EA did not utilize an appropriate environmental baseline. The analysis was based on a groundwater study which compared "no mounding" conditions to future + project conditions to identify environmental impacts. Mounding refers to the increasing surface elevation of brackish groundwater in the North Pleasant Valley Basin. Using "no mounding" as the environmental baseline is not appropriate because it does not represent present or future conditions.

The City determined that the water resources analysis should be revised to utilize future no project conditions as the environmental baseline and these revisions constitute "significant new information" for the purposes of Section 15088.5(a) of the California Environmental Quality Act (CEQA) Guidelines and recirculation is required. Consistent with Section 15088.5(f)(2) of the State CEQA Guidelines only revised sections (water resources) of the Draft EIR/EA were recirculated.

The revised Draft EIR/EA focused on water resources impacts and was re-circulated for public comment from March 2 through April 20, 2015. A Final EIR/EA was prepared in May 2015, including responses to public comments on the 2014 Draft EIR/EA and the 2015 Recirculated Draft EIR/EA. The Camarillo City Council certified the Final EIR/EA on May 27, 2015.

### 1.1.3 Current Supplemental EIR/EA

The proposed location of the two new groundwater production wells has changed, in part due to coordination with the adjacent Bell Ranch. In addition, the groundwater modeling conducted in support of the 2015 Recirculated Draft EIR/EA has been revised based on input from FCGMA. The revisions to the modeling mostly involve the use of post-2010 groundwater pumping data, which included increased pumping rates in response to drought conditions. In addition, the modeling was revised to account for the potential re-location of City groundwater pumping, assuming the City would pump it's full allocation (4,500 acre-feet/year) from the Airport area wells (Airport #3, Well D, and a possible new well).

This Supplemental EIR/EA has been prepared to provide additional information and environmental analysis to make the Final EIR/EA adequate for the revised project. Consistent with Section 15163 of the State CEQA Guidelines, a Supplemental EIR (instead of a Subsequent EIR) has been prepared because only minor changes or additions to the Final EIR/EA are required to make it adequately apply to the revised project. Also consistent with Section 15163 of the State CEQA Guidelines, this Supplemental EIR/EA contains only that information necessary to make the Final EIR/EA adequate for the project as revised.

## 1.2 PROJECT PROPONENT

The proposed project would be owned by the City of Camarillo, and operated and maintained by the City or through a contract with a private entity. Approximately 4,500 to 6,000 acre-feet/year of the treated groundwater produced by the project would be provided to the City of Camarillo's existing service area, with the balance sold to the Calleguas Municipal Water District.

## 1.3 PURPOSE AND LEGAL AUTHORITY

### 1.3.1 State Requirements

CEQA requires that local, regional, and state agencies and special purpose districts prepare an Environmental Impact Report (EIR) for any discretionary action that may have the potential to significantly affect the quality of the environment. The City of Camarillo (City) is the lead agency and has prepared this EIR for the proposed Groundwater Treatment Facility to comply with the provisions of CEQA.

In accordance with Section 15121 of the State CEQA Guidelines, the purpose of this Environmental Impact Report (EIR) is to serve as an informational document that:

> *"...will inform public agency decision-makers and the public generally of the significant environmental effects of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project..."*

The proposed project would entail the construction and operation of a groundwater treatment facility and two new well sites, with the facility site to be annexed into the City of Camarillo, California.

### 1.3.2 Federal Requirements

The project would be funded by the City of Camarillo. However, the City may seek Federal funding for the project, likely with the U.S. Bureau of Reclamation or Corps of Engineers. Therefore, this document is a joint Environmental Impact Report/Environmental Assessment (EIR/EA) to comply with the requirements of both CEQA and the National Environmental Policy Act (NEPA). This joint EIR/EA is used to identify impacts associated with each of the alternatives, which will allow the Federal action agency to determine if the project qualifies for a Finding of No Significant Impact (FONSI) or would require additional analysis as part of an Environmental Impact Statement (EIS).

CEQA requires the use of the word "significant" to identify environmental impacts that require mitigation and/or must be addressed under a finding of overriding considerations. Under NEPA, the word "significant" identifies an impact that is severe based on context and intensity, and cannot be mitigated to a level of less than significant. Under the EA process, the use of the word "significant" is limited to the FONSI. However, since this EIR/EA is a joint CEQA/NEPA document, the word significant is used to identify impacts significant under CEQA.

## 1.4 PROJECT OBJECTIVES/PURPOSE AND NEED

### 1.4.1 Background

The project has been in development for nearly 15 years, with the goal to restore the City's groundwater production and meet regional groundwater management objectives of reducing inland saline groundwater intrusion and removing accumulated salts from the watershed. The proposed project is included as an implementation project in the Calleguas Creek Watershed Management Plan, 2008 Calleguas Creek Salts TMDL, and the Watershed Coalition of Ventura County Integrated Regional Water Management Plan 2006. These Plans found that the proposed project is consistent with State-wide objectives and the strategies and objectives of the Plans, through increasing water supply reliability, managing groundwater, water quality protection and improvement, preventing further migration of poor quality groundwater to areas not contaminated with salts, facilitate conjuctive use by removing poor quality groundwater and enabling recharge with higher quality storm water flows, desalination, and reducing use of imported water. The proposed project is also included in the 2007 Fox Canyon Groundwater Management Plan, and is considered a beneficial strategy to prevent water quality degradation in the North Pleasant Valley (NPV) Basin and reduce pumping within the largest pumping depression in the Basin.

The City provides drinking water to approximately 75 percent of City residents, which is obtained from local groundwater wells (about 50 percent) and imported water (about 50 percent). The quality of groundwater from two of the City's four wells (Wells A and B) has substantially deteriorated, primarily due to elevated levels of total dissolved solids (TDS), chloride, sulfate, iron and manganese. Due to these water quality issues, the City has placed one of these wells (Well A) on standby, and is blending water from the second well (Well B) with imported water from the Calleguas Municipal Water District to meet drinking water quality standards. Due to high salt concentrations in Wells A and B, the City has limited pumping to about 2,250 acre-feet/year from the NPV Basin and about 2,250 acre-feet/year from the Airport area wells.

The City is considering the construction and operation of a Groundwater Treatment Facility to increase groundwater pumping to 9,000 acre-feet/year in the NPV Basin and produce 7,500 acre-feet/year of treated water to be served to its customers. The treatment facility would be located in the vicinity of Wells A and B to remove TDS, chloride, sulfate, iron and manganese from groundwater produced by these and future well(s). Overall, the purpose of the project is to allow the City to utilize its full groundwater allocation, remove brackish groundwater from the NPV Basin, and reduce reliance on imported water.

A Groundwater Treatment Facility Feasibility Study was prepared by Black & Veatch in 2005, in association with Separation Processes, Inc., to determine the appropriate technology and basic configuration of treatment processes to be used. The Feasibility Study identified target concentrations of TDS, chloride, sulfate, iron and manganese to be met by the proposed Groundwater Treatment Facility. The target concentrations of TDS (330 mg/l) and chloride (80 mg/l) were set low, as these constituents would add to the mass loading in wastewater produced during use of supplied potable water. Wastewater is treated by the Camarillo Sanitary District and discharged to Conejo Creek (north of confluence with Calleguas Creek), which has strict limits on TDS, chloride and sulfate. The target concentrations for iron (0.3 mg/l) and manganese (0.05 mg/l) are the drinking water Secondary Maximum Contaminant Levels set in Title 22 of the California Code of Regulations.

A recommendation from the 2005 Feasibility Study was to pilot test various treatment technologies prior to designing the full scale facility. A year-long pilot test was conducted at Well A and included the evaluation of four treatment processes (distillation, ion exchange, electro-dialysis, reverse osmosis). The results of the pilot test indicated reverse osmosis (RO) to be the most cost effective treatment process. Iron and manganese are effectively removed by the RO process. However, if iron and/or manganese are present in groundwater in oxidized forms, fouling of the RO membranes may occur. Therefore, pre-treatment of the groundwater prior to reverse osmosis would be required. Based on the results of a pilot study at Well A, oxidation of the dissolved iron and manganese using sodium hypochlorite was selected at the preferred pre-treatment process. The oxidation process would convert the dissolved iron and manganese into a solid precipitate, and the resulting precipitate would be removed by granular media filters. The filters would be backwashed periodically to remove accumulated precipitate.

In addition to the treatment facility, two new wells are proposed, one located immediately north of the new Rancho Campana High School (opened in Fall 2015) and a second located just northeast of the Church of Latter Day Saints (see Figure 3-2). These new wells would produce brackish groundwater for treatment at the new Facility. Overall, approximately 3,000 gallons per minute (gpm) from Wells A and B, and 3,000 gpm (each) from two new brackish groundwater wells would be treated at the Facility for a total of 9,000 acre-feet/year.

### 1.4.2 Objectives

The basic objectives of the project include:

- Restore groundwater production from Wells A and B to past levels (about 3,000 gpm);

- Fully utilize the existing 4,500 acre-feet/year groundwater allocation from the Pleasant Valley Groundwater Basin;
- Address the plume of salty groundwater currently migrating into the central portion of the Pleasant Valley Groundwater Basin by increasing pumping in the salt mound area (NPV Basin) from 2,250 to 9,000 acre-feet/year;
- Reduce dependence of the City on imported potable water;
- Reduce salt concentrations in treated wastewater discharged to Conejo Creek; and
- Minimize capital costs by locating new facilities near existing water pipelines.

### 1.4.3 Benefits

Based on preliminary analysis conducted during project development, implementation of the proposed groundwater treatment facility would have the following benefits:

- The City of Camarillo can beneficially use up to 9,000 acre-feet/year of poor quality groundwater that would not otherwise be used;
- The proposed facility would remove up to 33 million tons of total dissolved solids per year from the Calleguas Creek watershed and facilitate meeting the Salts TDML requirements;
- Higher quality groundwater from the proposed facility would produce recycled water (treated wastewater) with lower salt concentrations which may provide more opportunities for use of this recycled water;
- Prevent further migration of the salts plume;
- Expand a local water supply that could be essential if imported water supplies are unavailable after a major earthquake;
- The facility would reduce imported water demands, and diversify water supplies in the region; and
- Reducing imported water demand may lower energy demand and greenhouse gas emissions associated with supplying water to the City.

## 1.5 ALTERNATIVES DEVELOPMENT

The proposed Groundwater Treatment Facility would serve existing Wells A and B as well as new brackish groundwater wells, and discharge to the Calleguas Regional Salinity Management Project pipeline. Therefore, an economically feasible project site must be located in close proximity to these facilities. Wells A and B are located adjacent to the northern City limit, and surrounding land uses within the City are residential and commercial, which cannot accommodate the proposed Groundwater Treatment Facility.

As part of EIR scoping, eight facility sites (numbered 1 through 8) were assessed in the Initial Study, including one site (Site 7) located within the City limits and seven within adjacent Ventura County. Subsequently, three facility sites were selected for analysis in this document to represent a range of feasible alternative sites. These sites include the preferred facility site (former Site 2, now referred to as the Proposed Action), Site 4 and Site 7.

## 1.6 SCOPE AND CONTENT

Based on an Initial Study prepared by the City, an Environmental Impact Report was deemed necessary due to agricultural conversion, annexation issues, and other potentially significant impacts on the environment. As such, an Environmental Impact Report was prepared for the project in accordance with CEQA. As a Supplemental EIR/EA, the scope of this document is limited to information necessary to make the Final EIR/EA adequate for the project as revised. As such, this Supplemental EIR/EA is focused on agriculture (revised well sites), water resources (revised groundwater modeling), noise (revised well sites), land use (annexation issues) and alternatives (revised well sites). Impacts associated with other issue areas discussed in the Final EIR/EA would not substantially change with the revised project, and are not repeated in this Supplemental EIR/EA (see Section 1.1.3).

## 1.7 RESPONSIBLE AND TRUSTEE AGENCIES

The *State CEQA Guidelines* define "lead", "responsible", and "trustee" agencies. The City, as a public agency, has the principal responsibility for carrying out and approving the proposed project. Therefore, the City is the lead agency. Responsible agencies are State and local public agencies which have discretionary approval power over the project. Annexation would be subject to approval by the Ventura County Agency Formation Commission (LAFCO). The parcel subdivision would be subject to the approval of Ventura County and in this case, both LAFCO and Ventura County are considered responsible agencies.

Responsible agencies for the proposed project may include LAFCO, Camarillo Sanitary District, Ventura County Resource Management Agency, Fox Canyon Groundwater Management Agency, California Department of Public Health and the Regional Water Quality Control Board (Los Angeles Region).

Trustee agencies refer to agencies having jurisdiction by law over the natural resources affected by a project. Based upon this definition, the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service, which have jurisdiction over biological resources that may be impacted by the proposed project, are trustee agencies.

## 1.8 PROJECT APPROVALS AND PERMITS

Project implementation may require the City to obtain permits and/or other forms of approval from Federal, State and local agencies. Depending on the alternative site selected, these agencies may include, but are not limited to, the following:

### 1.8.1 Federal Agencies:

- U.S. Fish and Wildlife Service - Section 7 Consultation under the Endangered Species Act (required for Federal funding).

### 1.8.2 State Agencies

- Department of Transportation – highway encroachment permit.
- Department of Fish and Wildlife – CEQA review.
- Regional Water Quality Control Board - National Pollution Discharge Elimination System (NPDES) groundwater dewatering permit and General Construction Activity Stormwater Permit.
- Department of Public Health – amended water supply permit.

### 1.8.3 Local Agencies

- Ventura Local Agency Formation Commission – annexation, municipal reorganization.
- Ventura County Resource Management Agency – parcel subdivision, conditional use permit.
- Ventura County Public Works Agency – Grading and road encroachment permits.
- Fox Canyon Groundwater Management Agency – revised groundwater allocation (if needed).
- Calleguas Municipal Water District – treated groundwater purchase agreement, agreement to utilize the Calleguas Salinity Management Project pipeline for brine disposal.

## 1.9 MITIGATION MONITORING PLAN

Pursuant to California Resources Code Section 21081.6, a Mitigation Monitoring Plan has been developed and was provided as Section 8.0 in the Final EIR/EA to ensure the implementation of mitigation measures necessary to reduce or eliminate identified significant impacts. The Plan was adopted by the City Council in conjunction with the findings required under CEQA, when the City Council certified the Final EIR/EA. The Mitigation Monitoring Plan has been revised (see Section 6.0) to be consistent with revised mitigation measures provided to avoid significant impacts to groundwater supplies.

## 1.10 PUBLIC REVIEW OF THE SUPPLEMENTAL EIR/EA

The Supplemental EIR/EA will be circulated for review by public agencies and interested members of the public for a minimum 30-day period.

## 1.11 CERTIFICATION OF THE SUPPLEMENTAL EIR/EA

A public hearing will be held before the City Council at the end of the 30 day review period to receive comments regarding the adequacy of the Supplemental EIR/EA. Following the public hearing, the Supplemental EIR/EA will be finalized and will include all comment letters and responses to comments. The City will prepare responses to all comments on the adequacy of the Supplemental EIR/EA received during the review period.

# 2.0 SUMMARY

This section has been prepared in accordance with the CEQA Guidelines, and is divided into two components. The first summarizes the characteristics of the proposed project and alternatives, and the second identifies environmental impacts, mitigation measures and residual impacts. In addition, the project alternatives are summarized.

## 2.1 PROJECT SYNOPSIS

### 2.1.1 Lead Agency

City of Camarillo
601 Carmen Drive
Camarillo, California 93010

Contact: Lucia M. McGovern
(805) 388-5334

### 2.1.2 Project Development

The proposed Groundwater Treatment Facility would serve existing Wells A and B as well as new brackish groundwater wells (up to 9,000 acre-feet/year in total), and discharge to the Calleguas Municipal Water District's Regional Salinity Management Project pipeline. Therefore, an economically feasible project site must be located in close proximity to these facilities. Wells A and B are located adjacent to the northern City limit, and surrounding land uses within the City are residential and commercial, which cannot accommodate the proposed Groundwater Treatment Facility. As part of EIR scoping, eight facility sites (numbered 1 through 8) were assessed in the Initial Study, including one site (Site 7) located within the City limits and seven within adjacent Ventura County. Subsequently, three facility sites were selected for analysis in this document to represent a range of feasible alternative sites. These sites include the preferred facility site (former Site 2, now referred to as the Proposed Action), Site 4 and Site 7. The environmental impacts of these alternatives are analyzed at an equal level of detail in compliance with NEPA, as the City is pursuing Federal funding.

### 2.1.3 Location

The Proposed Action facility site (former Site 2), the Site 4 Alternative facility site and two proposed well sites are located adjacent to the City limits, west of the Las Posas Road/Lewis Road Intersection (see Figure 3-1). The Site 7 Alternative facility site is located within the City limits at the northeastern corner of the Upland Road/Lewis Road intersection.

### 2.1.4 Treated Groundwater Distribution

Approximately 4,500 to 6,000 acre-feet/year of the treated groundwater produced by the project would be provided to the City of Camarillo's existing service area. The balance of the treated groundwater would be sold to the Calleguas Municipal Water District for distribution within their existing service area.

### 2.1.5 Municipal Reorganization

The Proposed Action facility site and two well sites are located outside the City boundary and the City's Sphere of Influence, but within the City's Area of Interest (see Figure 3-2). As the preferred facility site is located outside the City's municipal boundaries and would be served by the Camarillo Sanitary District, the City would request approval from LAFCO for reorganization. The two well sites would not require service from public agencies and would not be annexed. The reorganization proposal would include:

- An amendment to the City's Sphere of Influence boundaries to include the facility site;
- Parcel subdivision to create a legal lot for the facility site;
- Annexation of the facility site to the City;
- An amendment to the Camarillo Sanitary District's Sphere of Influence boundary to include the facility site;
- Annexation of the facility site to the Camarillo Sanitary District;
- Detachment of the facility site from the Ventura County Resource Conservation District, Ventura County Waterworks District No. 19, County Service Area no. 32 (individual sewage disposal), County Service Area no. 33 (recreation and park services) and Gold Coast Transit District; and
- The City of Camarillo would pre-zone the facility site to ensure General Plan consistency.

The City would pre-zone the facility site to R-E (Rural Exclusive) and issue a conditional use permit in accordance with Chapter 19.62 of the City's Municipal Code to reflect a "Quasi Public/Utility" land use designation. A subdivision to create a legal lot for the facility site would be requested from the Ventura County Resource Management Agency.

### 2.1.6 Project Components

#### 2.1.6.1 Proposed Action

The Proposed Action facility site (former Site 2) would be approximately 4.0 acres in area, including a 50-foot buffer adjacent to agricultural areas. The proposed well sites would be approximately 0.25 acres for the northern site and 0.20 acres for the southern site, including a pull-through driveway for chemical delivery and service trucks.

**Groundwater Treatment Facility.** The proposed facility would have the capacity to treat 9,000 acre-feet/year of groundwater (which would include groundwater currently pumped from Well B), and provide 7,500 acre-feet/year of RO-treated water to the City of Camarillo's customers. A preliminary layout of the Groundwater Treatment Facility is provided as Figure 3-3. A single administration building approximately 3,250 square feet in size would include office space, control room, electrical room, and storage area. Parking and driveway space would be provided at the administration building for operations and maintenance personnel, delivery of water treatment chemicals and supplies, and for maintenance activities (e.g. RO membrane replacement) at the facility.

A wall (approximately 80 feet long by 20 feet high) would be constructed near the southern boundary of the facility to screen views from Antonio Avenue, and attenuate noise. Groundwater would be pre-treated using sodium hypochlorite to convert dissolved iron and manganese into a solid precipitate, which would be removed by granular media (green sand) filters. The filters would be backwashed periodically to remove accumulated precipitate. Solids removed from the wash water (primarily iron and manganese) would be disposed of as a sludge to the local sewer. A 100,000-gallon backwash supply tank would provide water storage needed for filter backwashing.

The RO process would be designed for a groundwater feed of 6,000 gallons per minute (gpm), and produce approximately 4,700 gpm of treated water using four RO trains (three operating, one standby). The RO process would be used to lower the total dissolved solids (TDS) content of the groundwater supply to make it suitable for potable use.

Sodium bisulfite, sulfuric acid and anti-scalant would be injected into the feed water upstream of the RO trains to remove residual free chlorine, adjust pH and minimize membrane scaling. A flush system with 3,800 gallon tank and clean-in-place system with 4,500 gallon tank would be provided to clean and maintain the RO membranes. The RO facility would be covered by a metal canopy to protect it from sun and rain.

Following RO treatment, the treated water would be decarbonated to remove carbon dioxide. Approximately 5 percent of the RO influent flow would be bypassed and blended with the treated water. The RO-treated water would be disinfected with aqueous ammonia and sodium hypochlorite. The resulting treated water would meet all drinking water standards, with an estimated concentration of less than 0.1 mg/l iron, less than 0.03 mg/l manganese, 196 mg/l TDS, 20 mg/l chloride and 70 mg/l sulfate.

The RO process would generate up to 2.1 million gallons per day of brine (typically 850 to 1,450 gallons/minute), with a TDS concentration of about 9,000 mg/l. The brine would be discharged to the Calleguas Regional Salinity Management Project pipeline at Lewis Road (see Figure 3-2), which would transport the brine stream to an existing ocean outfall at Port Hueneme.

Treated, blended (finished) water would be collected into a 43,000-gallon pump well located below the finished water pump station. The pumps would be housed in sound enclosures for noise control. The pump station would have the capability to pump all of the water produced either to the City's Zone 1 or Zone 2 distribution system or to a combination of the two zones.

Chemicals associated with water treatment would be stored on-site (30-day supply) and include sodium hydroxide, sodium hypochlorite, aqueous ammonia, sodium bisulfite, sulfuric acid, and anti-scalant. Chemical storage tanks and feed equipment would be under a 4,950 square foot canopy system to protect them from the sun and rain.

Photo-voltaic solar panels would be mounted on the roof of the administration building, and provide about 260 to 390 kilowatt-hours per day. This would offset about one percent of the estimated energy consumption of the project (up to 28,000 kilowatt-hours per day).

**New Wells**. The City proposes to install two new wells to provide about 3,000 gpm of brackish groundwater. The proposed northern well site is located in a 0.25-acre agricultural area immediately north of the new Rancho Campana High School, while the southern well site is located immediately east of the Church of Latter Day Saints and south of the High School (see Figure 3-2). The well sites would be accessed using existing farm roads. Brackish groundwater produced by these new wells would be treated at the facility, and would serve to provide an additional source of potable water, and remove salts from the groundwater basin. It is anticipated that the well sites would include the following components:

- Wellhead and enclosure;
- Submersible pumps; and
- Piping and electrical gear.

**Pipelines**. New pipelines would be required to:

- Connect existing Wells A and B to the inlet of the proposed Groundwater Treatment Facility;
- Connect both new wells to the inlet of the proposed Groundwater Treatment Facility;
- Connect the waste (brine) stream from the RO process to the Regional Salinity Management Project pipeline;
- Connect the wash-water solids settling system to a local sewer; and
- Connect the outlet of the proposed Groundwater Treatment Facility to existing Zone 1 and Zone 2 water service pipelines.

The well feed pipelines would be pressurized and have a diameter of approximately 12 inches. The brine stream pipeline would be approximately 12 inches in diameter and pressurized. Pipelines would be mostly located along roadways within the public right-of-way. However, the well feed pipelines from the proposed wells would be located within agricultural lands (see Figure 3-2).

**Access, Lighting and Landscaping**. An access road (approximately 150 feet long) would be constructed from Antonio Avenue, and extend north to the facility site. The access road alignment would be designed to avoid fragmentation of agricultural land between the facility site and Antonio Road. The access road would be approximately 20 feet wide, paved with asphalt concrete and maintained by the City. An internal access road would be constructed within the facility to provide access to the various components. Landscaping (tall shrubs and/or small trees) would be provided along the southern and western perimeter of the facility to screen views from Antonio Avenue.

The proposed northern well site would be accessed from Antonio Avenue using existing unpaved agricultural roads. The proposed southern well site would be accessed from Las Posas Road using the existing unpaved agricultural road. These agricultural roads would be upgraded to serve the well sites through excavation, compaction and surfacing with road base or recycled asphalt.

The facility would be lighted to facilitate 24 hour/day operations; however, lighting would be shielded and directed downward to the illuminate project facilities. The administration building would be lighted 24 hours per day, but would be provided with some type of window covering.

**Emergency Power**. An emergency generator would be provided at the Groundwater Treatment Facility site to ensure a reliable source of power to the high pressure pumps and other water treatment equipment. The emergency generator would only be used during power outages, and for short periods during maintenance periods. The generator would produce up to 2,000 kilowatt-hours of electricity and would be powered by a diesel engine. The generator would include an integral diesel fuel tank with secondary containment.

**Operation**. The Groundwater Treatment Facility and associated wells would be operated 24 hours per day with a crew of 2 to 3, and employ up to 9 persons (three 8-hour shifts). However, the night shift may consist of a single person monitoring the facility remotely. Existing City employees would provide a portion of project staffing. The Groundwater Treatment Facility would include a restroom, and wastewater would be piped to the nearest sewer served by the Camarillo Sanitary District. The facility would be served potable water by the City's Water Division.

### 2.1.7 Alternatives Considered

Three facility sites were selected for analysis in this document to represent a range of feasible alternative sites. These sites include the preferred facility site (former Site 2, now referred to as the Proposed Action), Site 4 and Site 7. The environmental impacts of these alternatives and the No Action/No Project Alternative are analyzed at an equal level of detail in compliance with NEPA, as the City is pursuing Federal funding.

In addition, several well pumping rates were considered to represent a range of groundwater draw-down rates. The relative impacts of these alternative pumping rates were addressed in the Final EIR/EA and have not substantially changed. Therefore, these analyses are not included in this Supplemental EIR/EA.

#### 2.1.7.1 No Action/No Project Alternative

This alternative would consist of continuing to utilize existing water sources to supply the City of Camarillo, including:

- Pumping about 2,250 acre-feet/year of groundwater from the NPV Basin (Wells A and B) and about 2,250 acre-feet per year from the central portion of the Basin (Well D and/or Airport #3).
- Blending with imported water provided by the Calleguas Municipal Water District to meet water quality requirements for potable water.

Surface water in Arroyo Las Posas would continue to infiltrate into the NPV Basin, filling it with poor quality water. In the long-term as groundwater quality in the NPV Basin continues to decline, the City anticipates terminating pumping from Wells A and B, and increasing pumping from the central portion of the Pleasant Valley Basin (Airport area) up to the full allocation (4,500 acre-feet/year).

#### 2.1.7.2 Site 4 Alternative

This Alternative would include the same facilities as the Proposed Action; however, the groundwater treatment facility would be located at a different site, north of the Camarillo Library and new Rancho Campana High School (see Figure 4-1). The southern well site would be the same, but the northern well would be incorporated into the groundwater treatment facility. Otherwise, the Site 4 Alternative facility would be same as the Proposed Action, including a 50 foot-wide landscaped buffer around the west, north and east boundary and a wall along the southern boundary.

In addition, the pipeline tie-in locations would be same as the Proposed Action. However, the pipeline alignments would differ due to the changed facility location. A new 2,400 foot-long, 30 foot-wide access road/pipeline corridor would be established from Antonio Road east to the northern well site and facility site. The access road would be approximately 20 feet wide and paved with asphalt concrete. In addition, an existing farm road would be widened to the provide access to the southern well site from Las Posas Road.

#### 2.1.7.3 Site 7 Alternative

This Alternative would include the same facilities as the Proposed Action; however, the groundwater treatment facility would be located at a different site, at the northeast corner of the Lewis Road/Upland Road intersection (see Figure 4-2). The Site 7 Alternative facility would be same as the Proposed Action, including a 50 foot-wide landscaped buffer around the perimeter. Both well sites would also be the same as the Proposed Action.

The pipeline tie-in locations would be same as the Proposed Action, except the Zone 2 water distribution system tie-in would occur near the Las Posas Road/Ponderosa Drive intersection. However, the pipeline alignments would differ due to the changed facility location. Access to the facility site would be provided to the adjacent Upland Road, and would be approximately 20 feet wide and paved with asphalt concrete. In addition, an existing farm road would be widened to the provide access to the southern well site from Las Posas Road.

## 2.2 AREAS OF KNOWN CONTROVERSY

The City is not aware of any controversy involving the proposed project. However, the Fox Canyon Groundwater Management Agency has some concerns about the City pumping groundwater from the Pleasant Valley Groundwater Basin beyond their current allocation, as the project entails increasing groundwater pumping from 2,250 to 9,000 acre-feet per year in the northern portion of the Basin. In addition, the Ventura County LAFCO has made it clear that the project must meet their standards regarding boundaries, and agricultural and open space preservation before municipal reorganization can be approved.

## 2.3 SUMMARY OF ENVIRONMENTAL IMPACTS, MITIGATION MEASURES AND ALTERNATIVES

This section identifies two types of project impacts:

### 2.3.1 Significant, Unavoidable Adverse Impacts

These are impacts for which specific economic, social or other considerations make infeasible the mitigation measures or project alternatives identified in the EIR/EA. Should the Camarillo City Council decide to approve the project, a Statement of Overriding Considerations must be adopted for any significant unavoidable adverse impacts. The Final EIR/EA identified short-term noise impacts associated with well drilling at the western well site as a significant, unavoidable adverse impact. The well site locations have been revised since the Final EIR/EA was certified, such that noise-sensitive land uses are located further from the well sites. Therefore, well drilling noise impacts can be mitigated below the level of significance. The project as revised would not result in any significant, unavoidable adverse impacts.

### 2.3.2 Significant Adverse Impacts

These are significant impacts that can be feasibly mitigated to less than significant levels. Therefore, by definition, residual impacts would be less than significant. Significant adverse impacts associated with the Proposed Action and alternatives are summarized in Table 2-1. Note that Table 2-1 includes a summary of all significant impacts, including those that have not changed since the Final EIR/EA was certified.

## 2.4 COMPARISON OF ALTERNATIVES

### 2.4.1 No Action/No Project Alternative

This alternative would consist of continuing the operation of existing facilities, including blending groundwater from Wells A and B with imported water for delivery to City customers. Local groundwater quality would continue to be impaired for salts and the existing disparity between salt inputs and outputs would allow the accumulation of salts in the watershed. In the absence of the Proposed Action, percolation of surface flows in Arroyo Las Posas would continue to degrade groundwater quality, and allow high salt groundwater to contaminate existing wells located in the central portion of the Pleasant Valley Groundwater Basin and ultimately render local groundwater unsuitable for agricultural purposes.

The City of Camarillo's 2010 Urban Water Management Plan includes treated groundwater provided by the Proposed Action as an important water supply for City residents. The No Action/No Project Alternative would deprive the City of this water supply.

### 2.4.2 Site 4 Alternative

The environmental impacts of the Site 4 Alternative would have the following substantial differences as compared to the Proposed Action:

- Conversion of Prime farmland would be greater than the Proposed Action and would exceed the 5 acre significance threshold;
- Flood-related impacts associated with the Proposed Action facility site would be avoided; and
- Potentially significant operation-related nighttime noise impacts associated with the Proposed Action facility site would be avoided.

### 2.4.3 Site 7 Alternative

The environmental impacts of the Site 7 Alternative would have the following substantial differences as compared to the Proposed Action:

- Unlike the Proposed Action, annexing the proposed facility site would likely make the remaining parcel unsuitable for continued agricultural production.

## 2.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Section 15126.6(e)(2) of the State CEQA Guidelines requires an environmentally superior alternative be identified, if the no project alternative is the environmentally superior alternative. Due to groundwater impacts associated with the continued accumulation of poor quality groundwater in the NPV Basin, the No Action/No Project Alternative is not considered the environmentally superior alternative. The Proposed Action is considered the environmentally superior alternative as it would have similar or lesser impacts as the alternatives considered (see Table 2-2). Mitigation measures provided would avoid significant cumulative groundwater quantity and subsidence impacts. The Alternatives are compared as to their relative environmental impacts and ability to meet the project objectives. Objectives of the project are:

1. Restore groundwater production from Wells A and B to past levels (about 3,000 gpm);
2. Fully utilize the existing groundwater allocation from the Pleasant Valley Groundwater Basin;
3. Address the plume of salty groundwater currently migrating into the central portion of the Pleasant Valley Groundwater Basin by increasing pumping in the salt mound (northern Basin) area from 2,250 to 9,000 acre-feet/year;
4. Reduce dependence of the City on imported potable water;
5. Reduce salt concentrations in treated wastewater discharged to Conejo Creek; and
6. Minimize capital costs by locating new facilities near existing water pipelines.

### 2.5.1 No Action/No Project Alternative

This alternative would not meet any of the project objectives. Groundwater of the NPV Basin would be ultimately rendered unsuitable for agricultural purposes. In addition, the City's water supply may be adversely affected as treated groundwater is an important part of future planning.

### 2.5.2 Site 4 Alternative

This alternative would meet five of the six basic project objectives. The Site 4 Alternative facility site would not be located adjacent to existing wells and the total pipeline length would be greater than the Proposed Action. This alternative is not considered the environmentally superior alternative because it would result in greater impacts to agriculture, air quality, and greenhouse gas emissions.

### 2.5.3 Site 7 Alternative

This alternative would meet five of the six basic project objectives. The Site 7 Alternative facility site would not be located adjacent to existing wells and the total pipeline length would be greater than the Proposed Action. This alternative is not considered the environmentally superior alternative because it would result in greater impacts to aesthetics, agriculture, air quality, cultural resources, and greenhouse gas emissions.

## Table 2-1. Summary of Significant Adverse Environmental Impacts and Mitigation Measures

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| **IMPACTS** | **MITIGATION MEASURES** | **IMPACTS** | **MITIGATION MEASURES** |
| ***AGRICULTURAL AND FORESTRY RESOURCES*** | | | |
| No significant impacts were identified. | Mitigation is not required. | **Site 4 Alternative**<br>This Alternative would result in the conversion of approximately 5.84 acres of Prime farmland, which would exceed the 5 acre adopted threshold for Prime farmland; therefore, farmland conversion impacts are considered significant. | **Site 4 Alternative**<br>The following mitigation measures focus on reducing the Prime farmland take below 5 acres.<br>• Design the groundwater treatment facility to reduce the site area below 3.9 acres;<br>• Reduce the length of the access road/pipeline corridor by accessing the site from Somis Road; and<br>• Fully bury pipelines between the facility and Antonio Road to prevent farmland take. |
| | | **Site 7 Alternative**<br>This Alternative would involve the conversion of approximately 4.80 acres of important farmlands (facility site, well access, well sites). Converting approximately 4.0 acres (facility site) of a 5.77 acre parcel (APN 163-0-071-250) to a non-agricultural use would likely make the remaining parcel unsuitable for continued agricultural production. This impact is considered potentially significant. | **Site 7 Alternative**<br>Construction of a groundwater treatment facility at this site would likely render the remaining parcel unsuitable for continued agricultural production. Therefore, the City shall purchase the entire 5.77 acre parcel (APN 163-0-071-250). |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| IMPACTS | MITIGATION MEASURES | IMPACTS | MITIGATION MEASURES |
| ***CULTURAL RESOURCES*** | | | |
| Based on the records search and archeological field survey results, the Proposed Action would not adversely impact any known prehistoric or historic archaeological resource. The facility and well sites have been cultivated for at least 100 years and have been extensively ripped, disked and plowed; therefore, no intact deposits are expected to occur within the top two feet of soil. However, as the facility site is located within an active depositional setting, there is a possibility that buried archaeological materials may be present, which could be potentially impacted by project implementation. Such impacts are considered potentially significant. | To mitigate impacts to any buried, intact and potentially significant archaeological resources, and to address the Chumash community's concerns, the following measures should be fully implemented during construction.<br>• An archaeologist and Chumash representative shall be retained to monitor all project-related earth disturbances that extend below 2 feet from the ground surface, within the facility site and the proposed well sites, and pipeline trenches located within agricultural fields.<br>• At the commencement of project construction, the archaeological monitor shall give all workers associated with earth-disturbing procedures an orientation regarding the probability of exposing cultural resources and directions as to what steps are to be taken if a find is encountered.<br>• The archaeologist shall have the authority to temporarily halt or redirect project construction in the event that potentially significant cultural resources are exposed. Based on monitoring observations and the actual extent of project disturbance, the lead archaeologist shall have the authority to refine the monitoring requirements as appropriate (i.e., change to spot checks or halt monitoring) in consultation with the City.<br>• A monitoring report shall be prepared upon completion of construction and provided to the City and the SCCIC.<br>• In the unexpected event that archaeological resources are exposed during project construction, all earth disturbing work within the vicinity of the find must be temporarily suspended until a qualified archaeologist has evaluated the nature and significance of the find. The City shall be notified of any such find. A Chumash representative should monitor any archaeological field work associated with Native American materials.<br>• If human remains are unearthed, State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission. The City shall be notified of any such find. | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>The proposed facility site has not been surveyed by an archeologist. However, the record search did not identify any cultural resources at the facility site. Similar to the Proposed Action, there is a possibility that buried archaeological materials may be present, which could be potentially impacted by project implementation. Such impacts are considered potentially significant. | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action, but also to include:<br>The facility site shall be subject to a Phase 1 Archaeological Investigation as early in the planning process as possible, and the facility design shall be modified to avoid any intact cultural resources to the extent feasible. |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| IMPACTS | MITIGATION MEASURES | IMPACTS | MITIGATION MEASURES |
| ***HAZARDOUS MATERIALS*** | | | |
| The Proposed Action includes excavation within areas that have been in agricultural production for over 60 years. It is possible that soil contaminated with hazardous materials such as petroleum hydrocarbons or residual concentrations of organo-chlorine pesticides may be encountered, which may result in exposure of construction workers and the public. Elevated concentrations of now-banned historically-applied pesticides such as DDT are known to occur in soils of Pleasant Valley and may occur at the proposed facility site and/or pipeline alignments in agricultural areas. Public or worker exposure of pesticides or other hazardous materials in soils during project excavation is considered a potentially significant impact. | Soil samples shall be obtained in all previously cultivated areas affected by project excavation, prior to project-related excavation. Pipeline alignments located on farmlands shall be sampled every 1,000 feet. The soil samples shall be collected at a depth of one-foot and three-feet. The number and depth of samples at each site may be adjusted based on field conditions, anticipated depth of soil disturbance and preliminary analytical results.<br><br>Samples shall be analyzed for organo-chlorine pesticides and total petroleum hydrocarbons according to U.S. EPA methods acceptable to the California Department of Toxic Substances Control. Soils with contaminant concentrations above the applicable Preliminary Remediation Goals established by U.S. EPA for non-residential land uses shall be considered contaminated and segregated in a stockpile. Contaminated soil shall be covered with impervious materials to prevent wind erosion and exposure to rainfall and storm run-off. These materials may be used as backfill, provided they are covered with at least one foot of non-contaminated soil or asphalt concrete.<br><br>When excavated, contaminated soil shall be handled by workers properly trained in accordance with the requirements of the California Occupational Safety and Health Administration (Cal OSHA). A Health and Safety Plan shall be developed and implemented by qualified individuals to minimize exposure of workers. Contaminated soils should be treated as hazardous materials and proper precautions taken to prevent inhalation (dust control) and dermal (skin) contact by construction workers. | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| IMPACTS | MITIGATION MEASURES | IMPACTS | MITIGATION MEASURES |
| ***WATER RESOURCES*** | | | |
| **Construction Stormwater**. Suspended sediment generated by construction activity adjacent to surface waters and storm run-off would result in an increase in turbidity that would likely exceed water quality objectives. The use of concrete near surface waters (trench slurry backfill) may result in discharge of concrete residue or concrete-contaminated run-off to surface waters. Such an event would likely cause an exceedance of the pH water quality objective. Overall, construction activities may result in exceedances of water quality objectives, which is considered a significant water quality impact. | The following measures shall be included in the Stormwater Pollution Prevention Plan and implemented by the construction contractor in coordination with the City to minimize erosion and siltation of surface waters, and reduce the potential for hydrocarbon discharge from construction equipment.<br>• De-watering shall be conducted for excavation below the water table and include discharge to a sediment basin (or equivalent) prior to entering storm drains, creeks or other surface water;<br>• Heavy equipment shall be fueled in a designated area away from creeks, storm drains and culverts. This designated area shall include a drain pan or drop cloth and absorbent materials to clean up spills;<br>• Vehicles and equipment shall be maintained properly to prevent leakage. If maintenance must occur onsite, a designated area away from creeks, storm drains and culverts shall be used. This designated area shall include a drain pan or drop cloth and adsorbent materials to clean up spills;<br>• Vegetation adjacent to construction activities shall be preserved when feasible to minimize erosion;<br>• Adjacent to drainages, concrete shall not be applied during or immediately prior to periods of precipitation; and<br>• Concrete application shall be limited to areas isolated from surface water, and any groundwater affected by concrete shall not be discharged to surface waters. | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| **IMPACTS** | **MITIGATION MEASURES** | **IMPACTS** | **MITIGATION MEASURES** |
| ***WATER RESOURCES (Continued)*** | | | |
| **Cumulative Groundwater Quantity**. Groundwater modeling indicates baseline groundwater elevations would drop after the Moorpark Desalter begins operation), and cumulative pumping would reduce groundwater levels, potentially below historic levels. Near proposed pumping wells, the incremental cumulative effect of the Proposed Action would be greatest, as groundwater elevation reductions would be 250 feet (25' reduced to -225') over 25 years as compared to baseline conditions.<br><br>The potential exists to interfere with groundwater production in nearby wells (such as 2N/20W-19E1) by drawing down groundwater elevations below historic levels, potentially increasing pumping costs (i.e., electrical consumption) and requiring well modifications. This cumulative impact is considered potentially significant if not mitigated. | **Groundwater Elevations: NPV Basin Monitoring.** Four monitoring wells (three new and one existing) shall be used to establish baseline information, track the progress of the project as it pulls salts from the basin, and identify any conflicts with existing wells. Recommended general locations (A, B and C) of three new down-gradient monitoring wells are provided in Figure 5.2-7. The precise locations of the new monitoring wells shall be identified by a qualified hydrogeologist. The monitoring wells shall be in operation prior to project-related groundwater pumping to allow baseline groundwater data to be collected. A nearby inactive well (2N/20W-20E2) shall be used as an up-gradient monitoring well (see Location D in Figure 5.2-7).<br><br>The monitoring wells shall be completed at multiple depths (e.g., typical U.S. Geological Survey monitoring well), with each sampled zone sealed from the rest of the well. Recommended monitoring well depths and screen intervals are provided for each of the four areas (A, B, C and D) shown in Figure 5.2-7 in Table 9 of Appendix A. The actual screened intervals shall be determined after a geophysical log is run between the time the well is drilled and it is cased. Each screened interval shall be continuously gravel-packed from 10 to 20 feet below the screen to 10 to 20 feet above the screen. A bentonite seal shall be placed at the bottom of the hole and between each screened interval.<br><br>The monitoring wells shall be designed such that a transducer can be installed and a submersible pump temporarily lowered in each well for sampling. A transducer/data logger shall be installed in each screened casing, with data downloaded periodically. Table 5.2-7 lists data to be collected at each NPV monitoring well.<br><br>**Groundwater Elevations: Project Area Monitoring.** The groundwater elevation and water quality of three existing groundwater production wells near the project wells shall also be monitored, including a Pleasant Valley Mutual Water Company well (2N/20W-19M5 or -19E1), a Bell Ranch well (2N/20W-19B1), and a third well located further east (to be identified). Table 5.2-8 lists data to be collected at each project area monitoring well.<br><br>**Groundwater Elevations: Project Extraction Well Monitoring.** The groundwater elevation and water quality of project extraction wells shall also be monitored. Table 5.2-9 lists data to be collected at each project extraction well. | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| **IMPACTS** | **MITIGATION MEASURES** | **IMPACTS** | **MITIGATION MEASURES** |
| ***WATER RESOURCES (Continued)*** | | | |
| **Cumulative Groundwater Quantity** (continued) | **Groundwater Elevations: Regional Monitoring.** Regional monitoring shall be conducted to detect regional trends (e.g., drought conditions, regional water quality changes) that may affect groundwater conditions at wells affected by the Proposed Action. Well 2N/21W-35M2 shall be used for regional monitoring. Data to be collected includes semi-annual grab samples for groundwater level and conductivity (each zone).<br><br>**Groundwater Elevation Contingency Measures.** These measures are based on numerical values (triggers) at which action would be taken to avoid approaching historic low groundwater elevations. When static (non-pumping) groundwater elevations reach 126 feet below mean sea level in a well monitored in the NPV Basin, reductions in pumping from project extraction wells would be implemented. The amount of pumping reduction shall be based on water elevations observed at the extraction wells in the sequence indicated in Table 5.2-10. If water levels recover, pumping can then be increased using the same sequence. Groundwater modeling indicates implementation of these contingency measures would avoid reducing groundwater elevations below historic lows under cumulative conditions (Bachman, 2016).<br><br>**Contingency Plan for Seawater Intrusion.** Although significant impacts related to seawater intrusion are not anticipated, these contingency measures are provided to address unforeseen conditions that may cause extension of the pumping depression towards the project area. These contingency measures are based on maintaining the groundwater gradient between the project and the pumping depression associated with seawater intrusion. The critical area for this gradient is where there is currently a sharp groundwater gradient towards the pumping depression which prevents the pumping depression from expanding eastward and increasing the size and depth of the depression. To calculate this gradient, two wells were selected – one an existing USGS monitoring well (2N/21W-34G4) and the other a new monitoring well to be constructed as part of the project (at Location B, see Figure 5.2-7). Pumping reductions would be required if the groundwater elevation in the USGS monitoring well is higher that the project monitoring well.<br><br>The contingency action would be similar to those for groundwater elevations; systematic reduction in project pumping until the groundwater gradient is reversed (groundwater elevation in the USGS monitoring well is lower than in the project monitoring well). Project pumping would be re-adjusted so that the project well closest to the affected area would reduce pumping by 10% for a period of six months. If these actions do not resolve the problem within a six-month period (i.e., prevent further drops in groundwater elevations), then pumping from this project well would be reduced an additional 10% (for a total reduction of 20%) for a period of six months and further evaluated. This step-wise reduction every six months would continue until the gradient is restored. | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| **IMPACTS** | **MITIGATION MEASURES** | **IMPACTS** | **MITIGATION MEASURES** |
| ***WATER RESOURCES (Continued)*** | | | |
| **Cumulative Groundwater Quantity** (continued) | **Annual Monitoring Report**. An Annual Report shall be prepared summarizing data collected each calendar year and submitted to FCGMA and interested parties by April 1. The Annual Report shall include the following information:<br>• A summary of project groundwater pumping and treatment rates.<br>• Groundwater elevation and water quality data analyses obtained from extraction wells, monitoring wells, wells near project area, the regional monitoring well, conclusions formed from the analyses, and recommendations for future operations and monitoring.<br>• Summary of observed changes in the location and elevation of the salt plume, using information obtained from the extraction wells and monitoring wells.<br>• Subsidence monitoring including results of any regional land survey program.<br>• Regional maps of groundwater elevation contours to document any effects of the project on the wider Pleasant Valley basin.<br>• Summary of any contingency measures implemented and observed effect on groundwater elevations.<br>In addition to the annual reporting, the FCGMA shall be notified within one month of any unexpected or critical results from project monitoring. Examples of such results include rapidly dropping water levels, approach of target groundwater elevations, and unexpected water quality analyses. | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| **IMPACTS** | **MITIGATION MEASURES** | **IMPACTS** | **MITIGATION MEASURES** |
| ***WATER RESOURCES (Continued)*** | | | |
| **Cumulative Subsidence**. Land subsidence can occur when groundwater pumping causes groundwater elevations to drop sufficiently to dewater sediments in the basin or to create pressure gradients where water flows out of the sediments. It is the fine-grained sediments (e.g., mudstone) which may be present both within the aquifers and as low-permeability layers between the aquifers that cause land subsidence, water lost from these sediments is permanent and causes compaction of the material. In contrast, water lost from coarser-grained sediments (e.g., sand and gravel) causes minimal compaction and water can re-enter the pore spaces when water levels rise. Repeated cycling of groundwater elevations caused by drought/wet periods or pumping/recharge periods is less likely to cause further subsidence as long as groundwater elevations remain above historical lows. Since the Proposed Action may incrementally contribute to reducing groundwater elevations below historic levels, subsidence may occur. This cumulative impact is considered potentially significant if not mitigated.<br><br>**Flooding.** The proposed Groundwater Treatment Facility would be occupied by operators. The Proposed Action facility site is partially located within a Special Flood Hazard Area (AO, subject to inundation by a 1% probability storm), and partially within an Other Flood Area (X). Therefore, the facility site and on-site operators may be adversely affected by flooding. Flood-related impacts are considered potentially significant. | **Subsidence**. The above groundwater elevation contingency measures would prevent groundwater elevations from approaching historic levels, such that subsidence would be avoided. However, the City shall monitor surface elevations to detect subsidence and ensure the contingency measures are effective.<br><br>The location and elevation of the project extraction wells, new and existing monitoring wells shall be surveyed to serve as a baseline to detect subsidence. To ensure detection of any subsidence, both the wellhead and the nearby ground surface shall be surveyed. The monitoring wells and adjacent ground surfaces shall be resurveyed every 10 years to detect any changes in elevation related to subsidence. The regional monitoring well (2N/21W-35M2) shall be re-surveyed every 5 years to detect regional trends.<br><br>**Flooding.** Flood walls shall be designed and constructed around the facility perimeter to minimize the potential for property damage and loss of human life during a 100-year storm event. | **Site 4 Alternative**<br><br>**Cumulative Subsidence**. Same as Proposed Action<br><br>**Flooding**. The Site 4 Alternative facility site and well site would not be located within the 100-year floodplain, and would not be adversely affected by flooding.<br><br>**Site 7 Alternative**<br><br>**Cumulative Subsidence**. Same as Proposed Action<br><br>**Flooding**. The Site 7 Alternative facility site would be located within an Other Flood Area (X), and may become inundated in a 100-year storm event. Therefore, the facility site and on-site operators may be adversely affected by flooding. Flood-related impacts are considered potentially significant. | **Site 4 Alternative**<br><br>**Cumulative Subsidence**. Same as Proposed Action<br><br>**Flooding**. Mitigation is not required.<br><br>**Site 7 Alternative**<br><br>**Cumulative Subsidence**. Same as Proposed Action<br><br>**Flooding**. Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| **IMPACTS** | **MITIGATION MEASURES** | **IMPACTS** | **MITIGATION MEASURES** |
| ***NOISE*** | | | |
| Noise generated by well drilling at the proposed southern well site would exceed the 45 dBA nighttime noise standard at the nearest residence (Placita San Leandro) and numerous residences nearby. This impact is considered potentially significant. | The following measures are provided to minimize nighttime noise impacts associated with well drilling.<br>• Avoid well drilling between 9 p.m. and 7 a.m., if feasible;<br>• Provide at least 7 days' notice of nighttime well drilling activities to all residents located within 1,000 feet of the well site; and<br>• Install and maintain temporary noise barriers around the well drilling site during all drilling operations. | **Site 4 Alternative**<br>Same as the Proposed Action, considered potentially significant<br><br>**Site 7 Alternative**<br>Same as the Proposed Action, considered potentially significant. | **Site 4 Alternative**<br>Same as the Proposed Action<br><br>**Site 7 Alternative**<br>Same as the Proposed Action |
| The proposed groundwater treatment facility would include RO feed pumps, decarbonator blowers, a finished water pumping station and other mechanical devices that would generate noise. These components would be enclosed in structures and/or sound enclosures which would attenuate noise to comply with the City's daytime 55 dBA residential noise standard. However, nighttime noise levels may exceed the 45 dBA nighttime noise standard at St. John's Pleasant Valley Hospital and residences located southeast of the facility site. Although nighttime noise levels generated by the proposed groundwater treatment facility may be very similar to existing ambient noise levels, operational noise impacts are considered potentially significant. | The following measures are provided to minimize nighttime noise impacts associated with facility operation.<br>• Prior to construction, conduct an engineering design review to ensure all noise-producing components are enclosed and shielded, to minimize noise generation to the extent feasible;<br>• Complete a noise study within 90 days of the start of operation to determine if nighttime noise levels associated with facility operation are detectable at adjacent residences; and<br>• Based on the findings of the noise study, implement additional noise reduction measures as needed which may include a facility perimeter sound wall. | **Site 4 Alternative**<br>Due to the lack of nearby noise sensitive land uses, nighttime noise generated by operation of the facility would not exceed the 45 dBA nighttime noise standard, and is considered a less than significant impact.<br><br>**Site 7 Alternative**<br>Nighttime noise levels may exceed the 45 dBA nighttime noise standard at the caretaker residence and residences located south of the facility site. Although nighttime noise levels generated by the proposed groundwater treatment facility may be very similar to existing ambient noise levels, operational noise impacts are considered potentially significant. | **Site 4 Alternative**<br>Mitigation is not required.<br><br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-1. Continued

| PROPOSED ACTION | | ALTERNATIVES | |
|---|---|---|---|
| IMPACTS | MITIGATION MEASURES | IMPACTS | MITIGATION MEASURES |
| ***TRANSPORTATION*** | | | |
| During the construction period, the Proposed Action may contribute at least one peak hour trip to the SR 118/SR 34 intersection, which currently operates at unacceptable LOS. This impact is considered potentially significant. | The intent of these mitigation measures is to avoid or offset the project-related contribution to existing traffic congestion. Therefore, two mitigation options are considered:<br>• The City shall pay Traffic Impact Mitigation fees to the Ventura County Transportation Department based on the projected number of average daily trips and the rates ($/trip) in effect at the time construction is implemented. These fees would be used for roadway improvements to offset the contribution of the project to level of service impacts.<br>• The project specifications shall limit the construction contractor to off-peak trips only, through the scheduling of worker hours and materials deliveries. | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action |
| Operation of the Proposed Action may contribute at least one peak hour trip to the SR 118/SR 34 intersection, which currently operates at unacceptable LOS. This impact is considered potentially significant. | The City shall pay Traffic Impact Mitigation fees to the Ventura County Transportation Department based on the projected number of average daily trips and the rates ($/trip) in effect at the time operation of the facility is initiated. These fees would be used for roadway improvements to offset the contribution of the project to level of service impacts. | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action | **Site 4 Alternative**<br>Same as the Proposed Action<br>**Site 7 Alternative**<br>Same as the Proposed Action |

## Table 2-2. Comparison of the Impacts of the Alternatives

| Issue Area | Proposed Action | Site 4 Alternative | Site 7 Alternative |
|---|---|---|---|
| Aesthetics | LS | LS- | LS+ |
| Agriculture | LS | LSM | LSM |
| Air quality | LS | LS+ | LS+ |
| Cultural resources | LSM | LSM | LSM+ |
| Greenhouse gas emissions | LS | LS+ | LS+ |
| Hazardous materials | LSM | LSM | LSM |
| Water resources | LSM | LSM | LSM |
| Land use & planning | LS | LS | LS- |
| Noise | LSM | LSM- | LSM |
| Transportation | LSM | LSM | LSM |

LS Less than significant
LSM Less than significant with mitigation
PS Potentially significant and unmitigable
\+ Greater than the Proposed Action
\- Less than the Proposed Action

# 3.0 PROJECT DESCRIPTION

## 3.1 PROJECT PROPONENT AND LEAD AGENCY

City of Camarillo
601 Carmen Drive
Camarillo, California 93010

Contact: Lucia M. McGovern
(805) 388-5334

## 3.2 PROJECT LOCATION

The facility site would serve two existing water wells, two proposed wells and several water distribution pipelines and would discharge a waste (brine) stream to the Regional Salinity Management Project pipeline operated by the Calleguas Municipal Water District. Therefore, the Proposed Action facility site (Site 2 in the Initial Study) is located near these facilities (see Figures 3-1 and 3-2). The Proposed Action facility site, Site 4 Alternative facility site and the two proposed well sites are located adjacent to the City limits within the unincorporated portion of Ventura County, and are zoned AE-40 ac. The Proposed Action facility site and the proposed northern well site is located within APN 156-0-180-38 (49.36 acres), and the proposed southern well site is located within APN 156-0-180-28 (40.22 acres), and the current land use is agriculture (row crops). Land uses surrounding the Proposed Action facility site include agriculture to the west, north and east, with St. John's Pleasant Valley Hospital and residential areas to the south.

## 3.3 TREATED GROUNDWATER DISTRIBUTION

Approximately 4,500 to 6,000 acre-feet/year of the treated groundwater produced by the project would be provided to the City of Camarillo's existing service area. The balance of the treated groundwater would be sold to the Calleguas Municipal Water District for distribution within their existing service area.

## 3.4 MUNICIPAL REORGANIZATION

The Proposed Action facility site and two well sites are located outside the City boundary and the City's Sphere of Influence, but within the City's Area of Interest (see Figure 3-2). As the preferred facility site is located outside the City's municipal boundaries and would be served by the Camarillo Sanitary District, the City would request approval from LAFCO for reorganization. The two well sites would not require service from public agencies and would not be annexed. The reorganization proposal would include:

- An amendment to the City's Sphere of Influence boundaries to include the facility site;
- Parcel subdivision to create a legal lot for the facility site;
- Annexation of the facility site to the City;
- An amendment to the Camarillo Sanitary District's Sphere of Influence boundary to include the facility site;
- Annexation of the facility site to the Camarillo Sanitary District;

- Detachment of the facility site from the Ventura County Resource Conservation District, Ventura County Waterworks District No. 19, County Service Area no. 32 (individual sewage disposal), County Service Area no. 33 (recreation and park services) and Gold Coast Transit District; and
- The City of Camarillo would pre-zone the facility site to ensure General Plan consistency.

The City would pre-zone the facility site to R-E (Rural Exclusive) and issue a conditional use permit in accordance with Chapter 19.62 of the City's Municipal Code to reflect a "Quasi Public/Utility" land use designation. A subdivision to create a legal lot for the facility site would be requested from the Ventura County Resource Management Agency.

## 3.5 PROJECT COMPONENTS

The Proposed Action facility site (former Site 2) would be approximately 4.0 acres in area, including a 50-foot buffer adjacent to agricultural areas. The proposed well sites would be approximately 0.25 acres for the northern site and 0.20 acres for the southern site, including a pull-through driveway for chemical delivery and service trucks.

### 3.5.1 Groundwater Treatment Facility

The proposed Facility would have the capacity to treat 9,000 acre-feet/year of groundwater (which would include groundwater currently pumped from Well B), and provide 7,500 acre-feet/year of RO-treated water to the City of Camarillo's customers.

#### 3.5.1.1 Structures

A preliminary layout of the Groundwater Treatment Facility is provided as Figure 3-3. A single administration building approximately 3,250 square feet in size would include office space, control room, electrical room, and storage area. A separate building would house an emergency generator (approximately 1,034 square feet). Three separate pumping facilities (reverse osmosis [RO] pumps, finished water pumps and chemical feed pumps) and the decarbonator blower facility would be housed in structures, and/or sound enclosures for noise control. The RO treatment system would be protected from the sun and rain by a metal canopy, but not a fully enclosed structure. Parking and driveway space would be provided at the administration building for operations and maintenance personnel, delivery of water treatment chemicals and supplies, and for maintenance activities (e.g. RO membrane replacement) at the facility.

A wall (approximately 80 feet long by 20 feet high) would be constructed near the southern boundary of the facility to screen views from Antonio Avenue, and attenuate noise.

#### 3.5.1.2 Pre-Treatment

Groundwater to be treated contains elevated concentrations of iron and manganese. If iron and/or manganese are present in oxidized forms, fouling of the RO membranes may occur. Therefore, pre-treatment of the groundwater prior to RO would be required. Based on the results of a pilot study at Well A, oxidation of the dissolved iron and manganese using sodium hypochlorite was selected at the preferred pre-treatment process. The oxidation process converts the dissolved iron and manganese into a solid precipitate, and would be conducted in a 90,000-gallon contact basin (see Figure 3-3).

The resulting precipitate would be removed by granular media (green sand) filters. The filters would be backwashed periodically to remove accumulated precipitate. The backwash water/precipitate mixture (wash water) would be temporarily stored in a 112,000-gallon equalization basin, then pumped to a package solids settling system to physically separate the solids from the water into a concentrated side-stream. Solids removed from the wash water (primarily iron and manganese) would be disposed of as a sludge to the local City sewer. A 100,000-gallon backwash supply tank would provide water storage needed for filter backwashing.

#### 3.5.1.3 Reverse Osmosis (RO) Treatment

The RO process would be designed for a groundwater feed of 6,000 gallons per minute (gpm), and produce approximately 4,700 gpm of treated water using four RO trains (three operating, one standby). The RO process would be used to lower the total dissolved solids (TDS) content of the groundwater supply to make it suitable for potable use. The City's two existing wells (A & B) have capacities of 1,500 gallons per minute (gpm) each for a total combined capacity of 3,000 gpm. The additional 3,000 gpm of feed water would be produced by two new brackish groundwater wells to be located off-site.

Sodium bisulfite, sulfuric acid and anti-scalant would be injected into the feed water upstream of the RO trains to remove residual free chlorine, adjust pH and minimize membrane scaling. Filtered water from the pre-treatment system would be held in a 90,000 gallon RO feed tank and pumped through cartridge filters and then booster pumped into the RO system. The feed tank provides flow equalization so that flows supplied to the RO system can be kept as constant as possible. The pumps would be enclosed for noise control. A flush system with 3,800 gallon tank and clean-in-place system with 4,500 gallon tank would be provided to clean and maintain the RO membranes. The RO facility would be covered by a metal canopy to protect it from sun and rain.

#### 3.5.1.4 Post-Treatment, Disinfection and Brine Disposal

Following RO treatment, the treated water would be decarbonated to remove carbon dioxide ($CO_2$). Approximately 5 percent of the RO influent flow would be bypassed and blended with the treated water. The RO-treated water would be disinfected with aqueous ammonia and sodium hypochlorite. The resulting treated water would meet all drinking water standards, with an estimated concentration of less than 0.1 mg/l iron, less than 0.03 mg/l manganese, 196 mg/l TDS, 20 mg/l chloride and 70 mg/l sulfate.

The RO process would generate up to 2.1 million gallons per day of brine (typically 850 to 1,450 gallons/minute), with a TDS concentration of about 9,000 mg/l. The brine would be discharged to the Calleguas Regional Salinity Management Project pipeline at Lewis Road (see Figure 3-2), which would transport the brine stream to an existing ocean outfall at Port Hueneme.

3.5.1.5 Treated Water Delivery to the Distribution System

Treated, blended (finished) water would be collected into a 43,000-gallon pump well located below the finished water pump station. The pumps would be housed in sound enclosures for noise control. The pump station would have the capability to pump all of the water produced either to the City's Zone 1 or Zone 2 distribution system or to a combination of the two zones.

3.5.1.6 Chemical Storage and Feed

Chemicals associated with water treatment would be stored on-site (30-day supply) and include sodium hydroxide, sodium hypochlorite, aqueous ammonia, sodium bisulfite, sulfuric acid, and anti-scalant (see Table 3-1). Chemical storage and feed equipment would be under a 4,950 square foot canopy system to protect them from the sun and rain.

3.5.1.7 Energy Management

Photo-voltaic solar panels would be mounted on the roof of the administration building, and provide about 260 to 390 kilowatt-hours per day. This would offset about one percent of the estimated energy consumption of the project (up to 28,000 kilowatt-hours per day).

**Table 3-1. Chemical Use and Storage**

| Chemical | Use | Concentration | On-site Storage (gallons) |
|---|---|---|---|
| Sodium hydroxide | RO membrane cleaning | 25% | 4,500 |
| Sodium hypochlorite | Oxidation pretreatment and disinfection | 25% | 5,900 |
| Aqueous ammonia | Disinfection | 19% | 1,200 |
| Sodium bisulfite | Removing residual chlorine present in RO feed water | 25% | 1,700 |
| Sulfuric acid | pH adjustment | 93% | 13,000 |
| Anti-scalant | Prevents precipitation on RO membranes | 100% | 530 |

### 3.5.2 New Wells

The City proposes to install two new wells to provide about 3,000 gpm of brackish groundwater. The proposed northern well site is located in a 0.25-acre agricultural area immediately north of the new Rancho Campana High School, while the southern well site is located immediately east of the Church of Latter Day Saints and south of the High School (see Figure 3-2). The well sites would be accessed using existing farm roads. Brackish groundwater produced by these new wells would be treated at the facility, and would serve to provide an additional source of potable water, and remove salts from the groundwater basin. It is anticipated that the well sites would include the following components:

- Wellhead and enclosure;
- Submersible pumps; and
- Piping and electrical gear.

### 3.5.3 Pipelines

New pipelines would be required to:

- Connect existing Wells A and B to the inlet of the proposed Groundwater Treatment Facility;
- Connect both new wells to the inlet of the proposed Groundwater Treatment Facility;
- Connect the waste (brine) stream from the RO process to the Regional Salinity Management pipeline;
- Connect the wash-water solids settling system to a local sewer; and
- Connect the outlet of the proposed Groundwater Treatment Facility to existing Zone 1 and Zone 2 water service pipelines.

The well feed pipelines would be pressurized and have a diameter of approximately 12 inches. The brine stream pipeline would be approximately 12 inches in diameter and pressurized. Pipelines would be mostly located along roadways within the public right-of-way. However, the well feed pipelines from the proposed wells would be located within agricultural lands (see Figure 3-2). Table 3-2 provides information concerning the proposed pipelines.

### 3.5.4 Access, Lighting and Landscaping

An access road (approximately 150 feet long) would be constructed from Antonio Avenue, and extend north to the facility site. The access road alignment would be designed to avoid fragmentation of agricultural land between the facility site and Antonio Road. The access road would be approximately 20 feet wide, paved with asphalt concrete and maintained by the City. An internal access road would be constructed within the facility to provide access to the various components. Landscaping (tall shrubs and/or small trees) would be provided along the southern and western perimeter of the facility to screen views from Antonio Avenue.

**Table 3-2. Proposed Pipeline Summary**

| Pipeline Purpose | Approximate Length (feet) | Approximate Diameter (inches) | Alignment |
|---|---|---|---|
| Connect Well A to the Treatment Facility | 1,800 | 12 | Las Posas Road, Antonio Avenue |
| Connect Well B to the Treatment Facility | 300 | 12 | Antonio Avenue, agricultural access road |
| Connect new northern off-site well to the Treatment Facility | 3,300 | 12 | Unpaved agricultural access road |
| Connect new southern off-site well to the Treatment Facility | 4,700 | 12 | Unpaved agricultural access road |
| Connect Treatment Facility to the Salinity Management Pipeline | 3,700 | 12 | Antonio Avenue, Las Posas Road |
| Connect Treatment Facility to Zone 1 distribution pipelines | 1,500 | 18 | Antonio Avenue |
| Connect Treatment Facility to Zone 2 distribution pipelines | 1,500 | 18 | Antonio Avenue |
| **Total** | **16,800** | | |

The proposed northern well site would be accessed from Antonio Avenue using existing unpaved agricultural roads. The proposed southern well site would be accessed from Las Posas Road using the existing unpaved agricultural road. These agricultural roads would be upgraded to serve the well sites through excavation, compaction and surfacing with road base or recycled asphalt.

The facility would be lighted to facilitate 24 hour/day operations; however, lighting would be shielded and directed downward to the illuminate project facilities. The administration building would be lighted 24 hours per day, but would be provided with some type of window covering.

### 3.5.5 Emergency Power

An emergency generator would be provided at the Groundwater Treatment Facility site to ensure a reliable source of power to the high pressure pumps and other water treatment equipment. The emergency generator would only be used during power outages, and for short periods during maintenance periods. The generator would produce up to 2,000 kilowatt-hours of electricity and would be powered by a diesel engine. The generator would include an integral diesel fuel tank with secondary containment.

### 3.5.6 Operation

The Groundwater Treatment Facility and associated wells would be operated 24 hours per day with a crew of 2 to 3, and employ up to 9 persons (three 8-hour shifts). However, the night shift may consist of a single person monitoring the facility remotely. Existing City employees would provide a portion of project staffing. The Groundwater Treatment Facility would include a restroom, and wastewater would be piped to the nearest sewer served by the Camarillo Sanitary District. The facility would be served potable water by the City's Water Division.

## 3.6 CONSTRUCTION

Construction of the proposed facilities would be coordinated with funding and would likely be initiated in 2017. Construction would last approximately 12 to 18 months, including pipeline installation.

### 3.6.1 Treatment and Well Facilities

Ground disturbance associated with construction of the Groundwater Treatment Facility would be approximately 4.0 acres (facility site and access road). Equipment to be used may include dozers, excavators, cranes, wheeled loaders and heavy-duty trucks. Cut and fill volumes would be balanced on-site, with no soil export or import anticipated.

Constructing each of the two off-site well facilities would require clearing up to 0.20 acres, widening and surfacing the existing farm access road, drilling the well, and installing the submersible pump and associated piping and control systems.

### 3.6.2 Pipelines

Generally, pipelines would be located in public roadways, and installed using conventional trenching methods. The trench would be about 3 feet wide and 5 feet deep. A concrete slurry would be used as the final backfill over the pipelines, and the pavement replaced. Pipeline installation would be coordinated with planned street repairs and pavement overlays, schedule permitting. Pipelines located in farmlands would be installed using conventional trenching methods. The pipelines would be located at least 5 feet under farmlands, to allow cultivation to occur over the buried pipelines.

## 3.7 CUMULATIVE PROJECTS

The following section describes recently approved and pending projects from the City of Camarillo's website, including the February 2016 Monthly Report that may contribute to cumulative impacts. In addition, projects located in adjacent Ventura County have been included.

### 3.7.1 Residential Projects

Based on the City's February 2016 Monthly Report, 16 projects totaling 1,527 units have been recently approved, and two projects totaling 188 units are under City review. The closest residential project is located approximately 2.2 miles to the south-southeast of the Proposed Action facility site.

Ventura County is currently reviewing three residential subdivision projects in the Camarillo area, totaling 21 units. The nearest project (5.2 miles to the east) is a 15 lot subdivision of six parcels totaling 49.79 acres.

### 3.7.2 Commercial Projects

Seven projects totaling 71,223 square feet have been recently approved, and three projects totaling 619,247 square feet are under City review. Most of these projects are located along the U.S. 101 corridor. The nearest project is located approximately 2.2 miles southeast of the Proposed Action facility site.

### 3.7.3 Industrial Projects

Eleven light industrial projects (buildings) totaling 570,488 square feet have been recently approved by the City. Most of these projects are located along the U.S. 101 corridor. The nearest project is located approximately 1.9 miles south of the Proposed Action facility site.

### 3.7.4 Institutional Projects

Two projects (church, medical building) totaling 81,400 square feet has been recently approved by the City, and are under construction. These projects would be completed and occupied prior to implementation of the proposed project. One of the projects (Dignity Health) involves a 72,342 square foot building addition at St. John's Pleasant Valley Hospital, located approximately 500 feet south of the Proposed Action facility site.

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**FIGURE 3-1**
**PROJECT LOCATION MAP**

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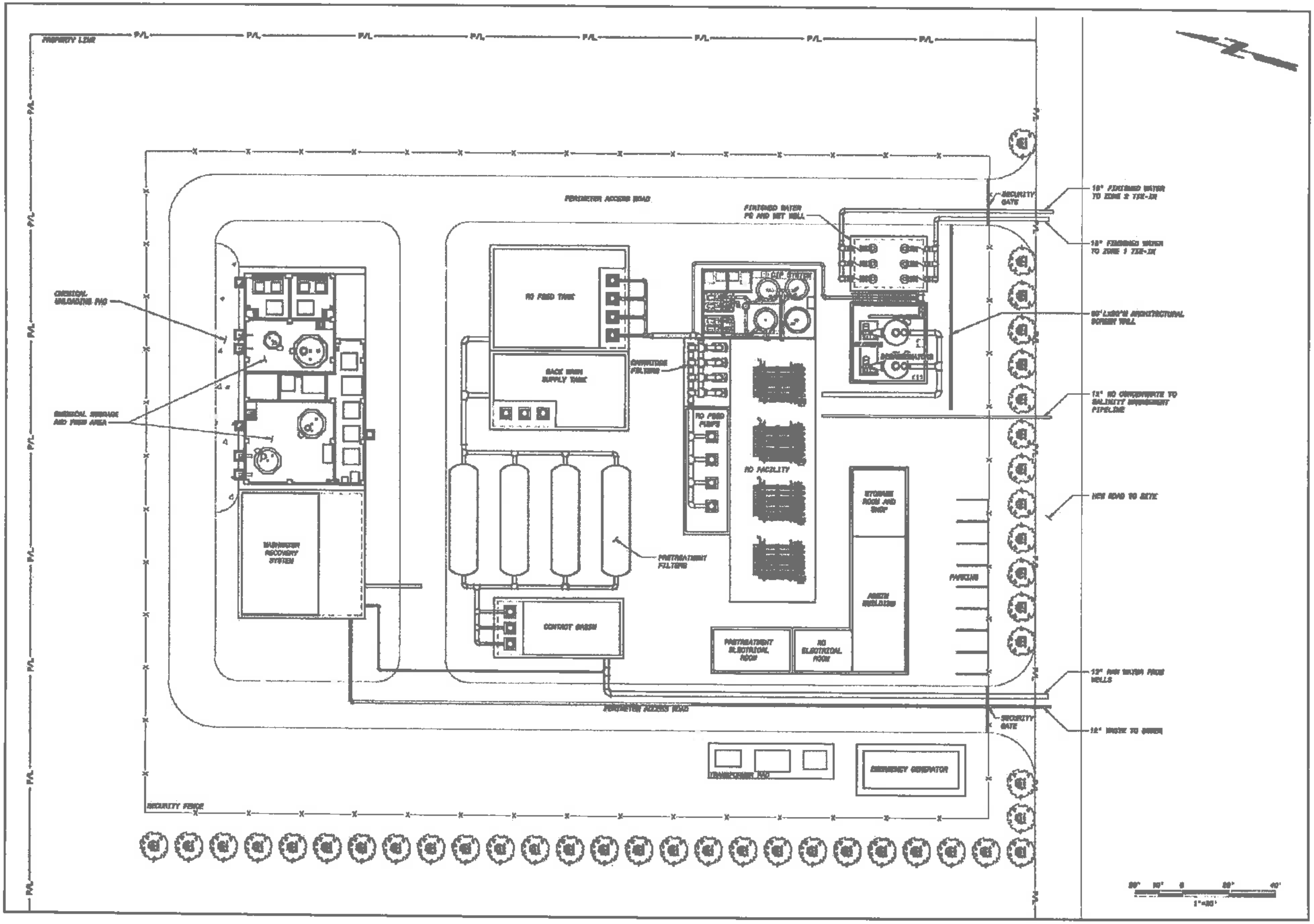
**FIGURE 3-2**
**PROPOSED ACTION FACILITY MAP**

Backside Figure 3-2






**CONCEPTUAL PLANT LAYOUT**

**FIGURE 3-3**

Back of Figure 3-3

a. Preferred facility site (Site 2)

b. Proposed southern well site, high school in background

c. Site 4 Alternative facility site, proposed northern well site

d. Neighborhood near preferred facility site: Antonio Ave @ Villamonte

**SITE PHOTOGRAPHS (1 of 2)**
**FIGURE 3-4**

Back of Figure 3-4


a. St. John's Hospital entrance on Antonio Avenue, Well B to right


b. Well B site with enclosure


c. Site 7 Alternative facility site


d. Well A site, well enclosure in right center

**SITE PHOTOGRAPHS (2 of 2)**
**FIGURE 3-5**

Back of Figure 3-5

# 4.0 ALTERNATIVES TO THE PROPOSED ACTION

The project alternatives have not fundamentally changed since certification of the Final EIR/EA. However, the changed location of the well sites affects pipeline alignments and agricultural and noise impacts. Therefore, the description of the alternatives has been revised accordingly.

This section of the EIR provides a comparative analysis of the merits of alternatives to the proposed project pursuant to Section 15126.6 of the State CEQA Guidelines. According to the Guidelines, the discussion of alternatives should focus on alternatives to a project or its location that would feasibly meet the basic objectives of the project while avoiding or substantially lessening the significant effects of the project. The CEQA Guidelines indicate that the range of alternatives included in this discussion should be sufficient to allow decision-makers a reasoned choice between alternatives and a proposed project. The alternatives discussion should provide decision-makers with an understanding of the environmental merits and disadvantages of various project alternatives.

The range of alternatives in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to make a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project (CEQA Guidelines Section 15126.6 [f]). Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision-making. When addressing feasibility, the CEQA Guidelines state that "among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site (or the site is already owned by the proponent)." The CEQA Guidelines also state that the alternative discussion need not be presented in the same level of detail as the assessment of the proposed project.

Therefore, based on the CEQA Guidelines, several factors need to be considered in determining the range of alternatives to be analyzed in an EIR and the level of detail of analysis that should be provided. These factors include: (1) the nature of the significant impacts of the proposed project; (2) the ability of alternatives to avoid or substantially lessen impacts associated with the project; (3) the ability of the alternatives to meet most of the basic objectives of the project; and (4) the feasibility of the alternatives.

The Council on Environmental Quality regulations (40 CFR 1508.9) requires an Environmental Assessment to include a discussion of alternatives to the proposed action. NEPA does not require that an agency consider every possible alternative, but requires that the range be comprehensive so the agency can make a "reasoned choice" among them. Alternatives selected for analysis should fulfill the requirements of the purpose and need of the project. Alternatives selected for analysis should fulfill the requirements of the purpose and need of the project.

## 4.1 SELECTION OF ALTERNATIVES

The proposed Groundwater Treatment Facility would pump up to 9,000 acre-feet/year of groundwater and provide up to 7,500 acre-feet/year of RO-treated water to the City of Camarillo's service area. The Facility would serve existing Wells A and B as well as new brackish groundwater wells, and discharge to the Calleguas Regional Salinity Management pipeline. Therefore, an economically feasible project site must be located in close proximity to these facilities. Wells A and B are located adjacent to the northern City limit, and surrounding land uses within the City are residential and commercial, which cannot accommodate the proposed Groundwater Treatment Facility. As part of EIR scoping, eight facility sites (numbered 1 through 8) were assessed in the Initial Study, including one site (Site 7) located within the City limits and seven within adjacent Ventura County. Subsequently, three facility sites were selected for analysis in this document to represent a range of feasible alternative sites. These sites include the preferred facility site (former Site 2, now referred to as the Proposed Action), Site 4 and Site 7. The environmental impacts of these alternatives are analyzed at an equal level of detail in compliance with NEPA, as the City is pursuing Federal funding.

In addition, several well pumping rates were considered to represent a range of groundwater draw-down rates. The relative impacts of these alternative pumping rates were addressed in the Final EIR/EA and have not substantially changed. Therefore, these analyses are not included in this Supplemental EIR/EA.

## 4.2 NO ACTION/NO PROJECT ALTERNATIVE

This alternative would consist of continuing to utilize existing water sources to supply the City of Camarillo, including:

- In the short term, continue to pump about 2,250 acre-feet/year of groundwater from the northern Pleasant Valley Groundwater Basin (Wells A and B) and about 2,250 acre-feet per year from the central portion of the Basin (Airport area wells).
- In the long-term as groundwater quality in the NPV Basin continues to decline, the City anticipates terminating pumping from Wells A and B, and increasing pumping from the central portion of the Pleasant Valley Basin (Airport area) up to the full allocation (4,500 acre-feet/year).
- Continue to blend groundwater with imported water provided by the Calleguas Municipal Water District to meet water quality requirements for potable water.

Surface water in Arroyo Las Posas would continue to infiltrate into the North Pleasant Valley (NPV) Groundwater Basin, filling it with poor quality water.

## 4.3 SITE 4 ALTERNATIVE

### 4.3.1 Description

This Alternative would include the same facilities as the Proposed Action; however, the groundwater treatment facility would be located at a different site, north of the Camarillo Library and the new Rancho Campana High School (see Figure 4-1). The southern well site would be the same, but the northern well would be incorporated into the groundwater treatment facility site. Otherwise, the Site 4 Alternative facility would be same as the Proposed Action, including a 50 foot-wide landscaped buffer around the west, north and east boundary and a wall along the southern boundary.

In addition, the pipeline tie-in locations would be same as the Proposed Action. However, the pipeline alignments would differ due to the changed facility location. A new 2,400 foot-long, 30 foot-wide access road/pipeline corridor would be established from Antonio Road east to the northern well site and facility site. The access road would be approximately 20 feet wide and paved with asphalt concrete. In addition, an existing farm road would be widened to the provide access to the southern well site from Las Posas Road. Table 4-1 provides a summary of pipelines required for this Alternative, as compared to the Proposed Action.

### 4.3.2 Comparison to Objectives

The basic objectives of the project include:

1. Restore groundwater production from Wells A and B to past levels (about 3,000 gpm);
2. Fully utilize the existing groundwater allocation from the Pleasant Valley Groundwater Basin;
3. Address the plume of salty groundwater currently migrating into the central portion of the Pleasant Valley Groundwater Basin by increasing pumping in the salt mound area from 2,250 to 9,000 acre-feet/year;
4. Reduce dependence of the City on imported potable water;
5. Reduce salt concentrations in treated wastewater discharged to Conejo Creek; and
6. Minimize capital costs by locating new facilities near existing water pipelines.

This Alternative would meet the five of the six project objectives. The Site 4 Alternative facility site is located further from existing facilities and the total pipeline length would be approximately 22 percent greater than the Proposed Action.

**Table 4-1. Comparison of Pipeline Lengths among the Alternative Sites (feet)**

| Pipeline Connection | Proposed Action | Site 4 Alternative | Site 7 Alternative |
|---|---|---|---|
| Northern well site to facility | 3,300 | 0* | 2,600 |
| Southern well site to facility | 4,700 | 1,200 | 1,200 |
| Well A to facility | 1,800 | 3,900 | 3,150 |
| Well B to facility | 300 | 2,450 | 3,850 |
| Treated water to Zone 1 distribution system | 1,500 | 3,450 | 2,700 |
| Treated water to Zone 2 distribution system | 1,500 | 3,600 | 4,150 |
| Brine to Regional Salinity Management pipeline | 3,700 | 5,900 | 200 |
| **Total** | **16,800** | **20,500** | **17,850** |

*Under the Site 4 Alternative, the northern well would be incorporated into the facility site

### 4.3.3 Environmental Consequences/Impacts

Environmental impacts associated with implementation of the Site 4 Alternative are addressed by issue area in each section of the Supplemental EIR/EA.

## 4.4 SITE 7 ALTERNATIVE

### 4.4.1 Description

This Alternative would include the same facilities as the Proposed Action; however, the groundwater treatment facility would be located at a different site, at the northeast corner of the Lewis Road/Upland Road intersection (see Figure 4-2). The Site 7 Alternative facility would be same as the Proposed Action, including a 50 foot-wide landscaped buffer around the perimeter. Both well sites would also be the same as the Proposed Action.

The pipeline tie-in locations would be same as the Proposed Action, except the Zone 2 water distribution system tie-in would occur near the Las Posas Road/Ponderosa Drive intersection. However, the pipeline alignments would differ due to the changed facility location. Access to the facility site would be provided to the adjacent Upland Road, and would be approximately 20 feet wide and paved with asphalt concrete. In addition, an existing farm road would be widened to the provide access to the southern well site from Las Posas Road. Table 4-1 provides a summary of pipelines required for this Alternative, as compared to the Proposed Action.

### 4.4.2 Comparison to Objectives

This Alternative would meet the five of the six project objectives as listed in Section 4.3.2. The Site 7 Alternative facility site is located further from existing facilities and the total pipeline length would be approximately six percent greater than the Proposed Action (see Table 4-1).

### 4.4.3 Environmental Consequences/Impacts

Environmental impacts associated with implementation of the Site 7 Alternative are addressed by issue area in each section of the Supplemental EIR/EA.

## 4.5 GROUNDWATER PUMPING RATE ALTERNATIVES

The relative water resources impacts of the pumping rate alternatives is discussed in Section 5.7.2.6 of the Final EIR/EA. For all other issue areas, impacts of the pumping rate alternatives would be same as the Proposed Action, Site 4 Alternative and Site 7 Alternative, depending on the facility site selected.

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**FIGURE 4-1**
**SITE 4 ALTERNATIVE FACILITY MAP**

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FIGURE 4-2
SITE 7 ALTERNATIVE FACILITY MAP

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# 5.1 AGRICULTURAL AND FORESTRY RESOURCES

## 5.1.1 Affected Environment

Ventura County agriculture gross dollar sales in 2014 were estimated at $2.14 billion. Approximately 100,000 acres in the southern portion of Ventura County are devoted to agricultural production. Ventura County agriculture focuses on production of citrus, cut flowers and nursery products as well as vegetables and field crops. Agriculture has become the leading industry in the County.

The Ventura County Agricultural Commissioner's Annual Crop Report for 2014 indicates strawberries are the leading single commodity with a value of $628 million. The most valuable crop group is fruits and nuts with a year 2014 value of $1.34 billion.

### 5.1.1.1 Soils

A summary of soil classifications for the facility and well sites under consideration is provided in Table 5.1-1. These soils were classified by Edwards, et al. (1970) and are described below.

The Mocho series consists of well-drained loams, gravelly loams, and clay loams 60 inches or more deep. Slopes range from 0 to 9 percent, with elevations from 100 feet to 1,000 feet above msl. These soils are used for vegetables, citrus crops, avocados, field crops, and walnuts. The Natural Resources Conservation Service has determined that the Mocho loam (0-2% slopes) soil series meets the criteria for Prime farmland.

The Sorrento series consists of well-drained loams and silty clay loams 60 inches or more deep. Slopes range from 0 to 9 percent, with elevations from 25 feet to 1,700 feet. These soils are used for vegetables, field crops, citrus crops, avocados, and walnuts. The Natural Resources Conservation Service has determined that the Sorrento loam (0-2 percent slopes), silty clay loam (0-2 percent slopes) and clay loam soil series meet the criteria for Prime farmland. The Sorrento loam (2-9 percent slopes) and silty clay loam (2-9 percent slopes) soil series meet the criteria for farmland of Statewide Importance.

The Anacapa series consists of well-drained sandy loams and gravelly sandy loams 60 inches or more deep. These soils are mainly used for vegetables and citrus crops. The Natural Resources Conservation Service has determined that the Anacapa sandy loam (0-2, 2-9 percent slopes) and Anacapa gravelly loam (2-9 percent slopes) meet the criteria for Prime farmland.

The Pico series consists of well-drained and somewhat excessively drained, calcareous sandy loams and loams 60 inches or more deep. These soils are mainly used for vegetables, citrus crops, field crops and range. The Natural Resources Conservation Service has determined that Pico loam (0-2 percent slopes) meets the criteria for Statewide importance farmland.

**Table 5.1-1. Soils Classification and Farmland Designation**

| Site | Soils Classification | Farmland Designation |
|---|---|---|
| Proposed Action facility site (Site 2) | Mocho loam (0-2% slopes) | Prime |
| Site 4 Alternative facility site | Sorrento silty clay loam (0-2% slopes) | Prime |
| Site 7 Alternative facility site | Mocho loam (0-2% slopes)<br>Pico loam (0-2% slopes) | Prime<br>Statewide importance |
| Northern well site | Sorrento silty clay loam (0-2% slopes) | Prime |
| Southern well site | Pico loam (0-2% slopes) | Statewide importance |

### 5.1.1.2 General Plan Land Use Designation and Zoning

**Ventura County**. The Proposed Action facility site, Site 4 Alternative facility site, and both proposed well sites are located in Ventura County, within areas designated as "Agriculture" in the Ventura County General Plan. The Proposed Action facility site and the proposed northern well site is located within APN 156-0-180-38 (49.36 acres), and the proposed southern well site is located within APN 156-0-180-28 (40.22 acres). The current land use is agriculture (row crops), and zoned AE-40 ac. The purpose of the County's AE zone is to preserve and protect commercial agricultural lands as a limited and irreplaceable resource, to preserve and maintain agriculture as a major industry in Ventura County and to protect these areas from the encroachment of nonrelated uses which, by their nature, would have detrimental effects upon the agriculture industry.

**City of Camarillo**. The Site 7 Alternative facility site is located within the City of Camarillo on APN 163-0-071-250 (5.77 acres). This parcel is zoned as AE (Agriculture Exclusive) by the City.

### 5.1.1.3 Agricultural Viability

The Farmland Mapping and Monitoring Program operated by the California Department of Conservation has classified farmland as "Prime," "Statewide Importance," "Unique" and "Local Importance". The basis for this classification is primarily the Soil Survey, Ventura Area, California (Edwards et al., 1970). "Prime" farmlands are defined as farmland with the best combination of physical and chemical features able to sustain long-term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the four years prior to the most recent mapping date (2012). The State farmland classification for proposed facility sites is summarized in Table 5.1-1, and illustrated in Figure 5.1-1.

Farmlands within and adjacent to the Proposed Action facility site, and Site 4 Alternative facility site and both proposed well sites are in row crop production. The Site 7 Alternative facility site is currently in lemon production.

### 5.1.1.4 Regulatory Environment

**Important Farmlands Inventory (IFI).** The Important Farmlands Inventory (IFI) system is used by the USDA Natural Resources Conservation Service (NRCS) to map and classify lands that have agricultural value. This system divides farmland into classes based upon soil type and the productive capability of the land. These classes are similar to California's Department of Conservation Farmland Mapping and Monitoring Program described above. The County of Ventura uses this system to inventory agricultural lands.

**Ventura County Programs.** Ventura County has adopted four programs to preserve farmland:

- Agricultural land use designation establishing a 40 acre minimum parcel size and Agriculture-Exclusive zoning;
- Greenbelt agreements to prevent urban encroachment;
- Land Conservation Act (LCA) contracts to provide property tax reductions as an incentive to maintain agricultural use; and
- Participation in water resources development and conservation programs to ensure long-term water availability for agriculture.

General Plan policies relative to farmland protection include the following:

Policy 1.6.2.1 Discretionary development located on land designated as Prime or Statewide Importance shall be planned and designed to remove as little land from agricultural production as possible and minimize impacts on topsoil.

Policy 1.6.2.2 Hillside agricultural grading shall be regulated by the Public Works Agency through the Hillside Erosion Control Ordinance.

Policy 1.6.2.3 LCA contracts shall be encouraged on irrigated farmlands.

Policy 1.6.2.4 The Public Works Agency shall plan transportation capital improvements so as to mitigate impacts to important farmlands to the extent feasible.

Policy 1.6.2.5 The County shall preserve agricultural land by retaining and expanding the existing Greenbelt Agreements and encouraging the formation of additional Greenbelt Agreements.

Policy 1.6.2.6 Discretionary development adjacent to Agriculture-designated lands shall not conflict with agricultural use of those lands.

**Greenbelt Agreements**. Several cities in Ventura County, the Local Agency Formation Commission (LAFCO) and the County have adopted greenbelt agreements between jurisdictions to further the objectives of the County's Guidelines for Orderly Development by preserving agriculture and open space between urban areas. The underlying purpose of a greenbelt is to establish a mutual agreement between cities regarding the limit of urban growth for each city. Annexation is discouraged within greenbelts. Any change to those boundaries would require mutual consent between the cities and LAFCO. These agreements have established a policy of non-annexation and retention of open space within parts of Ventura County.

Greenbelts in the project area include the Oxnard-Camarillo Greenbelt (located southwest of Camarillo) and the Santa Rosa Valley Greenbelt (located east of Camarillo). The project site is located approximately one mile west of the Santa Rosa Valley Greenbelt.

**Land Conservation Act Contracts**. A primary tool to preserve farmlands is the California Land Conservation Act (LCA) or Williamson Act contract program. Under the Act, landowners may voluntarily enter into a long-term contract (10 year minimum) to maintain their property in agriculture or open space in exchange for reduced property tax assessment. The term of an LCA contract is generally 9 years, and automatically renews itself for another 10-year-period unless a Notice of Non-Renewal is filed. Since its inception in 1962, the program has been the backbone of agricultural preservation efforts statewide. The Proposed Action and alternative facility sites, and adjacent parcels are not involved in any LCA Contracts.

**Save Open Space and Agricultural Resources (SOAR)**. The County of Ventura and eight cities in the County (Ventura, Camarillo, Oxnard, Simi Valley, Thousand Oaks, Moorpark, Santa Paula, Fillmore) have enacted SOAR ordinances or initiatives. The purpose of the SOAR ordinances is to ensure that agricultural, open space, and rural lands located beyond urban boundaries are not prematurely or unnecessarily converted to other more intensive development uses, unless approved by a majority of voters within the SOAR area. The County SOAR ordinance requires voter approval to allow development of lands with agricultural, open space and rural land use designations. The city SOAR ordinances establish a City Urban Restriction Boundary (CURB) and require voter approval for development outside the boundary. SOAR ordinances make it difficult to convert farmlands as it requires voter approval and costs of the placing the project on the ballot is the responsibility of the applicant.

The Proposed Action and Site 4 Alternative facility sites are located just beyond the City's CURB as delineated in the City's SOAR ordinance. The selected site would be annexed to the City and subject to City ordinances; however, public uses such as water facilities are exempt from the City's SOAR ordinance requirements.

**Ventura County Right-to-Farm Ordinance**. The County of Ventura adopted a Right-to-Farm Ordinance for the purpose of preserving and protecting existing agricultural operations adjoining new development. The ordinance only applies to properties located in the unincorporated areas of the County and, therefore, the agricultural land located upon and adjacent to the Proposed Action and Site 4 Alternative facility sites, and proposed well sites.

The Ventura County Right-to-Farm Ordinance states:

*No agricultural activities, operations, or facilities which are consistent with [the zoning ordinance] and the [Ventura County] General Plan and with proper and accepted customs and standards as established and followed by similar agricultural operations in the same locality, shall be or become a nuisance, private or public, due to any changed condition in or about the locality, after the agricultural uses have been in operation for more than one year if they were not a nuisance at the time they began.*

This ordinance effectively protects farmers in established farming areas from legal action that new uses or new residents in nearby settings may take against effects associated with customary, daily agricultural activities, including dust, odor, noise, and pesticide use. As this is a County ordinance, it applies to the agricultural uses around the City of Camarillo, but not agricultural land within the City boundaries.

**City of Camarillo General Plan.** As indicated in the General Plan, the City of Camarillo values its agricultural resources and proposed that agricultural activities be encouraged to continue both as a source of economic substance to the community and the County and as a physical definition to the urban area of the City. An Agricultural Use Category is included in the Open Space and Conservation Element of the General Plan. This type of zoning will permit, in addition to agricultural uses, those residential and industrial activities associated with farming, including housing at a density not to exceed one unit per ten acres, the processing, packing, and storing of produce raised on the site and such other uses that are pertinent to agriculture.

### 5.1.2 Environmental Consequences/Impacts

#### 5.1.2.1 Significance Thresholds

For the purposes of this project, the City has adopted the following significance thresholds developed by Ventura County (2011) for areas with a General Plan designation of "Agriculture". Loss of agricultural soils on the project site is considered a significant project-specific impact if any of the following thresholds are equaled or exceeded.

- Prime/Statewide Importance Farmland 5 acres
- Unique Farmland 10 acres
- Local Importance Farmland 15 acres

A non-agricultural project would have a potentially significant land use incompatibility impact if it would be located within 300 feet (without vegetative screening) of classified farmland (Prime/Statewide, Unique, Local Importance). This buffer distance may be waived for projects where individuals are not continuously present.

A project that would require a Ventura County General Plan amendment and result in a loss of agricultural soils greater than indicated above is considered as having a substantial contribution to a significant cumulative impact.

### 5.1.2.2 No Action/No Project Alternative

This alternative would not result in any direct farmland conversion, loss of crop production or conflicts with adjacent agricultural operations. However, in the absence of the Proposed Action, percolation of surface flows in Arroyo Las Posas would continue to degrade groundwater quality, and allow high salt groundwater to contaminate existing wells located in the central portion of the Pleasant Valley Groundwater Basin and ultimately render local groundwater unsuitable for agricultural purposes. Degradation of groundwater quality used to irrigate crops may result in substantial crop losses, and may ultimate render some properties unusable for agriculture.

### 5.1.2.3 Proposed Action

**Project-Specific Impacts**

**Loss of Important Farmlands**. The Proposed Action would result in the conversion of approximately 4.88 acres of Prime and Statewide Importance farmland (see Table 5.1-2). The area of farmland conversion would not equal or exceed the 5 acre adopted threshold for Prime and Statewide Importance farmland; therefore, farmland conversion impacts are considered less than significant.

**Table 5.1-2. Comparison of Important Farmland Take**

| Project Component | Proposed Action | Site 4 Alternative | Site 7 Alternative |
|---|---|---|---|
| Facility site | 3.94 | 3.94 | 3.94 |
| Facility access road | 0.08[1] | 0.00[2] | 0.00[3] |
| Well access road(s) | 0.41[4] | 1.70[5] | 0.41[4] |
| Northern well site | 0.25 | 0.00[6] | 0.25 |
| Southern well site | 0.20 | 0.20 | 0.20 |
| **Total** | 4.88 | 5.84 | 4.80 |

[1] Driveway from Antonio Road

[2] None required, included in well access road/pipeline corridor

[3] None required, site is adjacent to Upland Road

[4] Widening of existing farm roads to both well sites from 15 to 20 feet-wide

[5] Thirty foot-wide access road/pipeline corridor from Antonio Road and widening of existing farm road to southern well site

[6] Northern well incorporated into facility site

**Greenbelt Agreements**. Loss of farmland would not occur within a greenbelt, and all open space under the Greenbelt Agreements established within the project area would be retained with no changes in their boundaries. There would be no project-specific impacts to greenbelts.

**Land Conservation Act Contracts.** No farmlands enrolled in LCA contracts would be affected by the Proposed Action. Thus, no project-specific impacts to LCA Contracts are expected.

**Adverse Effects on Adjacent Agricultural Operations.** The Proposed Action would involve changing the land use on approximately 4.3 acres of land (facility site, access road, northern well site) on APN 156-0-180-38 to a non-agricultural use. However, the size of the remaining parcel would be above the 40 acre minimum required by the existing Ventura County zoning designation. In addition, the Proposed Action includes changing the land use of the 0.20 acre southern well site on APN 156-0-180-28. The size of the remaining parcel would be above the 40 acre minimum required by the existing Ventura County zoning designation.

The Ventura County Save Open-Space Agricultural Resources (SOAR) Initiative and the Ventura County Right-to-Farm ordinance would prevent conversion or modification of current agricultural practices on these parcels and adjacent farmlands.

The converted farmland area would be located adjacent to existing farmlands (facility site) and the new Rancho Campana High School (proposed well sites), and would not fragment remaining farmlands. The proposed treatment facility would be provided with a minimum 50 foot-wide buffer between treatment components and adjacent farmlands, including fencing and landscape screening. Therefore, facility operation would not preclude existing agricultural operations an adjacent parcels, including pest management. As a single-use City-operated facility, agreements and notification between parties can easily occur prior to pesticide use. Therefore, the project may meet the criteria for a waiver from the 300 foot agricultural/urban buffer identified in the County's Initial Study Assessment Guidelines and the Agricultural Commissioner's policy.

Operation of the proposed Groundwater Treatment Facility would not adversely affect existing irrigation water supplies, irrigation practices, micro-climate, agricultural pests/diseases, or pesticide application on adjacent farmlands. A minimum 50 foot buffer area would be provided between the Groundwater Treatment Facility and adjacent agricultural fields to minimize any land use compatibility issues. Overall, the Proposed Action would not conflict with surrounding agricultural operations, and would not preclude the continuation of farming on APN 156-0-180-38, -28 and adjacent parcels.

**Agricultural Conversion related to Increased Water Supply.** Projects that involve public infrastructure (e.g., roads, power, water, sewer, etc.) in a previously undeveloped area may lead to inducement of population growth and associated conversion of agricultural lands. The project would improve the quality and reliability of local potable water supplies, and allow the Calleguas Municipal Water District (Calleguas MWD) to utilize a portion of the City of Camarillo's imported water allocation. The City of Camarillo has an adequate allocation of imported water to augment local sources, and meet the needs of planned growth (Carollo Engineers, 2011).

The Calleguas MWD 2010 Urban Water Management Plan indicates that very little surplus water would be available in future years, even if additional recycled water and treated groundwater were used to supplement potable supplies (Black & Veatch, 2011). The project-related shift in imported water allocation is not expected to result in population growth beyond currently forecast levels. Therefore, potable groundwater and transfer of imported water provided by the Proposed Action would not remove an impediment to growth, and result in population growth or related conversion of farmland.

**Forestry Resources**. The nearest forest land (as defined in Public Resources Code Section 12220) or timberland is located within the Los Padres National Forest, approximately 10 miles north of the Proposed Action facility site. The project may require rezoning of the site to be annexed, but would not cause any forest land or timberlands to be rezoned. The project would not result in the loss or conversion of forest land to non-forest uses.

**Cumulative Impacts**

The two Ventura County subdivision projects (see Section 3.7.1) would also result in the conversion of agricultural lands.

The cumulative loss of agricultural soils was discussed in the Final EIR for the Comprehensive Amendment to the Ventura County General Plan, and found to be significant and unavoidable. The Proposed Action would incrementally contribute to the cumulative loss of farmland within the County and City. However, the project's incremental effect would not be "cumulatively considerable"; therefore, the project's contribution to cumulative loss of agricultural soils is not considered significant.

5.1.2.4 Site 4 Alternative

**Project-Specific Impacts**

**Loss of Important Farmlands**. The Site 4 Alternative would result in the conversion of approximately 5.84 acres of Prime and Statewide Importance farmland (see Table 5.1-2). The area of farmland conversion would exceed the 5 acre adopted threshold for Prime and Statewide Importance farmland; therefore, farmland conversion impacts are considered significant.

**Greenbelt Agreements**. Loss of farmland would not occur within a greenbelt, and all open space under the Greenbelt Agreements established within the project area would be retained with no changes in their boundaries. There would be no project-specific impacts to greenbelts.

**Land Conservation Act Contracts**. No farmlands enrolled in LCA contracts would be affected by the Site 4 Alternative. Thus, no project-specific impacts to LCA Contracts are expected.

**Adverse Effects on Adjacent Agricultural Operations**. The Site 4 Alternative would involve changing the zoning on approximately 4.0 acres of land (facility site) on APN 156-0-180-38 to a non-agricultural designation. However, the size of the remaining parcel would be above the 40 acre minimum required by the existing Ventura County zoning designation. In addition, this Alternative includes changing the zoning of the 0.20 acre southern well site on APN 156-0-180-28. The size of the remaining parcel would be above the 40 acre minimum required by the existing Ventura County zoning designation.

The Ventura County Save Open-Space Agricultural Resources (SOAR) Initiative and the Ventura County Right-to-Farm ordinance would prevent conversion or modification of current agricultural practices on these parcels and adjacent farmlands.

The converted farmland area would be located adjacent to the new Rancho Campana High School, and would not fragment remaining farmlands. The proposed treatment facility would be provided with a minimum 50 foot-wide buffer between treatment components and adjacent farmlands, including fencing and landscape screening. Therefore, facility operation would not preclude existing agricultural operations an adjacent parcels, including pest management. As a single-use City-operated facility, agreements and notification between parties can easily occur prior to pesticide use. Therefore, the project may meet the criteria for a waiver from the 300 foot agricultural/urban buffer identified in the County's Initial Study Assessment Guidelines and the Agricultural Commissioner's policy.

Operation of the proposed Groundwater Treatment Facility would not adversely affect existing irrigation water supplies, irrigation practices, micro-climate, agricultural pests/diseases, or pesticide application on adjacent farmlands. A minimum 50 foot buffer area would be provided between the Groundwater Treatment Facility and adjacent agricultural fields to minimize any land use compatibility issues. Overall, the Site 4 Alternative would not conflict with surrounding agricultural operations, and would not preclude the continuation of farming on APN 156-0-180-38, -28 and adjacent parcels.

**Agricultural Conversion related to Increased Water Supply**. Projects that involve public infrastructure (e.g., roads, power, water, sewer, etc.) in a previously undeveloped area may lead to inducement of population growth and associated conversion of agricultural lands. The project would improve the quality and reliability of local potable water supplies, and allow the Calleguas MWD to utilize a portion of the City of Camarillo's imported water allocation. The City of Camarillo has an adequate allocation of imported water to augment local sources, and meet the needs of planned growth (Carollo Engineers, 2011). The Calleguas MWD 2010 Urban Water Management Plan indicates that very little surplus water would be available in future years, even if additional recycled water and treated groundwater were used to supplement potable supplies (Black & Veatch, 2011). The project-related shift in imported water allocation is not expected to result in population growth beyond currently forecast levels. Therefore, potable groundwater and transfer of imported water provided by the Proposed Action would not remove an impediment to growth, and result in population growth or related conversion of farmland.

**Forestry Resources**. The nearest forest land (as defined in Public Resources Code Section 12220) or timberland is located within the Los Padres National Forest, approximately 10 miles north of the Site 4 Alternative facility site. The project may require rezoning of the site to be annexed, but would not cause any forest land or timberlands to be rezoned. The project would not result in the loss or conversion of forest land to non-forest uses.

**Cumulative Impacts**

The cumulative loss of agricultural soils was discussed in the Final EIR for the Comprehensive Amendment to the Ventura County General Plan, and found to be significant and unavoidable. The Site 4 Alternative would incrementally contribute to the cumulative loss of farmland within the County and City. However, the project's incremental effect would not be "cumulatively considerable"; therefore, the project's contribution to cumulative loss of agricultural soils is not considered significant.

5.1.2.5 Site 7 Alternative

**Project-Specific Impacts**

**Loss of Important Farmlands**. The Site 7 Alternative would result in the conversion of approximately 4.80 acres of Prime farmland and Statewide Importance farmland (see Table 5.1-2). The area of farmland conversion would not exceed the 5 acre adopted threshold for Prime farmland/Statewide Importance farmland; therefore, farmland conversion impacts are considered less than significant.

**Greenbelt Agreements.** Loss of farmland would not occur within a greenbelt, and all open space under the Greenbelt Agreements established within the project area would be retained with no changes in their boundaries. There would be no project-specific impacts to greenbelts.

**Land Conservation Act Contracts**. No farmlands enrolled in LCA contracts would be affected by the Site 7 Alternative. Thus, no project-specific impacts to LCA Contracts are expected.

**Adverse Effects on Adjacent Agricultural Operations**. The Site 7 Alternative would involve changing the zoning of approximately 4.0 acres of land (facility site) on APN 163-0-071-250 to a non-agricultural designation. Converting approximately 4.0 acres of a 5.77 acre agricultural parcel would likely make the remaining parcel unsuitable for continued agricultural production. This impact is considered potentially significant.

The proposed treatment facility would be provided with a minimum 50 foot-wide buffer between treatment components and adjacent farmlands, including fencing and landscape screening. Therefore, facility operation would not preclude existing agricultural operations on the adjacent parcel to the north (APN 163-0-071-210, including pest management. As a single-use City-operated facility, agreements and notification between parties can easily occur prior to pesticide use. Therefore, the project may meet the criteria for a waiver from the 300 foot agricultural/urban buffer identified in the County's Initial Study Assessment Guidelines and the Agricultural Commissioner's policy.

Operation of the proposed Groundwater Treatment Facility would not adversely affect existing irrigation water supplies, irrigation practices, micro-climate, agricultural pests/diseases, or pesticide application on adjacent farmlands. A minimum 50 foot buffer area would be provided between the Groundwater Treatment Facility and adjacent agricultural fields to minimize any land use compatibility issues. Overall, the Site 7 Alternative would not conflict with surrounding agricultural operations, and would not preclude the continuation of farming on APN 156-0-180-38, -28 and adjacent parcels.

**Agricultural Conversion related to Increased Water Supply**. Projects that involve public infrastructure (e.g., roads, power, water, sewer, etc.) in a previously undeveloped area may lead to inducement of population growth and associated conversion of agricultural lands. The project would improve the quality and reliability of local potable water supplies, and allow the Calleguas MWD to utilize a portion of the City of Camarillo's imported water allocation. The City of Camarillo has an adequate allocation of imported water to augment local sources, and meet the needs of planned growth (Carollo Engineers, 2011). The Calleguas MWD 2010 Urban Water Management Plan indicates that very little surplus water would be available in future years, even if additional recycled water and treated groundwater were used to supplement potable supplies (Black & Veatch, 2011). The project-related shift in imported water allocation is not expected to result in population growth beyond currently forecast levels. Therefore, potable groundwater and transfer of imported water provided by the Proposed Action would not remove an impediment to growth, and result in population growth or related conversion of farmland.

**Forestry Resources**. The nearest forest land (as defined in Public Resources Code Section 12220) or timberland is located within the Los Padres National Forest, approximately 10 miles north of the Site 7 Alternative facility site. The project may require rezoning of the site to be annexed, but would not cause any forest land or timberlands to be rezoned. The Site 7 Alternative would not result in the loss or conversion of forest land to non-forest uses.

**Cumulative Impacts**

The cumulative loss of agricultural soils was discussed in the Final EIR for the Comprehensive Amendment to the Ventura County General Plan, and found to be significant and unavoidable. The Site 7 Alternative would incrementally contribute to the cumulative loss of farmland within the County and City. However, the project's incremental effect would not be "cumulatively considerable"; therefore, the project's contribution to cumulative loss of agricultural soils is not considered significant.

### 5.1.3 Mitigation Measures

#### 5.1.3.1 Proposed Action

Significant project impacts to agricultural or forestry resources were not identified; therefore, mitigation measures are not required.

#### 5.1.3.2 Site 4 Alternative

This Alternative would result in the loss of Prime and Statewide Importance farmlands exceeding the significance threshold. The following mitigation measures focus on reducing the farmland take below 5 acres.

- Design the groundwater treatment facility to reduce the site area below 3.9 acres;
- Reduce the length of the access road/pipeline corridor by accessing the site from Somis Road; and
- Fully bury pipelines between the facility and Antonio Road to prevent farmland take.

5.1.3.3 Site 7 Alternative

Construction of a groundwater treatment facility at this site would likely render the remaining parcel unsuitable for continued agricultural production. Therefore, the City shall purchase the entire 5.77 acre parcel (APN 163-0-071-250), and maintain agricultural production on the unused portion of the parcel to the extent feasible.

### 5.1.4 Residual Impacts

5.1.4.1 Proposed Action

Significant project impacts to agricultural or forestry resources were not identified; therefore, mitigation measures are not required and residual impacts would be less than significant.

5.1.4.2 Site 4 Alternative

Implementation of mitigation measures identified in Section 5.1.3.2 is anticipated to reduce Prime farmland take below 5 acres. Therefore, residual impacts would be less than significant.

5.1.4.3 Site 7 Alternative

Implementation of the mitigation measure identified in Section 5.1.3.3 would reduce residual impacts to a less than significant level.

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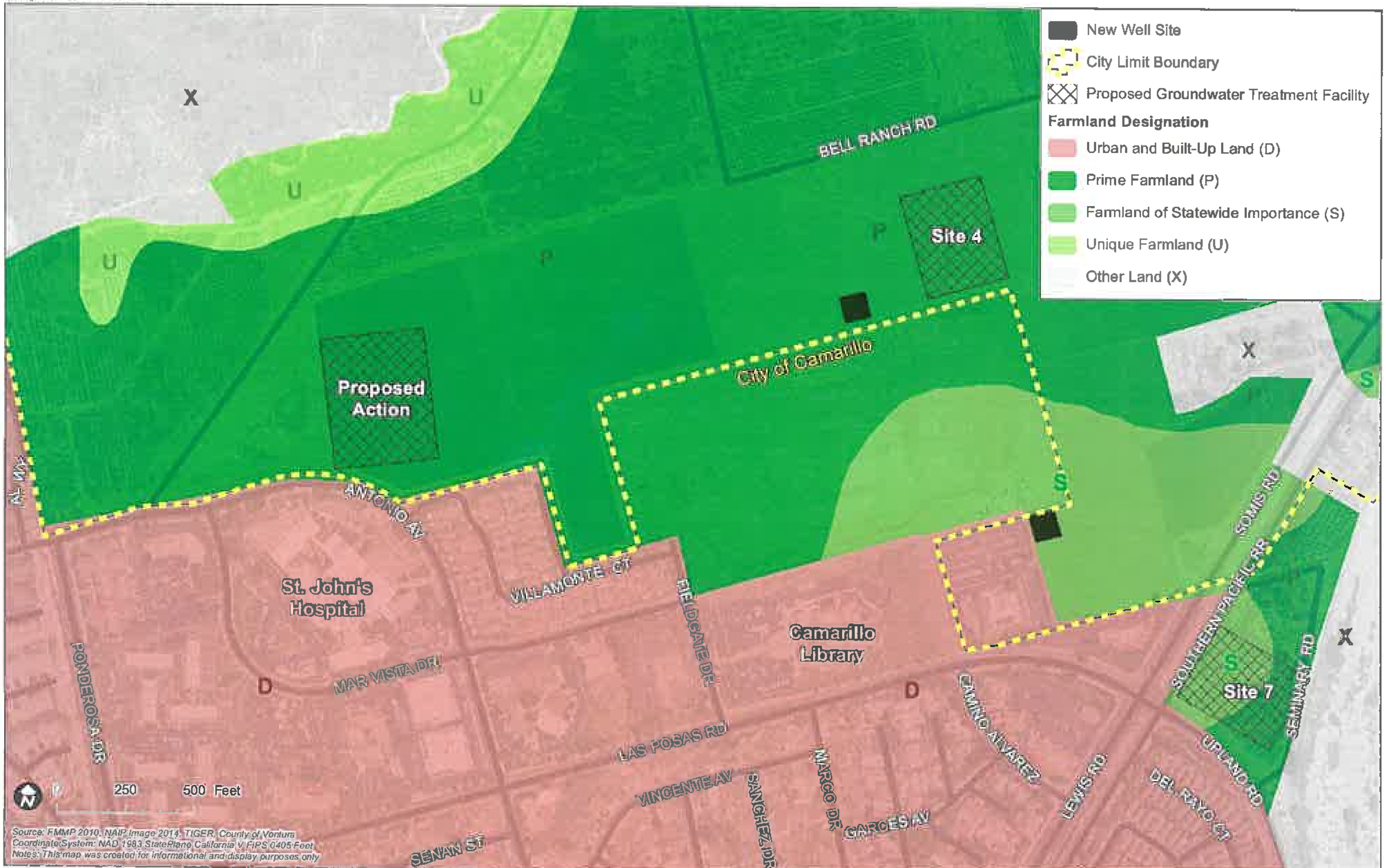


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North Pleasant Valley Groundwater Treatment Facility

**FIGURE 5.1-1**
**IMPORTANT FARMLAND MAP**

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# 5.2 WATER RESOURCES

## 5.2.1 Affected Environment

### 5.2.1.1 Regulatory and Public Policy Framework

**Federal Clean Water Act (CWA)**. The Federal Water Pollution Control Act Amendments of 1972 and 1987, collectively known as the Clean Water Act (33 United States Code [USC] §§1251 et seq.), establish the principal Federal statutes for water quality protection. The Clean Water Act (CWA)'s intent is "to restore and maintain 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."

According to the 1998 National Water Quality Inventory (Inventory), a biennial summary of State surveys of water quality mandated by CWA, approximately 40 percent of the nation's waters that were assessed did not meet water quality standards that have been established by the Federal and State governments. The Inventory lists 21,845 water bodies as "impaired", or not meeting water quality standards, including over 5 million acres of lakes and estuaries, and over 300,000 river and shoreline miles. Approximately 218 million Americans live within 10 miles of a water body designated as impaired.

CWA Section 303(d) requires States, territories, and tribes to develop lists of impaired waters within their jurisdictions every two years. Impaired waters are those that do not meet water quality standards. States, territories, and tribes are also required to establish priority rankings for waters on their respective lists. Water bodies in a given State or territory are prioritized by comparing their existing degrees of pollution, and the sensitivity and importance of beneficial uses that are being threatened. The water bodies that are deemed most important are designated as "high priority".

Section 303(d) also requires States, territories, and tribes to develop Total Maximum Daily Loads (TMDLs) for all water bodies on their respective lists of impaired waters. In essence, TMDLs are plans by which impaired water bodies would be restored such that they consistently meet the established water quality standard(s) that are currently being violated. TMDLs specify the maximum amount of pollutants that a water body can receive and still meet water quality standards, and allocates pollutant loads among point and non-point sources in the subject watershed. The intent of CWA is for the TMDL program to work hand in hand with the impaired waters lists; impaired waters are identified, and then restored to meet water quality standards. Based upon a March 22, 1999 consent decree between the U.S. Environmental Protection Agency (EPA), Heal the Bay, Inc. and Baykeeper, TMDLs must be prepared for all impaired waters within 13 years.

The Proposed Action site is located within the Calleguas Creek watershed, approximately 0.3 miles west of Calleguas Creek (Arroyo Las Posas segment). Each of the major waterbodies of the Calleguas Creek watershed have been listed under Section 303(d) as impaired. Table 5.2-1 lists these waterbodies in the project area, and the pollutants contributing to impairment.

**Table 5.2-1. Impaired Waters of the Calleguas Creek Watershed**

| Waterbody | Pollutant (varies by reach) |
|---|---|
| Mugu Lagoon<br>Calleguas Creek Reach 1 | Chlordane, copper, DDT, dieldrin, endosulfan, mercury, nickel, nitrogen, PCBs, sediment toxicity, sedimentation/siltation, toxaphene, zinc, ammonia, ChemA, fecal coliform, nitrate & nitrite, trash, chlorpyrifos, diazinon, nitrate, selenium, sulfates, total dissolved solids, toxicity, indicator bacteria, organophosphorus pesticides, boron, lindane, chloride |
| Calleguas Creek, Revolon Slough, Arroyo Simi, Arroyo Las Posas<br>Calleguas Creek Reaches 2-8 | |
| Conejo Creek<br>Calleguas Creek Reach 9 | |
| Arroyo Conejo<br>Calleguas Creek Reaches 10-13 | |

**California Porter-Cologne Act.** The Porter-Cologne Act (California Water Code Section 13000) is the principal law governing water quality regulation in California. It establishes a comprehensive program to protect water quality and the beneficial uses of water. The Porter-Cologne Act applies to surface waters, wetlands, and groundwater, and to both point and non-point sources of pollution. Pursuant to the Porter-Cologne Act, it is the policy of the State:

- The quality of all the waters of the State shall be protected;
- All activities and factors affecting the quality of water shall be regulated to attain the highest water quality within reason;
- The State must be prepared to exercise its full power and jurisdiction to protect the quality of water in the State from degradation; and
- The State shall undertake all possible steps to encourage development of water recycling facilities to help meet the growing water requirements of the State.

Pursuant to the Porter-Cologne Act, the responsibility for protection of water quality in California rests with the State Water Resources Control Board (SWRCB). The SWRCB administers Federal and State water quality regulations for California's ocean waters, and also oversees and funds the State's nine Regional Water Quality Control Boards (RWQCBs). The RWQCBs prepare water quality control plans, establish water quality objectives, and carry out Federal and State water quality regulations and permitting duties for inland water bodies, enclosed bays, and estuaries within their respective regions. The Porter-Cologne Act gives the SWRCB and RWQCBs broad powers to protect water quality by regulating waste dischargers to water and land, and requiring clean up of hazardous wastes.

The RWQCBs regulate discharges under the Porter-Cologne Act primarily through issuance of NPDES and waste discharge report permits. Anyone discharging or proposing to discharge materials that could affect water quality (other than to a community sanitary sewer system regulated by an NPDES permit) must file a report of waste discharge. The Porter-Cologne Act provides RWQCBs with several options for enforcing regulations, including cease and desist orders, cleanup and abatement orders, administrative civil liability orders, civil court actions, and criminal prosecutions.

The Calleguas Creek watershed is within the jurisdiction of the Los Angeles Regional Water Quality Control Board (LARWQCB), which includes coastal drainages from Rincon Point (western boundary of Ventura County) to the eastern Los Angeles County boundary.

Per the requirements of the CWA and the California Porter-Cologne Act, LARWQCB has prepared a Water Quality Control Plan for the watersheds under its jurisdiction. The Water Quality Control Plans from all nine of the RWQCBs and the California Ocean Plan (prepared and implemented by SWRCB) collectively constitute the State Water Quality Control Plan. Water Quality Control Plan, Los Angeles Region has been designed to support the intentions of the CWA and the Porter-Cologne Act by: (1) characterizing watersheds within the Los Angeles Region; (2) identifying beneficial uses that exist or have the potential to exist in each water body; (3) establishing water quality objectives for each water body to protect beneficial uses or allow their restoration, and; (4) providing an implementation program that achieves water quality objectives. Implementation program measures include monitoring, permitting, and enforcement activities. Per the requirements of CWA Section 303(c), the Water Quality Control Plan is reviewed every three years and revised as necessary to address problems with the plan, and meet new legislative requirements.

Beneficial uses designated by LARWQCB in the Water Quality Control Plan for the Calleguas Creek watershed are listed in Table 5.2-2. Beneficial uses are potential uses of surface waters and groundwater that could be supported, including water supply, recharge of groundwater supplies, recreation and wildlife habitat. Consistent with the requirements of CWA Section 303(d), LARWQCB identifies impaired waters and prepares TMDLs for impaired waters within its jurisdiction. TMDLs completed to date for the Calleguas Creek Watershed include:

- Nitrogen compounds: in effect July 16, 2003 (waste load allocations updated, effective 2009);
- Toxicity, chlorpyrifos and diazinon: in effect March 24, 2006;

- Organochlorine pesticides, polychlorinated biphenyls and siltation: in effect March 24, 2006;
- Metals: in effect March 26, 2007;
- Boron, chloride, sulfate and total dissolved solids (TDS) (salts): in effect December 2, 2008; and
- Trash (Revolon Slough and Beardsley Wash): in effect March 6, 2008.

Each of the above approved TMDLs have compliance deadlines of 15 to 20 years, along with implementation plans or necessary technical studies needed to bring waterbodies into compliance with TMDL requirements.

**Table 5.2-2. Beneficial Uses of Surface Waters of the Calleguas Creek Watershed**

| Resource | Beneficial Uses |
|---|---|
| Mugu Lagoon | Navigation, water-contact recreation (potential), non-water contact recreation, commercial and sport fishing, estuarine habitat, marine habitat, wildlife habitat, preservation of biological habitats, rare, threatened or endangered species habitat, migration of aquatic organisms, spawning habitat, shellfish harvesting, wetland habitat |
| Calleguas Creek (Arroyo Simi, Arroyo Las Posas) | Municipal water supply (potential), industrial water supply, industrial process supply, agricultural supply, groundwater replenishment, water-contact recreation, non-water contact recreation, warm freshwater habitat, wildlife habitat, wetland habitat |
| Conejo Creek | Municipal water supply (potential), industrial water supply, industrial process supply, agricultural supply, groundwater replenishment, water-contact recreation, non-water contact recreation, warm freshwater habitat, wildlife habitat |
| Arroyo Conejo | Municipal water supply (potential), groundwater replenishment (intermittent), freshwater replenishment (intermittent), water-contact recreation (intermittent), non-water contact recreation (intermittent), warm freshwater habitat (intermittent), wildlife habitat |

Salts (TDS, chloride and sulfates) are a critical factor affecting water quality in the watershed. The connection between salts and water supply are inextricably linked in watersheds where imported water supplies are extensively utilized. The evolution of the Salts TMDL reflects a growing understanding of how water supply management, wastewater management, and surface water quality standards are linked.

Even during average to slightly above average rainfall years, more salts enter the watershed on an average daily basis through imported water supplies, than is transported off the watershed in surface waters. While wet and dry weather patterns follow a generally cyclical pattern, there can be significant variation in the length of dry weather patterns (Hanson et al., 2003). The accumulation of salts during these relatively dry periods and the subsequent release during wet weather cycles complicates the instantaneous management of chlorides and salts on the watershed by stockpiling salts that once in solution would exceed the assimilative capacity of other contributing sources to the surface waters. Unless salts are actively managed, stranded salts will continue to accumulate and periodically impair surface waters. They also have the potential to further degrade groundwater sources. The proposed project would remove salts from the watershed by treating brackish groundwater and discharging the resulting brine directly to the ocean.

**Fox Canyon Groundwater Management Agency (FCGMA).** The FCGMA manages and protects both confined and unconfined aquifers within several groundwater basins underlying the southern portion of Ventura County, including the Pleasant Valley Groundwater basin. The FCGMA is an independent special district, separate from the County of Ventura or any city government. It was created by the California Legislature in 1982 to oversee Ventura County's vital groundwater resources. The boundary covers 183 square miles, and all lands lying above the deep Fox Canyon aquifer account for more than half of the water needs for over 700,000 residents in the cities of Ventura, Oxnard, Port Hueneme, Camarillo, and Moorpark, plus the unincorporated communities of Saticoy, El Rio, Somis, Moorpark Home Acres, Nyeland Acres, Point Mugu and Montalvo.

In response to a multi-year period of below-normal rainfall, the FCGMA adopted Emergency Ordinance E on April 11, 2014. This Ordinance replaced all municipal and industrial groundwater extraction allocations with temporary extraction allocations, which would be reduced over time to address anticipated reductions in groundwater supplies. Mandated reductions include 10 percent by July 1, 2014, 15 percent by January 1, 2015 and 20 percent by July 1, 2015.

**Groundwater Management Plan.** The FCGMA, in coordination with the United Water Conservation District and Calleguas Municipal Water District developed a Groundwater Management Plan, updated in 2007. The goals of this Management Plan are to set specific, measurable management objectives for each basin, identify strategies to reach these goals, and set future FCGMA policy to help implement these strategies. The main focus of the initial Groundwater Management Plan was to contain seawater intrusion in the south Oxnard Plain basin. The combination of FCGMA policies and new water conservation facilities, which included the FCGMA pumping reductions, shifting of pumping from the Upper Aquifer System to the Lower Aquifer System, the construction of the Freeman Diversion, and the operation of the Pumping Trough and Pleasant Valley pipeline systems has had a significant effect on seawater intrusion in at least a portion of the aquifers.

**Sustainable Groundwater Management Act of 2014.** This Act requires a Groundwater Sustainability Agency to adopt a groundwater sustainability plan or alternative plan. A groundwater sustainability plan specifies measures to ensure that basins operate within its sustainable yield (required for high- and medium-priority basins). The plan is required to address groundwater levels, water quality, subsidence, groundwater–surface water interaction, historical and projected demands and supplies, recharge areas, and provide measurable objectives, interim five-year milestones with the goal of sustainability within 20 years. On January 9, 2015, by Resolution No. 2015-01, the FCGMA accepted the authority as the Groundwater Sustainability Agency for groundwater basins under its management. The FCGMA is currently preparing to develop a draft groundwater sustainability plan by June 2016.

**Integrated Regional Water Management Plan (IRWMP) for Calleguas Creek Watershed.** In the period from June to July 2005, the Calleguas Creek Watershed Management Plan Steering Committee, the Calleguas Municipal Water District (Calleguas MWD); the City of Camarillo, the City of Thousand Oaks, the City of Simi Valley, the Camarillo Sanitary District, the Santa Monica Mountains Recreation and Conservation Authority, the Ventura County Resource Conservation District, and the Camrosa Water District's respective governing bodies adopted an Integrated Regional Water Management Plan (IRWMP) for the Calleguas Creek Watershed. The integrated plan is a milestone in a watershed planning effort that began in 1996 and has included a broadly based group of stakeholders representing federal, state, and local public agencies, water and sanitary districts, environmental NGOs, business interests, and agricultural interests. The Proposed Action is described as a priority project in Volume II of the 2006 Calleguas Creek Watershed Integrated Regional Water Management Plan, and considered part of the 2014 Integrated Regional Water Management Plan.

5.2.1.2 Surface Water Characteristics

**Watershed Overview.** The Calleguas Creek Watershed is approximately 30 miles long and 14 miles wide, with a surface area of about 343 square miles. The northern boundary of the watershed is formed by the Santa Susana Mountains, South Mountain and Oak Ridge, the southern boundary is formed by the Simi Hills and Santa Monica Mountains. Primary surface water features of the watershed include Calleguas Creek, Arroyo Las Posas, Arroyo Simi, Conejo Creek, Arroyo Conejo, Arroyo Santa Rosa, Revolon Slough and Mugu Lagoon.

The Watershed was historically characterized as an ephemeral stream system that supported substantial surface flow only during the wet season. Importation of State Water Project water began in 1963, and over time, the watershed began to support perennial surface water. Since 1962, dry weather flows on Conejo Creek above U.S. Highway 101 increased from an average of 0.5 cfs to 15 cfs (Hanson et al., 2003). These flows are a result of rising groundwater generated by percolation of applied imported water, discharge of treated municipal wastewater to streams and urban run-off. Currently, natural surface flow in the Watershed is augmented by:

1. Discharge of groundwater from the Simi Valley dewatering wells to Arroyo Simi;

2. Discharge of tertiary-treated effluent from the Simi Valley Water Quality Control Plant (Simi Valley WQCP) to Arroyo Simi;
3. Occasional wet weather discharge of treated wastewater from the Moorpark Wastewater Treatment Plant (MWTP) to Arroyo Las Posas;
4. Occasional wet weather discharge of treated wastewater from the Camrosa Water District Water Reclamation Facility (Camrosa WRF) to Calleguas Creek;
5. Discharge of tertiary-treated effluent from the Hill Canyon Wastewater Treatment Plant to Arroyo Conejo;
6. Discharge of tertiary-treated effluent from the Camarillo Sanitary District Water Reclamation Plant (Camarillo WRP) to Conejo Creek; and
7. Agricultural irrigation run-off and tiled drain discharge.

The first three discharges listed above are located upstream of the Proposed Action facility site and augment natural surface flow in the adjacent Arroyo Las Posas. Note that a portion of effluent discharged by the Camarillo WRP to Conejo Creek originates as potable water provided to City residents by Well B. As a result of the Proposed Action, the source of this water would shift from mostly imported water to mostly treated groundwater.

Currently, a portion of the Simi Valley WQCP effluent is reclaimed for irrigation purposes. The amount of effluent reclaimed is expected to increase over time, reducing the amount discharged to Arroyo Simi. However, this effect may be offset by the overall increase in wastewater production as the City's population grows.

**Arroyo Las Posas.** The flow of Arroyo Las Posas as it crosses the boundary between the Las Posas Groundwater Basin (LP Basin) and the NPV Basin is one of the most important components of the water balance for the Proposed Action. Since the 1990's, base-flow has entirely percolated into groundwater in the upstream quarter-mile or so of the arroyo as it flows into the NPV Basin (Bachman, 2016). Current base-flow in Arroyo Las Posas is a mixture of natural dry-weather flows, discharges from wastewater treatment plants, discharge from dewatering wells in Simi Valley, and agricultural tail waters. The terminus of the base-flow has moved downstream over the past decades as groundwater basins adjacent to Arroyo Las Posas have filled, with spillage across the LP Basin-NPV Basin boundary occurring in the early 1990s, and will continue unless stakeholders along Arroyo Las Posas reduce these discharges to surface waters. If upstream desalters (i.e., Moorpark) are constructed in the future, flows into the NPV Basin would be substantially reduced.

In contrast, storm flows percolate into a longer reach of Arroyo Las Posas than base-flow. The extent of storm flow percolation in the NPV Basin is not known with certainty. Aquifer testing in City of Camarillo wells A and B indicate that confined aquifer conditions exist at those locations, somewhat limiting the potential extent of percolation of storm flow into the Fox Canyon Aquifer. The possible downstream limit of significant percolation may occur where the arroyo changes from a wider braided stream to a narrow channel.

Arroyo Las Posas base-flow reaching the NPV Basin can be estimated by the difference between recorded daily base-flow at the Hitch Boulevard stream gage and estimated daily losses. Within rounding errors, the base-flow reaching the NPV Basin is 8,300 acre-feet/year (1994-2010 average) (Bachman, 2016).

Storm flow percolation from Arroyo Las Posas into the NPV Basin must be calculated using a different technique. Percolation rates can be estimated from base-flow percolation, based on about 23 acre-feet per day (8,300 acre-feet per year divided by 365 days/year) over the measured length of the streambed where percolation occurs (1,400 feet). This equates to an infiltration rate of about 0.02 acre-feet per day per foot of arroyo length. If the same infiltration rate (0.02 acre-feet per day per foot) is used over the 5,500 feet reach where storm flow can infiltrate, a maximum of 89 acre-feet per day of storm water can be infiltrated. When this infiltration rate is applied during days when storm flow reaches the NPV Basin (averages 54 days/year), percolated storm flow averages about 2,200 acre-feet per year (Bachman, 2016).

#### 5.2.1.3 Groundwater Environment

**Regional**. The project area lies within the Santa Clara-Calleguas Hydrologic Unit. The Santa Clara-Calleguas Hydrologic Unit covers most of Ventura County, part of northern Los Angeles County, and small parts of Santa Barbara and Kern Counties; comprising a total drainage area of 1,760 square miles. The Santa Clara River and Calleguas Creek are the major streams in this area, draining the San Gabriel Mountains, Santa Susana Mountains, Oak Ridge, South Mountain, Simi Hills, Sawmill, Liebre and Frazier Mountains. Large reserves of groundwater exist in alluvial aquifers underlying the Oxnard Plain and along valleys of the Santa Clara River and its tributaries (LARWQCB, 1994).

Specific groundwater quality problems for the Ventura Central Groundwater Basins include overdraft, degradation, and contamination. Overdraft is defined as the condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions are about average (California Department of Water Resources [DWR], 1999).

The Oxnard Plain, the western portion of the Santa Clara-Calleguas Hydrologic Unit, began experiencing seawater intrusion into its groundwater supply as early as 1930. In the Port Hueneme area, seawater in the aquifer system reached its farthest point inland in the early 1980's. Following high rainfall in 1983, chloride levels began to decrease in many of the area's wells. This improving trend was accelerated in the 1990's as aquifer pressures were restored and seawater was pushed back towards the coast. The over pumping of the aquifers that led to seawater intrusion also led to land subsidence of up to 2.2 feet in the Pleasant Valley area as dewatered clay layers between aquifer zones collapsed from reduced hydrostatic pressures. This subsidence is permanent, as refilling the sand and gravel aquifers does not force water back into the dry clay layers.

The Fox Canyon Groundwater Management Agency (FCGMA) was created to moderate the use of groundwater within the area. Two major aquifer systems have been identified; the Upper Aquifer System (Oxnard and Mugu aquifers) and the Lower Aquifer System (Hueneme, Fox and Grimes Canyon aquifers). In 1985, the FCGMA summed all water inputs and outputs to determine how much could be extracted from the basins in the region. Since that initial analysis, basin yield in the area has been recalculated several times. It has been found that many of the inland basins which do not abut the coastline are hydrologically connected to the coastal basins, evidenced by the continuity of groundwater elevation contours across their boundaries (FCGMA, 2007). This allows seawater to intrude further inland, degrading large volumes of groundwater with high concentrations of chloride. In addition, nutrients and other dissolved constituents in irrigation return-flows are seeping into shallow aquifers and degrading groundwater in these shallow unconfined basins. Furthermore, degradation and cross-contamination is occurring as degraded or contaminated groundwater travels between aquifers through abandoned and improperly sealed wells and corroded active wells.

Despite efforts to artificially recharge groundwater and to control efforts of pumping, groundwater in several of the Ventura Central basins has been, and continues to be, overdrafted. In the project area, the Lower Aquifer System of the Pleasant Valley Groundwater Basin exhibits a large pumping depression that has been below sea level for several decades despite groundwater recharge and direct delivery of mitigation water by the United Water Conservation District (UWCD). At the peak of the local drought in the early 1990's, groundwater elevations in this pumping depression dropped as deep as 160 feet below sea level (UWCD, 2003). However, percolation of surface flow in Arroyo Las Posas has sufficiently recharged the Lower Aquifer System that the pumping depression in the northern Pleasant Valley Groundwater Basin developed into a recharge mound by 2011 (Bachman, 2016).

**Pleasant Valley Groundwater Basin**. The City's source of groundwater is composed of four wells, with two wells in the north Pleasant Valley Groundwater Basin (Wells A and B), and two wells in the central Pleasant Valley Groundwater Basin (Wells D and Airport #3). A generalized groundwater basin map of the project area is provided as Figure 5.2-1. The Pleasant Valley Groundwater Basin is comprised of approximately 21,600 acres, with an estimated storage capacity of about 1.9 million acre-feet. Although the Pleasant Valley Groundwater Basin is in a state of overdraft, the basin is not adjudicated. The FCGMA Ordinance established reductions in extraction allocations as a method to reduce overdraft of the groundwater basin. The reductions were scheduled to reduce groundwater pumping by 25 percent over a 15 year period. In 2010, the reduction was set to 75 percent of historical allocation (4,082 acre-feet/year). After including transfers and the 25 percent reduction, the City's "adjusted allocation" for 2010 was 4,279 acre-feet/year.

For confined aquifers within the Pleasant Valley Groundwater Basin, existing beneficial uses include municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply. For unconfined and perched aquifers, existing beneficial uses include industrial service supply, industrial process supply, and agricultural supply; and potential beneficial uses include municipal and domestic supply (LARWQCB, 1994).

**North Pleasant Valley Groundwater Basin (NPV Basin) – Geology.** The Proposed Action well sites and City Wells A and B are located within the northeastern portion of the Pleasant Valley Groundwater Basin. Faulting and accompanying folding in the NPV Basin is largely controlled by regional stresses associated with the rotation and movement of the Transverse Ranges. Compressional forces dominate, with the major faults in the area having a significant component of north-south thrusting. The Simi-Santa Rosa Fault Zone is associated with anticlinal folding, and located just north of the Proposed Action facility site. The NPV Basin is located in a syncline that trends south-southwest (Bachman, 2016).

The water-bearing units of the Lower (LAS) and Upper (UAS) Aquifer Systems rest on both older sedimentary units and Conejo Volcanics. The UAS and LAS together reach a thickness of as much as 1,500 feet in the NPV Basin (see Figure 5.2-2). The basal LAS consists of the Grimes Canyon Aquifer overlain by the Fox Canyon Aquifer. The Fox Canyon Aquifer is the primary water-producing unit in the NPV Basin. The UAS is present in the NPV Basin, but is not a major water-producing unit. Overlying the UAS and LAS is an alluvial unit deposited along Arroyo Las Posas. Drillers' logs indicate that this alluvial unit, herein designated as the Shallow Aquifer, consists of sand and gravel, with finer-grained units in overbank locations. The maximum thickness of this Shallow Aquifer unit in the NPV Basin is about 200 feet. Where the sand and gravel of the Shallow Aquifer overlies the Fox Canyon Aquifer, there is a ready conduit for recharge from Arroyo Las Posas to the Fox Canyon Aquifer. This occurs in a limited area, but appears to be the main recharge area for the NPV Basin (Bachman, 2016).

**North Pleasant Valley Groundwater Basin (NPV Basin) – Hydrogeology.** The NPV Basin has experienced rapid changes in both water levels and water quality over a two-decade period. The trigger for these changes appears to be the advent of overflow of dry-weather flow from the LP Basin, with the dual effect of rapidly raising groundwater elevations from this new source of recharge and deterioration of water quality from the poorer-quality base-flow in Arroyo Las Posas.

<u>Groundwater Elevation Changes</u>. Hydrographs constructed in the northern portion of the NPV Basin exhibit the rapid rise (over 200 feet) in groundwater elevations that began in the early 1990s. Based on a contour map prepared by Bachman (2016), groundwater elevations rose by 200 to 225 feet at the Proposed Action facility site from 1994 to 2011 (see Figure 5.2-3). South across Highway 101, there was a less substantial rise in groundwater elevations, with water level trends complicated by recovery from drought pumping in the late 1980s and early 1990s, increased in-lieu surface water deliveries by the United Water Conservation District, and the initiation of operation of the Conejo Creek Diversion Project (removal of treated wastewater-derived flow from Conejo Creek) (Bachman, 2016).

There was a significant pumping depression in the NPV Basin, with groundwater elevations as low as 120 feet below sea level in 1994 (see Figure 10 in Appendix A). The additional percolation from the dry-weather flow (base flow) of Arroyo Las Posas had sufficiently recharged the LAS of the NPV Basin that by 2011 the pumping depression was eradicated and a recharge mound (locally high groundwater elevations) created.

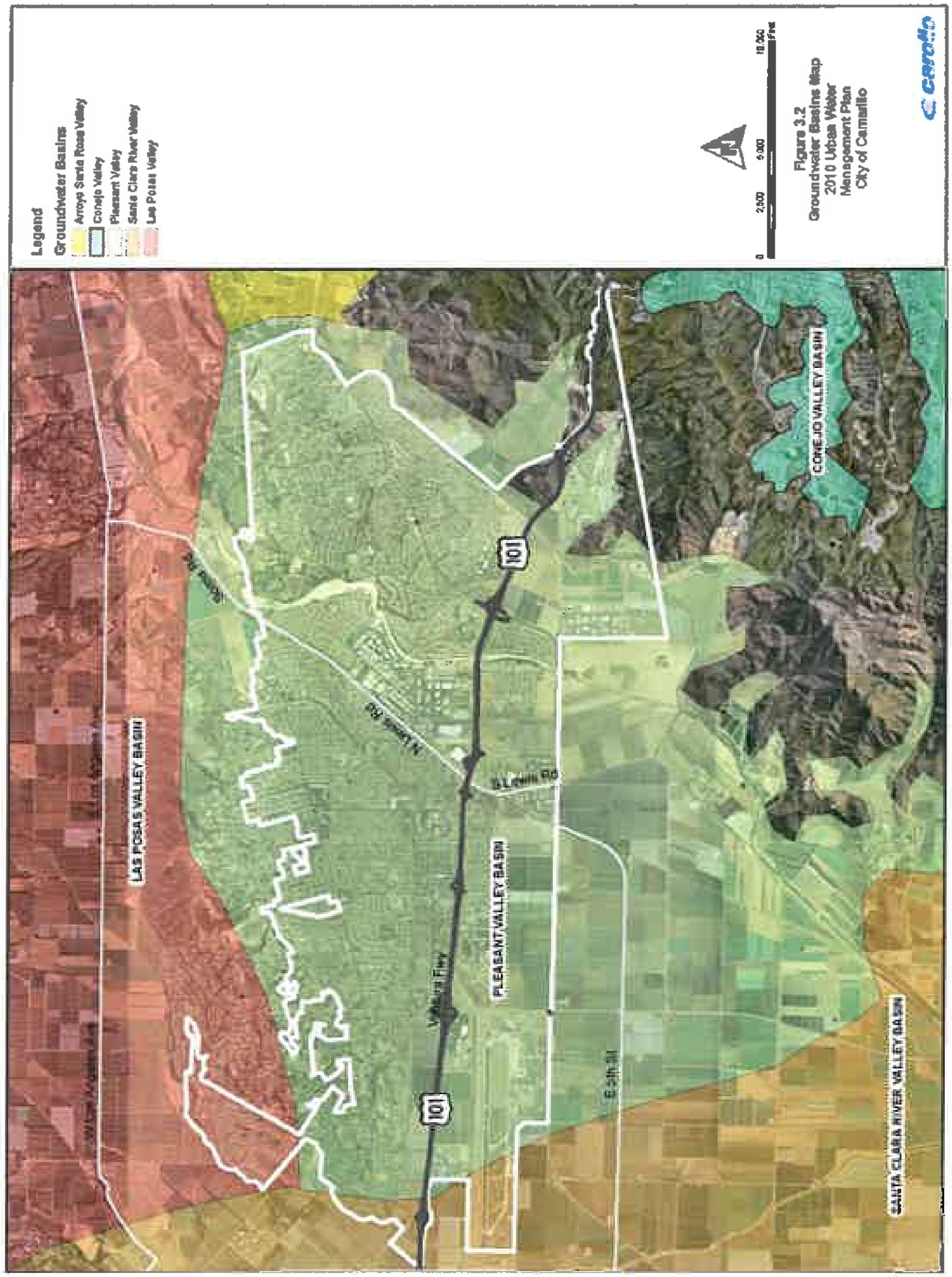



**Figure 5.2-1. Groundwater Basins Map**

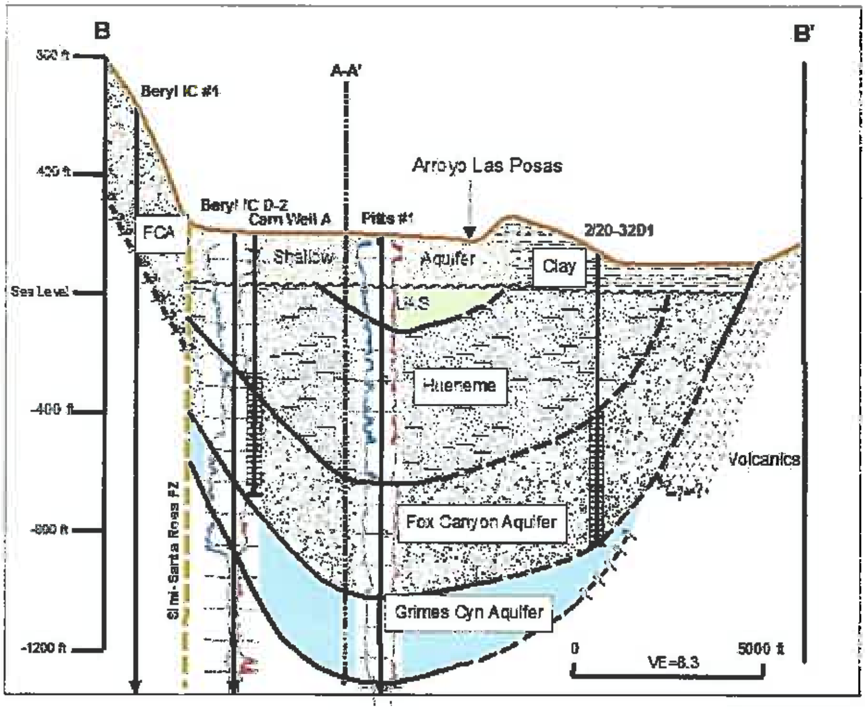



**Figure 5.2-2. North Pleasant Valley Basin Geology Map**

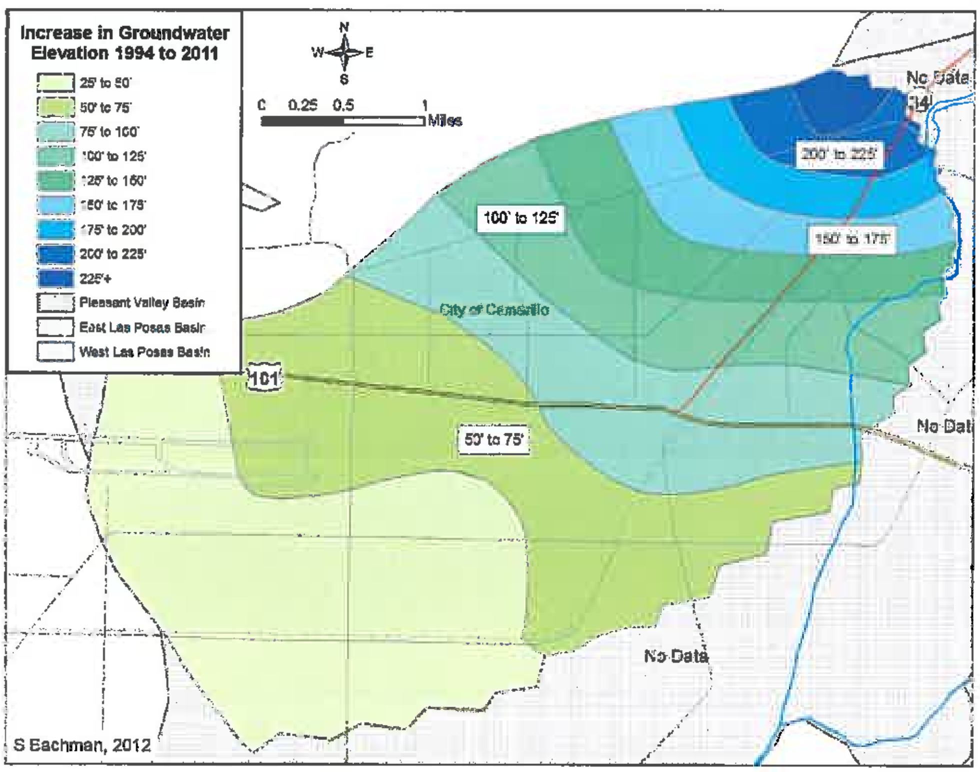



**Figure 5.2-3. North Pleasant Valley Basin Groundwater Elevation Map**

Groundwater Quality. The effect of the recharge of the poor quality base-flow of Arroyo Las Posas is evident in the wells closest to the area of recharge in the northernmost wells in the NPV Basin. Table 5.2-3 illustrates the decline in groundwater quality at the City's wells A and B, while total dissolved solids and chloride concentrations in wells in the central portion of the Pleasant Valley Basin (including 2N/21W-34G1 and Well D) did not change substantially. Historical and recent water quality data from Well B appear to indicate the mineral composition of groundwater has become more similar to surface water (Hopkins, 2008), which indicates surface water percolation results in groundwater quality degradation.

**Table 5.2-3. Groundwater Quality Changes in the Pleasant Valley Basin**

| Well | Sub-Basin | 1980-1985 | 1995 | 2013 |
|---|---|---|---|---|
| **Total Dissolved Solids (mg/l)** | | | | |
| Camarillo Well A | North | 700 | 1000 | 1800 |
| Camarillo Well B | North | 500 | 500 | 1500 |
| 2N/21W-34G1 | Central | 1100 | 1150 | 1200 |
| Camarillo Well D | Central | 620 | 600 | 800 |
| **Chloride (mg/l)** | | | | |
| Camarillo Well A | North | 80 | 110 | 180 |
| Camarillo Well B | North | 35 | 50 | 150 |
| 2N/21W-34G1 | Central | 150 | 160 | 190 |
| Camarillo Well D | Central | 50 | 50 | 75 |
| **Iron (mg/l)** | | | | |
| Camarillo Well A | North | 0.1 | 0.25 | 0.38 |
| Camarillo Well B | North | 0.066 | 0.1 | 0.21 |
| 2N/21W-34G1 | Central | - | 0.11 | 0.38 |
| Camarillo Well D | Central | 0.19 | 0.554 | 0.62 |
| **Manganese (mg/l)** | | | | |
| Camarillo Well A | North | 0.083 | 0.16 | 0.20 |
| Camarillo Well B | North | 0.06 | 0.066 | 0.14 |
| 2N/21W-34G1 | Central | - | 0.02 | 0.02 |
| Camarillo Well D | Central | 0.04 | 0.046 | 0.05 |

The purpose of the Proposed Action is to reduce the concentrations of total dissolved solids (TDS), sulfate, chloride, iron and manganese from groundwater produced by City wells in the NPV Basin, which would allow the treated groundwater to be used directly, without blending with imported water.

#### 5.2.1.4 City of Camarillo Water Division

The City of Camarillo Water Division provides potable water to approximately 75 percent of the City's incorporated area. Approximately fifty percent of the Service Area is currently provided imported water supplied by the Calleguas MWD. This water is supplied from both the 36-inch Oxnard-Santa Rosa Feeder and the 39-inch Camarillo Feeder.

The City's existing water distribution system consists of approximately 190 miles of 6-inch through 20-inch diameter pipelines, which include eight (U.S. 101) freeway crossings. Other components of the City's water distribution system include six reservoirs (four above ground and two underground) with a total combined capacity of 13.4 million gallons, four groundwater wells, three pumping stations, and 11 pressure reducing valve locations.

Between 1995 and 2009, the City's local groundwater supply met about 39 percent of the overall demand (City of Camarillo, 2011). The City pumps approximately 4,000 acre-feet/year of groundwater, which is just below the allotment set by the FCGMA of 4,279 acre-feet/year. Due to poor water quality, groundwater is blended with imported water prior to delivery to consumers.

The City of Camarillo Water Division currently operates four wells: Well A, Well B, Well D and Airport #3, each one is rated for a maximum production capability of approximately 1,500 gallons per minute. Well A and Well B are located in the northeast portion of the distribution system, and within the NPV Basin. Well D and Airport #3 are located near the Ponderosa Corridor in the southwest portion of the distribution system, and within the central Pleasant Valley Groundwater Basin. Due to elevated TDS, sulfate, chloride, iron and manganese concentrations in the northeastern portion of its service area, the City is blending water from Well A or Well B with imported water from the Calleguas MWD to meet drinking water quality standards.

The City of Camarillo Water Division annexed the Camarillo Utility Enterprise in 2006, which delivers potable water to the Camarillo Airport for both municipal supply purposes and for fire suppression. Groundwater pumped from Airport #3 is currently combined with the City's other wells. Airport #3 provides a maximum supply rate of 1,200 gallons per minute to one storage tank.

Table 5.2-4 provides estimates of potable water demand from the City, based on the City's 2010 Urban Water Master Plan. Note that planned water conservation measures will reduce the per capita water consumption over time. This is evidenced by actual water consumption recorded in 2015 as 85.3 gallons/day/capita or 7,813 acre-feet/year, which is much lower than estimates provided in the 2010 Urban Water Master Plan.

**Table 5.2-4. Camarillo Water Service Area Demand Estimates**

| Year | Per Capita Consumption (gallons/day) | Total (acre-feet/year) |
|---|---|---|
| 2015 | 201 | 10,564 |
| 2020 | 179 | 9,652 |
| 2025 | 179 | 9,875 |

#### 5.2.1.5 Floodplain

Based on the Federal Emergency Management Agency Flood Insurance Rate Map Panel 06111C0932E, effective January 20, 2010, the Proposed Action facility site is located partially within a Special Flood Hazard Area (AO, subject to inundation by a 1% probability storm), and partially within an Other Flood Area (X). The Site 4 Alternative facility site is not located within the 100-year floodplain. The Site 7 Alternative facility site is located within an Other Flood Area (X). Both the proposed western and eastern well sites are not located within the 100-year floodplain.

### 5.2.2 Environmental Consequences/Impacts

Most of the water resources impact analysis presented in this Supplemental EIR/EA is taken from a groundwater study prepared by Steven Bachman, titled "Northern Pleasant Valley Desalter Groundwater Analysis and Modeling" (revised March 2016, see Appendix A). An earlier version of this study was peer-reviewed by HydroMetrics Water Resources Inc. under contract to the City, and revised in response to their comments.

The groundwater modeling conducted in support of the Final EIR/EA (and this Supplemental EIR/EA) has been revised based on input from FCGMA. The revisions to the modeling mostly involve the use of post-2010 groundwater pumping data, which included increased pumping rates in response to drought conditions. In addition, the modeling was revised to account for the potential re-location of City groundwater pumping, assuming the City would pump it's full allocation (4,500 acre-feet/year) from the Airport area wells (Airport #3, Well D).

Note that modeling of the pumping rate alternatives (described in Section 4.5 of the Final EIR/EA) was not updated. The revisions to the groundwater modeling conducted for the Proposed Action indicated an increase in project-related reductions in groundwater elevations, and would have the same effect on previous modeling results for the pumping rate alternatives. Therefore, the relative impacts of the pumping rate alternatives (4,500 and 11,800 acre-feet/year) have not changed.

A fundamental part of the analysis is the establishment of a baseline for comparison to the effects of the proposed project (and alternatives) as groundwater is pumped and treated. Section 15125(a) of the State CEQA Guidelines requires an EIR to include a description of the environmental setting as it exists at the time the notice of preparation is published, and will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant.

The description of the affected water resources environment in Section 5.2.1 meets the requirements of the State CEQA Guidelines with regard to the environmental setting. However, the groundwater modeling presented in this EIR does not use conditions present in September 2013, when the Notice of Preparation for the 2014 Draft EIR/EA was published as the environmental baseline. Groundwater conditions are dynamic and the effects of the proposed project can be modeled over time; therefore, future conditions in the absence of the project are used as the environmental baseline. This approach allows the characterization and disclosure of the full effects of the project on groundwater conditions over time to the public, affected agencies and the decision-makers. The revised groundwater modeling includes a 60 year modeling period, including a 17 year calibration period (1994 through 2010), five year verification period (2011 through 2015), three year interim period (time required for project approval and construction), 25 year project operation period and 10 years following project termination.

The groundwater impact analysis is based on the assumption that groundwater elevations in the NPV Basin will continue to rise as described in Section 5.2.1.3. This continued rise (also known as mounding) can be predicted and was included in the groundwater modeling. Therefore, future groundwater conditions without project-related pumping is considered the environmental baseline, and compared to modeled future post-project conditions to determine if significant project-specific impacts would occur. Groundwater pumping data used as model inputs for each modeled year (after the calibration and verification periods) is the ten year average of pumping reported to the FCGMA. However, pumping rates used in the model for the Proposed Action analysis at the City's Airport area wells reflects the City's full pumping allocation (4,500 acre-feet/year).

Infiltration of surface water in Arroyo Las Posas is a major source of water for the NPV Basin (see page 5.2-7). The groundwater modeling uses surface flow data (storm flow and base-flow) from the Hitch Boulevard stream gauge for 1994 through 2012. Base-flow has not been observed in Arroyo Las Posas since 2012 due to below normal rainfall conditions. Since stream flow data was not available for the 4th quarter 2012 and 2013-2015, stormflow infiltration for 2013-2015 used in the groundwater modeling was estimated as the average of dry-year storm flow during the model period.

A second environmental baseline is used for cumulative impacts, which is based on the assumption that pumping of poor quality groundwater and treatment by the proposed Moorpark Desalter in the South Las Posas Basin would begin in 2023. It is assumed this cumulative project would initially remove 5,000 acre-feet per year of groundwater originating as base-flow in Arroyo Las Posas that would have infiltrated into the NPV Basin. By 2028, it is assumed that the balance of the base-flow in Arroyo Las Posas would be removed by the Moorpark Desalter, leaving only storm flow entering the NPV Basin (same as pre-1994 conditions). The proposed Moorpark Desalter would reduce the rate of mounding, which would exacerbate project-related effects on groundwater elevations.

#### 5.2.2.1 Significance Thresholds

**Construction Water Quality**. Any project-related exceedance of the water quality objectives of the Water Quality Control Plan is considered a significant impact.

**Surface Water Quality**. Any project-related exceedance of the water quality objectives of the Water Quality Control Plan is considered a significant impact. By complying with this Plan, it is expected that surface waters are protected for aquatic life, wildlife, water contact recreation, and other designated beneficial uses. In addition, any reduction in water quantity that may threaten beneficial uses is considered a significant impact.

Water quality standards from the California Toxics Rule (Federal Register Vol. 65 No. 97, pp. 31682-31719, May 18, 2000) are used as thresholds of significance for priority toxic pollutants in surface waters.

**Surface Water Quantity**. Any project-related reduction in surface flow that would substantially reduce the potential for the affected waterbody to support identified beneficial uses is considered a significant impact.

**Groundwater Quality**. Any project-related exceedance of the water quality objectives of the Water Quality Control Plan is considered a significant impact. By complying with this Plan, it is expected that groundwaters are protected for designated beneficial uses.

**Groundwater Quantity**. Any project-related activity that would substantially increase groundwater production from an overdrafted basin is considered a significant impact. Overdraft is defined as a long-term decline in groundwater in storage caused by extraction rates exceeding recharge rates.

#### 5.2.2.2 No Action/No Project Alternative

This alternative would consist of continuing the operation of existing facilities, including blending groundwater from Wells A and B with imported water for delivery to City customers. In the long-term, existing pumping in the NPV Basin may be terminated due to water quality concerns. Groundwater pumping may need to be moved to other parts of the City where water quality meets drinking water standards.

Local groundwater quality would continue to be impaired for salts and the existing disparity between salt inputs and outputs would allow the accumulation of salts in the watershed. In the absence of the Proposed Action, percolation of surface flows in Arroyo Las Posas would continue to degrade groundwater quality, and allow high salt groundwater to contaminate existing wells located in the central portion of the Pleasant Valley Groundwater Basin and ultimately render local groundwater unsuitable for agricultural purposes. A particle tracking analysis was conducted as part of the groundwater modeling conducted for the project, which simulates brackish groundwater movement in the aquifer. The results of this analysis indicate that the mound of brackish groundwater would continue to expand in the absence of the project, and extend into groundwater production areas located south of U.S. Highway 101 in the future.

The City of Camarillo's 2010 Urban Water Management Plan includes treated groundwater provided by the Proposed Action as an important water supply for City residents. The No Action Alternative would deprive the City of this water supply.

Groundwater elevation contours projected 25 years into the future are shown in Figure 5.2-4, and indicates the pumping depression (see circular contours in center of Figure) would deepen to 120 feet below sea level (-120 in Figure 5.2-4) and extend further north, largely caused by the City's shift to its Airport #3 well as the NPV Basin is affected by the continued mounding of brackish water. Figure 5.2-4 also shows the elevation of the poor quality groundwater mound as it increases and reaches 260 feet above mean sea level in the future (see contours in upper right corner).

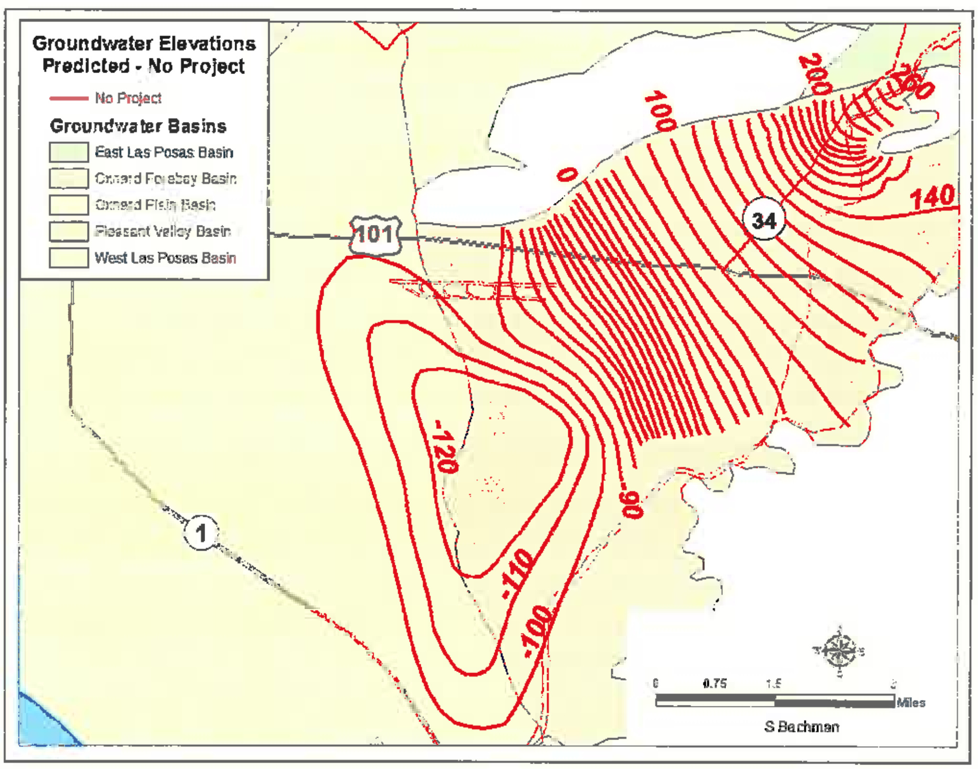



**Figure 5.2-4. Future No Action/No Project Groundwater Elevations**

### 5.2.2.3 Proposed Action

**Project-Specific Impacts**

**Construction Impacts.** Run-off of storm water during construction of the proposed Groundwater Treatment Facility, and during installation of wells and pipelines may transport sediment and other pollutants to Calleguas Creek. The Proposed Action would be subject to the Statewide General Permit for Storm Water Discharges Associated with Construction Activity, and would need to submit a Storm Water Pollution Prevention Plan to eliminate or reduce non-storm discharges to storm water systems and other waters of the U.S.

Suspended sediment generated by construction activity adjacent to surface waters and storm run-off would result in an increase in turbidity that would likely exceed water quality objectives. The use of concrete near surface waters (trench slurry backfill) may result in discharge of concrete residue or concrete-contaminated run-off to surface waters. Such an event would likely cause an exceedance of the pH water quality objective. Overall, construction activities may result in exceedances of water quality objectives, which is considered a significant water quality impact.

**Surface Water Quality.** The Proposed Action would serve to improve drinking water quality in the City of Camarillo. However, the project would generate brine as part of the reverse osmosis process, which would be discharged to the Calleguas MWD Salinity Management pipeline and would be ultimately discharged to the Pacific Ocean near Port Hueneme. Project-related brine flows were included in the design flows analyzed in the EIR/EA for the Calleguas Regional Salinity Management Project – Hueneme Outfall Replacement Project (Padre Associates, 2007). This EIR/EA concluded that the ocean outfall diffuser design would provide sufficient dilution of wastewater with ocean water to meet the water quality standards of the California Ocean Plan.

The proposed extraction and treatment of brackish groundwater, and offshore disposal of salts would benefit the Calleguas Creek watershed by removing accumulated salts. The treated groundwater provided to the City's service area would have lower chloride, sulfate and TDS concentrations than existing water. Since source water would have lower chloride, sulfate and TDS concentrations, treated wastewater discharged to Conejo Creek by the Camarillo WRP would also have lower chloride, sulfate and TDS concentrations, and more available for use as recycled water. Overall, the project would improve surface water quality in Conejo Creek, and beneficially contribute to meeting the Salts TMDL in the Calleguas Creek watershed.

**Surface Water Quantity.** Currently, the terminus of base-flow in Arroyo Las Posas has moved downstream as groundwater basins have become full. This trend may continue as the NPV Basin becomes full. The Proposed Action would harvest groundwater from the NPV Basin and could prevent it from becoming full, and could reverse the trend of base-flow extension in Arroyo Las Posas. However, proposed groundwater production rates are less than current surface flow infiltration rates, and it is anticipated that surface flow rates in Arroyo Las Posas would not be substantially affected by the Proposed Action.

**Groundwater Quality**. Groundwater quality in the NPV Basin is currently influenced by surface water infiltration and not seawater intrusion. An area of concern raised by the Fox Canyon Groundwater Management Agency is the potential for project-related groundwater pumping to generate a cone of depression and result in a hydraulic gradient that may draw in saline groundwater from the coast (seawater intrusion).

The groundwater elevations predicted by groundwater modeling at the completion of the project indicate: 1) the mound of brackish groundwater would be substantially reduced (from an elevation of about 80 above to 60 feet below sea level near the U.S. 101/State Route 34 intersection); 2) the location of the current pumping depression near the boundary between the Pleasant Valley and Oxnard Plain basins would not be substantially changed (compare Figure 5.2-4 to 5.2-5); and 3) there would continue to be a steep southwest-ward groundwater gradient from the project area to the pumping depression. A continued southwest gradient would not allow seawater or poor quality water near the pumping depression to migrate towards the project area. These modeling results indicate that conditions for intrusion of seawater would not be exacerbated by the Proposed Action.

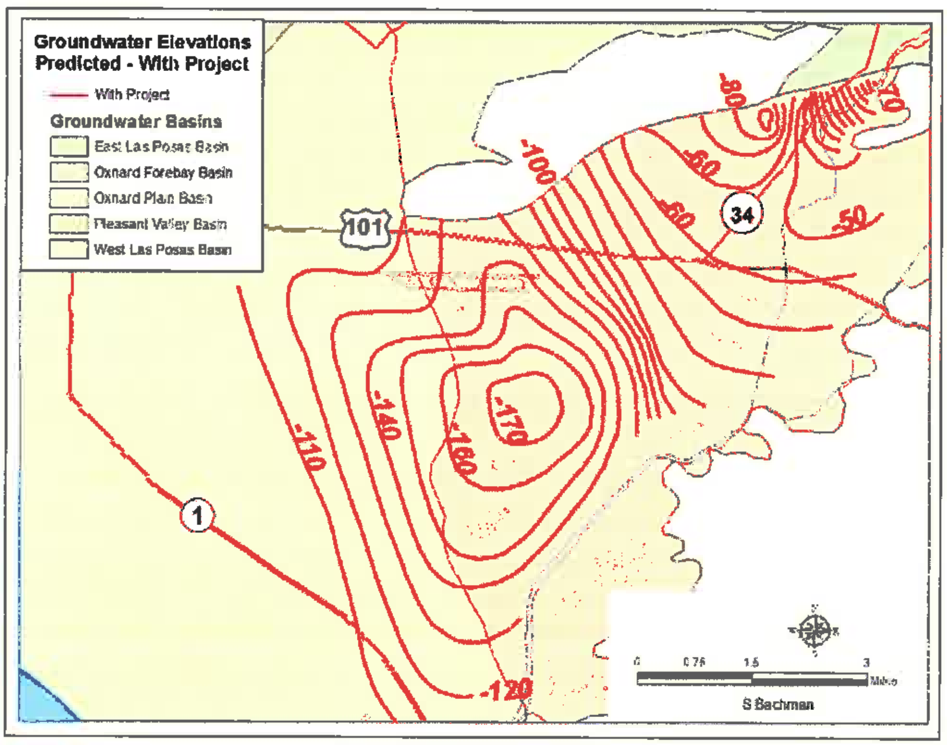



**Figure 5.2-5. Future (End of Project) Proposed Action Groundwater Elevations**

A particle tracking analysis was included as part of the groundwater modeling conducted for the project, which simulates brackish groundwater movement in the aquifer in response to pumping. The results of this analysis indicate that the mound of brackish groundwater would be substantially reduced as a result of project operation. This would improve groundwater quality in most wells in the NPV Basin located north of U.S. Highway 101, and is considered a beneficial impact of the Proposed Action.

The proposed extraction and treatment of brackish groundwater, and offshore disposal of salts would benefit the Calleguas Creek watershed by removing accumulated salts. The treated groundwater provided to the City's service area would have lower salts (chloride, sulfate and TDS) concentrations than existing water. Since source water would have lower salts concentrations, treated wastewater discharged to Conejo Creek by the Camarillo WRP would also have lower salts concentrations. Therefore, surface water percolating into the Upper Aquifer System in the lower Calleguas Creek watershed would contribute less salts, resulting in an improvement in groundwater quality.

The proposed extraction and treatment of brackish groundwater would also prevent further migration of this low quality groundwater plume into the central portion of the Pleasant Valley Groundwater Basin. The proposed extraction of brackish groundwater from the NPV Basin would remove an artificial source of salts in the watershed and allow space for natural replenishment (by rainfall, storm flow) of the Basin. Therefore, the Proposed Action would reduce the potential for further groundwater quality degradation, which is considered a beneficial impact.

**Drinking Water Quality**. Most of the groundwater to be pumped and treated originates as surface water in Arroyo Las Posas, which readily percolates to the NPV Basin. Based on the 2012 Calleguas Creek Watershed TMDL Monitoring Program Annual Report, pesticides (DDE, toxaphene, chlorpyrifos, bifenthrin, cyfluthrin, cypermethrin) have been detected in samples of surface water taken from Arroyo Las Posas. Therefore, the potential exists that these pesticides would be present in groundwater treated at the proposed facility, and be present in drinking water supplied to City residents. However, the City is currently pumping this same groundwater from Well B, blending with imported water and serving it as drinking water to City residents. Note that all groundwater would be treated using RO prior to use as drinking water, which is highly effective in removing pesticides (EPA, 2011). In addition, all water would be tested for organic compounds (including pesticides) as required by the existing water supply permit issued by the California Department of Public Health. Treated water not meeting pesticide standards would not be served to City residents as drinking water.

**Groundwater Quantity**. In the absence of proposed groundwater pumping and treatment, modeling indicates that poor quality groundwater will continue to migrate towards and into the agricultural areas of the central Pleasant Valley Groundwater Basin (Bachman, 2016). The Proposed Action includes groundwater production of up to 9,000 acre-feet/year from the NPV Basin (*an increase from the current 2,250 acre-feet/year from Wells A and B*) and producing up to 7,500 acre-feet/year of treated groundwater. In addition, the City may pump its existing groundwater allocation of up to 4,500 acre-feet/year from the Airport area wells.

Bachman (2016) used the MODFLOW 2000 interface Groundwater Vistas model to evaluate the effect of project-related groundwater pumping on groundwater elevations in the three groundwater production areas shown in Figure 5.2-6. Future groundwater elevations predicted from the modeling after 25 years of pumping (and 10 years after project pumping) is summarized in Table 5.2-5, including the baseline (no project) and Proposed Action.

**Table 5.2-5. Projected Future Groundwater Elevations from Modeling (feet above mean sea level)**

| Area | Well No. | Historical | Project Starting Point | Future Conditions (end of 25 years of project operation) | | Post-Project Conditions (10 years after project pumping) |
|---|---|---|---|---|---|---|
| | | | | No Project | Proposed Action | |
| 1 | Monitoring Site 1 (near City wells A & B) | -170 | 90 | 160 | -50 | 100 |
| 2 | 1N/21W-1B5 | -160 | 0 | 60 | -40 | 10 |
| 3 | 2N/21W-34G4 | -175 | -25 | 15 | -60 | -25 |

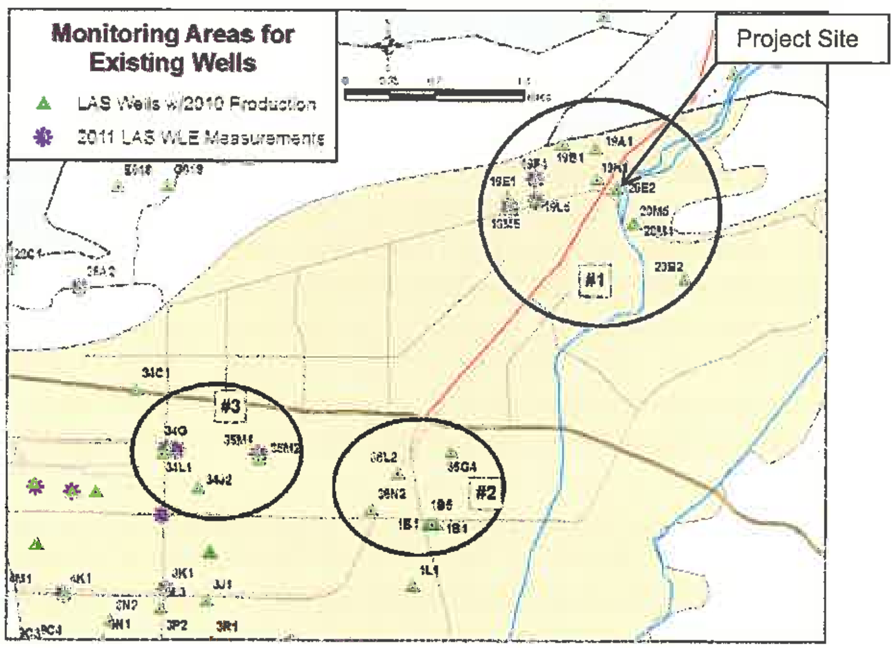



**Figure 5.2-6. Groundwater Production Areas Assessed in the Modeling**

Table 5.2-5 indicates that groundwater elevations will continue to rise (see Future No Project column), and project-related pumping would reduce groundwater levels, but not below historic levels. Near proposed brackish groundwater extraction wells (see Area 1 in in Figure 5.2-6 and Table 5.2-5), the effects would be greatest, as groundwater elevation reductions would be approximately 210 feet (160' reduced to -50') over 25 years as compared to baseline conditions (no project). Note that modeling indicates groundwater levels in Area 1 would rebound from -50 to 100 feet above sea level 10 years after the termination of project pumping (see Table 5.2-5).

Therefore, the effect on these nearby wells is an increased pumping lift, but there would be no negative effect on the wells themselves – groundwater elevations would remain within historical fluctuations. Nearby well owners would also benefit over time from improved water quality, potentially more than offsetting any increased pumping lift.

Southwest of the proposed pumping wells (see Area 2 in Figure 5.2-6 and Table 5.2-5), the effects would be less, as groundwater elevation reductions would be approximately 100 feet (60' reduced to -40') over 25 years as compared to baseline conditions (no project). West-southwest of the proposed pumping wells (see Area 3 in in Figure 5.2-6 and Table 5.2-5), the effects would be even less, as groundwater elevation reductions would be approximately 75 feet (15' reduced to -60') over 25 years as compared to baseline conditions (no project). The potential overall decrease in groundwater elevations is in the range of the semi-annual fluctuations in groundwater elevations from wet to dry portions of the year. Well owners in these areas would also likely avoid the arrival of the mound of brackish water that is predicted to degrade their water quality in the future if the project is not implemented. Overall, impacts of the Proposed Action on groundwater quantity are considered less than significant.

**Subsidence**. Land subsidence can occur when groundwater pumping causes groundwater elevations to drop sufficiently to dewater sediments in the basin or to create pressure gradients where water flows out of the sediments. It is the fine-grained sediments (e.g., mudstone) which may be present both within the aquifers and as low-permeability layers between the aquifers that cause land subsidence, water lost from these sediments is permanent and causes compaction of the material. In contrast, water lost from coarser-grained sediments (e.g., sand and gravel) causes minimal compaction and water can re-enter the pore spaces when water levels rise. Repeated cycling of groundwater elevations caused by drought/wet periods or pumping/recharge periods is less likely to cause further subsidence as long as groundwater elevations remain above historical lows.

Potential subsidence caused by historical lowering of groundwater elevations has not been measured in the NPV Basin area, although there are no reported surface indications of subsidence (e.g., offset roads or parking lots, foundation cracking, etc.). There may have been some loss of volume of fine-grained sediments within and between the aquifers by dewatering during historical lowered groundwater elevations, but the pore space in sand and gravel aquifers is largely unaffected by lowered groundwater elevations. Because groundwater elevations dropped significantly by the early 1990s, any subsidence related to those lowered water levels has likely already occurred (Bachman, 2016).

The potential for project-related land subsidence would be minimized if groundwater elevations remain above historical low elevations. Modeling conducted by Bachman (2016) and summarized in Table 5.2-5 indicates project-related groundwater pumping would not draw down groundwater elevations below historical low levels. Therefore, subsidence impacts of the Proposed Action are considered less than significant.

**Flooding**. The proposed Groundwater Treatment Facility would be occupied by operators. The Proposed Action facility site is partially located within a Special Flood Hazard Area (AO, subject to inundation by a 1% probability storm), and partially within an Other Flood Area (X). Therefore, the facility site and on-site operators may be adversely affected by flooding. Flood-related impacts are considered potentially significant, but could be mitigated to a level of less than significant as part of final design of the project.

## Cumulative Impacts

**Water Supply**. Other projects recently approved or under review within the City include commercial and residential land uses, which would require potable water service. The Proposed Action would provide water to these City water customers, and included in the water demand estimates listed in Table 5.2-4.

**Surface Water Quality**. Cumulative development may increase pollutant concentrations in storm run-off and may adversely affect surface water quality. During the construction period, the Proposed Action may incrementally contribute to cumulative surface water quality impacts. However, mitigation measures are provided to avoid and minimize impacts to surface water quality.

**Surface Water Quantity**. Currently, the terminus of base-flow in Arroyo Las Posas has moved downstream as groundwater basins have become full. This trend may continue as the NPV Basin becomes full. The cumulative projects (Proposed Action + Moorpark Desalter) would remove base-flow and reduce the volume and linear extent of dry season surface flow in Arroyo Las Posas. However, most infiltration of surface flow to groundwater occurs in the Las Posas Basin, such that cumulative impacts on the volume and extent of base-flow would be primarily a result of operation of the proposed Moorpark Desalter. The incremental effect of the Proposed Action on base-flows in Arroyo Las Posas would not be cumulatively considerable.

**Groundwater Quantity**. Future groundwater elevations predicted from the modeling after 25 years of cumulative pumping (Proposed Action + Moorpark Desalter) is summarized in Table 5.2-6, including the baseline (No Project, Moorpark Desalter only), Proposed Action and pumping rate alternatives. Table 5.2-6 indicates that baseline groundwater elevations would drop after the Moorpark Desalter begins operation (see Future No Project column), and cumulative pumping would reduce groundwater levels, potentially below historic levels. Near proposed pumping wells (see Area 1 in Table 5.2-6), the incremental cumulative effect of the Proposed Action would be greatest, as groundwater elevation reductions would be 250 feet (20' reduced to -230') over 25 years as compared to baseline conditions.

The potential exists to interfere with groundwater production in nearby wells (such as 2N/20W-19E1) by drawing down groundwater elevations below historic levels, potentially increasing pumping costs (i.e., electrical consumption) and requiring well modifications. This cumulative impact is considered potentially significant if not mitigated.

**Subsidence**. Since the Proposed Action may incrementally contribute to reducing groundwater elevations below historic levels, subsidence may occur. This cumulative impact is considered potentially significant if not mitigated.

**Table 5.2-6. Projected Cumulative Future Groundwater Elevations from Modeling (feet above mean sea level)**

| Area | Well No. | Historical | Project Starting Point | Future Conditions (end of 25 years of project operation) | | Post-Project Conditions (10 years after project pumping) |
|---|---|---|---|---|---|---|
| | | | | No Project (Moorpark Desalter only) | Proposed Action | |
| 1 | Monitoring Site 1 (near City wells A & B) | -170 | 90 | 20 | -230 | -125 |
| 2 | 1N/21W-1B5 | -160 | 0 | -10 | -125 | -120 |
| 3 | 2N/21W-34G4 | -175 | -25 | -25 | -110 | -110 |

### 5.2.2.4 Site 4 Alternative

**Project-Specific Impacts**

**Groundwater and Surface Water Quality**. Impacts identified for the Proposed Action are also applicable to the Site 4 Alternative.

**Flooding**. The Site 4 Alternative facility site and well site would not be located within the 100-year floodplain, and would not be adversely affected by flooding.

**Surface Water Quantity, Groundwater Quantity and Subsidence.** Impacts identified for the Proposed Action are also applicable to the Site 4 Alternative.

**Cumulative Impacts**

**Water Supply.** Other projects recently approved or under review within the City include commercial and residential land uses, which would require potable water service. The Site 4 Alternative would provide water to these land uses, and have been included in the water demand estimates listed in Table 5.2-4.

**Surface Water Quality**. Cumulative development may increase pollutant concentrations in storm run-off and may adversely affect surface water quality. During the construction period, the Site 4 Alternative may incrementally contribute to cumulative surface water quality impacts. However, mitigation measures are provided to avoid and minimize impacts to surface water quality.

**Surface Water Quantity, Groundwater Quantity and Subsidence**. Cumulative impacts identified for the Proposed Action are also applicable to the Site 4 Alternative.

### 5.2.2.5 Site 7 Alternative

**Project-Specific Impacts**

**Groundwater and Surface Water Quality**. Impacts identified for the Proposed Action are also applicable to the Site 7 Alternative.

**Flooding**. The Site 7 Alternative facility site would be located within an Other Flood Area (X), and may become inundated in a 100-year storm event. Therefore, the facility site and on-site operators may be adversely affected by flooding. Flood-related impacts are considered potentially significant, unless mitigation is incorporated into the design of the facility.

**Surface Water Quantity, Groundwater Quantity and Subsidence**. Impacts identified for the Proposed Action are also applicable to the Site 7 Alternative.

**Cumulative Impacts**

**Water Supply**. Other projects recently approved or under review within the City include commercial and residential land uses, which would require potable water service. The Site 7 Alternative would provide water to these land uses, and have been included in the water demand estimates listed in Table 5.2-4.

**Surface Water Quality**. Cumulative development may increase pollutant concentrations in storm run-off and may adversely affect surface water quality. During the construction period, the Site 7 Alternative may incrementally contribute to cumulative surface water quality impacts. However, mitigation measures are provided to avoid and minimize impacts to surface water quality.

**Surface Water Quantity, Groundwater Quantity and Subsidence**. Cumulative impacts identified for the Proposed Action are also applicable to the Site 7 Alternative.

5.2.2.6 Pumping Rate Alternatives

The relative water resources impacts of the pumping rate alternatives is discussed in Section 5.7.2.6 of the Final EIR/EA.

### 5.2.3 Mitigation Measures

5.2.3.1 Proposed Action

**Project-Specific Impacts**

**Construction Stormwater**. The following measures shall be included in the Stormwater Pollution Prevention Plan and implemented by the construction contractor in coordination with the City to minimize erosion and siltation of surface waters, and reduce the potential for hydrocarbon discharge from construction equipment.

- De-watering shall be conducted for excavation below the water table and include discharge to a sediment basin (or equivalent) prior to entering storm drains, creeks or other surface water;
- Heavy equipment shall be fueled in a designated area away from creeks, storm drains and culverts. This designated area shall include a drain pan or drop cloth and absorbent materials to clean up spills;
- Vehicles and equipment shall be maintained properly to prevent leakage. If maintenance must occur onsite, a designated area away from creeks, storm drains and culverts shall be used. This designated area shall include a drain pan or drop cloth and adsorbent materials to clean up spills;

- Vegetation adjacent to construction activities shall be preserved when feasible to minimize erosion;
- Adjacent to drainages, concrete shall not be applied during or immediately prior to periods of precipitation; and
- Concrete application shall be limited to areas isolated from surface water, and any groundwater affected by concrete shall not be discharged to surface waters.

**Flooding**. Flood walls shall be designed and constructed around the facility perimeter to minimize the potential for property damage and loss of human life during a 100-year storm event.

**Cumulative Impacts**

**Groundwater Elevations: North Pleasant Valley Basin Monitoring**. Four monitoring wells (three new and one existing) shall be used to establish baseline information, track the progress of the project as it pulls salts from the basin, and identify any conflicts with existing wells. Recommended general locations (A, B and C) of three new down-gradient monitoring wells are provided in Figure 5.2-7. The precise locations of the new monitoring wells shall be identified by a qualified hydrogeologist. The monitoring wells shall be in operation prior to project-related groundwater pumping to allow baseline groundwater data to be collected. A nearby inactive well (2N/20W-20E2) shall be used as an up-gradient monitoring well (see Location D in Figure 5.2-7).

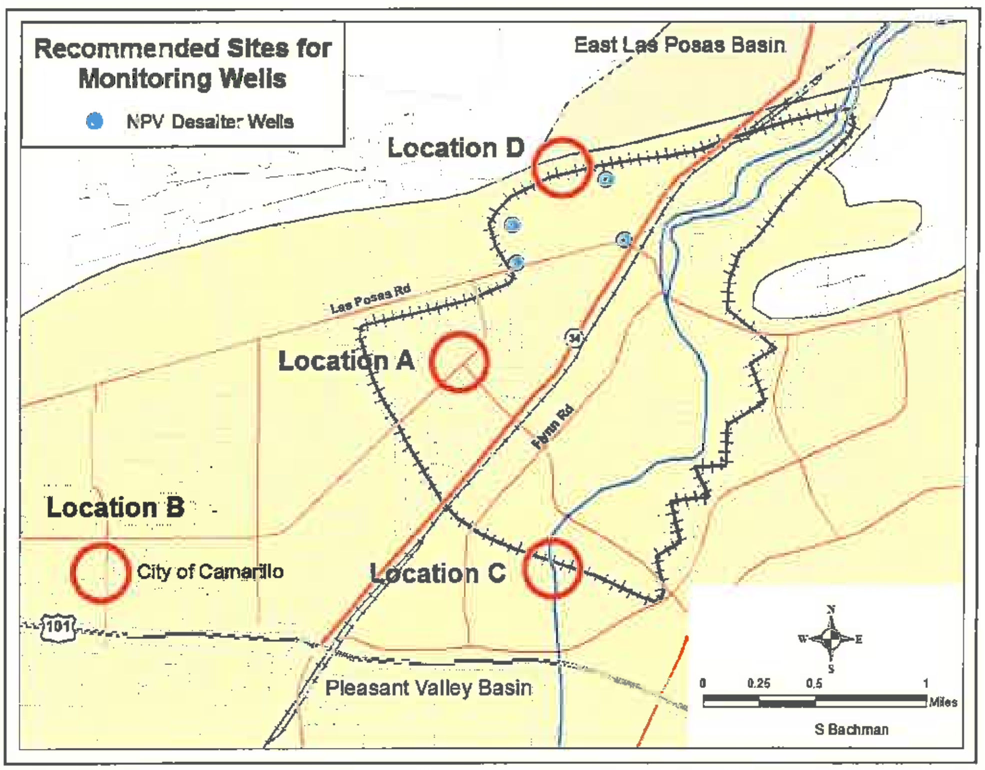



**Figure 5.2-7. Recommended Areas (circles) for Selection of Wells for Monitoring**

The monitoring wells shall be completed at multiple depths (e.g., typical U.S. Geological Survey monitoring well), with each sampled zone sealed from the rest of the well. Recommended monitoring well depths and screen intervals are provided for each of the four areas (A, B, C and D) shown in Figure 5.2-7 in Table 9 of Appendix A. The actual screened intervals shall be determined after a geophysical log is run between the time the well is drilled and it is cased. Each screened interval shall be continuously gravel-packed from 10 to 20 feet below the screen to 10 to 20 feet above the screen. A bentonite seal shall be placed at the bottom of the hole and between each screened interval.

The monitoring wells shall be designed such that a transducer can be installed and a submersible pump temporarily lowered in each well for sampling. A transducer/data logger shall be installed in each screened casing, with data downloaded periodically. Table 5.2-7 lists data to be collected at each NPV monitoring well.

**Table 5.2-7. North Pleasant Valley Basin Monitoring Well Data Collection**

| Parameter | Sample Type | Frequency |
|---|---|---|
| TDS (mg/l) | Grab | Quarterly |
| Chloride (mg/l) | Grab | Quarterly |
| Sulfate (mg/l) | Grab | Quarterly |
| Manganese (mg/l) | Grab | Quarterly |
| Groundwater level (each zone) | Grab | Quarterly |
| Groundwater level (each zone) | Continuous transducer (3 hour intervals) | Download data each quarter |
| Conductivity (each zone) | Grab | Quarterly |
| Conductivity (each zone) | Continuous transducer (3 hour intervals) | Download data each quarter |

**Groundwater Elevations: Project Area Monitoring**. The groundwater elevation and water quality of three existing groundwater production wells near the project wells shall also be monitored, including a Pleasant Valley Mutual Water Company well (2N/20W-19M5 or -19E1), the Bell Ranch well (2N/20W-19B1), and a third well located further east (to be identified). Table 5.2-8 lists data to be collected at each project area monitoring well.

**Table 5.2-8. Project Area Monitoring Well Data Collection**

| Parameter | Sample Type | Frequency |
|---|---|---|
| TDS (mg/l) | Grab | Semi-annually |
| Chloride (mg/l) | Grab | Semi-annually |
| Sulfate (mg/l) | Grab | Semi-annually |
| Manganese (mg/l) | Grab | Semi-annually |
| Groundwater level (each zone) | Continuous transducer* (3 hour intervals) | Download data semi-annually |
| Conductivity (each zone) | Continuous transducer* (3 hour intervals) | Download data semi-annually |

*If transducer installation is allowed by the well owner

**Groundwater Elevations: Project Extraction Well Monitoring**. The groundwater elevation and water quality of project extraction wells shall also be monitored. Table 5.2-9 lists data to be collected at each project extraction well.

**Table 5.2-9. Project Extraction Well Data Collection**

| Parameter | Sample Type | Frequency |
|---|---|---|
| TDS (mg/l) | Grab | Monthly |
| Chloride (mg/l) | Grab | Monthly |
| Sulfate (mg/l) | Grab | Monthly |
| Manganese (mg/l) | Grab | Monthly |
| Groundwater level (static) | Grab | Monthly |
| Conductivity | Grab | Monthly |

**Groundwater Elevations: Regional Monitoring**. Regional monitoring shall be conducted to detect regional trends (e.g., drought conditions, regional water quality changes) that may affect groundwater conditions at wells affected by the Proposed Action. Well 2N/21W-35M2 shall be used for regional monitoring. Data to be collected includes semi-annual grab samples for groundwater level and conductivity (each zone).

**Groundwater Elevation Contingency Measures**. These measures are based on numerical values (triggers) at which action would be taken to avoid approaching historic low groundwater elevations. When static (non-pumping) groundwater elevations reach 126 feet below mean sea level in a well monitored in the NPV Basin, reductions in pumping from project extraction wells would be implemented. The amount of pumping reduction shall be based on water elevations observed at the extraction wells in the sequence indicated in Table 5.2-10. If water levels recover, pumping can then be increased using the same sequence. Groundwater modeling indicates implementation of these contingency measures would avoid reducing groundwater elevations below historic lows under cumulative conditions (Bachman, 2016).

**Table 5.2-10. Groundwater Pumping Reduction Contingency Triggers**

| Measured Static Groundwater Elevation (msl) | Pumping Reduction (%) |
|---|---|
| -126 | 10 |
| -140 | 20 |
| -150 | 30 |
| -153 | 40 |
| -157 | 50 |
| -160 | 75 |
| -168 | 100 |

**Contingency Plan for Seawater Intrusion**. Although significant impacts related to seawater intrusion are not anticipated, these contingency measures are provided to address unforeseen conditions that may cause extension of the pumping depression towards the project area. These contingency measures are based on maintaining the groundwater gradient between the project and the pumping depression associated with seawater intrusion. The critical area for this gradient is where there is currently a sharp groundwater gradient towards the pumping depression which prevents the pumping depression from expanding eastward and increasing the size and depth of the depression. To calculate this gradient, two wells were selected – one an existing USGS monitoring well (2N/21W-34G4) and the other a new monitoring well to be constructed as part of the project (at Location B, see Figure 5.2-7). Pumping reductions would be required if the groundwater elevation in the USGS monitoring well is higher that the project monitoring well.

The contingency action would be similar to those for groundwater elevations; systematic reduction in project pumping until the groundwater gradient is reversed (groundwater elevation in the USGS monitoring well is lower than in the project monitoring well). Project pumping would be re-adjusted so that the project well closest to the affected area would reduce pumping by 10% for a period of six months. If these actions do not resolve the problem within a six-month period (i.e., prevent further drops in groundwater elevations), then pumping from this project well would be reduced an additional 10% (for a total reduction of 20%) for a period of six months and further evaluated. This step-wise reduction every six months would continue until the gradient is restored.

**Subsidence**. The above groundwater elevation contingency measures would avoid groundwater elevations from approaching historic levels, such that subsidence would be avoided. However, the City shall monitor surface elevations to detect subsidence and ensure the contingency measures are effective.

The location and elevation of the project extraction wells, new and existing monitoring wells shall be surveyed to serve as a baseline to detect subsidence. To ensure detection of any subsidence, both the wellhead and the nearby ground surface shall be surveyed. The monitoring wells and adjacent ground surfaces shall be resurveyed every 10 years to detect any changes in elevation related to subsidence. The regional monitoring well (2N/21W-35M2) shall be re-surveyed every 5 years to detect regional trends.

**Annual Monitoring Report.** An Annual Report shall be prepared summarizing data collected each calendar year and submitted to FCGMA and interested parties by April 1. The Annual Report shall include the following information:

- A summary of project groundwater pumping and treatment rates.
- Groundwater elevation and water quality data analyses obtained from extraction wells, monitoring wells, wells near project area, the regional monitoring well, conclusions formed from the analyses, and recommendations for future operations and monitoring.
- Summary of observed changes in the location and elevation of the salt plume, using information obtained from the extraction wells and monitoring wells.
- Subsidence monitoring including results of any regional land survey program.
- Regional maps of groundwater elevation contours to document any effects of the project on the wider Pleasant Valley basin.
- Summary of any contingency measures implemented and observed effect on groundwater elevations.

In addition to the annual reporting, the FCGMA shall be notified within one month of any unexpected or critical results from project monitoring. Examples of such results include rapidly dropping water levels, approach of target groundwater elevations, and unexpected water quality analyses.

5.2.3.2 Site 4 Alternative

Mitigation measures related to construction storm water, groundwater elevations and subsidence identified for the Proposed Action are applicable to this alternative.

5.2.3.3 Site 7 Alternative

Mitigation measures identified for the Proposed Action are applicable to this alternative.

### 5.2.4 Residual Impacts

Full implementation of identified mitigation measures would reduce water resources impacts below the level of significance for each of the alternatives.

# 5.3 NOISE

## 5.3.1 Affected Environment

### 5.3.1.1 Noise Measurement Scales

Noise is generally defined as unwanted or objectionable sound. Noise levels are measured on a logarithmic scale because of physical characteristics of sound transmission and reception. Noise energy is typically reported in units of decibels (dB). Noise levels diminish (or attenuate) as distance to the source increases according to the inverse square rule, but the rate constant varies with the type of sound source. The typical sound attenuation rate from point sources such as industrial facilities is about 6 dB per doubling of distance. Heavily traveled roads with few gaps in traffic approximate continuous line sources and attenuate at 3 dB per doubling of distance. Noise from more lightly traveled roads is attenuated at 4.5 dB per doubling of distance.

Community noise levels are typically measured in terms of the A-weighted decibel (dBA). A-weighting is a frequency correction that correlates overall sound pressure levels with the frequency response of the human ear. Equivalent noise level (Leq) is the average noise level on an energy basis for a specific time period. The duration of noise and the time of day at which it occurs are important factors in determining the impact of noise on communities. Noise is more disturbing at night and noise indices have been developed to account for the time of day and duration of noise generation. The Community Noise Equivalent Level (CNEL) and Day-Night Average Level (DNL or Ldn) are such indices. These indices are time-weighted average values equal to the amount of acoustic energy equivalent to a time-varying sound over a 24-hour period. The CNEL index penalizes night-time noise (10 p.m. to 7 a.m.) by adding 10 dB and evening noise (7 p.m. to 10 p.m.) by adding 5 dB to account for increased sensitivity of the community after dark. The Ldn index penalizes night-time noise the same as the CNEL index, but does not penalize evening noise. The following Table 5.3-1 summarizes typical community noise exposure and acceptability for various land uses.

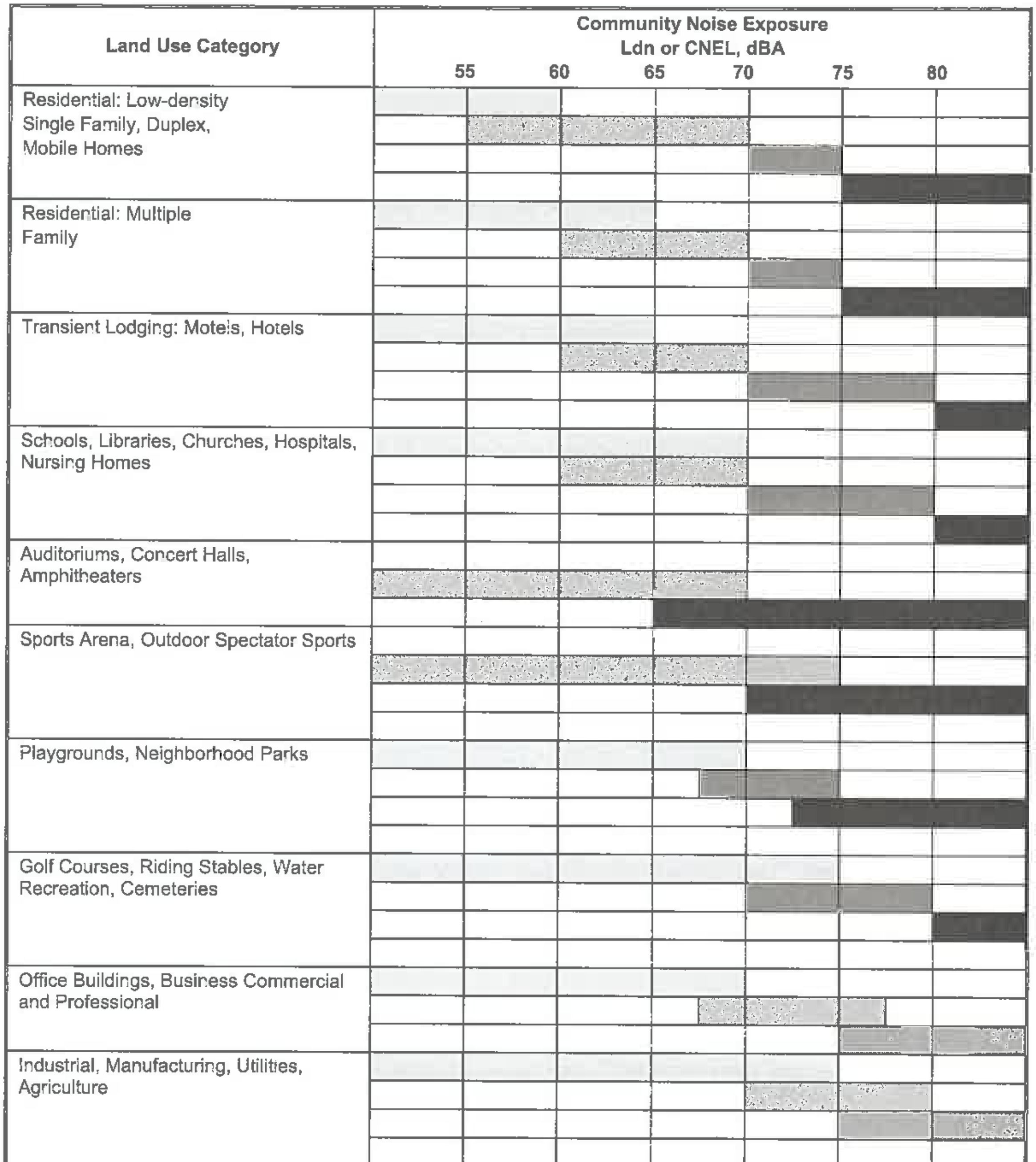
### 5.3.1.2 Regulatory Environment

Chapter 10.34 of the City's Municipal Code provides noise standards for four noise zones, including agricultural/open space, residential, commercial/office and industrial. Construction activities are exempt from these noise standards provided they are limited to 7 a.m. to 7 p.m.

### 5.3.1.3 Current Noise Environment

Land uses adjacent to the sites under consideration include residential, educational (adjacent Rancho Campana High School), commercial, institutional (hospital, churches) and agricultural. As such, existing noise levels can be attributable to a number of sources, including but not limited to motor vehicles, air traffic from the Camarillo Airport, railroad transportation, and agricultural operations. In particular, existing vehicular traffic on Las Posas Road and Lewis Road, and railroad traffic along Lewis Road contribute substantially to existing noise levels in the project area.

**Table 5.3-1. Land Use Compatibility for Community Noise Environments**




Source: California Department of Health, Office of Noise Control

## INTERPRETATION:

- Normally Acceptable: specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction without any special noise insulation requirements.
- Conditionally Acceptable: New construction or development should only be undertaken after a detailed analysis of the noise reduction requirements is made and the needed insulation features included in the design.
- Normally Unacceptable: New construction or development should generally be discouraged. If new development is to proceed, a detailed analysis of the noise reduction requirements is made and the needed insulation features included in the design.
- Clearly Unacceptable: New development or construction should not be undertaken.

As defined in Appendix A of the City's General Plan Noise Element, noise sensitive uses are residences, transient lodging (hotel, motel), dormitories, hospitals, nursing homes, churches, educational facilities and libraries. Noise sensitive receptors near the sites under consideration include St. John's Pleasant Valley Hospital (near Well B and Proposed Action facility site), Church of Latter Day Saints (near southern well site), new Rancho Campana High School (adjacent to the well sites) and residential areas (near the Proposed Action facility site, Site 7 Alternative facility site and southern well site).

Noise levels were measured at two sensitive receptor locations near the Proposed Action facility site on December 4, 2013 using a Larson & Davis LXT precision integrating sound level Meter. Leq noise measurements were taken for 20-minute periods. Table 5.3-2 identifies the noise measurement location and the ambient Leq value. However, it is important to realize that existing noise data presented in Table 5.3-2 are short-term monitoring values and may not adequately characterize the existing noise environment within the project area. Note that a six foot-high masonry block wall is located along the north side of Villamonte Court and east side of Antonio Avenue near the Proposed Action facility site, and serves to attenuate noise at the ground floor of these two-story homes.

**Table 5.3-2. Existing Noise Levels in the Project Area**

| Monitoring Location | Monitoring Period | Dominant Noise Source | dBA Leq |
|---|---|---|---|
| Antonio Avenue across from St. John's Hospital | 8:44-9:04 a.m. | Traffic, pumps at Well B | 49.1 |
| Antonio Avenue near Ponderosa Drive | 9:12-9:32 a.m. | Traffic, distant railroad horn | 53.0 |

### 5.3.2 Environmental Consequences/Impacts

#### 5.3.2.1 Significance Thresholds

Noise impacts associated with the project would include short-term construction noise, and long-term operation noise (treatment facility and wells). City of Camarillo Municipal Code Chapter 10.34 establishes noise standards for land use compatibility, but exempts construction activity conducted between 7 a.m. and 7 p.m. Noise generated by construction outside of these hours would be subject to residential exterior noise standards of 55 dBA (daytime, 7 am to 9 pm) and 45 dBA (nighttime, 9 pm to 7 am). As the City has not established exterior noise standards for institutional, church or school land uses, the residential noise standard is used as a significance threshold for St. John's Pleasant Valley Hospital, the Rancho Campana High School and the Church of Latter Day Saints.

#### 5.3.2.2 No Action/No Project Alternative

This alternative would not result in any noise generation, or cause a change in existing groundwater pumping or treating activities that would increase noise levels. No noise impacts would occur with implementation of the No Action/No Project Alternative.

### 5.3.2.3 Proposed Action

**Project-Specific Impacts**

**Construction**. The Proposed Action would generate noise as a result of construction (site preparation, treatment plant erection, building construction, well drilling and pipeline installation) and operation of facilities (treatment plant, wells). Construction noise generation would be generally limited to normal working hours (7 a.m. to 4 p.m.). However, some nighttime work may be required during well drilling. The Federal Highway Administration's Roadway Construction Noise Model was used to estimate project-related noise levels at the nearest sensitive receptors (see Table 5.3-3). Noise modeling indicates site preparation activities at the facility site would generate noise levels of 67.3 dBA Leq at St. John's Pleasant Valley Hospital and at the nearest residence (Villamonte Court). Construction noise levels would exceed the residential noise standard of 55 dBA. Noise associated with pipeline installation may exacerbate existing traffic noise at residences along Las Posas Road. However, excluding well drilling, all construction activities would be conducted between 7 a.m. and 7 p.m. and are exempt from the City's noise regulations.

Well drilling may occur after 7 p.m. and would generate noise levels of 55.0 dBA Leq at Rancho Campana High School and Church of Latter Day Saints and 47.5 dBA Leq at the nearest residence (see Table 5.3-3). Note that the noise modeling assumes temporary noise barriers would be used during nighttime well drilling. Noise generated by well drilling at the proposed southern well site would exceed the 45 dBA nighttime noise standard at the nearest residence (Placita San Leandro) and numerous residences nearby. This impact is considered potentially significant. Note that the church and high school would not be occupied during nighttime, such that exceedances of the City's nighttime noise standard at these land uses is not a concern.

**Table 5.3-3. Construction Noise Modeling Results**

| Site | Nearest Sensitive Receptor | Distance (feet) | Modeled Activity | Modeled Noise Level (dBA Leq) |
|---|---|---|---|---|
| Proposed Action facility site | St. John's Hospital, residences on Villamonte Court | 300 | Site preparation | 67.3 |
| Site 4 Alternative Facility site | Residences along Somis Road | 1400 | Site preparation | 54.8 |
| Site 7 Alternative facility site | Adjacent caretaker residence | 200 | Site preparation | 70.4 |
| Southern well site | Church of Latter Day Saints | 300 | Well drilling with noise barrier | 55.0 |
| | Nearest residence (Placita San Leandro) | 750 | Well drilling with noise barrier | 47.5 |
| | Rancho Campana High School | 300 | Well drilling with noise barrier | 55.0 |
| Northern well site | Rancho Campana High School | 300 | Well drilling with noise barrier | 55.0 |

Excavation and other earthwork at the facility site as part of construction may result in some ground-borne noise or vibration. Due to the distance to the nearest structure (300 feet) and small magnitude of earthmoving activities, these impacts are considered less than significant.

**Operation**. The proposed groundwater treatment facility would include RO feed pumps, decarbonator blowers, a finished water pumping station and other mechanical devices that would generate noise. These components would be enclosed in structures and/or sound enclosures which would attenuate noise to comply with the City's daytime 55 dBA residential noise standard. However, nighttime noise levels may exceed the 45 dBA nighttime noise standard at St. John's Pleasant Valley Hospital and residences located southeast of the facility site. Although nighttime noise levels generated by the proposed groundwater treatment facility may be very similar to existing ambient noise levels, operational noise impacts are considered potentially significant.

Operation of the proposed well sites would involve noise generated by well pump(s). However, these pumps would be submersible (located within the well bore) and the wellhead would be enclosed by a masonry building. Therefore, noise levels are anticipated to comply with the City's exterior noise standards at adjacent residential, church and school land uses.

**Cumulative Impacts**

Other projects discussed in Section 3.7 would generate both short-term construction noise and long-term traffic noise. The Proposed Action would contribute to traffic noise associated with vehicle trips generated by the cumulative projects, but would not contribute to cumulative construction noise because the proposed project is not located in close proximity to other projects (the Dignity Health project would be completed prior to project construction) and would not have a detectable incremental contribution to impacts at noise sensitive receptors affected by these projects.

The long-term vehicle noise generated by the small number of vehicles associated with project operation would be negligible because project-related traffic would be much less than one percent of existing traffic volumes on affected roadways (primarily Las Posas Road). Therefore, the project's incremental contribution to traffic noise would not be cumulatively considerable.

5.3.2.4 Site 4 Alternative

**Project-Specific Impacts**

**Construction**. The Site 4 Alternative would generate noise as a result of construction (site preparation, treatment plant erection, building construction, well drilling and pipeline installation) and operation of facilities (treatment plant, wells). Construction noise would be generally limited to normal working hours (7 a.m. to 4 p.m.). However, some nighttime work may be required during well drilling. The Federal Highway Administration's Roadway Construction Noise Model was used to estimate project-related noise levels at the nearest sensitive receptors (see Table 5.3-3). Noise modeling indicates site preparation activities at the facility site would generate noise levels of 54.8 dBA Leq at the nearest residence (on Somis Road). These levels would not exceed the City's 55 dBA daytime residential noise standard.

Noise associated with pipeline installation may exacerbate existing traffic noise at residences along Las Posas Road. However, excluding well drilling, all construction activities would be conducted between 7 a.m. and 7 p.m. and are exempt from the City's noise regulations.

Well drilling may occur after 7 p.m. and would generate noise levels of 55.0 dBA Leq at Rancho Campana High School and Church of Latter Day Saints and 47.5 dBA Leq at the nearest residence (see Table 5.3-3). Note that the noise modeling assumes temporary noise barriers would be used during nighttime well drilling. Noise generated by well drilling at the proposed southern well site would exceed the 45 dBA nighttime noise standard at the nearest residence (Placita San Leandro) and numerous residences nearby. This impact is considered potentially significant. Note that the church and high school would not be occupied during nighttime (after 9 p.m.).

Excavation and other earthwork at the facility site as part of construction may result in some ground-borne noise or vibration. Due to the distance to the nearest structure (1,200 feet) and small magnitude of earthmoving activities, these impacts are considered less than significant.

**Operation**. The proposed groundwater treatment facility would include RO feed pumps, decarbonator blowers, a finished water pumping station and other mechanical devices that would generate noise. These components would be enclosed in structures and/or sound enclosures which would attenuate noise to comply with the City's daytime 55 dBA residential noise standard. Due to the lack of nearby noise sensitive land uses, nighttime noise generated by operation of the facility would not exceed the 45 dBA nighttime noise standard, and is considered a less than significant impact. Note that Rancho Campana High School would not be occupied during nighttime; therefore, would not be adversely affected by nighttime facility operation.

Operation of the proposed well sites would involve noise generated by well pump(s). However, these pumps would be submersible (located within the well bore) and the wellhead would be enclosed by a masonry building. Therefore, noise levels are anticipated to comply with the City's exterior noise standards at adjacent residential, church and school land uses.

### Cumulative Impacts

Other projects discussed in Section 3.7 would generate both short-term construction noise and long-term traffic noise. The Site 4 Alternative would contribute to cumulative traffic noise, but would not contribute to cumulative construction noise because the Site 4 Alternative is not located in close proximity to other projects and would not have a detectable incremental contribution to impacts at noise sensitive receptors affected by these projects.

The long-term vehicle noise generated by the small number of vehicles associated with project operation would be negligible because project-related traffic would be much less than one percent of existing traffic volumes on affected roadways (primarily Las Posas Road). Therefore, the project's incremental contribution to traffic noise would not be cumulatively considerable.

### 5.3.2.5 Site 7 Alternative

**Project-Specific Impacts**

**Construction.** The Site 7 Alternative would generate noise as a result of construction (site preparation, treatment plant erection, building construction, well drilling and pipeline installation) and operation of facilities (treatment plant, wells). Construction noise would be generally limited to normal working hours (7 a.m. to 4 p.m.). However, some nighttime work may be required during well drilling. The Federal Highway Administration's Roadway Construction Noise Model was used to estimate project-related noise levels at the nearest sensitive receptors (see Table 5.3-3). Noise modeling indicates site preparation activities at the facility site would generate noise levels of 70.4 dBA Leq at the nearest residence (on-site caretaker). Construction noise levels would exceed the City's 55 dBA daytime residential noise standard. Noise associated with pipeline installation may exacerbate existing traffic noise at residences along Las Posas Road. However, excluding well drilling, all construction activities would be conducted between 7 a.m. and 7 p.m. and are exempt from the City's noise regulations.

Well drilling may occur after 7 p.m. and would generate noise levels of 55.0 dBA Leq at Rancho Campana High School and Church of Latter Day Saints and 47.5 dBA Leq at the nearest residence (see Table 5.3-3). Note that the noise modeling assumes temporary noise barriers would be used during nighttime well drilling. Noise generated by well drilling at the proposed southern well site would exceed the 45 dBA nighttime noise standard at the nearest residence (Placita San Leandro) and numerous residences nearby. This impact is considered potentially significant. Note that the church and high school would not be occupied during nighttime, and would not be adversely affected by project noise levels above the City's nighttime noise standard.

Excavation and other earthwork at the facility site as part of construction may result in some ground-borne noise or vibration. Due to the distance to the nearest structure (200 feet) and small magnitude of earthmoving activities, these impacts are considered less than significant.

**Operation.** The proposed groundwater treatment facility would include RO feed pumps, decarbonator blowers, a finished water pumping station and other mechanical devices that would generate noise. These components would be enclosed in structures and/or sound enclosures which would attenuate noise to comply with the City's daytime 55 dBA residential noise standard. However, nighttime noise levels may exceed the 45 dBA nighttime noise standard at the caretaker residence and residences located south of the facility site. Although nighttime noise levels generated by the proposed groundwater treatment facility may be very similar to existing ambient noise levels, operational noise impacts are considered potentially significant.

Operation of the proposed well sites would involve noise generated by well pump(s). However, these pumps would be submersible (located within the well bore) and the wellhead would be enclosed by a masonry building. Therefore, noise levels are anticipated to comply with the City's exterior noise standards at adjacent residential, church and school land uses.

### Cumulative Impacts

Other projects discussed in Section 3.7 would generate both short-term construction noise and long-term traffic noise. The Site 7 Alternative would contribute to cumulative traffic noise, but would not contribute to cumulative construction noise because the Site 7 Alternative is not located in close proximity to other projects and would not have a detectable incremental contribution to impacts at noise sensitive receptors affected by these projects.

The long-term vehicle noise generated by the small number of vehicles associated with project operation would be negligible because project-related traffic would be much less than one percent of existing traffic volumes on affected roadways (primarily Las Posas Road). Therefore, the project's incremental contribution to traffic noise would not be cumulatively considerable.

## 5.3.3 Mitigation Measures

### 5.3.3.1 Proposed Action

The following measures are provided to minimize nighttime noise impacts associated with well drilling.

- Avoid well drilling between 9 p.m. and 7 a.m., if feasible;
- Provide at least 7 days notice of nighttime well drilling activities to all residents located within 1,000 feet of the well site; and
- Install and maintain temporary noise barriers around the well drilling site during all drilling operations.

The following measures are provided to minimize nighttime noise impacts associated with facility operation.

- Prior to construction, conduct an engineering design review to ensure all noise-producing components are enclosed and shielded, to minimize noise generation to the extent feasible;
- Complete a noise study within 90 days of the start of operation to determine if nighttime noise levels associated with facility operation are detectable at adjacent residences; and
- Based on the findings of the noise study, implement additional noise reduction measures as needed which may include a facility perimeter sound wall.

### 5.3.3.2 Site 4 Alternative

The following measures are provided to minimize nighttime noise impacts associated with well drilling.

- Avoid well drilling between 9 p.m. and 7 a.m., if feasible;
- Provide at least 7 days' notice of nighttime well drilling activities to all residents located within 1,000 feet of the well site; and

- Install and maintain temporary noise barriers around the well drilling site during all drilling operations.

#### 5.3.3.3 Site 7 Alternative

The following measures are provided to minimize nighttime noise impacts associated with well drilling.

- Avoid well drilling between 9 p.m. and 7 a.m., if feasible;
- Provide at least 7 days' notice of nighttime well drilling activities to all residents located within 1,000 feet of the well site; and
- Install and maintain temporary noise barriers around the well drilling site during all drilling operations.

The following measures are provided to minimize nighttime noise impacts associated with facility operation.

- Prior to construction, conduct an engineering design review to ensure all noise-producing components are enclosed and shielded, to minimize noise generation to the extent feasible;
- Complete a noise study within 90 days of the start of operation to determine if nighttime noise levels associated with facility operation are detectable at adjacent residences; and
- Based on the findings of the noise study, implement additional noise reduction measures as needed which may include a facility perimeter sound wall.

### 5.3.4 Residual Impacts

#### 5.3.4.1 Proposed Action

Implementation of mitigation measures provided would reduce construction and operational noise impacts to a level of less than significant.

#### 5.3.4.2 Site 4 Alternative

Implementation of mitigation measures provided would reduce construction and operational noise impacts to a level of less than significant.

#### 5.3.4.3 Site 7 Alternative

Implementation of mitigation measures provided would reduce construction and operational noise impacts to a level of less than significant.

# 5.4 LAND USE AND PLANNING

## 5.4.1 Affected Environment

### 5.4.1.1 Site Description

A land use summary is provided in Table 5.4-1 for each site considered for the project. Adjacent land uses include:

- Proposed Action facility site: row crops, with St. John's Hospital across Antonio Avenue, and a residential area along Villamonte Court to the southeast;
- Site 4 Alternative facility site and northern well site: row crops, with the new Rancho Campana High School immediately to the south;
- Site 7 Alternative facility site: citrus orchard to the north, residential area south across Upland Road, and Arroyo Las Posas to the east; and
- Southern well site: row crops to the south and east, the new Rancho Campana High School immediately to the north, and the Church of Latter Day Saints to the west.

**Table 5.4-1. Land Use Summary**

| Site | Current Land Use | Area (acres) | APN | Jurisdiction | Land Use Designation | Zoning |
|---|---|---|---|---|---|---|
| Proposed Action facility site | Row crops | 4.0 | 156-0-180-380 | Ventura County | Agriculture | AE-40 ac |
| Site 4 Alternative facility site | Row crops | 4.0 | 156-0-180-380 | Ventura County | Agriculture | AE-40 ac |
| Site 7 Alternative facility site | Citrus orchard | 4.0 | 163-0-071-250 | Camarillo | Agriculture | AE |
| Northern well site* | Row crops | 0.25 | 156-0-180-380 | Ventura County | Agriculture | AE-40 ac |
| Southern well site | Row crops | 0.20 | 156-0-180-280 | Ventura County | Agriculture | AE-40 ac |

*Northern well incorporated into the facility site for the Site 4 Alternative

### 5.4.1.2 Zoning Ordinance Compliance

The Proposed Action facility site, Site 4 Alternative facility site and both proposed well sites are currently located with the municipal jurisdiction of Ventura County and subject to the County's Non-Coastal Zoning Ordinance. The proposed project (public service/utility office and service yard) is not an allowed use under the current AE-40 ac (agricultural exclusive) zoning. The Ventura County Save our Open Space and Agricultural Resources (SOAR) Initiative prevents changing the agricultural zoning without a vote of people, unless the Board of Supervisors makes certain findings regarding the proposed zone change.

#### 5.4.1.3 Camarillo Urban Restriction Boundary

The Proposed Action facility site, Site 4 Alternative facility site and both proposed well sites are located outside the City's Urban Restriction Boundary, as delineated by the City's SOAR Ordinance. The purpose of this Urban Restriction Boundary is to ensure that the purposes and principles set forth in the Camarillo General Plan relating to Land Use (Chapter IV) and Open Space and Conservation (Chapter IX) are inviolable against transitory short-term political decisions and that agricultural, watershed and open space lands are not prematurely or unnecessarily converted to other non-agricultural or non-open space uses without public debate and a vote of the people. The proposed project is a potable water facility and exempt from the City's SOAR Ordinance.

### 5.4.2 Environmental Consequences/Impacts

#### 5.4.2.1 Significance Thresholds

The following thresholds are taken from the Ventura County Initial Study Assessment Guidelines and have been adopted by the City for this project:

- Any project that is inconsistent with a specific environmental policy of the General Plan is considered as having a significant environmental impact.
- The above criterion is not applicable if the project includes a General Plan Amendment (GPA) that would eliminate the inconsistency, and the GPA itself would not have a significant impact on any other environmental issue nor be inconsistent with any other environmental policy or goal of the General Plan.

#### 5.4.2.2 No Action/No Project Alternative

This alternative would not result in any changes in land use, or otherwise result in conflicts with land uses, or policies of the Ventura County General Plan or City of Camarillo General Plan.

#### 5.4.2.3 Proposed Action

**Project-specific Impacts**

The Proposed Action facility site and two well sites are located outside the City boundary and the City's Sphere of Influence, but within the City's Area of Interest (see Figure 3-2). As the preferred facility site is located outside the City's municipal boundaries and would be served by the Camarillo Sanitary District, the City would request approval from LAFCO for reorganization. The two well sites would not require service from public agencies and would not be annexed and would remain within unincorporated Ventura County. Publically operated wells within AE zoning may require a conditional use permit from Ventura County.

The reorganization proposal would include:

- An amendment to the City's Sphere of Influence boundaries to include the facility site;
- Parcel subdivision to create a legal lot for the facility site;
- Annexation of the facility site to the City;

- An amendment to the Camarillo Sanitary District's Sphere of Influence boundary to include the facility site;
- Annexation of the facility site to the Camarillo Sanitary District;
- Detachment of the facility site from the Ventura County Resource Conservation District, Ventura County Waterworks District No. 19, County Service Area no. 32 (individual sewage disposal), County Service Area no. 33 (recreation and park services) and Gold Coast Transit District; and
- The City of Camarillo would pre-zone the facility site to ensure General Plan consistency.

The City would pre-zone the facility site to R-E (Rural Exclusive) and issue a conditional use permit in accordance with Chapter 19.62 of the City's Municipal Code to reflect a "Quasi Public/Utility" land use designation. The proposed project is an allowed use under the City's R-E zoning (Municipal Code Chapter 19.12.020G, public buildings and other facilities). A parcel subdivision to create a legal lot for the facility site would be requested from the Ventura County Resource Management Agency.

The Proposed Action is consistent with the policies of the City's General Plan. Following implementation of reorganization, change in zoning, and conditional use permit, the proposed project would be consistent with the City and County's Zoning Ordinance and General Plan. Overall, no impacts related to land use or planning are anticipated following proposed municipal reorganization and conditional use permit issuance.

The facility site and well sites are located in an agricultural area, and would not require the construction of any roads, barriers, or facilities that could potentially physically divide an existing community. No impact of this nature would result.

**Cumulative Impacts**

Other projects discussed in Section 3.7 may require a General Plan amendment and/or change in zoning. However, the Proposed Action would not incrementally contribute to these impacts.

5.4.2.4 Site 4 Alternative

**Project-specific Impacts**

The Site 4 Alternative facility site and proposed southern well site are located outside the City boundary and the City's Sphere of Influence, but within the City's Area of Interest and contiguous with the City's municipal boundary. As the facility site is located outside the City's municipal boundaries, the City would request approval from LAFCO for a reorganization. The reorganization proposal would be the same as discussed in Section 5.4.2.3. The southern well site would not require service from public agencies and would not be annexed and would remain within unincorporated Ventura County. Publically operated wells within AE zoning may require a conditional use permit from Ventura County.

The Site 4 Alternative is consistent with the policies of the City's General Plan. Following implementation of reorganization, change in zoning, and conditional use permit, the Site 4 Alternative would be consistent with the City and County's Zoning Ordinance and General Plan. Overall, no impacts related to land use or planning are anticipated following proposed municipal reorganization and conditional use permit issuance.

The facility site and southern well site are located in an agricultural area, and would not require the construction of any roads, barriers, or facilities that could potentially physically divide an existing community. No impact of this nature would result.

**Cumulative Impacts**

Other projects discussed in Section 3.7 may require a General Plan amendment and/or change in zoning. However, the Site 4 Alternative would not incrementally contribute to these impacts.

5.4.2.5 Site 7 Alternative

**Project-specific Impacts**

Although the Site 7 Alternative facility site is located within the City, the proposed well sites are located outside the City boundary and the City's Sphere of Influence, but within the City's Area of Interest and contiguous with the City's municipal boundary. The two well sites would not require service from public agencies and would not be annexed and would remain within unincorporated Ventura County. Publically operated wells within AE zoning may require a conditional use permit from Ventura County.

The Site 7 Alternative is consistent with the policies of the City's General Plan. Following implementation of a conditional use permit(s) for the well sites, the Site 7 Alternative would be consistent with the County's Zoning Ordinance and General Plan. Overall, no impacts related to land use or planning are anticipated.

The facility site and well sites are located in an agricultural area, and would not require the construction of any roads, barriers, or facilities that could potentially physically divide an existing community. No impact of this nature would result.

**Cumulative Impacts**

Other projects discussed in Section 3.7 may require a General Plan amendment and/or change in zoning. However, the Site 7 Alternative would not incrementally contribute to these impacts.

### 5.4.3 Mitigation Measures

Significant impacts were not identified; therefore, mitigation measures are not necessary.

# 6.0 SUMMARY OF MITIGATION MEASURES/ENVIRONMENTAL COMMITMENTS

The following is a summary of mitigation measures and environmental commitments made on behalf of the Proposed Action. This Section also comprises a Mitigation Monitoring and Reporting Program as required by Section 15097 of the State CEQA Guidelines and Section 21081.6 of the Public Resources Code. The City of Camarillo would be responsible for implementation of each measure/commitment.

| MEASURE | TIMING | RESPONSIBLE PARTY/METHODS |
|---|---|---|
| **CULTURAL RESOURCES** | | |
| To mitigate impacts to any buried, intact and potentially significant archaeological resources, and to address the Chumash community's concerns, the following measures should be fully implemented during construction.<br>• An archaeologist and Chumash representative shall be retained to monitor all project-related earth disturbances that extend below 2 feet from the ground surface, within the facility site and the proposed well site, and pipeline trenches located within agricultural fields.<br>• At the commencement of project construction, the archaeological monitor shall give all workers associated with earth-disturbing procedures an orientation regarding the probability of exposing cultural resources and directions as to what steps are to be taken if a find is encountered.<br>• The archaeologist shall have the authority to temporarily halt or redirect project construction in the event that potentially significant cultural resources are exposed. Based on monitoring observations and the actual extent of project disturbance, the lead archaeologist shall have the authority to refine the monitoring requirements as appropriate (i.e., change to spot checks or halt monitoring) in consultation with the City.<br>• A monitoring report shall be prepared upon completion of construction and provided to the City and the SCCIC.<br>• In the unexpected event that archaeological resources are exposed during project construction, all earth disturbing work within the vicinity of the find must be temporarily suspended until a qualified archaeologist has evaluated the nature and significance of the find. The City shall be notified of any such find. A Chumash representative should monitor any archaeological field work associated with Native American materials.<br>• If human remains are unearthed, State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission. The City shall be notified of any such find. | These measures would be implemented during construction | The City of Camarillo would be responsible for implementation by qualified archeologists. Compliance would be verified by field inspections and review of monitoring reports. |

| MEASURE | TIMING | RESPONSIBLE PARTY/METHODS |
| --- | --- | --- |
| **HAZARDOUS MATERIALS** | | |
| Soil samples shall be obtained in all previously cultivated areas affected by project excavation, prior to project-related excavation. Pipeline alignments located on farmlands shall be sampled every 1,000 feet. The soil samples shall be collected at a depth of one-foot and three-feet. The number and depth of samples at each site may be adjusted based on field conditions, anticipated depth of soil disturbance and preliminary analytical results.<br><br>Samples shall be analyzed for organo-chlorine pesticides and total petroleum hydrocarbons according to U.S. EPA methods acceptable to the California Department of Toxic Substances Control. Soils with contaminant concentrations above the applicable Preliminary Remediation Goals established by U.S. EPA for non-residential land uses shall be considered contaminated and segregated in a stockpile. Contaminated soil shall be covered with impervious materials to prevent wind erosion and exposure to rainfall and storm run-off. These materials may be used as backfill, provided they are covered with at least one foot of non-contaminated soil or asphalt concrete.<br><br>When excavated, contaminated soil shall be handled by workers properly trained in accordance with the requirements of the California Occupational Safety and Health Administration (Cal OSHA). A Health and Safety Plan shall be developed and implemented by qualified individuals to minimize exposure of workers. Contaminated soils should be treated as hazardous materials and proper precautions taken to prevent inhalation (dust control) and dermal (skin) contact by construction workers. | These measures would be implemented during construction | The City of Camarillo would be responsible for implementation by qualified hazardous materials specialists. Compliance would be verified by field inspections and review of laboratory testing results. |
| **WATER RESOURCES - Construction** | | |
| The following measures shall be included in the Stormwater Pollution Prevention Plan and implemented by the construction contractor in coordination with the City to minimize erosion and siltation of surface waters, and reduce the potential for hydrocarbon discharge from construction equipment.<br>• De-watering shall be conducted for excavation below the water table and include discharge to a sediment basin (or equivalent) prior to entering storm drains, creeks or other surface water;<br>• Heavy equipment shall be fueled in a designated area away from creeks, storm drains and culverts. This designated area shall include a drain pan or drop cloth and absorbent materials to clean up spills;<br>• Vehicles and equipment shall be maintained properly to prevent leakage. If maintenance must occur onsite, a designated area away from creeks, storm drains and culverts shall be used. This designated area shall include a drain pan or drop cloth and adsorbent materials to clean up spills;<br>• Vegetation adjacent to construction activities shall be preserved when feasible to minimize erosion;<br>• Adjacent to drainages, concrete shall not be applied during or immediately prior to periods of precipitation; and<br>• Concrete application shall be limited to areas isolated from surface water, and any groundwater affected by concrete shall not be discharged to surface waters. | These measures would be implemented during construction | The City of Camarillo would be responsible for implementation by qualified storm water specialists. Compliance would be verified by field inspections. |

| MEASURE | TIMING | RESPONSIBLE PARTY/METHODS |
|---|---|---|
| **WATER RESOURCES – Groundwater Monitoring** | | |
| **NPV Basin.** Four monitoring wells (three new and one existing) shall be used to establish baseline information, track the progress of the project as it pulls salts from the basin, and identify any conflicts with existing wells. Recommended general locations (A, B and C) of three new down-gradient monitoring wells are provided in Figure 5.2-7. The precise locations of the new monitoring wells shall be identified by a qualified hydrogeologist. The monitoring wells shall be in operation prior to project-related groundwater pumping to allow baseline groundwater data to be collected. A nearby inactive well (2N/20W-20E2) shall be used as an up-gradient monitoring well (see Location D in Figure 5.2-7).<br><br>The monitoring wells shall be completed at multiple depths (e.g., typical U.S. Geological Survey monitoring well), with each sampled zone sealed from the rest of the well. Recommended monitoring well depths and screen intervals are provided for each of the four areas (A, B, C and D) shown in Figure 5.2-7 in Table 9 of Appendix A. The actual screened intervals shall be determined after a geophysical log is run between the time the well is drilled and it is cased. Each screened interval shall be continuously gravel-packed from 10 to 20 feet below the screen to 10 to 20 feet above the screen. A bentonite seal shall be placed at the bottom of the hole and between each screened interval.<br><br>The monitoring wells shall be designed such that a transducer can be installed and a submersible pump temporarily lowered in each well for sampling. A transducer/data logger shall be installed in each screened casing, with data downloaded periodically. Table 5.2-7 lists data to be collected at each NPV monitoring well.<br><br>**Project Area Groundwater Monitoring**. The groundwater elevation and water quality of three existing groundwater production wells near the project wells shall also be monitored, including a Pleasant Valley Mutual Water Company well (2N/20W-19M5 or -19E1), a Bell Ranch well (2N/20W-19B1), and a third well located further east (to be identified). Table 5.2-8 lists data to be collected at each project area monitoring well.<br><br>**Project Extraction Well Groundwater Monitoring.** The groundwater elevation and water quality of project extraction wells shall also be monitored. Table 5.2-9 lists data to be collected at each project extraction well.<br><br>**Regional Groundwater Monitoring.** Regional monitoring shall be conducted to detect regional trends (e.g., drought conditions, regional water quality changes) that may affect groundwater conditions at wells affected by the Proposed Action. Well 2N/21W-35M2 shall be used for regional monitoring. Data to be collected includes semi-annual grab samples for groundwater level and conductivity (each zone).<br><br>**Groundwater Elevation Contingency Measures**. These measures are based on numerical values (triggers) at which action would be taken to avoid approaching historic low groundwater elevations. When static (non-pumping) groundwater elevations reach 126 feet below mean sea level in a well monitored in the NPV Basin, reductions in pumping from project extraction wells would be implemented. The amount of pumping reduction shall be based on water elevations observed at the extraction wells in the sequence indicated in Table 5.2-10. If water levels recover, pumping can then be increased using the same sequence.<br><br>**Contingency Plan for Seawater Intrusion.** Although significant impacts related to seawater intrusion are not anticipated, these contingency measures are provided to address unforeseen conditions that may cause extension of the pumping depression towards the project area. These contingency measures are based on maintaining the groundwater gradient between the project and the pumping depression associated with seawater intrusion. The critical area for this gradient is where there is currently a sharp groundwater gradient towards the pumping depression which prevents the pumping depression from expanding eastward and increasing the size and depth of the depression. To calculate this gradient, two wells were selected – one an existing USGS monitoring well (2N/21W-34G4) and the other a new monitoring well to be constructed as part of the project (at Location B, see Figure 5.2-7). Pumping reductions would be required if the groundwater elevation in the USGS monitoring well is higher that the project monitoring well. | These measures would be implemented throughout operation of the groundwater treatment facility | The City of Camarillo would be responsible for implementation by qualified groundwater specialists. Compliance would be verified by review of monitoring reports. |

| MEASURE | TIMING | RESPONSIBLE PARTY/METHODS |
|---|---|---|
| **WATER RESOURCES – Groundwater Monitoring, Subsidence and Annual Monitoring Report** | | |
| The contingency action would be similar to those for groundwater elevations; systematic reduction in project pumping until the groundwater gradient is reversed (groundwater elevation in the USGS monitoring well is lower than in the project monitoring well). Project pumping would be re-adjusted so that the project well closest to the affected area would reduce pumping by 10% for a period of six months. If these actions do not resolve the problem within a six-month period (i.e., prevent further drops in groundwater elevations), then pumping from this project well would be reduced an additional 10% (for a total reduction of 20%) for a period of six months and further evaluated. This step-wise reduction every six months would continue until the gradient is restored. | These measures would be implemented throughout operation of the groundwater treatment facility | |
| **Subsidence.** The above groundwater elevation contingency measures would avoid groundwater elevations from approaching historic levels, such that subsidence would be avoided. However, the City shall monitor surface elevations to detect subsidence and ensure the contingency measures are effective. The location and elevation of the project extraction wells, new and existing monitoring wells shall be surveyed to serve as a baseline to detect subsidence. To ensure detection of any subsidence, both the wellhead and the nearby ground surface shall be surveyed. The monitoring wells and adjacent ground surfaces shall be resurveyed every 10 years to detect any changes in elevation related to subsidence. The regional monitoring well (2N/21W-35M2) shall be re-surveyed every 5 years to detect regional trends. | | The City of Camarillo would be responsible for implementation by qualified groundwater specialists. Compliance would be verified by review of monitoring reports. |
| **Annual Report.** An Annual Report shall be prepared summarizing data collected each calendar year and submitted to FCGMA and interested parties by April 1. The Annual Report shall include the following information:<br>• A summary of project groundwater pumping and treatment rates.<br>• Groundwater elevation and water quality data analyses obtained from extraction wells, monitoring wells, wells near project area, the regional monitoring well, conclusions formed from the analyses, and recommendations for future operations and monitoring.<br>• Summary of observed changes in the location and elevation of the salt plume, using information obtained from the extraction wells and monitoring wells.<br>• Subsidence monitoring including results of any regional land survey program.<br>• Regional maps of groundwater elevation contours to document any effects of the project on the wider Pleasant Valley basin.<br>• Summary of any contingency measures implemented and observed effect on groundwater elevations.<br>In addition to the annual reporting, the FCGMA shall be notified within one month of any unexpected or critical results from project monitoring. Examples of such results include rapidly dropping water levels, approach of target groundwater elevations, and unexpected water quality analyses. | The Annual Report would be prepared each year throughout operation of the groundwater treatment facility | |
| **WATER RESOURCES - Flooding** | | |
| Flood walls shall be designed and constructed around the facility perimeter to minimize the potential for property damage and loss of human life during a 100-year storm event. | This measure would be implemented during design and construction of the facility | The City of Camarillo would be responsible for implementation by qualified engineers and contractors. Compliance would be verified by field inspections. |

| MEASURE | TIMING | RESPONSIBLE PARTY/METHODS |
|---|---|---|
| **NOISE – Well Drilling**<br>The following measures are provided to minimize nighttime noise impacts associated with well drilling.<br>• Avoid well drilling between 9 p.m. and 7 a.m., if feasible;<br>• Provide at least 7 days' notice of nighttime well drilling activities to all residents located within 1,000 feet of the well site; and<br>• Install and maintain temporary noise barriers around the well drilling site during all drilling operations.<br>Due to the close proximity of the caretaker residence to the western well site, it may not be feasible to reduce nighttime noise generated by well drilling below the 45 dBA noise standard. Therefore, residual nighttime well drilling noise impacts would be potentially significant. | These measures would be implemented during well drilling | The City of Camarillo would be responsible for implementation by the construction contractor. Compliance would be verified by field inspections. |
| **NOISE – Operation**<br>The following measures are provided to minimize nighttime noise impacts associated with facility operation.<br>• Prior to construction, conduct an engineering design review to ensure all noise-producing components are enclosed and shielded, to minimize noise generation to the extent feasible;<br>• Complete a noise study within 90 days of the start of operation to determine if nighttime noise levels associated with facility operation are detectable at adjacent residences; and<br>• Based on the findings of the noise study, implement additional noise reduction measures as needed which may include a facility perimeter sound wall. | These measures would be implemented prior to construction, and during initial operation | The City of Camarillo would be responsible for implementation by qualified engineers and noise specialists. Compliance would be verified by field inspections of noise reduction measures and review of the noise study. |
| **TRANSPORTATION – Construction**<br>The intent of these mitigation measures is to avoid or offset the project-related contribution to existing traffic congestion. Therefore, two mitigation options are considered:<br>• The City shall pay Traffic Impact Mitigation fees to the Ventura County Transportation Department based on the projected number of average daily trips and the rates ($/trip) in effect at the time construction is implemented. These fees would be used for roadway improvements to offset the contribution of the project to level of service impacts.<br>• The project specifications shall limit the construction contractor to off-peak trips only, through the scheduling of worker hours and materials deliveries. | These measures would be implemented prior to construction | The City of Camarillo would be responsible for payment of traffic impact fees and/or preventing peak hour trips. Compliance would be verified by field inspections. |
| **TRANSPORTATION – Operation**<br>The City shall pay Traffic Impact Mitigation fees to the Ventura County Transportation Department based on the projected number of average daily trips and the rates ($/trip) in effect at the time operation of the facility is initiated. These fees would be used for roadway improvements to offset the contribution of the project to level of service impacts. | This measure would be implemented prior to operation | The City of Camarillo would be responsible for payment of traffic impact fees. |

# 7.0 LIST OF PREPARERS

This document was prepared for the City of Camarillo by Padre Associates, Inc. and Conejo Archeological Consultants, with support by Black & Veatch Corporation. Persons involved in its preparation include:

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# 9.0 DISTRIBUTION LIST

## 9.1 FEDERAL AGENCIES

U.S. Bureau of Reclamation

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

U.S. Army Corps of Engineers

## 9.2 STATE AGENCIES

State Clearinghouse (CEQA)

California Department of Fish and Wildlife

California Department of Public Health

Los Angeles Regional Water Quality Control Board

California Department of Transportation

State Water Resources Control Board

Native American Heritage Commission

## 9.3 COUNTY AGENCIES

Local Agency Formation Commission

Resource Management, Planning Division

Public Works, Transportation Department

Fox Canyon Groundwater Management

Agricultural Commissioners Office

Farm Bureau

Watershed Protection District

Air Pollution Control District

## 9.4 LOCAL AGENCIES

Calleguas Municipal Water District

Camrosa Water District

City of Thousand Oaks

United Water Conservation District

Pleasant Valley County Water District

Oxnard Union High School District

## 9.5 OTHER ENTITIES

Southern California Gas Company

Sierra Club

## 9.6 NATIVE AMERICAN TRIBES

Chumash – Owl Clan

## 9.7 LIBRARIES

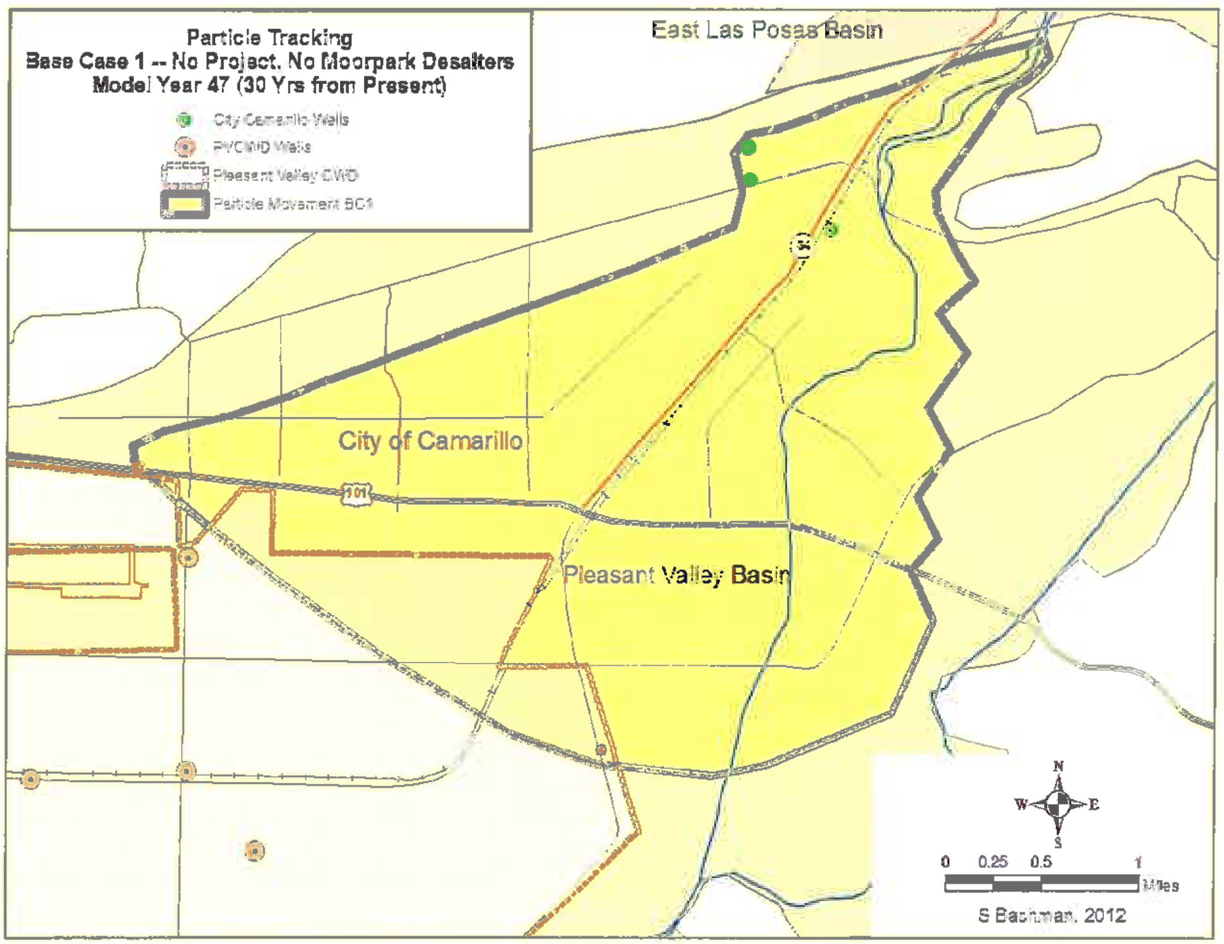
Camarillo (Ventura County)

# APPENDIX A

# NORTHERN PLEASANT VALLEY DESALTER GROUNDWATER ANALYSIS AND MODELING (2016)

# Northern Pleasant Valley Desalter Groundwater Analysis and Modeling

## Report to Desalter Working Group




**March, 2016**


**Prepared by Steven Bachman, PhD**

# Table of Contents

# 1 Introduction

Poor-quality brackish water from upstream discharges has infiltrated into the northern Pleasant Valley basin (NPV) since 1994. This infiltration has caused a large mound of poor-quality groundwater in NPV that has both raised groundwater elevations almost 200 ft within the mound and deteriorated groundwater quality for both agricultural and municipal pumpers. The proposed NPV Desalter project aims to reverse the water quality degradation by pumping poor-quality groundwater from the mound and treating it to drinking water standards. The timing of the proposed project is dependent upon the arrival of the Salinity Management Pipeline (SMP) into the Camarillo area near the location of the proposed project because brine from the reverse osmosis treatment process must be discharged to the SMP.

This study included constructing a groundwater flow model to simulate a range of scenarios to help answer several questions:

- Groundwater elevations – would the NPV Desalter pumping effectively reduce the mound of poor quality groundwater and prevent its migration into the main portion of the Pleasant Valley basin? Could the pumping occur without adversely affecting the basin and other pumpers?
- Water quality – how far has the poor-quality water spread into the basin[1]? Could the project pull this water back effectively? What duration of desalting project would the re-captured water sustain? Would all the poor-quality water be extracted?
- Project Capacity – how many wells would be required, what capacity could be pumped and treated, what would pumping rates be, and where would the desalter wells be located?

The study consisted of collecting and analyzing surface water and groundwater data, constructing and calibrating a groundwater flow model, simulating salt migration through particle tracking modeling, and analyzing a number of model scenarios to test capacity and location of desalter wells, and the groundwater response to this pumping.

# 2 Hydrogeology of Northern Pleasant Valley Basin

NPV is the northern extension of the main Pleasant Valley basin, an important source of groundwater for both urban use and the irrigation of the extensive crops of the Oxnard Plain. The discussion of the hydrogeology of the NPV is organized from the general to the specific, with general geology followed by aquifer testing and aquifer properties.

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[1] Poor quality water defined as exceeding Los Angeles Regional Water Quality Control Board, Basin Plan Objectives, TDS 700 mg/L, sulfate 300 mg/L, chloride 150 mg/L (*http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/electronics_documents/bp3_water_quality_objectives.pdf*)

## 2.1 General Geology

Historical interest in NPV has largely focused on structural geology, with a number of faults identified over the years. Because some of these faults are considered active, evaluating these faults in terms of geologic hazards has been a priority. Some of these faults have surface expression, whereas others are buried in the alluvium (Figure 1 indicates faults as they are depicted by the U.S. Geological Survey in their latest GIS coverage[2]). Whether any of these faults impede groundwater movement is discussed in the next section.

Faulting and accompanying folding in NPV is largely controlled by regional stresses associated with the rotation and movement of the Transverse Ranges. Compressional forces dominate, with the major faults in the area having a significant component of north-south thrusting. The Simi-Santa Rosa Fault Zone (Figure 1) is associated with anticlinal folding, both along the Camarillo Hills and as shown crossing Section A-A' just south of the Reunion Beryl #2 well. NPV is located in a syncline that trends south-southwest through the approximate location of the Pitts #1 well.

Two cross sections were constructed approximately orthogonally through the center of NPV (Figure 1). Stratigraphic correlations along the section lines were made primarily using oil well geophysical logs, supplemented by water well drillers logs. Section A-A' was tied on both ends to Turner and Mukae's (1975) regional cross sections B-B' and D-D'. The sections were also tied to cross sections being constructed by United Water Conservation District as part of the effort to revise the Ventura Regional Groundwater Model. The interpreted geophysical log for the Pitts #1 well is shown in Figure 2.

The water-bearing units of the Lower (LAS) and Upper (UAS) Aquifer Systems rest on both older sedimentary units and Conejo Volcanics. The UAS and LAS together reach a thickness of as much as 1,500 ft in NPV (Figure 3, Figure 4). The basal LAS consist of the Grimes Canyon Aquifer overlain by the Fox Canyon Aquifer. The Fox Canyon is now the primary water-producing unit in NPV. The LAS is folded and partially truncated at the north end of NPV (Figure 3). This truncation is evident where the LAS is exposed in the hills on the west and east sides of northernmost NPV (Figure 1). Along Arroyo Las Posas, this truncation surface is unconformably overlain by the sediments deposited by the arroyo (description in following paragraph). The UAS is present in NPV but is not a major water-producing unit. It is entirely truncated in the northern portion of NPV (Figure 3).

Unconformably overlying the UAS and LAS is an alluvial unit deposited along the Arroyo Las Posas. Drillers' logs indicate that this alluvial unit, herein designated as the Shallow Aquifer, consists of sand and gravel, with finer-grained units in overbank locations (e.g., Figure 4). The maximum thickness of the unit in NPV is about 200 ft. Where the sand and gravel facies of the Shallow Aquifer overlies the Fox Canyon Aquifer, there is a ready conduit for recharge from the arroyo to the Fox Canyon (e.g., Figure 3). This occurs in a limited area within NPV, but apparently is the main recharge area for NPV. The limits of this recharge area are discussed in the next chapter.

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[2] USGS, 2003, *Simulation of Groundwater/Surface Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California*, WRIR 02-4136, 157 p.

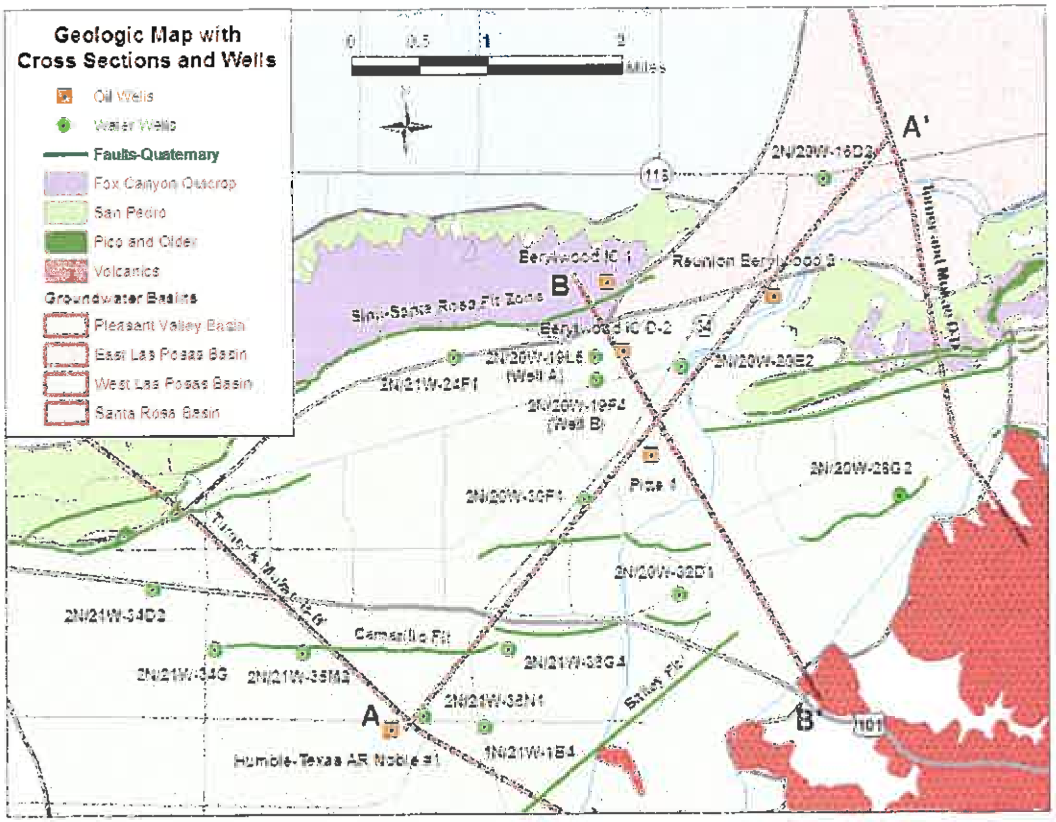



**Figure 1. Geologic map of NPV indicating location of cross sections in following figures. Wells used in hydrographs are also shown.**

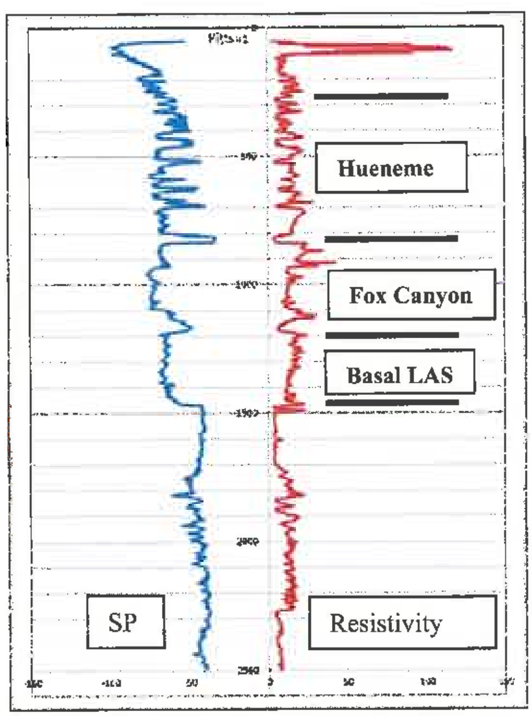



**Figure 2. Geophysical log from Pitts #1 oil well (see location map). SP (spontaneous potential) is measured in millivolts; resistivity is measured in ohms m²/m.**

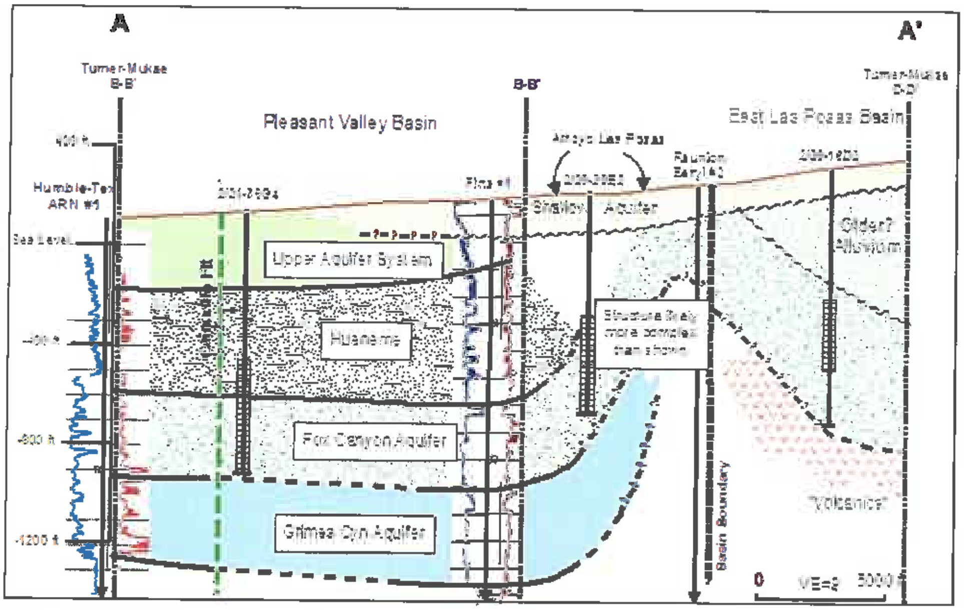



**Figure 3.** **Section A-A' that crosses the project area from southwest (A) to northeast (A') (see location map). The southern end of the section ties to Turner-Mukae's section B-B' and United Water's regional cross sections and the northern end of the section ties to Turner-Mukae's section D-D'. The northern end of the project area is located at the basin boundary, where an anticline (and likely at least one fault structure) forms the boundary between NPV and the East Las Posas basin. Note that the Fox Canyon Aquifer is truncated by the Shallow Aquifer near the basin boundary; where this relationship occurs, water from the arroyo can percolate through the Shallow Aquifer into the Fox Canyon Aquifer, providing a conduit for movement of brackish water from the arroyo into the Fox Canyon. Perforations in water wells are indicated by hachured areas.**

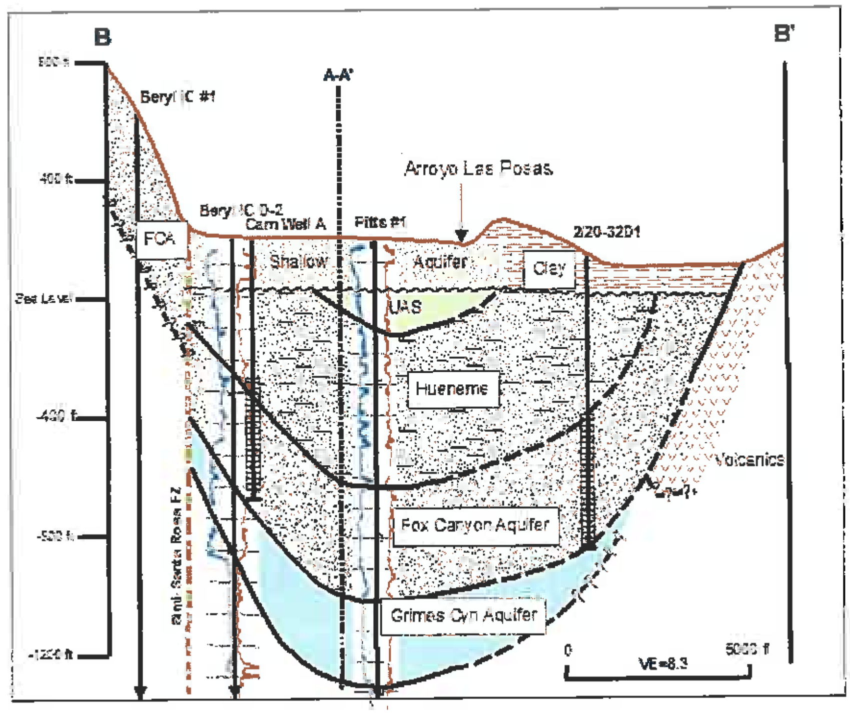



**Figure 4. Section B-B' that crosses the project area from northwest (B) to southeast (B') (see location map). Although this section indicates the same relationships between geologic units as Section A-A', the Fox Canyon Aquifer in Section B-B' is overlain by clay-rich alluvium and does not present a ready path for movement of surface water into the Fox Canyon Aquifer.**

## 2.2 Hydrogeology

NPV has seen rapid changes in both water levels and water quality over a two-decade period. The trigger for these changes appears to be the advent of overflow of dry-weather flow from the Las Posas basin, with the dual effect of rapidly raising groundwater elevations from this new source of recharge and deterioration of water quality from the poorer-quality baseflow in the arroyo.

### Trends in Groundwater Elevations

Hydrographs constructed in the northern portion of NPV exhibit the rapid rise (over 200 ft) in groundwater elevations that began in the early 1990s (Figure 5). In the portions of NPV closest to the Santa Rosa basin (and away from the recharge area in NPV), groundwater elevations had risen by about 50 ft by 2005 (Figure 6); there are no data available for later time periods in that area. South across Highway 101, there was a less substantial rise in groundwater elevations (Figure 7, Figure 8, Figure 9), with water level trends complicated by recovery from drought pumping in the late 1980s and early 1990s, increased in-lieu surface water deliveries by United Water Conservation District, and the beginning of the Conejo Creek Project.

Groundwater elevation maps were constructed for Spring of 1994 (Figure 10) and 2011 (Figure 11). There was a significant pumping depression in NPV (groundwater elevations as low as 120 feet below sea level) in 1994 (Figure 10). The additional percolation from the dry-weather flow (base flow) of Arroyo Las Posas had sufficiently recharged the Lower Aquifer System of NPV that by 2011 the pumping depression was eradicated and a recharge mound created (Figure 11). At its northern edge, this recharge mound creates heads that are near ground surface. Figure 12 indicates that groundwater elevations increased by as much as 225 ft from 1980 to 2011. As discussed previously, some of this rise in groundwater elevations south of Highway 101 is likely caused by increased in-lieu surface water deliveries by United Water Conservation District and the Conejo Creek Project to the area.

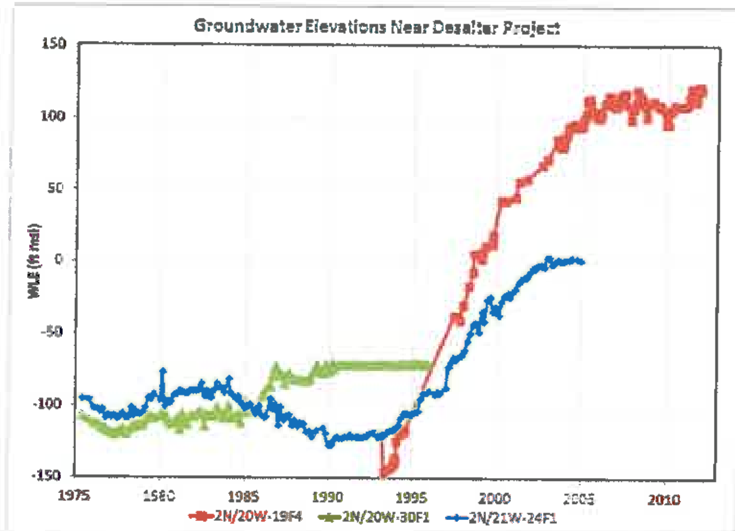



**Figure 5. Hydrographs for wells near Desalter Project. See Figure 1 for well locations.**

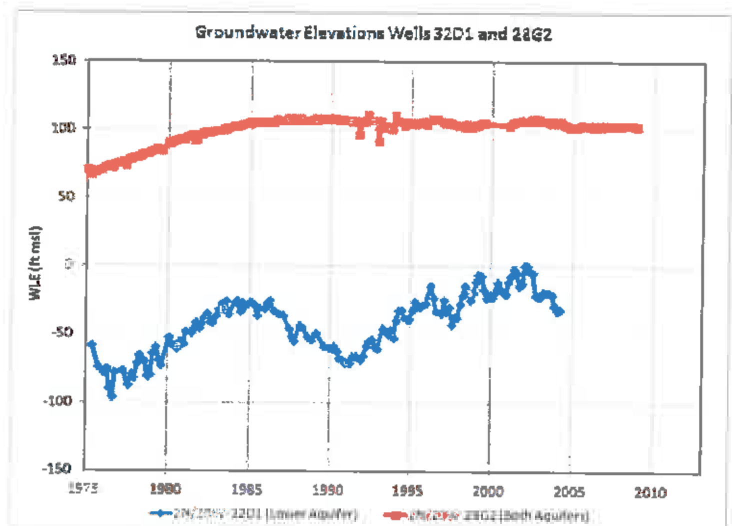



**Figure 6. Hydrographs for wells 32D1 and 28G2. See Figure 1 for well locations.**

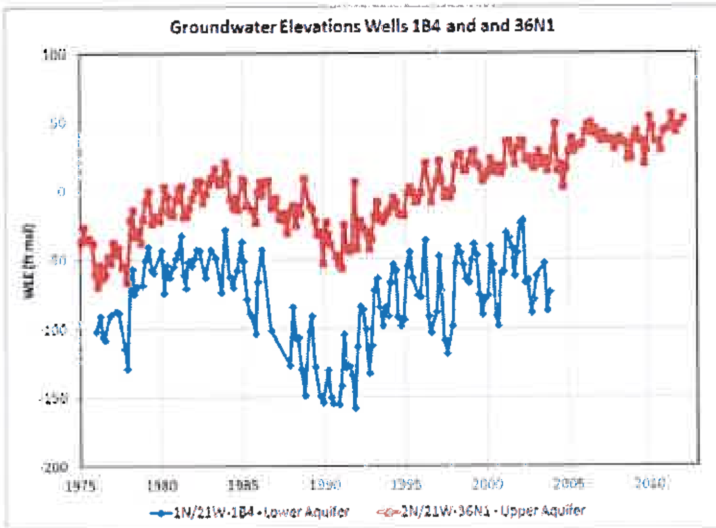



**Figure 7. Hydrographs for wells 1B4 and 36N1. See Figure 1 for well locations.**

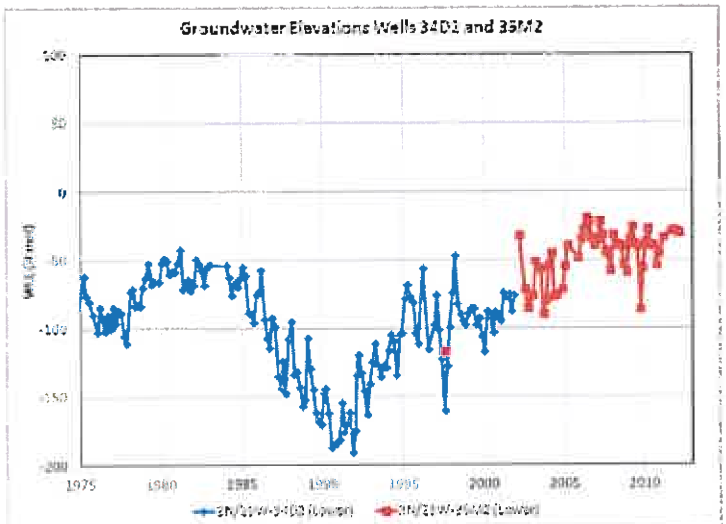



**Figure 8. Hydrographs for wells 34D2 and 35M2. See Figure 1 for well locations.**

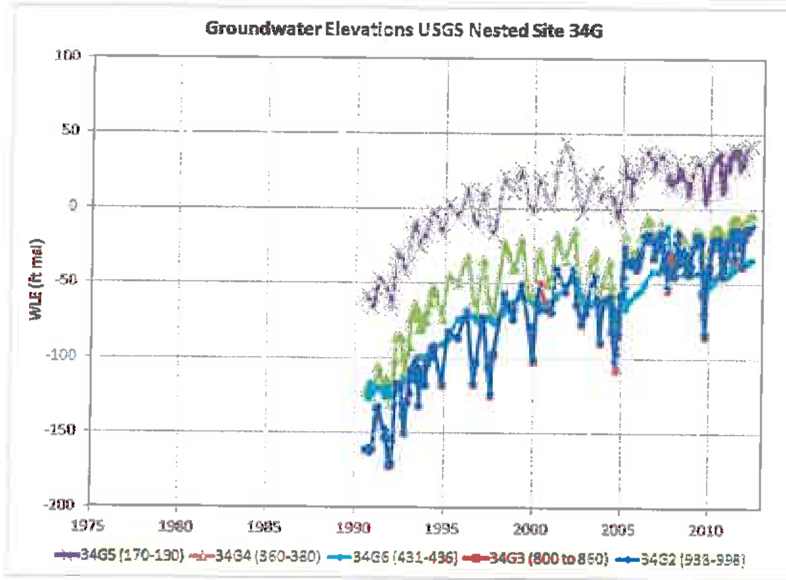



**Figure 9. Hydrographs for USGS nested site 34G. See Figure 1 for well locations.**

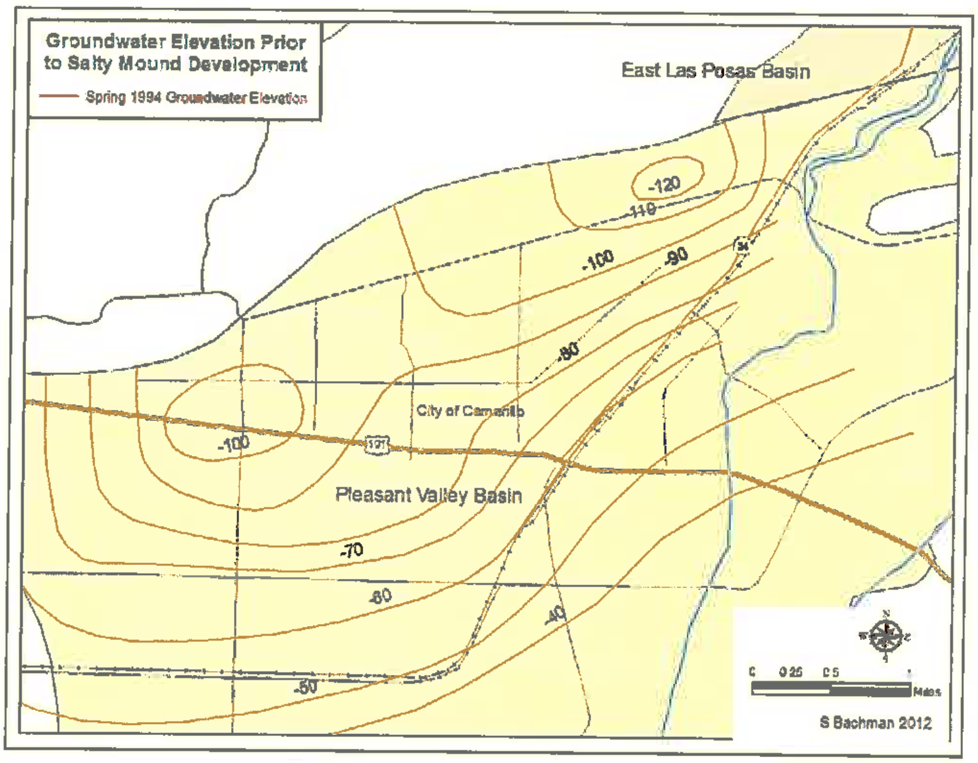



**Figure 10. Groundwater elevation map for Spring 1994.**

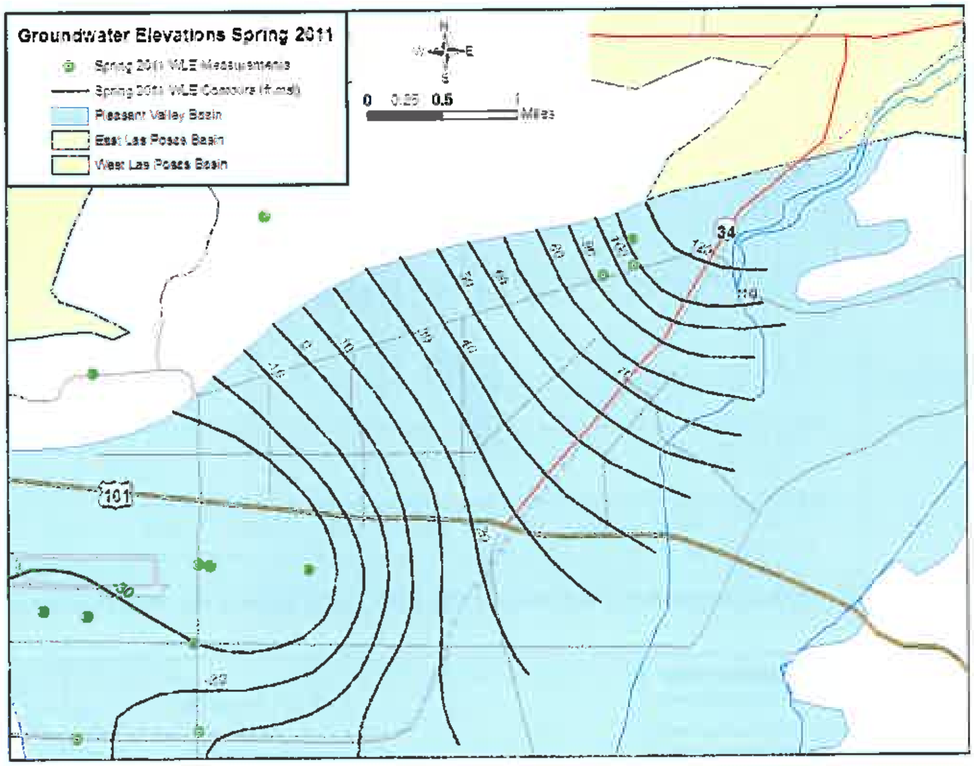



Figure 11. Groundwater elevation map for Spring 2011.

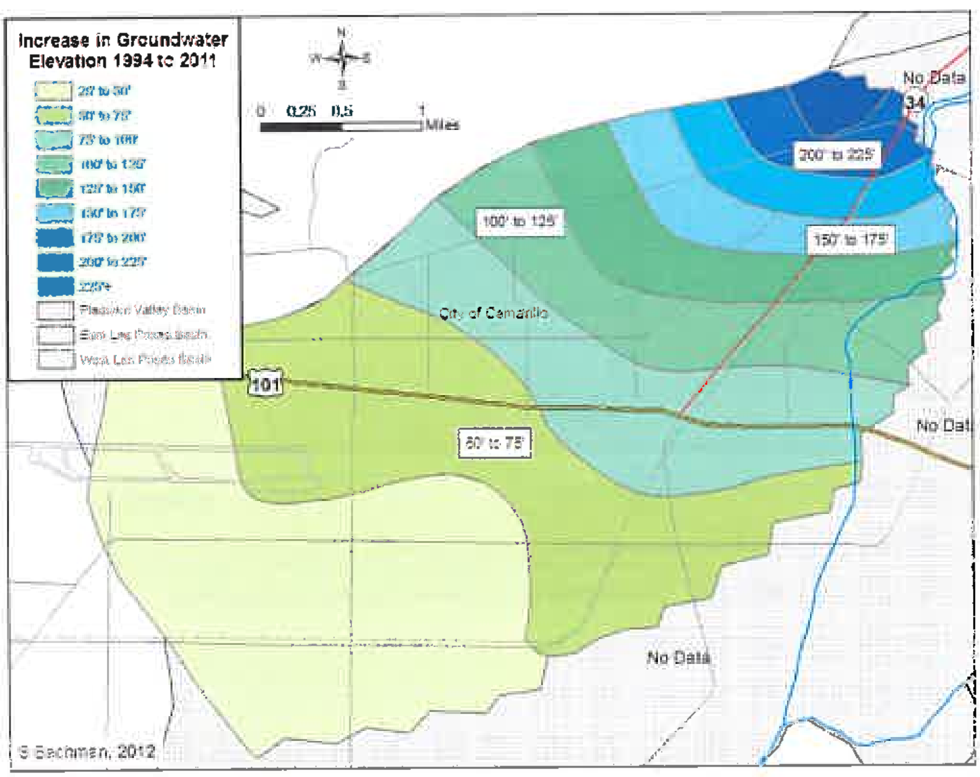



Figure 12. Increase in groundwater elevation from 1994 to 2011.

## Groundwater Quality

The effect of the recharge of the poorer-quality base flow of Arroyo Las Posas is evident in the wells closest to the area of recharge in the northernmost wells in NPV. Figure 14 and Figure 15 show increases in sulfate, chloride, and TDS starting in the 1990s; Figure 14 shows the most distinct change in water quality sometime after year 1995. For context, groundwater elevations started to rise in about 1992 in these wells – a lag time between a rise in groundwater elevation and actual movement of the poor-quality out into the aquifer would be expected. The observed lag time was used to help calibrate the groundwater model.

PV wells located towards the center of the basin have not yet detected the water quality changes seen in the wells located in northern PV (Figure 16 to Figure 21). There is a data gap in recent sampling in much of NPV because the wells that provided earlier data have been destroyed as urban growth occurred. Thus, it is not known how much further the poor quality water has migrated southward in PV. The particle tracking analysis discussed in a later chapter models the possibilities for this migration.

Two additional water quality analyses were performed in NPV. Stiff diagrams (charting milliequivalents of major cations and anions) for the 1980s and in 2010-11 were constructed to examine differences in water quality with time and space (Figure 22 and Figure 23). There is a variety of water quality types shown in Figure 22, indicating different sources of water and/or different histories of migration of the waters. From the 1980s to 2010-11, the only evident change in water quality occurs in the northernmost wells, where sulfate and chloride now dominate the major ions. This is consistent with the determination of water quality documented in preceding paragraphs in this northern portion of NPV. The gap in recent data in NPV is also documented in Figure 23.

A series of graduated-dot maps were constructed for groundwater quality in NPV in 2010-11. Although chloride concentrations have increased in NPV, levels are below drinking water standards. In the main Pleasant Valley basin, chloride concentrations above 200 mg/L are problematic for irrigation of many crops (Figure 24) and are not related to the baseflow recharge in NPV. Increased TDS and sulfate concentrations in NPV are higher than drinking water standards (Figure 25 and Figure 26), one of the main reasons the NPV Desalter Project was conceived to remove the excess salts that have infiltrated into NPV.

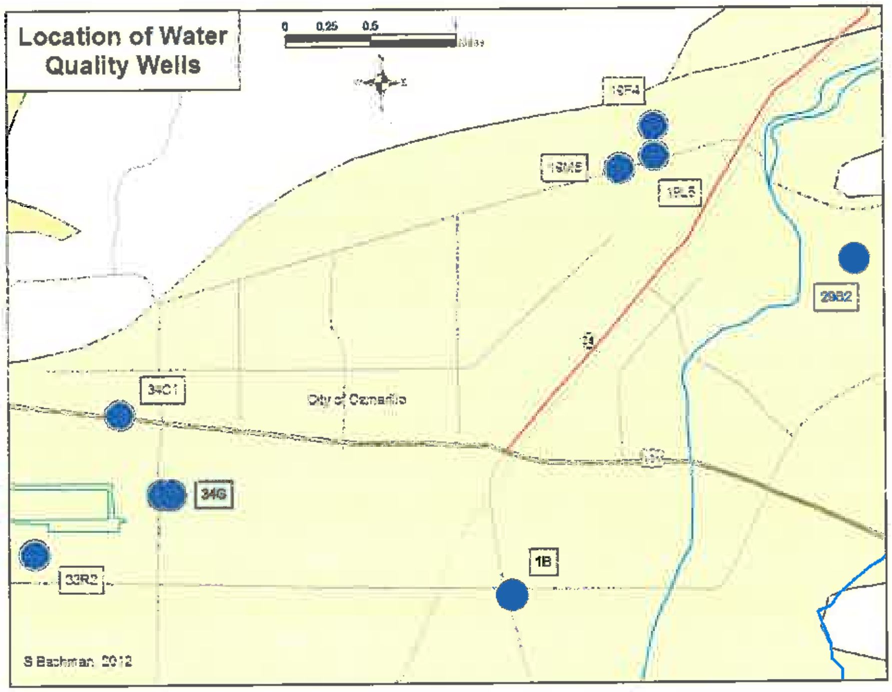



**Figure 13. Location of wells with water quality graphs. Some of the graphs are in the Appendix.**

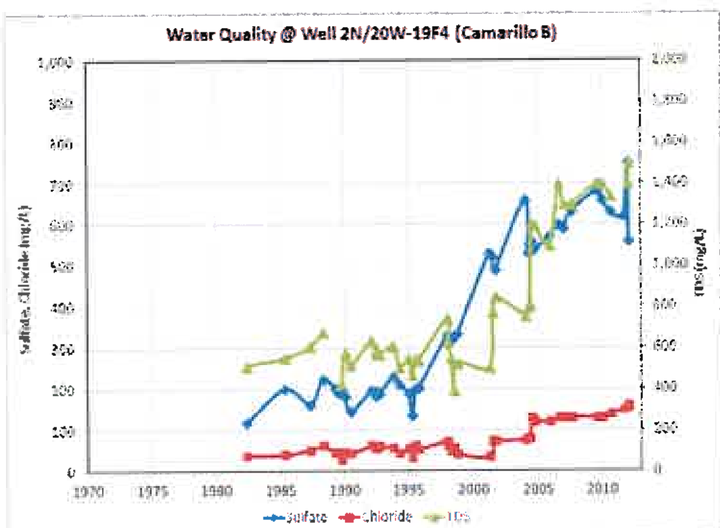



**Figure 14. Water quality in well 19F4. See Figure 13 for location.**

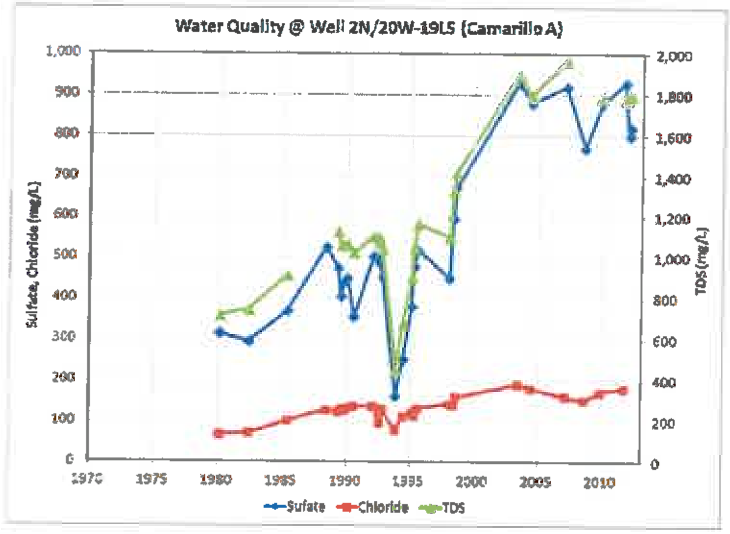



**Figure 15. Water quality in well 19L5. See Figure 13 for location.**

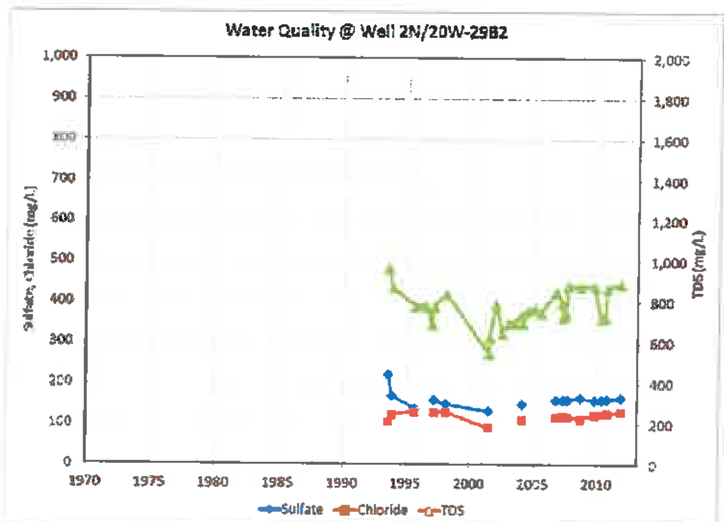



**Figure 16. Water quality in well 29B2 (Camrosa WD Woodcreek well). See Figure 13 for location.**

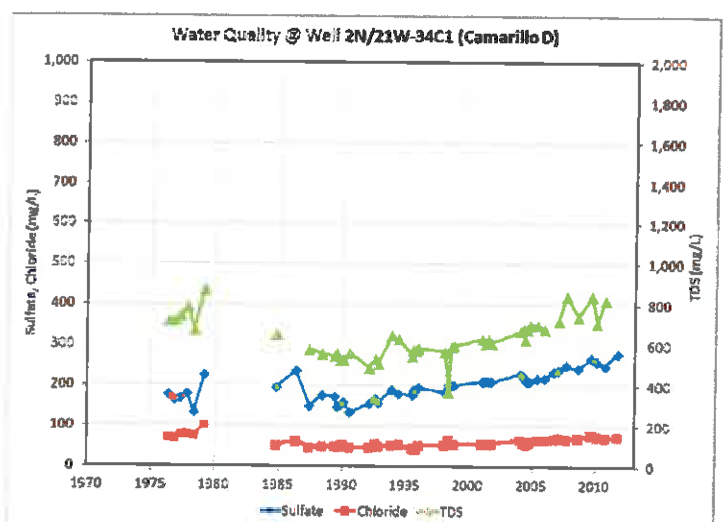



**Figure 17. Water quality in well 34C1. See Figure 13 for location.**

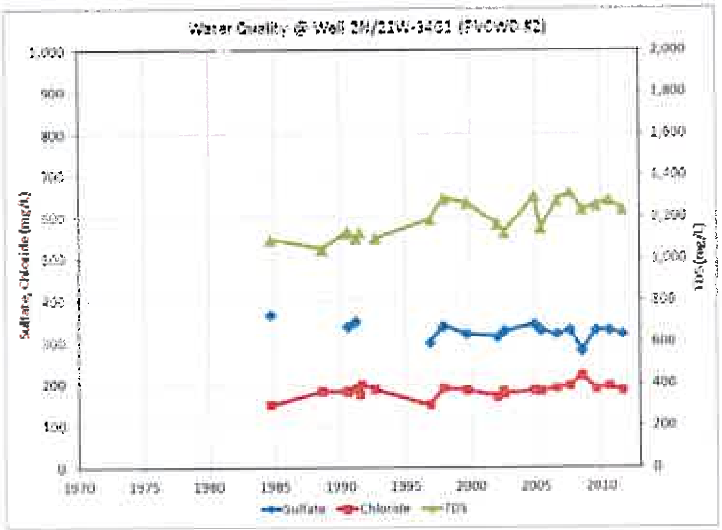



**Figure 18. Water quality in well 34G1. See Figure 13 for location.**

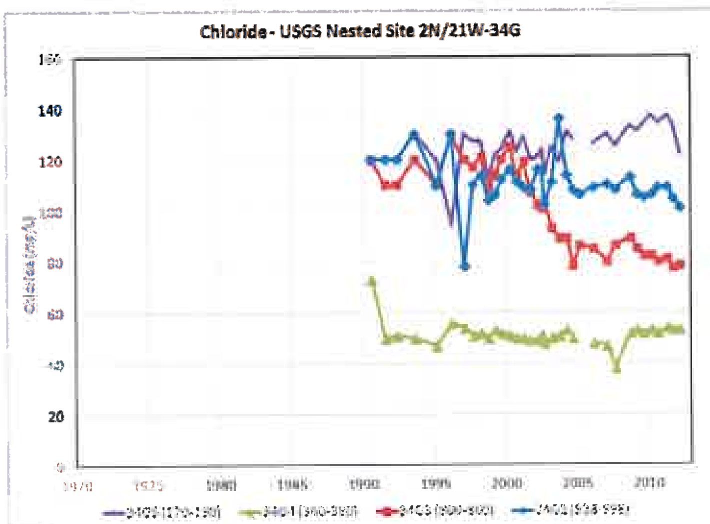



**Figure 19. Chloride in wells 34G. See Figure 13 for location.**

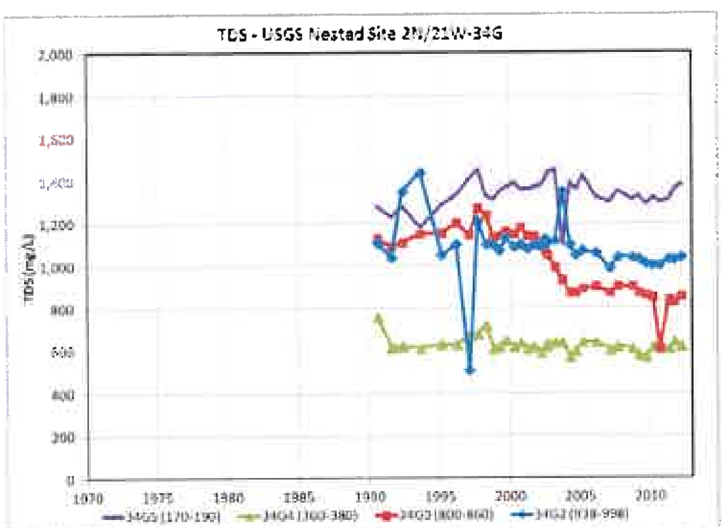



**Figure 20. TDS in wells 34G. See Figure 13 for location.**

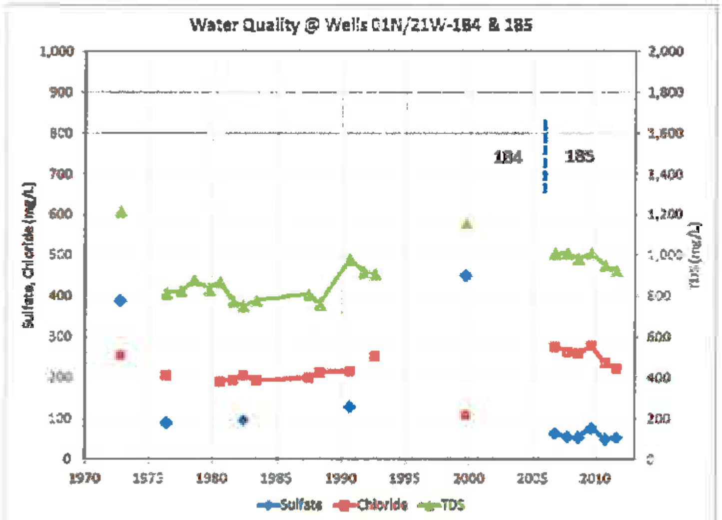



**Figure 21. Water quality in wells 1B. See Figure 13 for location.**

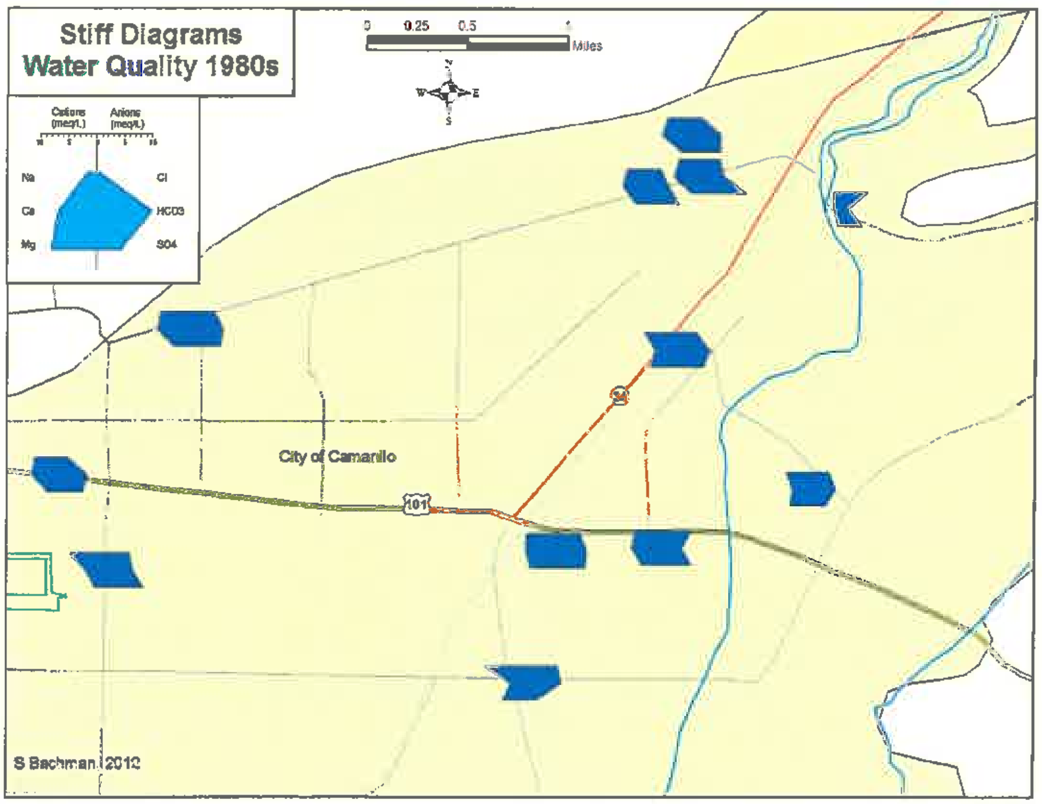



**Figure 22. Stiff water quality diagrams for NPV groundwater in the 1980s.**

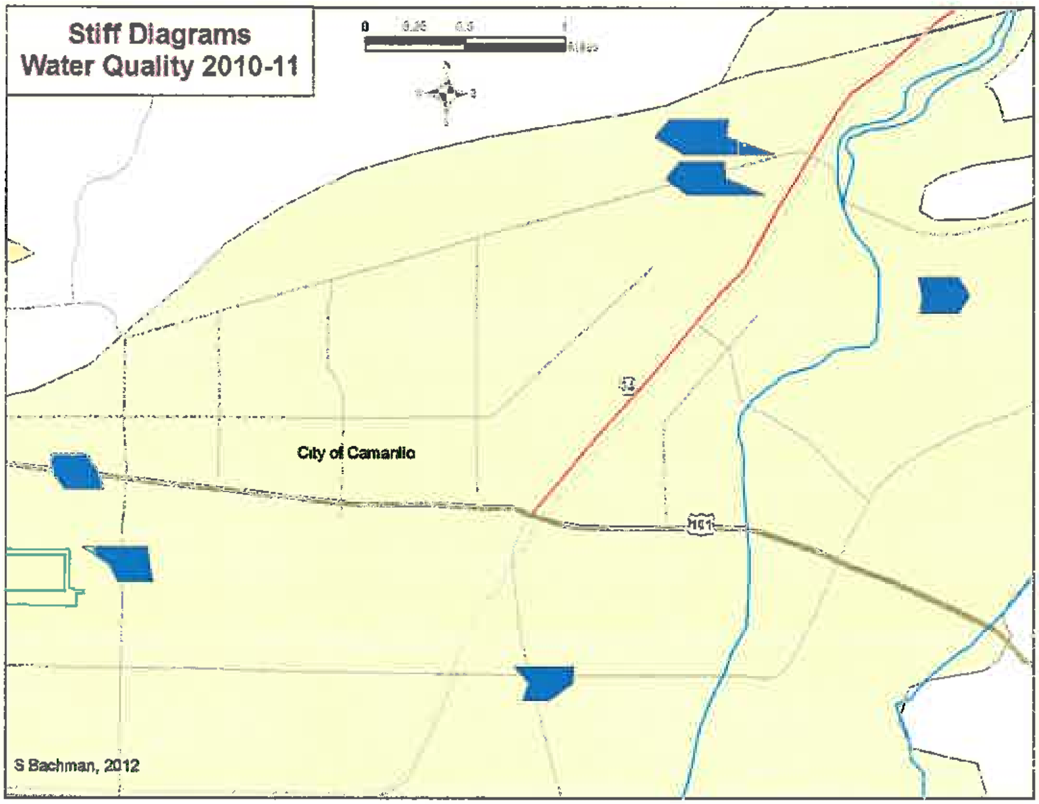



**Figure 23. Stiff water quality diagrams for NPV groundwater 2010-11. See previous figure for Stiff legend.**

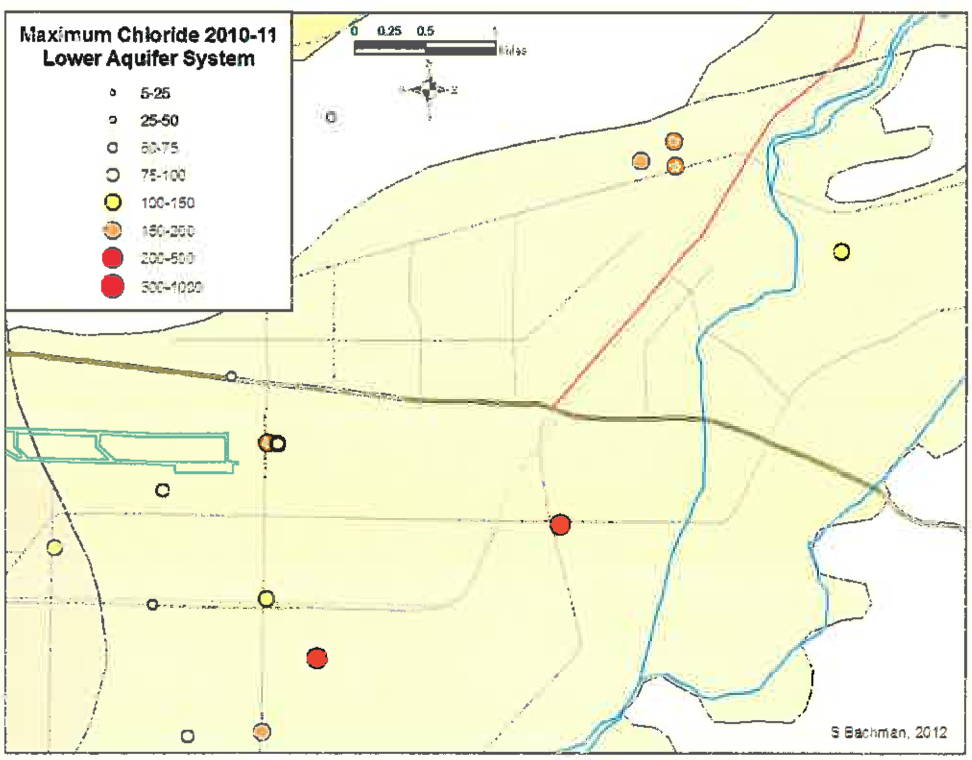



**Figure 24. Maximum chloride concentrations (mg/L) measured in Lower Aquifer System wells during 2010 and 2011.**

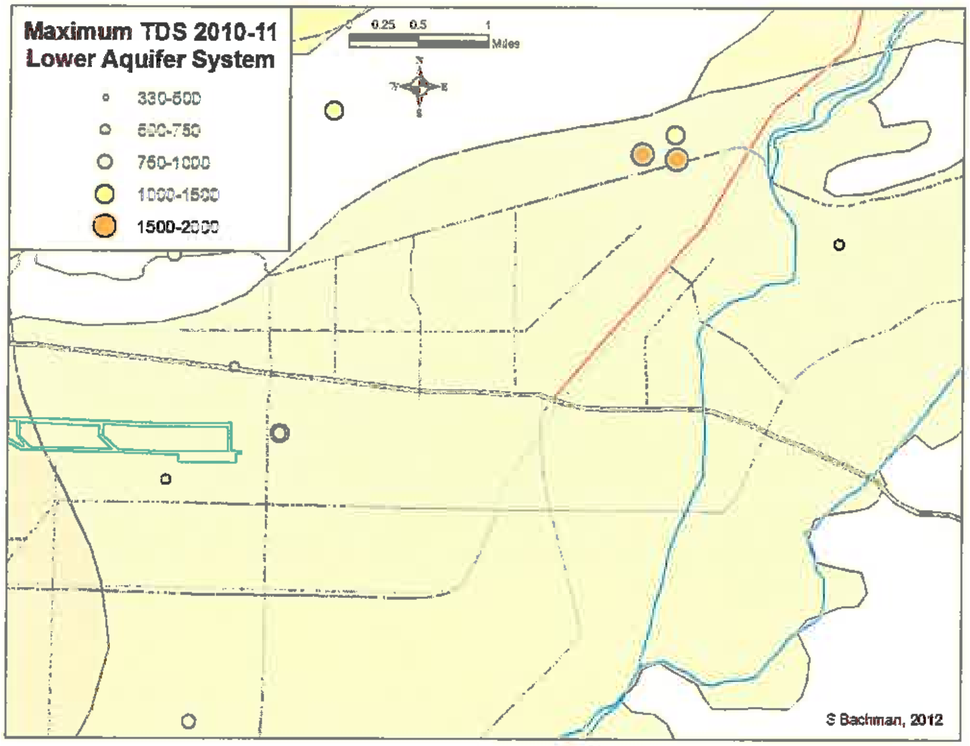



**Figure 25. Maximum TDS concentrations (mg/L) measured in Lower Aquifer System wells during 2010 and 2011.**

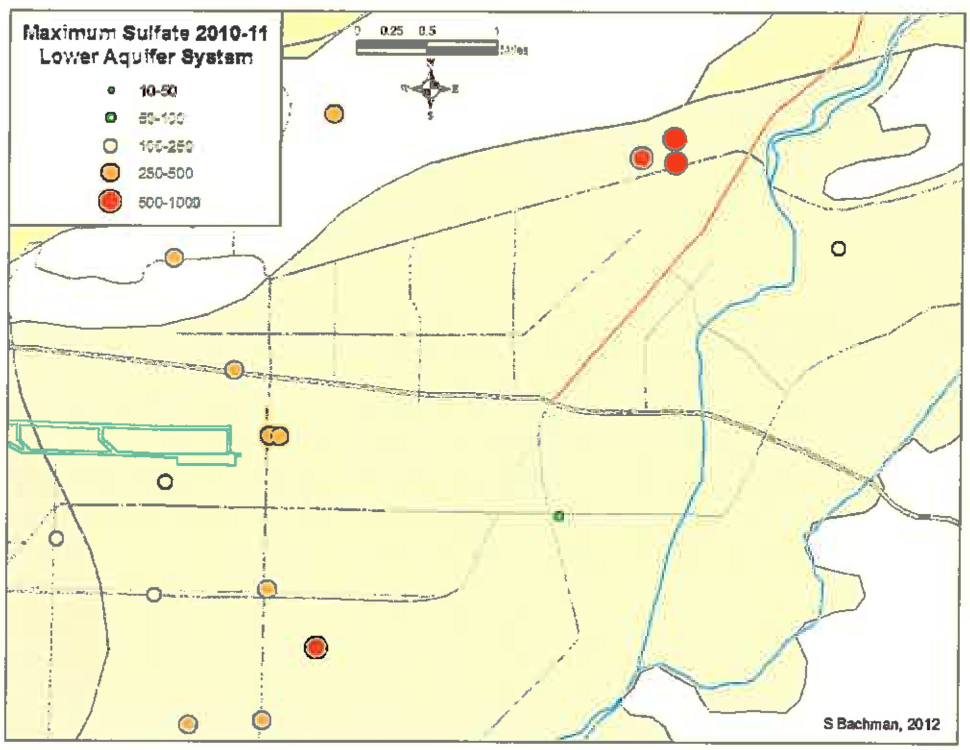



**Figure 26. Maximum sulfate concentrations (mg/L) measured in Lower Aquifer System wells during 2010 and 2011.**

### Subsidence

Potential subsidence caused by historical lowering of groundwater elevations has not been measured in the NPV area, although there are no reported surface indications of subsidence (e.g., offset roads or parking lots, foundation cracking, etc.). The USGS documented a couple of feet of subsidence on the Oxnard Plain that they related to overdraft of the Oxnard Plain basin. There is a baseline of information from a LIDAR fly-over a decade ago; portions of this survey have been processed, largely at well heads and in Arroyo Las Posas. There is also additional information from traditional surveys within NPV.

When subsidence occurs because of lowered groundwater elevations in a basin, there is dewatering of the finer-grained sediments within and between the aquifers, but the pore space in sand and gravel aquifers is largely unaffected by lowered groundwater elevations. Because groundwater elevations dropped significantly by the early 1990s (see Figure 7 and Figure 8), any subsidence related to those lowered water levels has likely already occurred – future subsidence, if any, related to drops in groundwater elevations to similar depths in the future may be largely mitigated by the earlier event.

### Aquifer Properties

A series of aquifer tests, dynamic spinner logs, and vertical chemical profiles were conducted in 2011 for the City of Camarillo (contracted by TMR Geological Consulting Services). Two of Camarillo's production wells (A and B) and two other nearby wells were used as pumping and observation wells for the aquifer tests. All of the testing was conducted in the Fox Canyon Aquifer. The details of the results are included in the Appendix and on the attached CD. Ranges of results included:

Transmissivity: 4,000 to 10,300 $ft^2$/day

Storativity: 3.1E-06 to 4.5 E-04

Horizontal Hydraulic Conductivity: 11 to 30 ft/day

# 3 Analysis of Flow – Arroyo Las Posas

The flow of Arroyo Las Posas as it crosses the boundary between the Las Posas basin (LPB) and NPV is one of the most important components of the water balance for the NPV Desalter. There is no permanent gage at the basin boundary, so gages upstream and downstream of the project area must be used in flow analysis. Additional information was provided by a two-month long dry-weather flow study conducted in late 2011 in the LPB[3].

The two permanent gage sites of interest (Figure 27) are upstream in the LPB at Hitch Blvd (Gages #841, 841a) and downstream near Highway 101 (Gages #806, 806a). The gages have overlapping but not completely coincident periods of record (Table 1). A number of analyses were conducted to understand baseflow and stormflow relationships between the gage sites. An

[3] Larry Walker and Assoc., 2012, *Phase I Study: Surface Flow and Groundwater Recharge in Arroyo Las Posas*, report to Calleguas Municipal Water District.

examination of historical aerial photos also provided insight into the downstream progression of baseflow percolation as the Shallow Aquifer in the LPB filled.

Baseflow in Arroyo Las Posas is a mixture of natural dry-weather flows, discharges from wastewater treatment plants, discharge from dewatering wells in Simi Valley, and agricultural tail waters. The terminus of the baseflow has moved downstream over the past decades as basins adjacent to the arroyo have filled, with spillage across the LPB-NPV boundary occurring in the early 1990s. Since that time, baseflow has entirely percolated into groundwater in the upstream quarter-mile or so of the arroyo as it flows into NPV (Figure 28).

In contrast, stormflows percolate into a longer reach of the arroyo than baseflow (Figure 28). The extent of stormflow percolation in NPV is not known with certainty. Aquifer testing in City of Camarillo wells A and B indicate that confined aquifer conditions exist at those locations, somewhat limiting the potential extent of percolation of stormflow into the Fox Canyon Aquifer. The possible downstream limit of significant percolation may occur where the arroyo changes from a wider braided stream to a narrow channel (Figure 28).

There are a number of inputs and outputs to streamflow between the Hitch and 101 gage sites. These include:

a) Tributaries within LPB (flow gain);

b) Percolation into groundwater as the arroyo flows over the LPB (flow lost);

c) Rising groundwater as the arroyo flows over the LPB (flow gain),

d) Percolation into groundwater as the arroyo flows over the NPV (flow lost); and

e) Tributaries and stormwater channels within NPV (flow gain).

There is only a loose correlation between daily flows gaged at the Hitch and 101 sites (Figure 29). The main reason for this poor correlation of daily flows is that baseflow is included in the comparison, and baseflow at Hitch never reaches the 101 gage site (it completely percolates along the route). However, if stormflow totals (the total flows from individual storm events) are compared, there is a good correlation between the two gage sites (Figure 30). Stormflow totals are somewhat higher at the 101 gage site, indicating that storm runoff between the two gages is higher than percolation from the arroyo.

It is important to separate infiltration of baseflow from infiltration of stormflow because baseflow is the source of poor-quality water in the aquifers. To estimate the amount of baseflow infiltration into NPV, the fate of baseflow between the Hitch gage site and the NPV basin boundary must be determined. The two-month long dry-weather study of the arroyo in LPB by Larry Walker Associates characterized flow at a number of sites in the reach between the Hitch gage and the LPB/NPV boundary. Net dry-weather loss along this reach averaged 10.6 acre-feet per day (Table 2). This net loss includes all additions and subtractions of water along the reach from the Hitch gage to the NPV boundary – water flowing in from upstream of the gage, water from tributaries and treatment plants along the reach, infiltration into the groundwater basin, and evapotranspiration losses. There were some uncertainties that will be addressed in a follow-up study during the 2012 dry season.

By subtracting the daily losses from the daily baseflow at Hitch, the baseflow reaching NPV can be estimated for the period 1994-2010 (baseflow first reached NPV about 1994). Within rounding errors, the baseflow reaching NPV is 3,851 acre-feet per year (10.55 acre-feet per day loss multiplied by 365 days) less than the baseflow at the Hitch gage. The summation of these daily estimates is shown in Table 4. Note that all baseflow entering NPV is percolated, which has been established by visual and aerial photography evidence. In addition, there is little or no recorded baseflow at the 101 gage site.

Stormflow percolation in NPV must be calculated using a different technique. Because there is currently little infiltration of stormflow in the Las Posas basin (infiltration of baseflow keeps groundwater elevations at stream level), it was assumed that stormflow gaged at the Hitch site reached the Las Posas basin/NPV boundary (plus additional tributary flows that are ungaged). The stormflow likely bypassed the first quarter-mile of the NPV reach because this reach has perennial flow and percolation of baseflow. Thus, infiltration of stormflow likely occurs downstream of the first quarter-mile of the arroyo, with the downstream limit of percolation indicated in Figure 28 and discussed earlier.

There is no direct measurement of percolation rates in the area of stormflow percolation. However, percolation rates can be estimated from baseflow percolation (Table 3). Baseflow percolates about 23 acre-feet per day (8,300 acre-feet per year divided by 365 days/year) over the measured length of the streambed where percolation occurs (1,400 ft). This equates to an infiltration rate of about 0.02 acre-feet per day per foot of arroyo length. If the same infiltration rate (0.02 acre-feet per day per foot) is used over the 5,500 ft reach where storm flow can infiltrate, a maximum of 89 acre-feet per day of storm water can be infiltrated.

The average number of days of stormflow at the Hitch gage was calculated using the daily measured flow at that gage for the period of record 1990-2011. Stormflow was considered to be the portion of the flow in a day that was in excess of the 5-day average from the previous baseflow-only period. This increase in flow occurred on average over the period of record about 54 days/year (ranges from 18 to 103 days/year). When the infiltration rate from the previous paragraph is applied during the stormflow days of the year, percolated stormflow can be estimated (Table 4). It should be noted that ungaged tributary flows between the Hitch gage and NPV are not included in this estimate. Infiltration of baseflow into NPV averages about 8,300 acre-feet per year and infiltration of stormflow averages at least 2,200 acre-feet per year (Table 4).

These estimated recharge rates are based on current data and studies, and likely have an error range of tens of percent. Potential errors in percolation amounts are integrated into the groundwater modeling for this study; amounts of percolation are varied to determine the sensitivity of percolation amounts to project modeling results.

| Gage | Period of Record | Missing Yrs since 1990 |
|---|---|---|
| Gage #841,a (Hitch) | 1990 to present | WY 1996 |
| Gage #806,a (101) | 1968 to present | WY 2008 |

**Table 1. Period of record of gages used in this study.**

| Reach between Gage Sites | Reach Gain (Loss) (CFD) | Reach Gain (Loss) (AFD) |
|---|---|---|
| Portion of 5 to 6 below Hitch | 78,577 | 1.80 |
| 6 to 7 | (5,967) | (0.14) |
| 7 to 8 | 193,226 | 4.43 |
| 8 to 9 | (480,211) | (11.0) |
| 9 to 10 | Unknown | |
| 10 to 11 at NPV Boundary | (245,806) | (5.64) |
| Total Gain (Loss) | (460,181) | (10.6) |

**Table 2. Calculations of dry-weather stream gains and losses in Las Posas basin between the Hitch gage and the NPV border, based on Table 3 of the Larry Walker Assoc. study.**

| Recharge Area | Reach Length (ft) | Annual Recharge (AFY) | Daily Recharge (AFD) | Unit Recharge Rate (AFD/ft) |
|---|---|---|---|---|
| Baseflow | 1,400 | 8,307 | 23 | 0.02 |
| Stormflow | 5,500 | | 89 | 0.02 |

**Table 3. Calculation of recharge rate for stormflows in NPV. The average annual recharge for baseflow was based on daily and annual calculations (see Table 4). The average recharge of 8,307 AFY equates to a daily recharge rate of 23 AFD, or 0.02 AFD for each foot of reach length. Using this unit recharge rate over the 5,500 feet of stormflow reach yields a potential of 89 AFD of stormflow recharge. 89 AFD was then applied in the daily stormflow calculations as the upper limit on daily infiltration.**

| Calendar Year | Hitch Storm Flow (AF) | Hitch Base Flow (AF) | NPV Infiltration Storm Flow (AF) | NPV Infiltration Base Flow (AF) |
|---|---|---|---|---|
| 1994 | 3,229 | 9,663 | 1,528 | 5,812 |
| 1995 | 27,621 | 10,980 | 4,229 | 7,129 |
| 1996 | 8,629 | 11,139 | 1,475 | 7,278 |
| 1997 | 7,206 | 10,313 | 1,308 | 6,462 |
| 1998 | 39,138 | 10,252 | 5,258 | 6,402 |
| 1999* | 1,783 | 14,879 | 739 | 11,028 |
| 2000 | 5,794 | 13,518 | 1,216 | 9,654 |
| 2001 | 17,206 | 12,465 | 1,891 | 8,614 |
| 2002* | 5,576 | 11,567 | 1,463 | 7,717 |
| 2003 | 10,787 | 12,086 | 1,304 | 8,236 |
| 2004* | 14,668 | 14,415 | 2,425 | 10,554 |
| 2005 | 50,708 | 11,546 | 4,166 | 7,695 |
| 2006 | 8,046 | 13,032 | 1,581 | 9,181 |
| 2007* | 3,298 | 13,198 | 1,928 | 9,348 |
| 2008 | 13,285 | 11,383 | 4,044 | 7,522 |
| 2009* | 6,197 | 12,414 | 2,202 | 8,564 |
| 2010 | 19,658 | 11,636 | 4,577 | 7,797 |
| 2011 | 17,373 | 13,382 | 6,840 | 9,531 |
| 2012* | 1,422 | 14,365 | 438 | 10,504 |
| 2013 | N/A | N/A | 1,532 | 0 |
| 2014 | N/A | N/A | 1,532 | 0 |
| 2015 | N/A | N/A | 1,532 | 0 |
| | | | | |
| Average Used* | 14,345 | 12,104 | 2,419 | 8,540 |

**Table 4. Estimated baseflow and stormflow percolating into NPV. All of the Arroyo Las Posas baseflow crossing into NPV percolates into NPV. A portion of the stormflow crossing into NPV percolates into NPV. Totals are summations of daily flows. Data not available for 4th quarter 2012 and 2013-2015 at Hitch gage. Visual observations of stream at NPV boundary indicate no baseflow into NPV 2013-2015. Stormflow infiltration in NPV 2013-2015 was estimated as the average of dry-year stormflow during the model period (years used in calculation marked with asterisk). Likewsie, the long-term average used in the model for future flows is calculated for the period 1994-2015 by using measured flows for 1994-2012 and dry-year average values for baseflow and stormflow for the un-measured years 2013-2015. Significant figures are to nearest thousand at best. The sensitivity of modeling results to streamflow was tested and is described in the section "Using Model Results".**

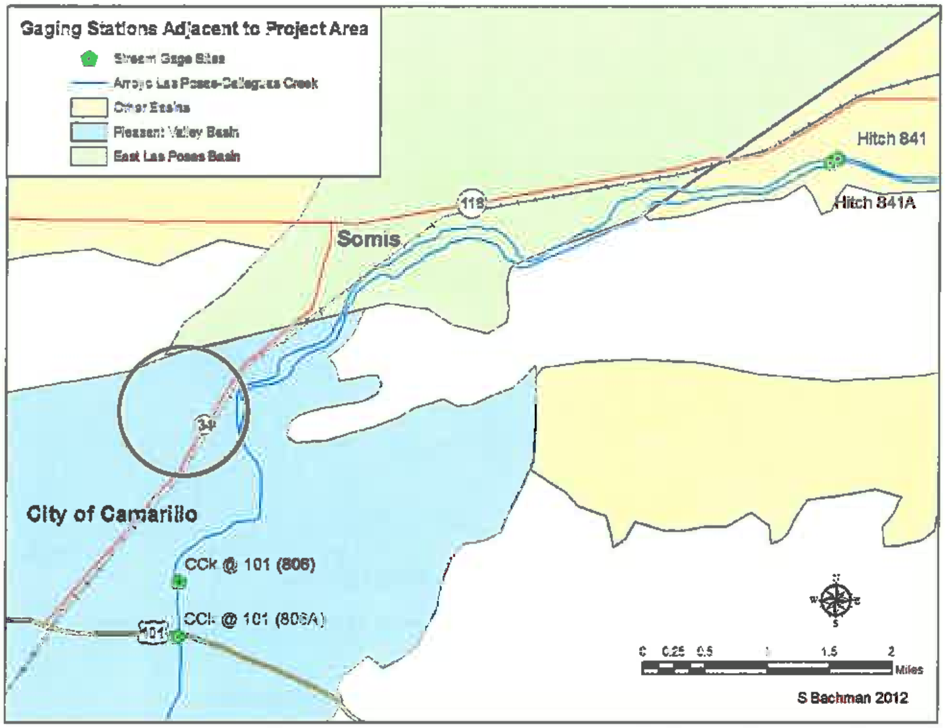



**Figure 27. Gages on Arroyo Las Posas/Calleguas Creek used in this study. Circle is location of project.**

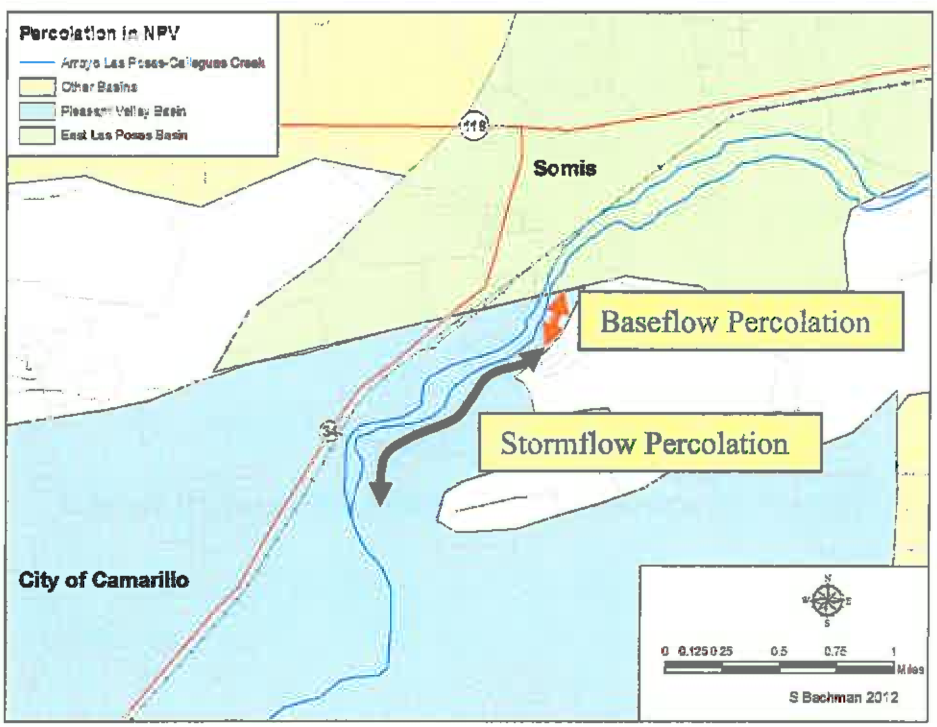



**Figure 28. Location of percolation of baseflow and stormflow of Arroyo Las Posas into groundwater.**

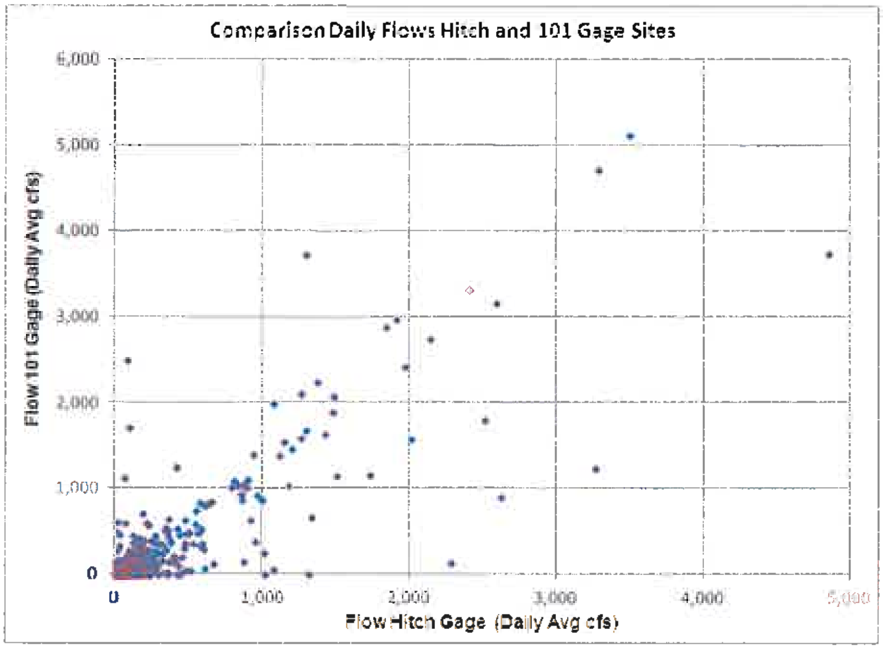


Figure 29. Comparison of daily flows at Hitch and 101 gage sites.

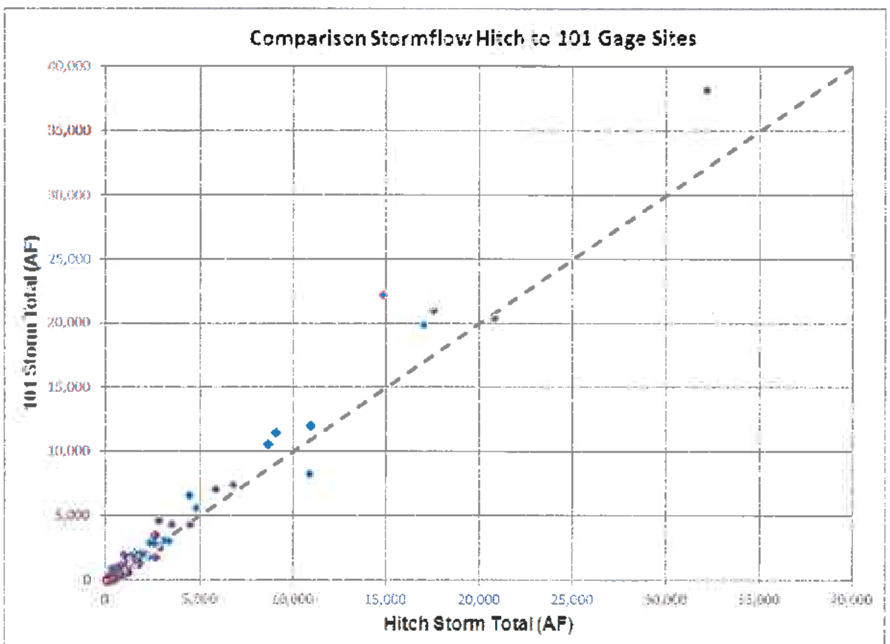


Figure 30. Comparison of storm total flows at Hitch and 101 gage sites.

# 4 Model Setup

The MODFLOW 2000 interface Groundwater Vistas version 6 was used for the modeling. Grid spacing is variable, with the smallest cells (200 ft by 200 ft) located in the project area to accommodate particle tracking.

## 4.1 Model Hydrogeology

Although the geology of the project area appears highly folded and faulted in the cross sections shown in this report (Figure 3 and Figure 4), it must be noted that the vertical exaggeration in the cross sections is 8.3:1 to 9:1, meaning that the folds are shown with much more amplitude than actual (this is done to better show the stratigraphy in the cross section). The beds are actually relatively flat-lying and can be readily modeled (the model uses the actual dips of the beds). Faulting which causes documented offsets in groundwater elevations and thus represent hydrogeologic boundaries can be accommodated by either low-flow or no-flow boundaries.

The model has two layers, Shallow Aquifer/Upper Aquifer/Hueneme (Layer 1) and Fox Canyon Aquifer (Layer 2), with both layers extending to the coast (Figure 31). In practice, the active portion of Layer 1 largely represents the Shallow Aquifer because the layer is considered no-flow outside of the area where the Shallow Aquifer overlies the Fox Canyon Aquifer (Figure 32). The active portion of Layer 1 is considered to be unconfined. The outer limit where the Shallow Aquifer lies directly on the Fox Canyon Aquifer is somewhat uncertain. Its location is estimated based on historical aerial photos showing the location of stream percolation, aquifer testing (City of Camarillo wells are in the confined portion of aquifer and therefore outside of the area where the unconfined Shallow Aquifer rests directly in the Fox Canyon), the cross sections discussed earlier, and stream morphology.

The active area of Layer 1 accommodates all the percolation from Arroyo Las Posas. Layer 1 aquifer properties were initially estimated and then refined during the model calibration process (Table 5).

The thickness of Layer 2 (Fox Canyon Aquifer) within the project area varies laterally somewhat, based on perforated intervals and well logs. South of US 101, the aquifer thickness used was that defined by the US Geological Survey in their groundwater model. In all cases within the project area and within a mile or so south of Highway 101, the thickness of Layer 2 was between 300 ft and 340 ft. Layer 2 aquifer properties in the project area were based on the recent aquifer testing of City of Camarillo's and nearby wells (discussed in an earlier section), where the effects of constant rate pumping on nearby wells were measured (Table 5) and on USGS model-calibrated values.

The thickness of the Fox Canyon in the model is the overall thickness based on drilling results. Within this overall aquifer thickness there are more- and less-transmissive beds. The extent of these beds both vertically and across the modeled area is very likely to be highly variable, and cannot be determined from a few wells penetrating the aquifer. Any attempt to separate the Fox Canyon Aquifer into more- and less-transmissive zones would not only be difficult, it would be highly misleading as to the knowledge of aquifer details. Increased uncertainty in model results occurs when model complexity increases without more data control[4]. The calibrated property values in the model thus represent an average across the aquifer – the horizontal conductivity represents the average for lateral flow through all beds and the vertical conductivity is the average for vertical flow through very-transmissive beds as well as less-transmissive beds. This averaging of layer properties is inherent in essentially every groundwater model. It should also be noted that aquifer properties outside of the project area were based on the calibrated USGS regional groundwater model[5].

The model boundaries were defined by basin edges (no-flow) and a set of constant-head cells located near the coastline and at a distance sufficient from the project area not to cause unwanted boundary effects. The values of the constant-head cells were based on sets of historical groundwater elevations measured during the calibration period. The model edge at the Pleasant Valley/Santa Rosa basin boundary was considered a no-flow boundary for model simplification. Because there is likely some movement of groundwater across this basin boundary, groundwater elevations in NPV may be higher than modeled and the effects of pumping may be overstated. There is also a no-flow boundary between the Pleasant Valley and East Las Posas basins. This is based upon observed groundwater elevations that indicate large differences in head (100+ ft) across the boundary.

## 4.2 Modeling Conditions

The model has annual stress periods, with 25 time steps each. Pumping for the appropriate model period was assigned to each well location based on historical pumping reported semi-annually to the FCGMA. Streamflow percolation was simulated by a set of cells with a specified flux located along the arroyo between the northern edge of the Pleasant Valley basin and the southern edge of Layer 1. Water was added to Layer 1 based on the estimated streamflow percolation of Table 4.

There were four types of modeling runs performed:

1. Steady State – Model was run in steady-state mode (inputs and outputs are constant) during an historical period when there was little change in groundwater elevations. Used to test the overall water balance, conceptual geometry, and aquifer properties for stability.
2. Transient Calibration – Model was run in transient mode (input and outputs change with time) using historical data. Groundwater elevations predicted by the model should match measured historical water levels during the calibration period. Selected parameters (hydraulic properties of layers) were varied until there was a reasonable match.
3. Verification – After a period of time between completion of the model and the project approval process, new data were available for the model. Thus, the model period was extended to the current time and the model results for the newest time period were compared to measured groundwater elevations.

[4] US Environmental Protection Agency, Office of Science Advisor, 2009, *Guidance on the Development, Evaluation, and Application of Environmental Models*, EPA/100/K-09/003.
[5] USGS, 2003, *Simulation of Groundwater/Surface Water Flow in the Santa Clara-Calleguas Basin, Ventura County, California*, WRIR 02-4136, 157 p.

4. Project Modeling – Project scenarios were simulated for a future period given specific inputs and outputs to the calibrated transient model.

| | Kx (ft/day) | Kz (ft/day) | S |
|---|---|---|---|
| Model – Layer 1 | 40 | 20 | 0.15 |
| Model – Layer 2 | 18 | 10 | 2E-04 |
| Aquifer Tests Fox Canyon (Layer 2) | 11-30 | 2-4 | 3E-06 to 5E-04 |

**Table 5. Aquifer properties from aquifer tests on Camarillo wells A & B and adjacent wells compared to calibrated aquifer properties in model. Kx = horizontal conductivity, Kz = vertical conductivity, S = storativity. The modeled value for Kz in layer 2 is a calibrated value, which can vary from aquifer tests at a specific well because it applies to a large area of the model.**

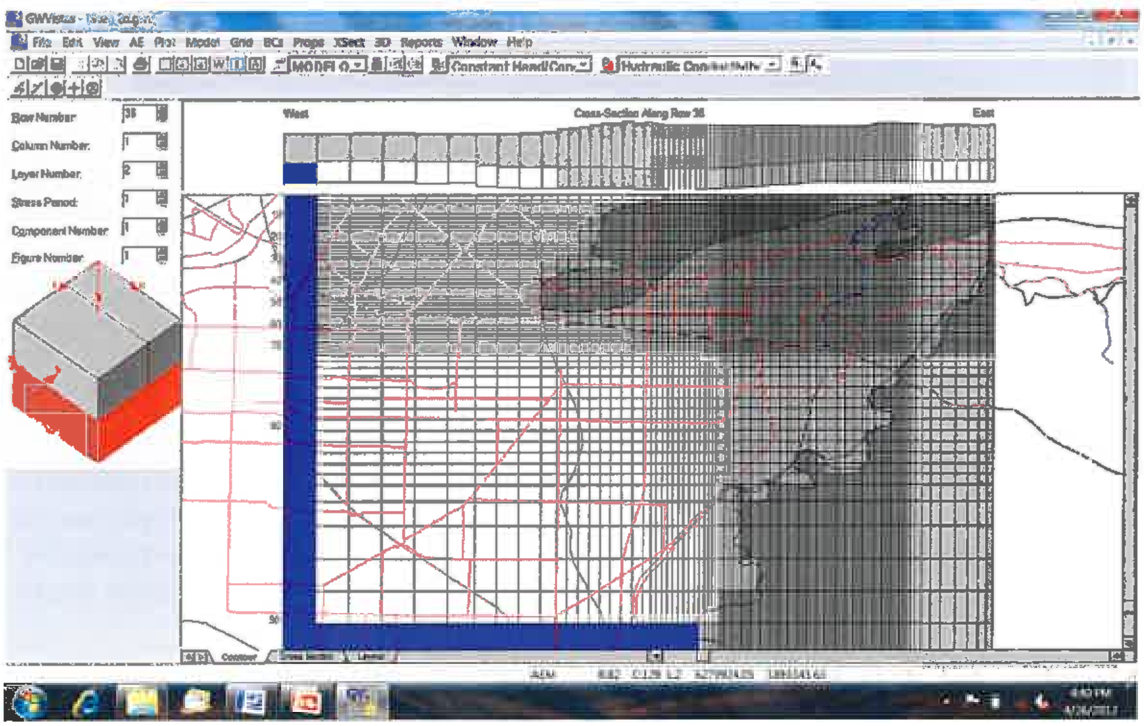



**Figure 31. Model grid for layer 2. Model cell size was significantly decreased in the project area to accommodate particle tracking. Shaded areas are no-flow boundaries coinciding with the edges of the groundwater basins; blue model cells are constant head boundaries near the coastline.**

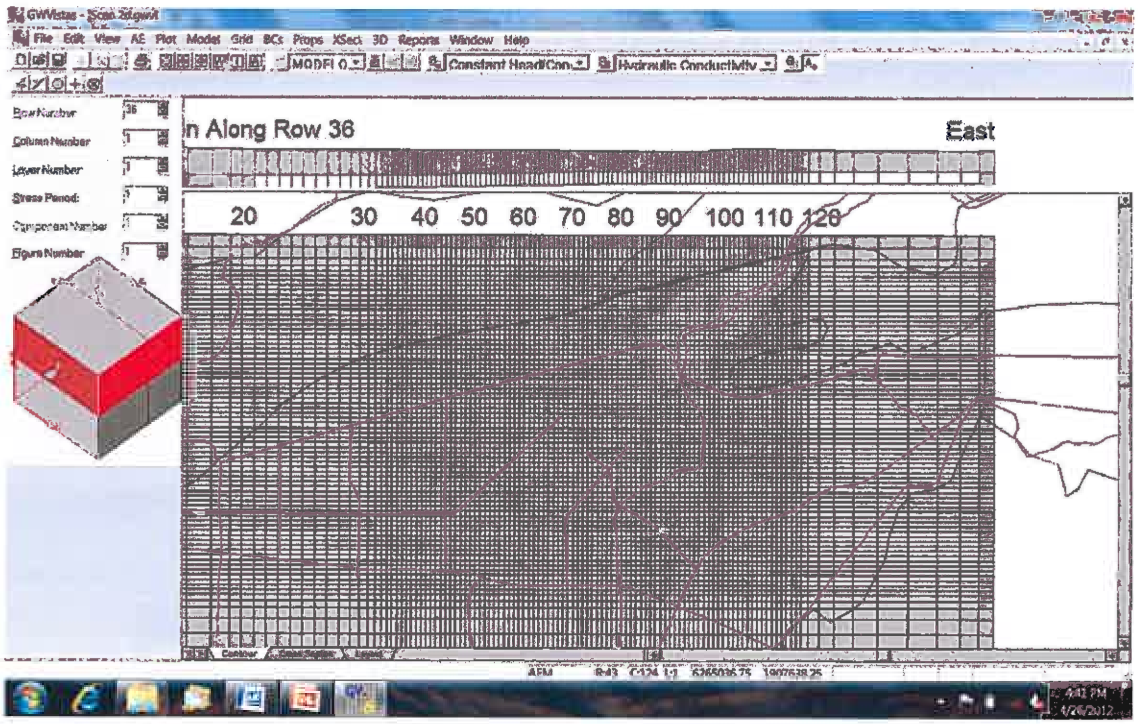


Figure 32. Model grid for layer 1. Model cell size was significantly decreased in the project area to accommodate particle tracking. Shaded areas are no-flow boundaries coinciding with the modeled extent of the Shallow Aquifer.

## 4.3 Steady-State Model

The model was run in steady-state mode for the period 1983 through 1986 to test the stability of the model. This period was chosen because there was little change in groundwater elevations and there was little baseflow yet reaching NPV from the Las Posas basin. Average stormflow and reported pumping for the period were used as inputs and outputs. Results simulated by the model indicated that water levels did not change during the period, verifying that the model was stable and ready for transient calibration (Figure 33).

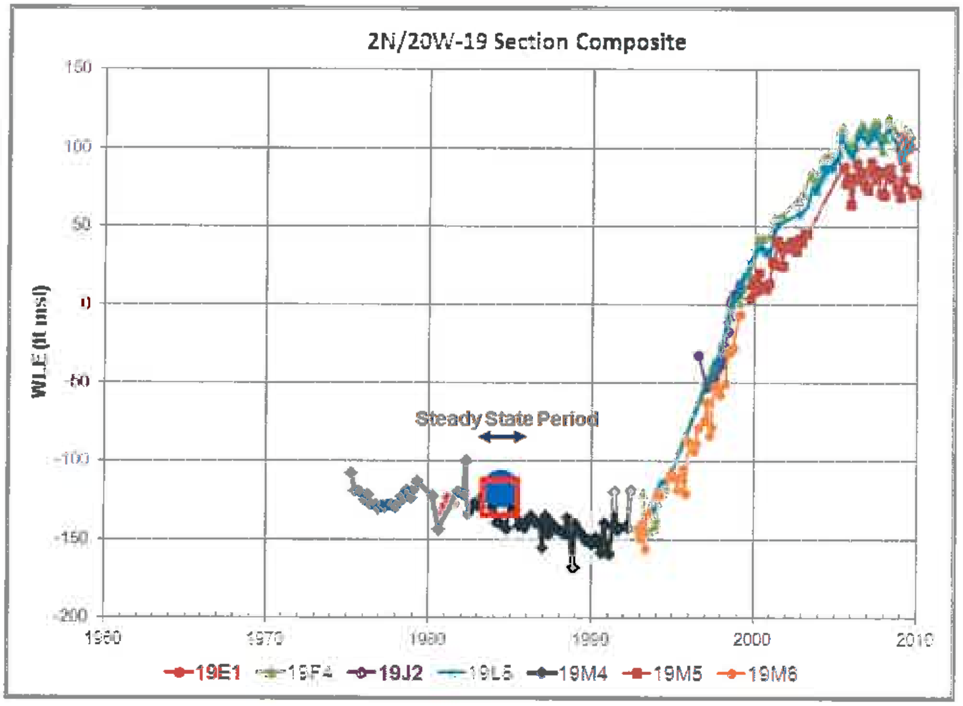



**Figure 33. Composite groundwater elevations in area of Camarillo's wells A and B (2N/20W-19 location shown on Figure 34). Symbols are initial heads (blue circle) and final heads (red box) in the steady-state model.**

## 4.4 Transient Calibration of Model

The model was then run in transient mode. Annual stress periods with 25 time steps each were prepared for the time interval 1994 through 2010. This period coincided with the beginning of spillage of brackish arroyo baseflow into NPV and the rapid rise in groundwater elevations caused by percolation of this brackish water. Streamflow percolation was simulated by introducing water into Layer 1 in the annual quantities indicated in Table 4. Baseflow was added in the first quarter-mile of the arroyo south of the boundary with the Las Posas basin and stormflow was added in the remainder of the arroyo within the extent of Layer 1. Production wells were pumped with the annual volume reported by well operators to the FCGMA (varied by year).

A set of wells with measured historical groundwater elevations was selected as "target" wells for the calibration period (Figure 34). The measured groundwater elevations for the target wells were input into the model for comparison with modeled values. The model then compared target to simulated groundwater elevations in these wells. The calibration process is iterative, with changes made to the model following one calibration run and then the model is run again. There were approximately 25 calibration runs for this study. The RMS error for each calibration well is indicated in Figure 35. Contours of measured groundwater elevations at the beginning and the end of the calibration period are indicated in Figure 36 and Figure 37.

Although Groundwater Vistas has various methods of auto-calibration, the only automated tool used in this calibration was doing a sensitivity analysis of single model parameters. Because there were measured constraints on many of the model parameters, the only parameters that were allowed to be varied in the calibration process were Layer 1 hydraulic conductivity (horizontal and vertical), Layer 1 storage coefficient, and Layer 2 vertical conductivity.

The results of the calibration process are indicated in Figure 38 and Figure 39, with additional targets in the Appendix. The most important parameters in model verification are the timing and magnitude of change of groundwater elevations. In addition, calibration error is calculated by Groundwater Vistas – the scaled root mean squared (RMS) error of this model is 4.5%, well within the recommended error range of 10%[6]. An expanded list of calibration statistics is shown in Table 6.

The rise in groundwater elevations during the calibration period was significant, so the model is calibrated over a range of groundwater elevations; this is important in simulating project effects because pumping down the mound of brackish water would also occur over this same range of groundwater elevations.

| Statistic | Value |
|---|---|
| Residual Standard Dev | 16.48 |
| Absolute Residual Mean | 11.51 |
| RMS Error | 16.48 |
| Scaled Residual Standard Dev | 0.045 |
| Scaled Absolute Mean | 0.031 |
| Scaled RMS | 0.045 |

**Table 6. Statistics at completion of model calibration.**

[6] Zheng, C., and C. Neville, 1994, Practical Modeling of Pump-and-Treat Systems Using MODFLOW, PATH3d and MT3D, Short Course Notes.

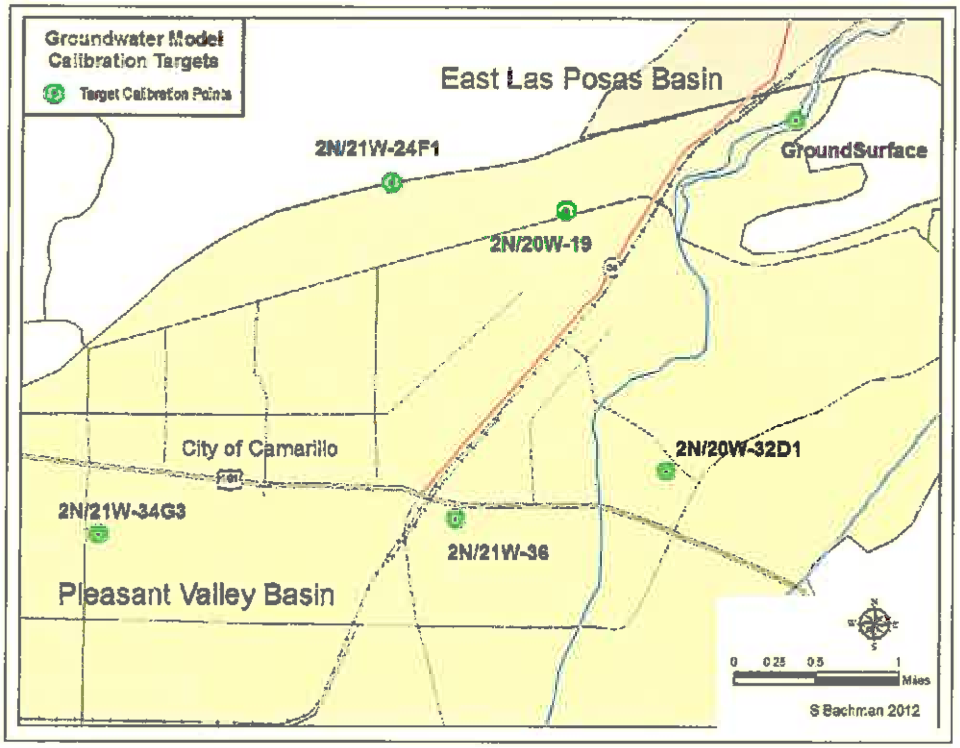



**Figure 34. Calibration targets. Charts for two of these targets are shown in following pages; the remainder are included as Appendix 14.3. In addition to wells with measured groundwater elevations, a calibration target was chosen in the area of the groundwater mounding to ensure that groundwater elevations did not exceed ground surface (MODFLOW allows this to occur in unconfined aquifers).**

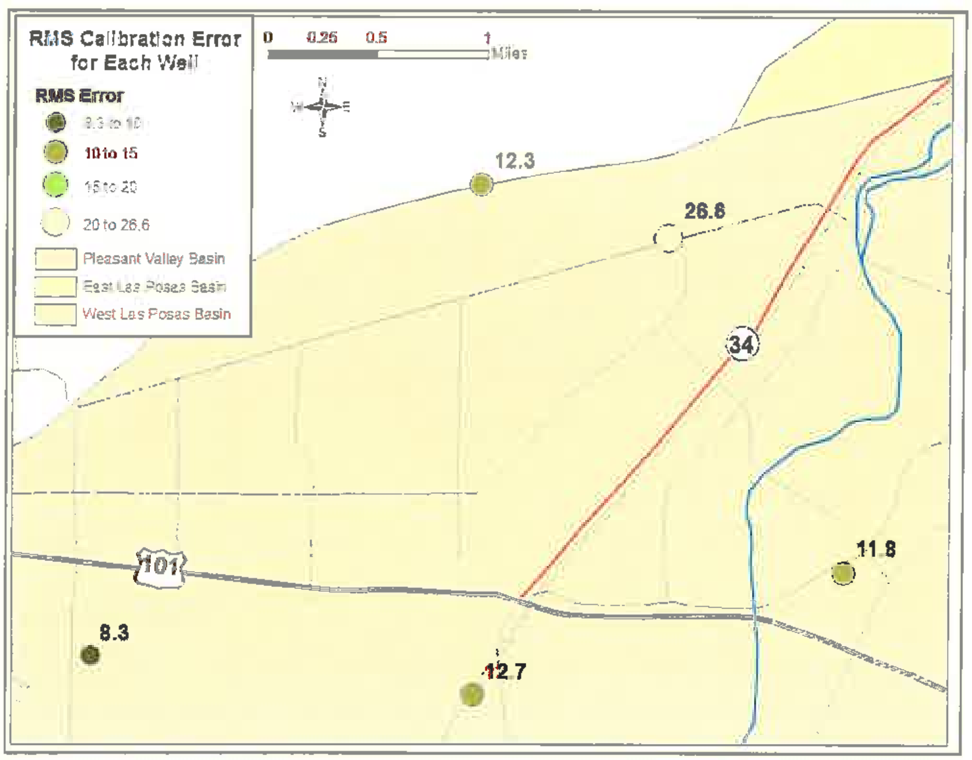



**Figure 35. Model RMS error for each calibration well.**

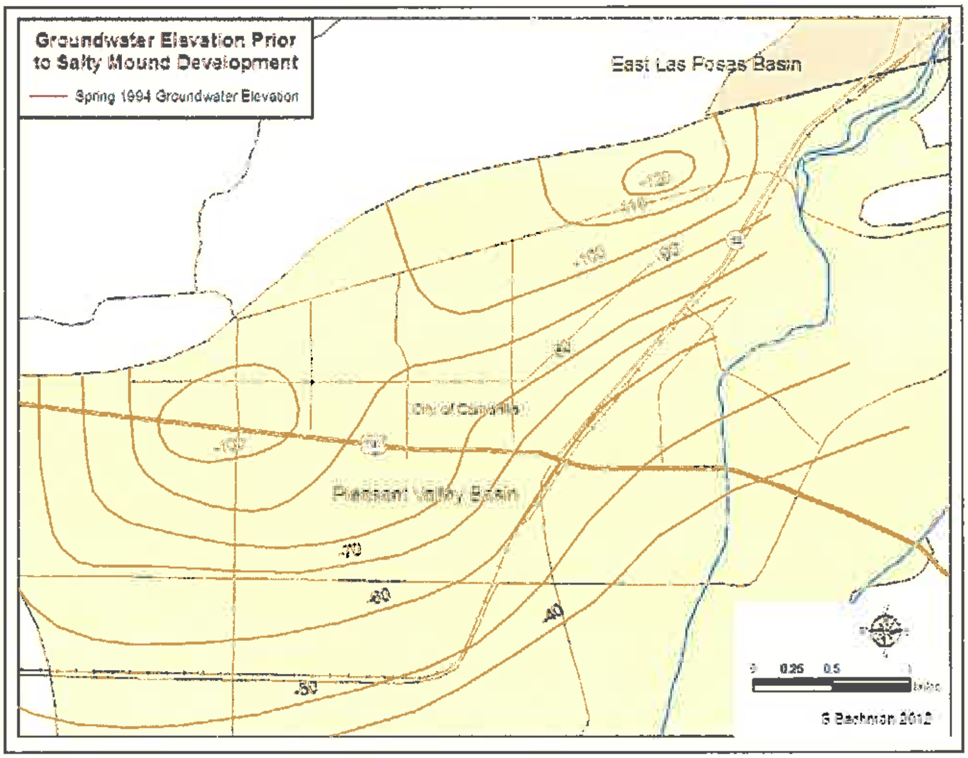



**Figure 36. Groundwater elevations in spring 1994, just prior to the beginning of growth of the brackish mound beneath NPV.**

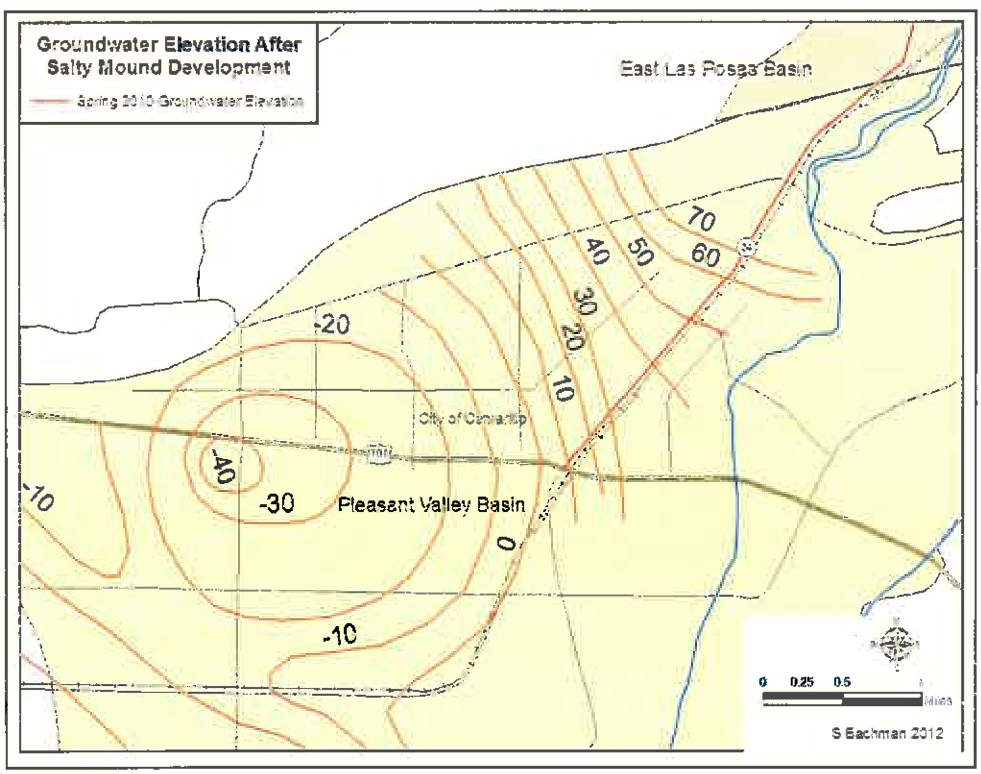



**Figure 37. Groundwater elevations in spring 2010, after development of the brackish mound beneath NPV.**

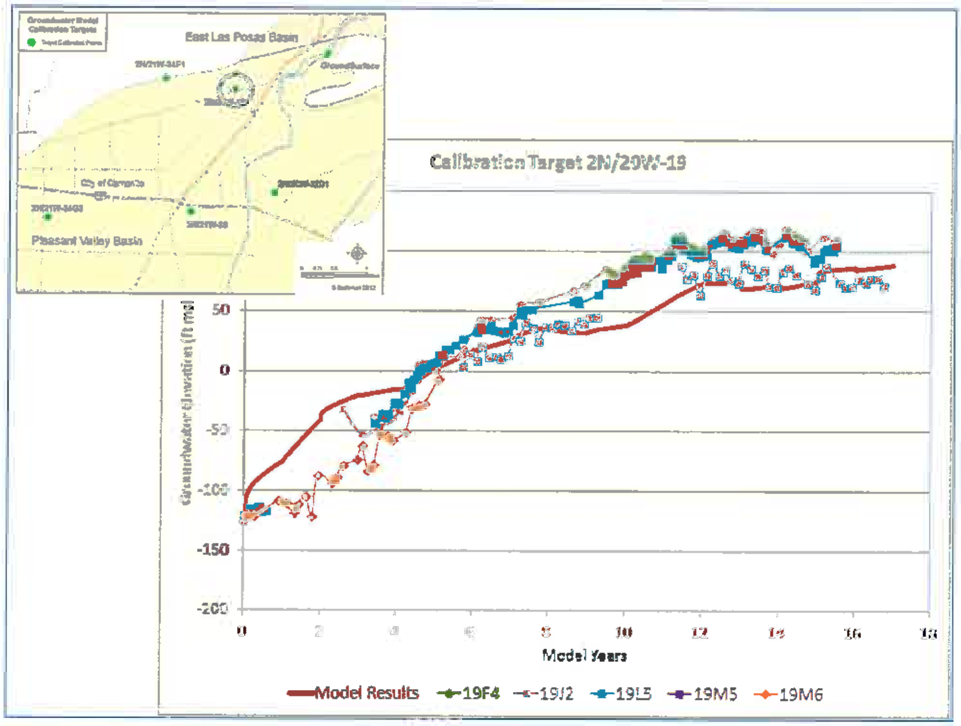



**Figure 38. Calibration targets in section 2N/20W-19. Multiple wells are used because a single well does not have adequate data across the calibration period.**

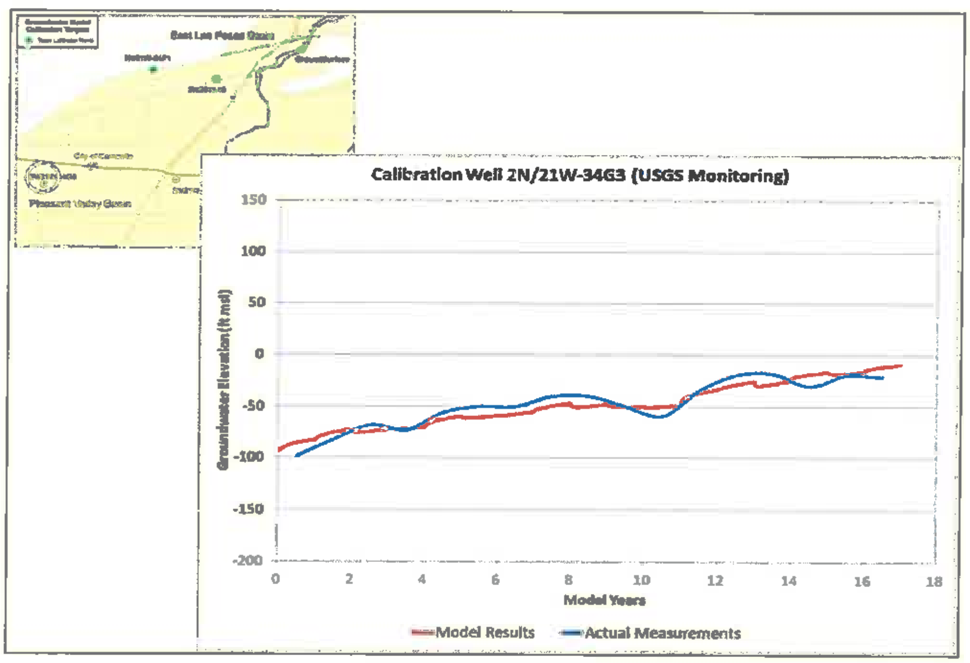



**Figure 39. Calibration target 2N/21W-34G3.**

## 4.5 Model Verification

Because time passed between initial modeling and the project approval process, additional years of measured data became available. This was particularly important because much of this additional period was during a severe drought, with pumping, streamflow, and groundwater elevations considerably impacted. Thus, five years of data were available after the end of the calibration period in 2010, so the verification period was 2011-2015. Data inputs included:

Pumping – Pumping reported to the FCGMA was used for the period 2011 to 2014. For 2015, the average for 2013-2014 was used (all three of these years were drought years). Pumping in NPV for 2013-2014 was almost double the annual average for the preceding decade, caused by both the dry weather and because surface water sources that are normally used in-lieu of pumping were not available.

Streamflow Percolation – Upstream and downstream gage data were available for the first half of the verification period. However, bi-weekly observations of streamflow for CMWD indicated that base flow in the arroyo no longer reached NPV by the middle of 2013; that continued to be the case through 2014 and 2015. The only flow reaching NPV was from storm events, which were less frequent. Thus, baseflow was eliminated from model percolation from 2013 to 2015. In 2014, runoff from four storms reached the downstream gage near Highway 101(this meant that the recharge area in NPV was fully wetted for the days of the storm). Downstream gage data were not available for 2013 and 2015, so the 2014 storm data were also used for those years. This storm percolation was the only stream recharge in the model during the three dry years.

The model was run for the verification period and compared to measured groundwater elevations in the model area. Groundwater elevations dropped significantly in many areas because of the combination of reduced recharge and increased pumping. The results of the verification run are illustrated in Figure 40 and Figure 41; the drops in measured groundwater elevations are also reflected in the model results, indicating that the model is performing properly.

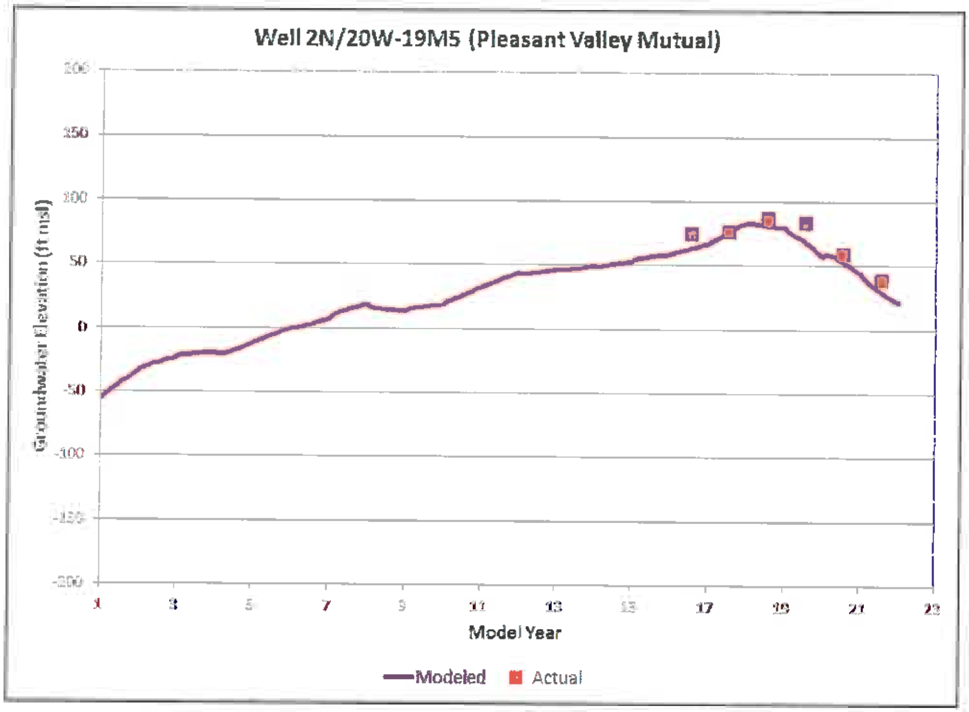



**Figure 40. Modeled vs. measured groundwater elevations for the 19M5 well for the verification period 2011-2015 (model years 18 to 22). The actual groundwater elevations are the annual average to coincide with the annual time step in the model. Well location shown in Figure 38.**

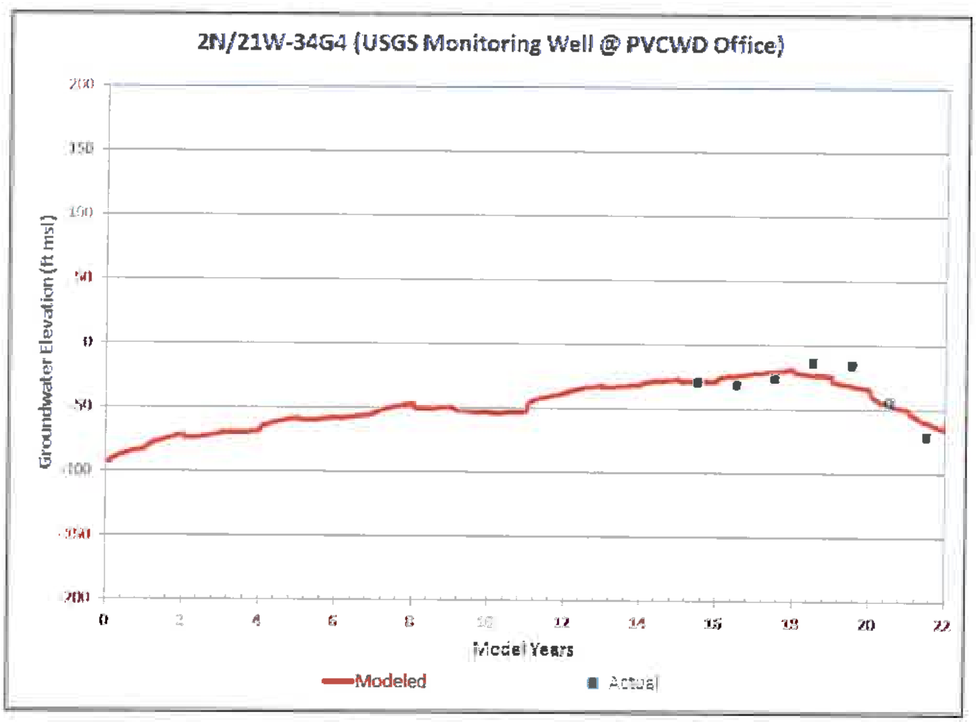



**Figure 41. Modeled vs. measured groundwater elevations for the 34G4 well for the verification period 2011-2015 (model years 18 to 22). The actual groundwater elevations are the annual average to coincide with the annual time step in the model. Well location shown in Figure 39 (same location as 34G3 on map).**

## 4.6 Project Modeling

To model the effects of the project, both background hydrology (streamflow) and project yield/locations were varied. A representative base period was chosen to evaluate the project.

### Model Base Period

A base period used for project modeling should reflect conditions that might be expected during the project. These conditions could include rainfall (e.g., wet and dry cycles), streamflow (base flow and storm flow), groundwater pumping, and discharges to the arroyo. In many basins, choosing a representative rainfall pattern would ensure that streamflow and pumping are also representative because they are inter-related.

In the NPV area, however, the largest changes in hydrology are not related to climate cycles – the basin filled because of increased upstream discharges from wastewater treatment plants and dewatering wells. Likewise, pumping has only partially been controlled by climate, with the majority controlled by urbanization and in-lieu projects such as the Pleasant Valley pipeline and the Conejo Creek project. Thus, the base period used in the modeling must reflect conditions expected during the project, rather than historical climate conditions that are of lesser effect in NPV.

Figure 42 is an illustration of historical streamflow in the Arroyo Simi-Arroyo Las Posas stream system. Discharges from wastewater treatment plants and dewatering wells have significantly increased streamflow over time. Any choice of a base period prior to the most recent two decades would not accurately portray future streamflow conditions that include these higher flows.

Choosing a base period that includes representative future pumping is also limited by local factors. The most serious concern is that prior to the 1980s, pumping was not reported in the NPV area. Although pumping prior to the 1980s could be estimated using historical aerial photographs and crop factors, it is the policy of the FCGMA that reported pumping is a more accurate method of determining pumping. In addition, pumping patterns within the NPV area have changed over the last several decades, as urbanization replaced some agricultural pumping. Figure 43 illustrates the change in pumping from the beginning of the reporting period. There was significantly higher pumping in the early years in the NPV area – even though the 1987-90 period was dry, the overall pumping in subsequent average and dry years never reached the 1984 to 1990 levels. Thus, to reflect current pumping trends, the model base period should be limited to within the period following 1990.

The 60-year period used for the project modeling included:

**Model Years 1-17**: calibration period (1994-2010), period satisfies the constraints discussed above related to streamflow and pumping trends, plus it coincides with the advent of filling of the basin with brackish water, which will be tracked as part of the modeling;

**Model Years 18-22**; verification period (2011-2015);

**Model Years 23-25**: prior to project beginning;

**Model Years 26-50**: 25 years of project;

**Model Years 51-60**: 10 years following completion of project.

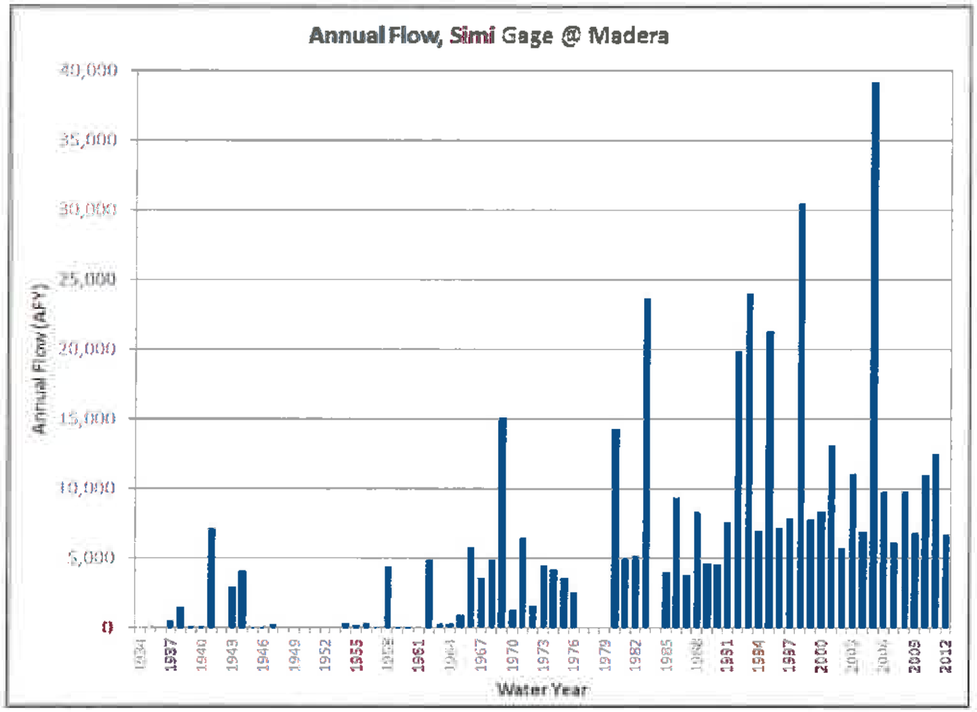



**Figure 42. Annual streamflow in Arroyo Simi measured at the downstream (western) end of Simi Valley. This gage has the longest period of record in the Arroyo Simi-Arroyo Las Posas stream system. Note the significant increase in streamflow as upstream discharges increased with time. Representative streamflow for project modeling must be biased towards the last two decades to reflect the increase in arroyo flows during that time.**

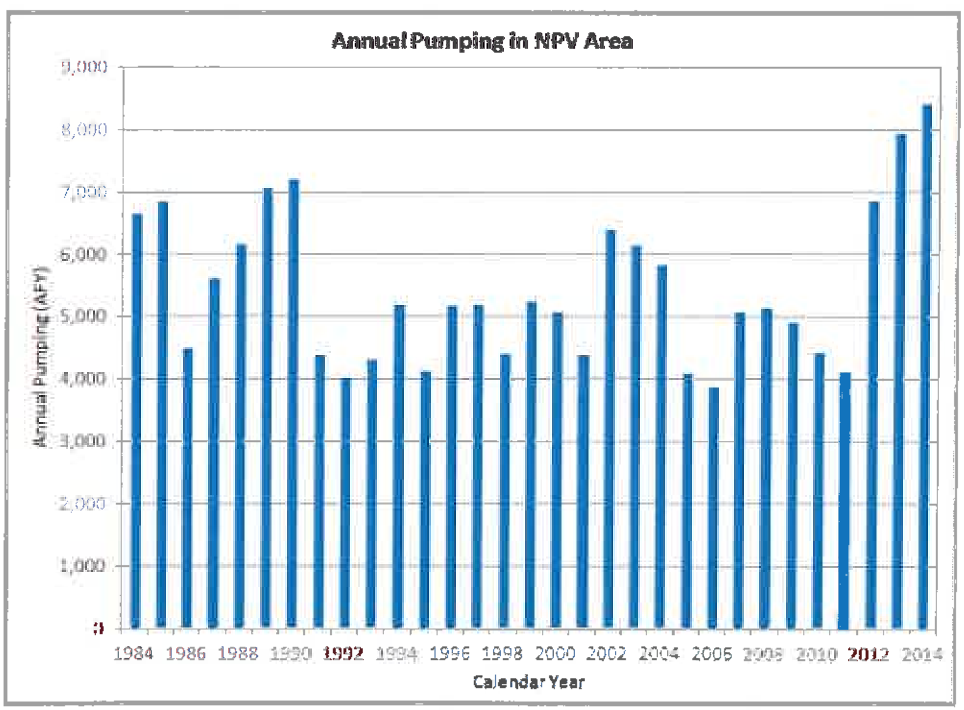



**Figure 43. Groundwater pumping reported to the FCGMA in the NPV modeled area.**

### Modeling Inputs

Streamflow for model years 1 to 22 were the same as for model calibration and verification. For the next 38 years, streamflow varied in two overall scenarios:

**Base Case and Scenario #1** – Annual streamflow (including baseflow and stormflow) was the average of the period 1994-2015 (see average and caption explanation in Table 4). This captures the period of increased streamflow caused by wastewater and dewatering discharges. This scenario assumes that no desalters (with their accompanying shallow groundwater pumping) were built and operated in Las Posas basin. This is a best-case scenario for source water for the NPV Desalter project.

**Base Case and Scenario #2** – Baseflow percolating into NPV is identical to Scenario #1 until the beginning of model year 31, when 5,000 AFY of baseflow is removed from NPV as a Las Posas desalter comes on line[7]. At the beginning of model year 36, the rest of the baseflow is removed by Las Posas desalting, leaving only stormflow entering NPV (as was the case prior to 1994). The amount of stormflow entering NPV would vary depending upon the effect of future upstream pumping for desalters in the Las Posas basin. Historically, when baseflow was lower prior to discharges of wastewater and dewatering into the arroyo, stormflow commonly flowed across NPV and was measured at a gage near US 101. Therefore, it is likely that stormflow would reach NPV in quantity after the man-made baseflow was removed. Recharge of stormflow in NPV could actually increase with the removal of baseflow – stormflow would then have a longer length of streambed available for percolation. Scenario #2 is a worse-case scenario for source water for the NPV Desalter and the best-case for removal of brackish water.

Groundwater pumping at individual wells for model years 1 to 22 was from the calibration and verification model runs. For model years 23 to 60 under all scenarios, groundwater pumping at each well was the average of the past ten years of pumping reported to the FCGMA. The ten-year period was chosen to reflect current pumping patterns, unbiased by historical changes in pumping caused by past urbanization. The only exception to the ten-year average was for City of Camarillo wells, where existing and new wells near the airport pumped Camarillo's FCGMA allocation each year and desalting wells pumped during project years.

### Base Cases

The base case for the modeling analysis is that no desalting project would be built. All other inputs and outputs remain the same except that there is no project pumping.

In Base Case #1, the mound of poor-quality water continued to grow, extending into the main portion of the Pleasant Valley basin (Figure 44). Particle tracking for this scenario indicates that salts would affect a wide area of the basin, causing a potential new threat to aquifers within the FCGMA (see section Particle Tracking).

In Base Case #2 where desalters in the Las Posas basin eventually remove brackish baseflow from the arroyo, the recharge mound at the northern edge of NPV remained, but was less pronounced (Figure 45). The main reason for any mound remaining in Base Case #2 is that the

[7] This desalter is likely to be the Moorpark Desalter, but any desalter project along the arroyo in Las Posas will yield the same effect in NPV.

City of Camarillo no longer pumps its production wells in the area of mound, reducing pumping of the mound.

### Project Scenarios

A number of project scenarios were run with the model against the backdrop of Scenarios #1 and #2 changes in baseflow in the arroyo. The initial model runs, before the model was extended through the verification period, examined desalter pumping amount, locations, and duration. These initial runs helped determine that the project that made most sense pumped 9,000 AFY from the poor-quality mound for a period of 25 years. Two scenarios also tested the sensitivity of varying the amount of baseflow in the arroyo that percolates into NPV (increase/decrease by 20%). Project scenarios labeled "extended period" are for the model runs where the verification period was added to the model. With the exception of the sensitivity scenarios, the following analyses are for the "extended period" model runs. Well locations used in the modeling are indicated on Figure 46.

**Scenario #1c-Extended** – Base Case #1 streamflow with project pumping model years 26-50.

**Scenario #2c-Extended** – Base Case #2 streamflow with project pumping model years 26-50.

**Scenario #2e** – Initial model run (not extended through verification period) with project pumping; however, baseflow infiltration increased to 120% of that in Base Case 2.

**Scenario #2f** – Initial model run (not extended through verification period) with project pumping; however, baseflow infiltration decreased to 80% of that in Base Case 2.

Modeling results were analyzed several ways. The modeled change in groundwater elevations at several monitoring points within and adjacent to NPV were plotted and scenarios were compared. Groundwater elevation contour maps were also compared among scenarios. Particle tracking provided a technique to evaluate the potential movement of salts from their site of infiltration, their potential path of migration into NPV, and their movement after desalter pumping began.

The monitoring points that were used for evaluating model results included a combination of calibration wells, wells at the northern edge of agricultural production in the Pleasant Valley basin, and monitoring points located within the model at strategic positions within NPV. The locations of these monitoring points are shown in Figure 47.

The groundwater model operates on one-year time steps. Thus, the groundwater elevations indicated at specific monitoring points are an annual average – actual groundwater elevations would be higher during the wet portion of the year and lower during the dry portion of the year. The range of measured annual fluctuations in groundwater elevations is indicated for each hydrograph.

#### *Model Results in Groundwater Mound*

The mound of poor-quality water is pumped down in both future base flow conditions (Figure 48, Figure 49). In both cases, there is significant recovery of Shallow Aquifer groundwater elevations after the project is completed.

### *Model Results within City of Camarillo*

Scenario #1 pumping would not reduce the mound of poor-quality water to below historical-low groundwater elevations within the City of Camarillo (Figure 50, Figure 52). Scenario #2 pumping would eliminate the mound completely, in some cases lowering water levels below historical-low groundwater elevations (Figure 51, Figure 53).

### *Model Results at Southern Edge of City of Camarillo*

Model results at three locations south of the City of Camarillo were analyzed: the USGS monitoring well at the PVCWD office and the two active agricultural wells closest to the southern boundary of the City of Camarillo (Figure 47). All Scenario #1 pumping options failed to reduce the effect of the mounding of the poor-quality groundwater at the USGS monitoring well site (Figure 54). In contrast, the higher pumping-rate options of Scenario #2 essentially eliminated the post-1994 groundwater mounding (Figure 55, Figure 56, Figure 57).

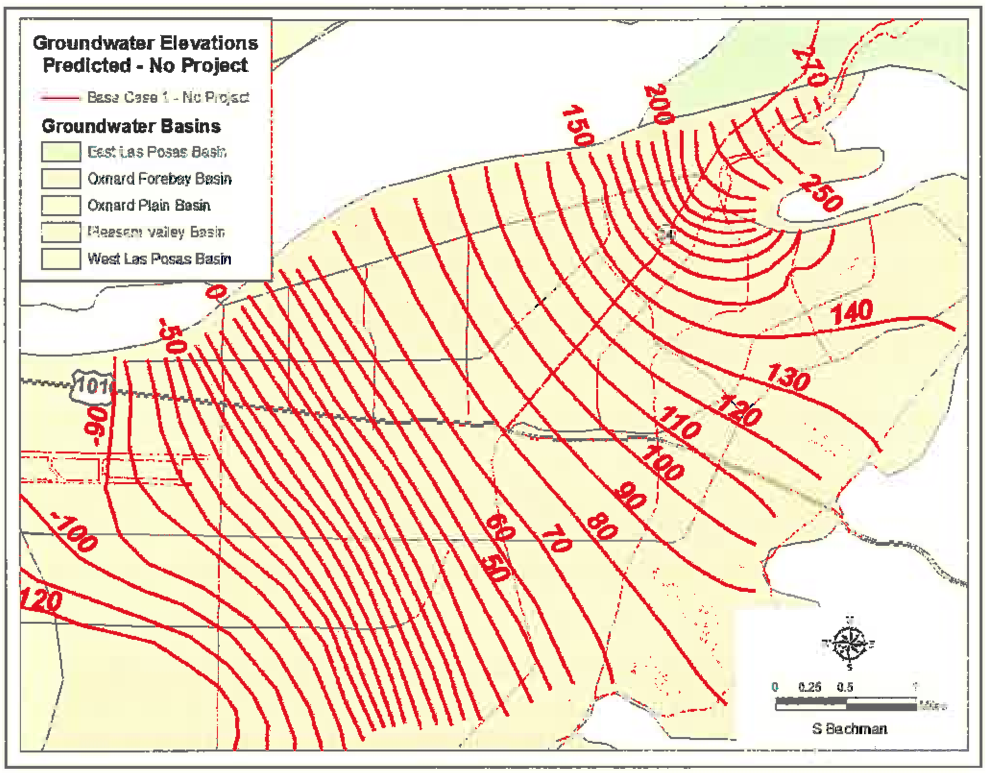



**Figure 44. Base Case #1 (no project) groundwater elevations at end of 50 years in model. No upstream desalter projects.**

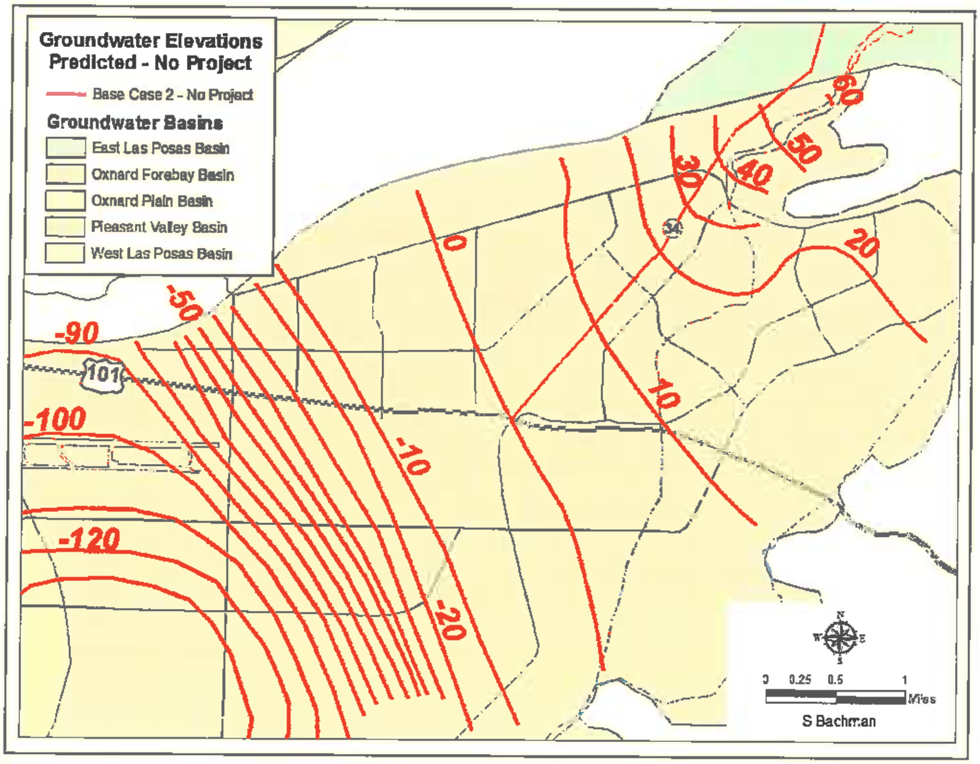



**Figure 45. Base Case #2 (no project) groundwater elevations at end of 50 years in model. Progressive reduction in brackish baseflow as Las Posas desalters comes on line.**

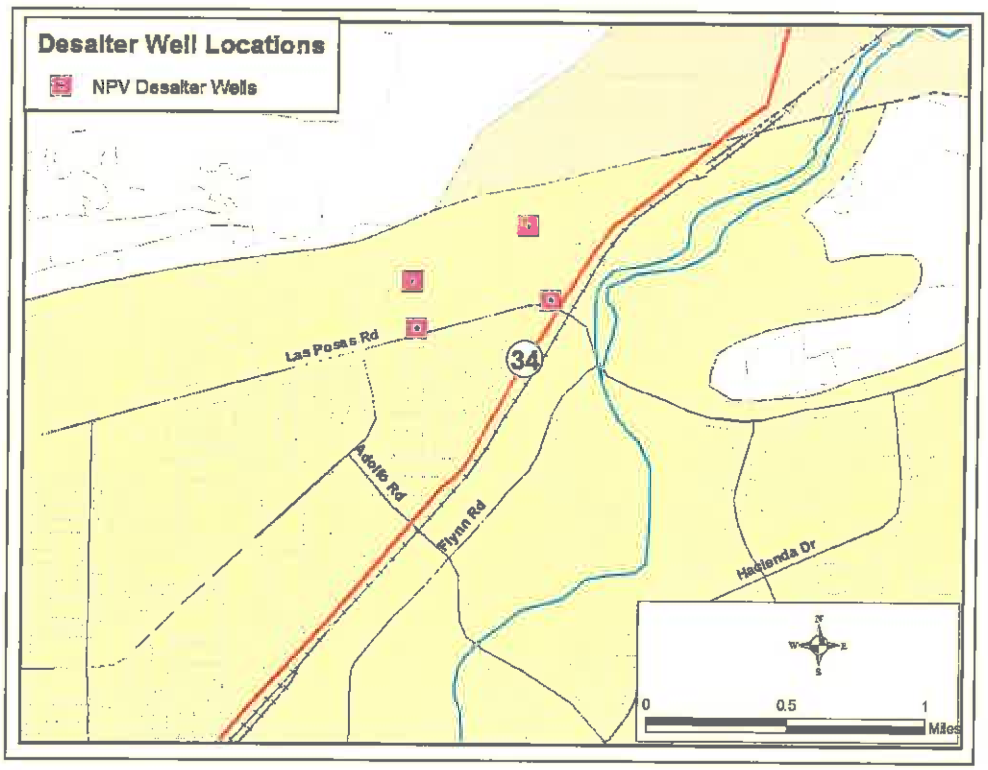



**Figure 46. Location of wells used in desalter model runs.**

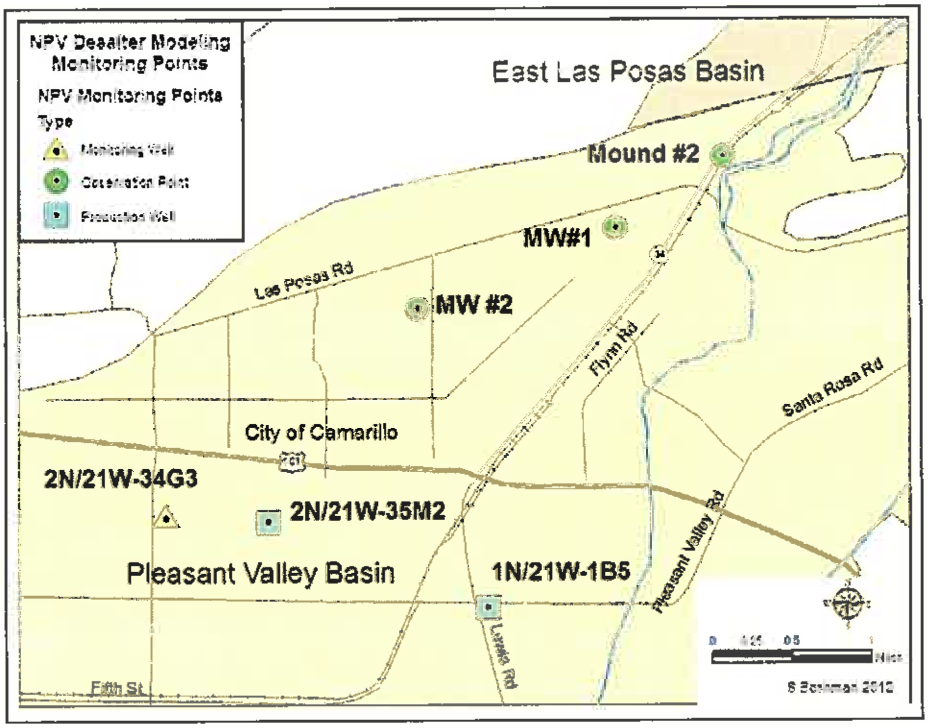



Figure 47. Location of monitoring points in model used for evaluation of the varying project scenarios. Monitoring wells and production wells are actual wells; observation points are selected in the model to simulate what a monitoring well would observe at that location. Mound #2 is a Shallow Aquifer (model Layer 1) monitoring point whereas the other monitoring points are in the Fox Canyon Aquifer (model Layer 2).

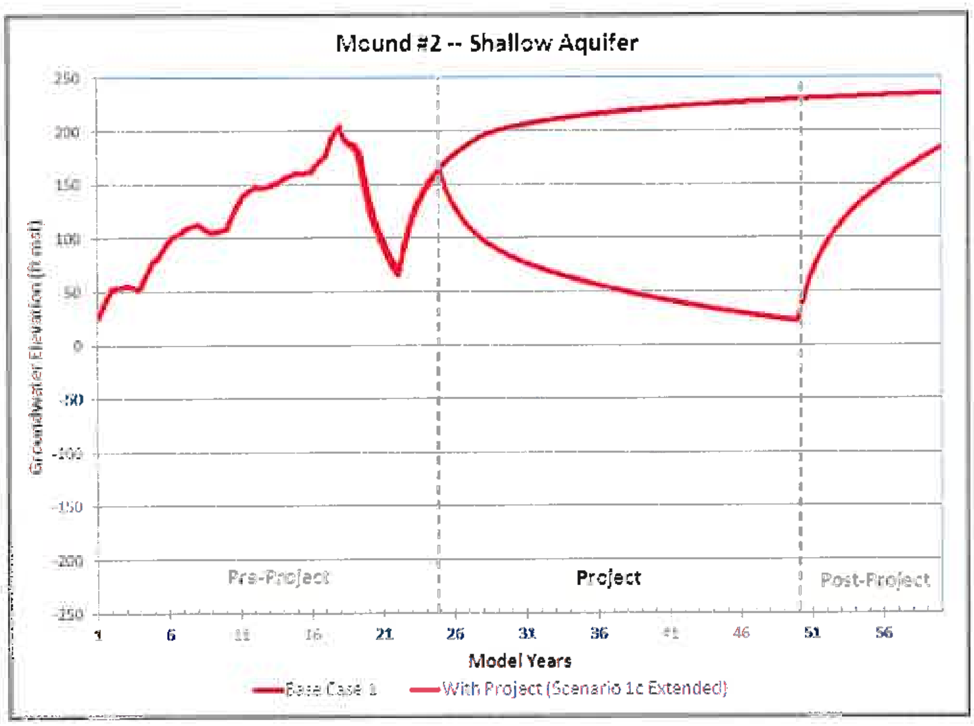



Figure 48. Hydrograph of Base Case and Scenario #1 at Mound #2 observation point. See Figure 45 for location.

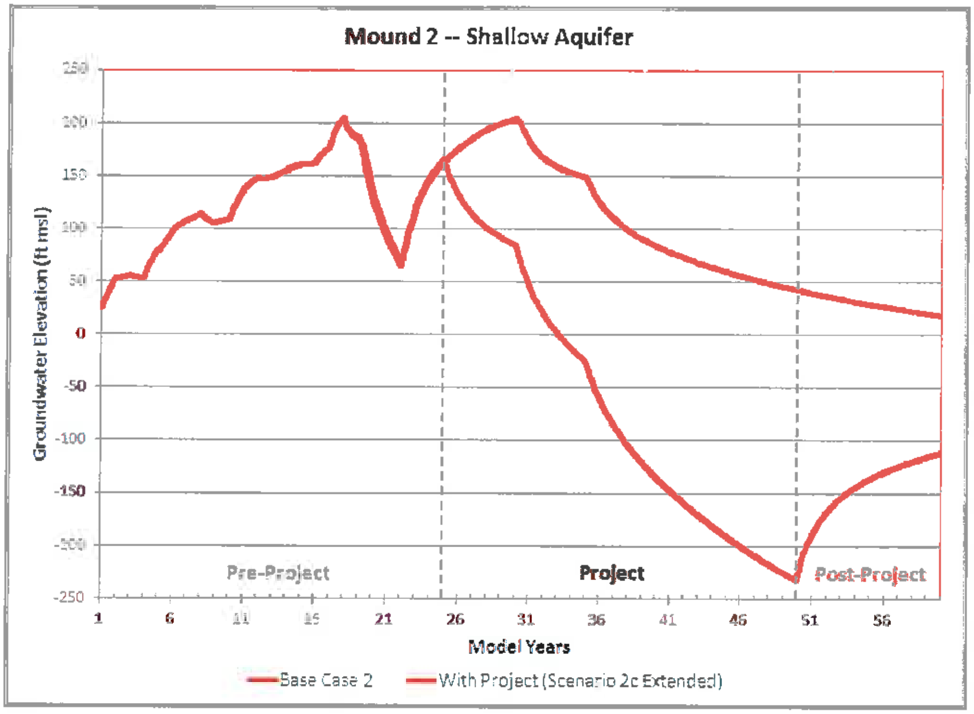



**Figure 49. Hydrograph of Base Case and Scenario #2 at Mound #2 observation point. Drop in groundwater elevations for base case starting at model year 31 is caused by decrease in base flow in arroyo because of start-up of desalting projects in the Las Posas basin. See Figure 45 for location.**

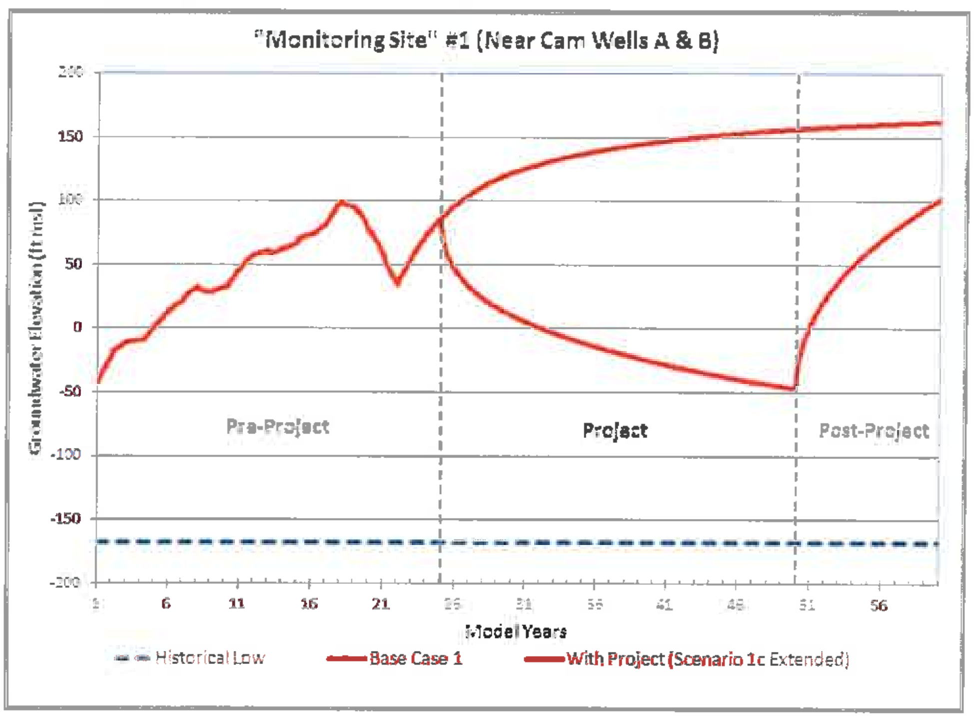



**Figure 50. Hydrograph of Base Case and Scenario #1 near City of Camarillo's well #A and #B. Historical low is for well 2N/20W-19M4. Seasonal variations of about ±8 ft from yearly average are observed in measured groundwater elevations. See Figure 45 for location.**

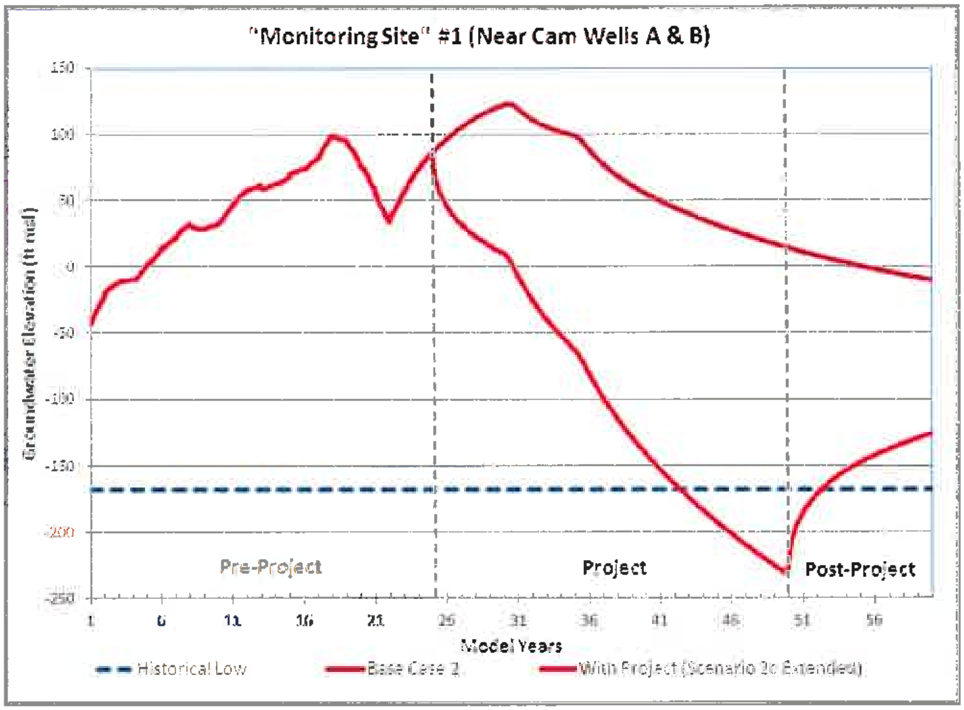



**Figure 51. Hydrograph of Base Case and Scenario #2 near City of Camarillo's well #A and #B. Historical low is for well 2N/20W-19M4. Drop in groundwater elevations for base case starting at model year 31 is caused by decrease in base flow in arroyo because of start-up of desalting projects in the Las Posas basin. Seasonal variations of about ±8 ft from yearly average are observed in measured groundwater elevations. See Figure 45 for location.**

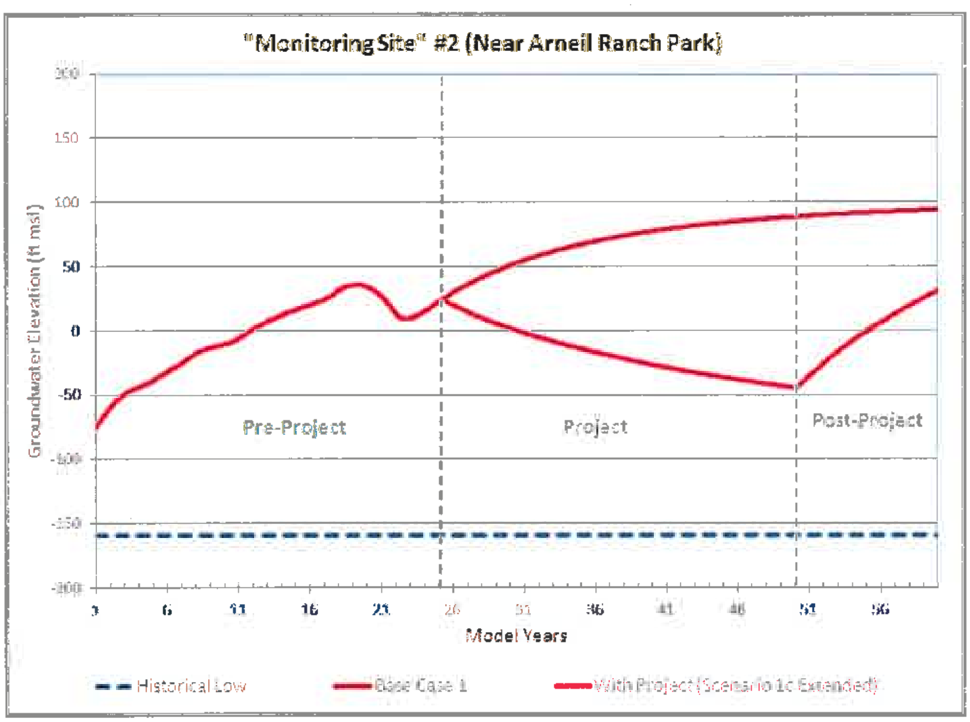



**Figure 52. Hydrograph of Base Case and Scenario #1 near middle of City of Camarillo. Historical low is for well 2N/21W-25B1. Seasonal variations of ±5 ft from yearly average were observed in measured groundwater elevations. See Figure 45 for location.**

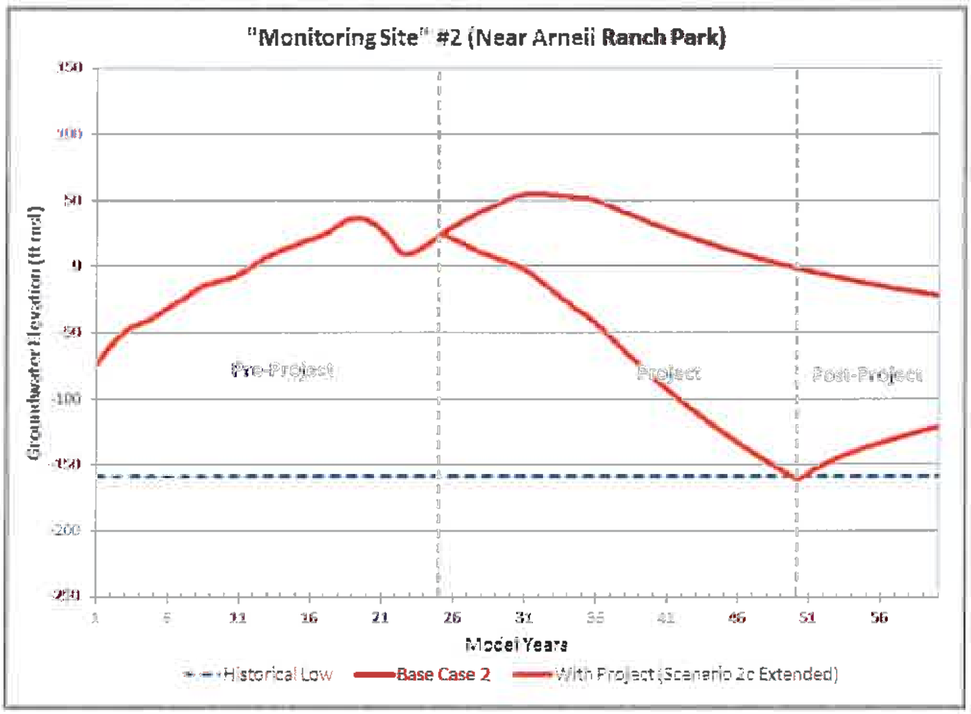



**Figure 53. Hydrograph of Base Case and Scenario #2 near middle of City of Camarillo. Historical low is for well 2N/21W-25B1. Drop in groundwater elevations for base case starting at model year 31 is caused by decrease in base flow in arroyo because of start-up of desalting projects in the Las Posas basin. Seasonal variations of ±5 ft from yearly average were observed in measured groundwater elevations. See Figure 45 for location.**

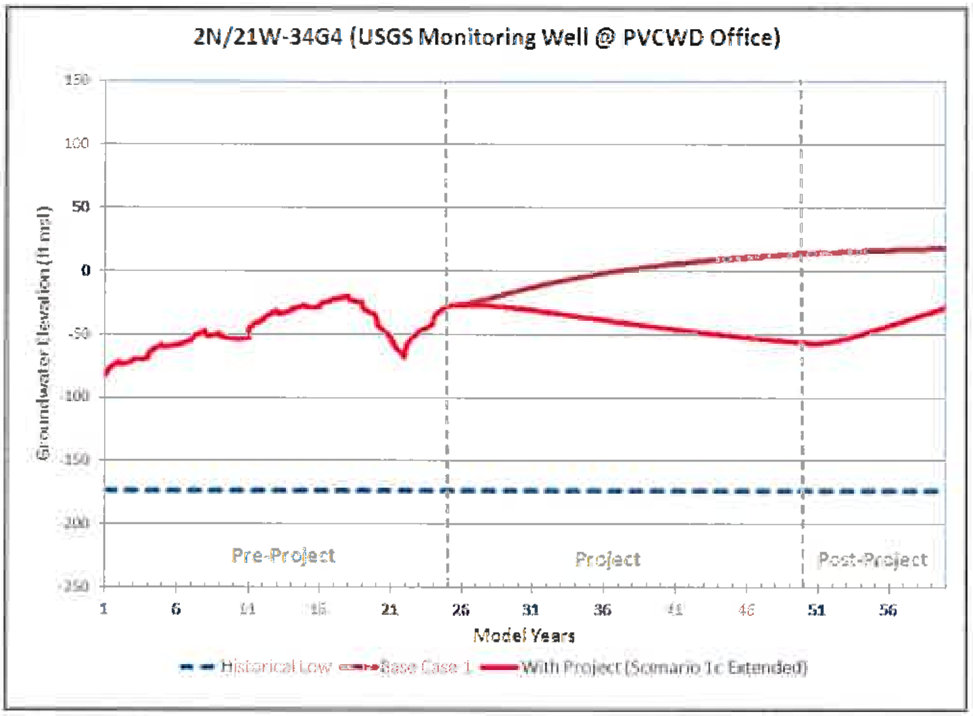



**Figure 54. Hydrograph of Base Case and Scenario #1 at USGS monitoring site at PVCWD office. Historical low is for well 2N/21W-34G3. Seasonal variations up to ±25 ft from yearly average were observed in measured groundwater elevations. See Figure 45 for location (same location as well 34G3).**

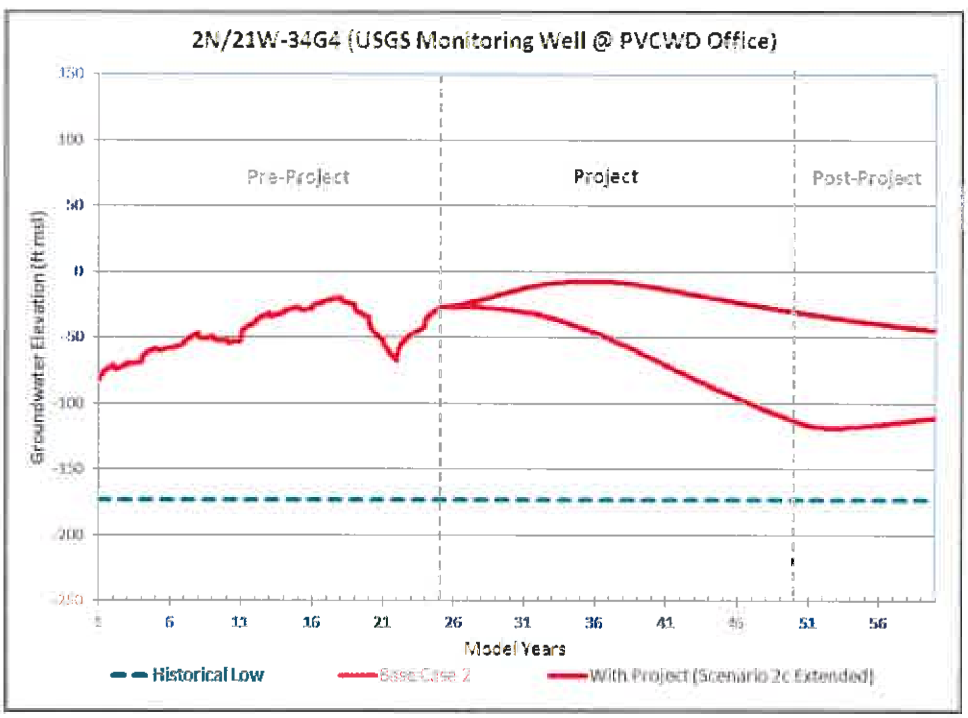



**Figure 55. Hydrograph of Base Case and Scenario #2 at USGS monitoring site at PVCWD office. Historical low is for well 2N/21W-34G3. Seasonal variations up to ±25 ft from yearly average were observed in measured groundwater elevations. See Figure 45 for location (same location as well 34G3).**

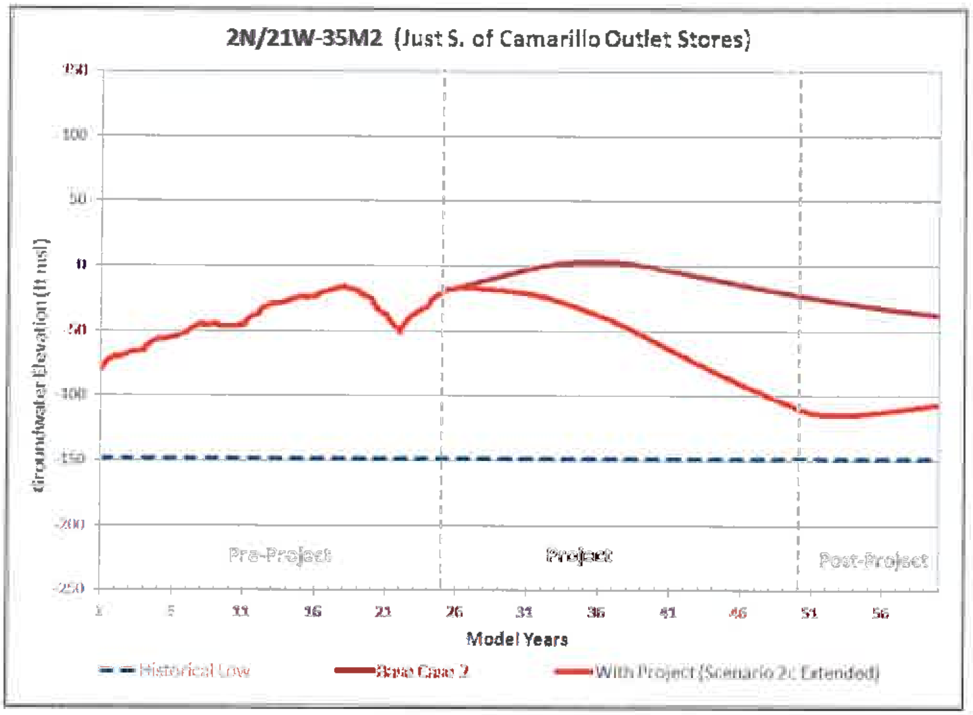



**Figure 56. Hydrograph of Base Case and Scenario #2 at well 35M2. Historical low is for nearby well 2N/21W-35K1. Seasonal variations up to ±25 ft from yearly average were observed in measured groundwater elevations. See Figure 45 for location.**

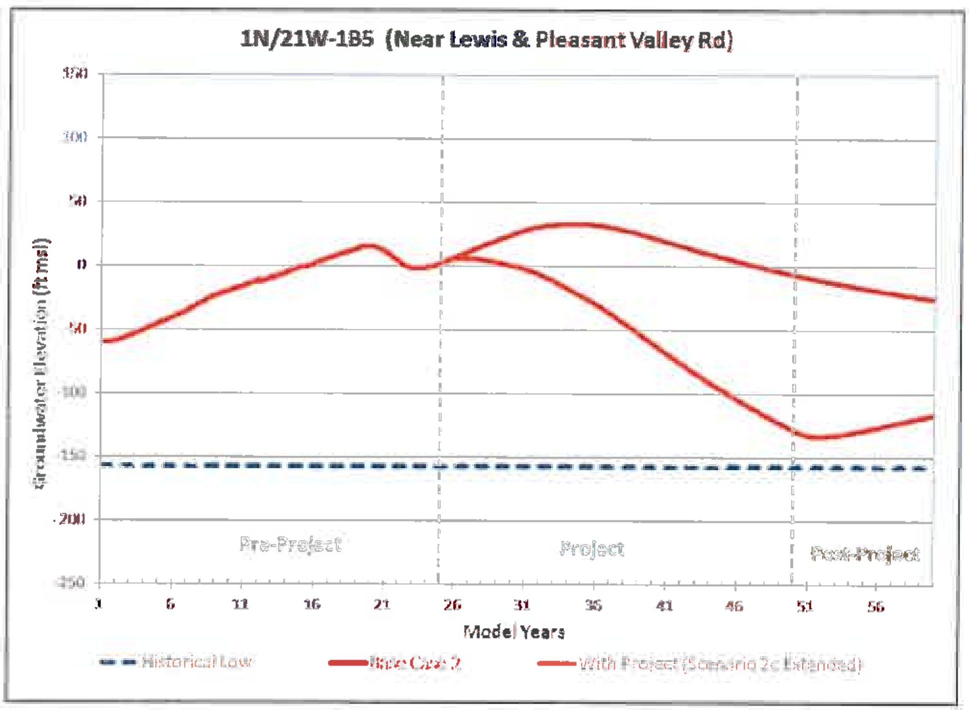



**Figure 57. Hydrograph of Base Case and Scenario #2 at well 1B5. This well represents the farthest north pumping in that area. Historical low is for well 1N/21W-1B4. Seasonal variations up to ±25 ft from yearly average were observed in measured groundwater elevations. See Figure 45 for location.**

# 5 Particle Tracking

Particle tracking is an especially useful tool for analyzing projects such as the NPV Desalter. The particle tracking component of MODFLOW, called MODPATH, uses the MODFLOW grid and cell-by-cell model results to simulate the movement of a particle within the groundwater flow path. A starting time and location of a particle is designated, and the path of the particle is then traced during any portion of the model period. The particle moves both horizontally and vertically (potentially from one model layer to another) depending upon the groundwater gradient in each cell of the model for each time step of the model. When a model uses 25 time steps in each of 47 annual stress periods, a particle can be tracked over as many as 1,175 time steps.

In this study, particles were used to simulate plug-flow in the aquifer. In other words, the brackish water moves as a mass through the aquifer, pushing fresh water in front of it. There is no assumed dilution or dispersion at the front of the water mass. At monitoring wells along the coastline, there appears to be a relatively sharp contrast between seawater and fresh water, so this assumption does not likely lead to large error. Particle tracking was accomplished with the earlier model runs, with model years 1-17 being pre-project years and model years 18-47 being project years (30-year project was analyzed). Now that the project is considered to have a life of 25 years, the results at model year 42 (end of project) can be interpolated between years 40 and 47.

The results of one set of particle tracks are indicated in Figure 58. A set of these particle tracking results was generated for each scenario, with the set containing tracks of particles at different starting times. In Base Case and Scenario #2, one set of particle tracks was timed to coincide with the end of baseflow percolation into NPV (when upstream desalters had removed all baseflow from the arroyo). This set of particles represented the beginning of movement of better-quality stormflow, so the location of the tail-end of the brackish water could be tracked.

By combining the results of the set of particle tracks for each scenario, an approximation of the location of the brackish water at any time could be determined. For the Base Case scenarios, the furthest travel of the particles at the end of the 47 years of the model is indicated. For all other scenarios, the progressive movement of the particles is indicated.

## 5.1 Verification of Particle Tracking

An additional verification of the groundwater model is available as the result of the particle tracking simulations. The arrival time of the first particles released in the model (coinciding with base flow first reaching NPV) can be compared against the time when measured water quality changed in production wells (Figure 59 and Figure 60). As shown in the two charts, water levels rose several years prior to the arrival of brackish water. The delay time for these brackish water molecules to actually reach the wells coincides with the arrival time predicted by particle tracking, providing model verification. This verification can be accomplished for wells within about the first 10 years of travel time from the arroyo; beyond that, the recommended monitoring wells can be used for verification in the future.

## 5.2 Particle Tracking Results

**Results for Base Cases** – For Base Case #1 (no desalters in either Las Posas basin or NPV), particles track across Highway 101 and beneath the agricultural fields of Pleasant Valley (Figure 61). The potential of salts reaching that far south is a new threat to the water resources of the Pleasant Valley basin. If desalters are built in Las Posas and baseflow into NPV is eliminated (Base Case #2), brackish water that entered the aquifer prior to reduction of baseflow would continue to move southward towards the main Pleasant Valley basin, but at a slower rate (Figure 62).

**Results with NPV Desalter Pumping** – Particle movement with NPV desalters operating (starting in model year 18) is largely dependent upon the location of the desalter wells and the rate of pumping. The locations of desalter wells were optimized iteratively by examining both water level drawdown and particle tracking.

With project pumping under Scenario #2 conditions, the southwest movement of particles into the main portion of the Pleasant Valley basin was halted by the fifth year of project pumping (model year 23) (Figure 63). For a 25-year project pumping 9,000 AFY, not all the brackish water is removed (42-yr interpolation between arcs for 40 and 47 years in Figure 64).

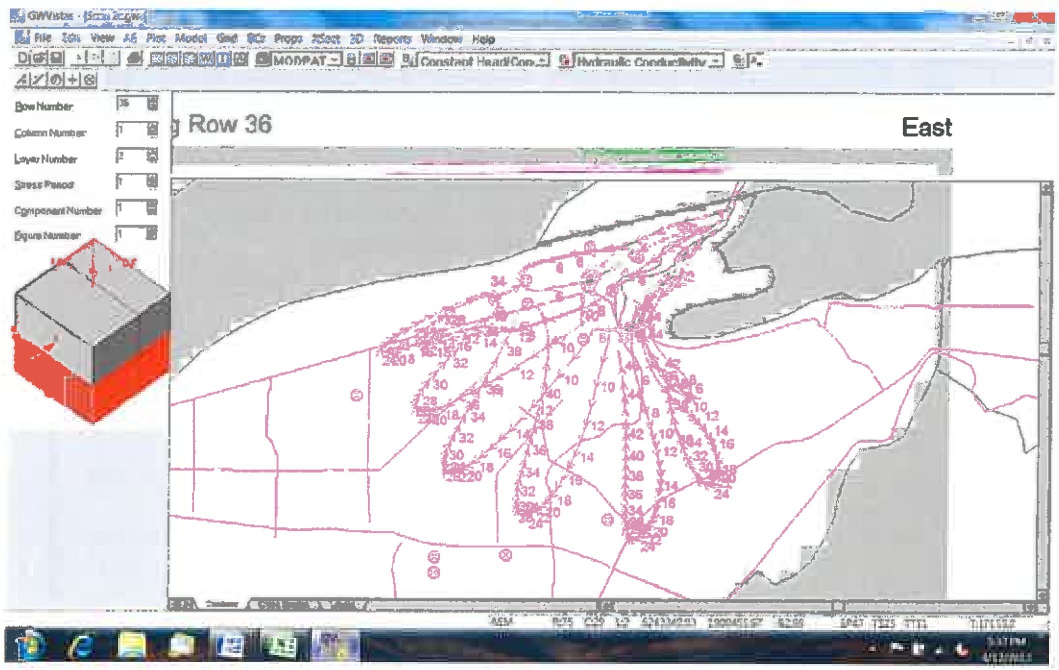



**Figure 58. Particle tracking results for Scenario #2c with a set of particles released at the baseflow recharge area at the beginning of year 1 of the model. Years are shown for each particle track; the light green tracks are when the particle is in Layer 1, whereas the purple tracks are when the particle is in Layer 2. Particles reverse direction following the beginning of desalter pumping in year 18.**

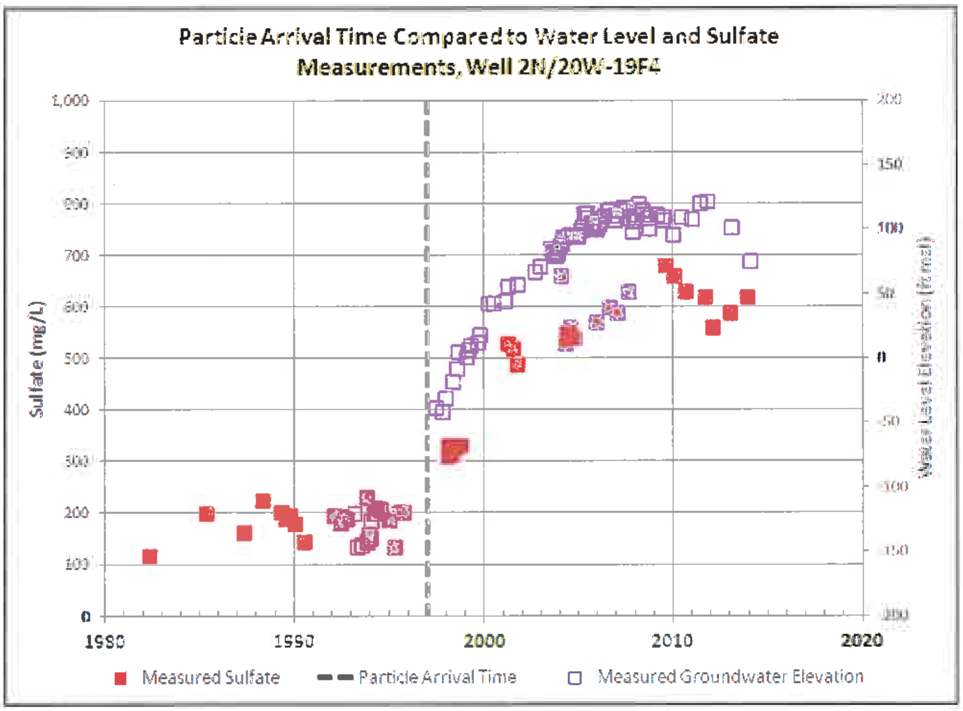



**Figure 59. Measurements of sulfate concentrations and groundwater elevations compared to timing of arrival of first particles at well 19F4. Note that measured groundwater elevations rise several years prior to the first brackish water arriving, with the predicted brackish water arrival coinciding with its actual arrival.**

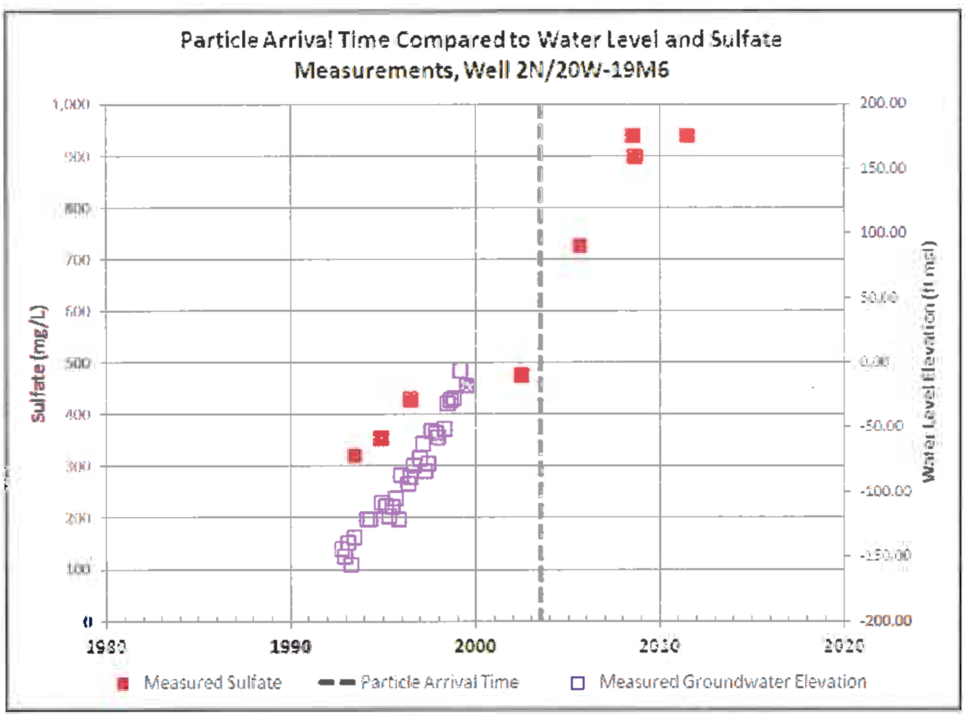



**Figure 60. Measurements of sulfate concentrations and groundwater elevations compared to timing of arrival of first particles at well 19M6. Note that measured groundwater elevations rise several years prior to the first brackish water arriving, with the predicted brackish water arrival coinciding with its actual arrival.**

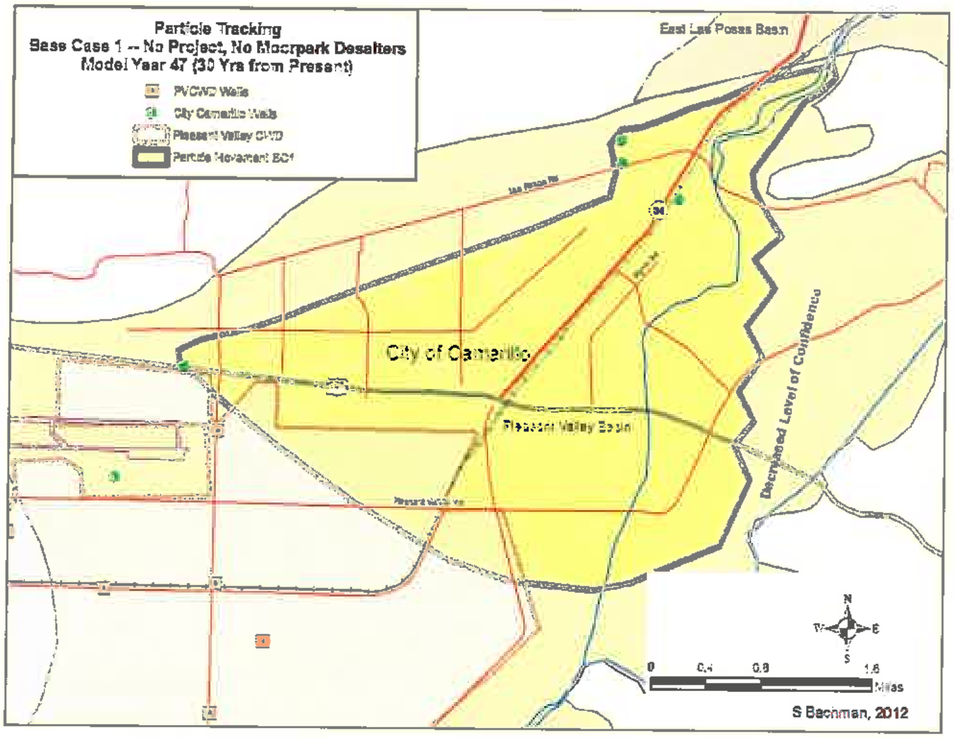



**Figure 61. Particle tracking results for Base Case #1, indicating that by the end of model year 47, the poor-quality water could migrate beneath the agricultural fields of the Pleasant Valley County Water District.**

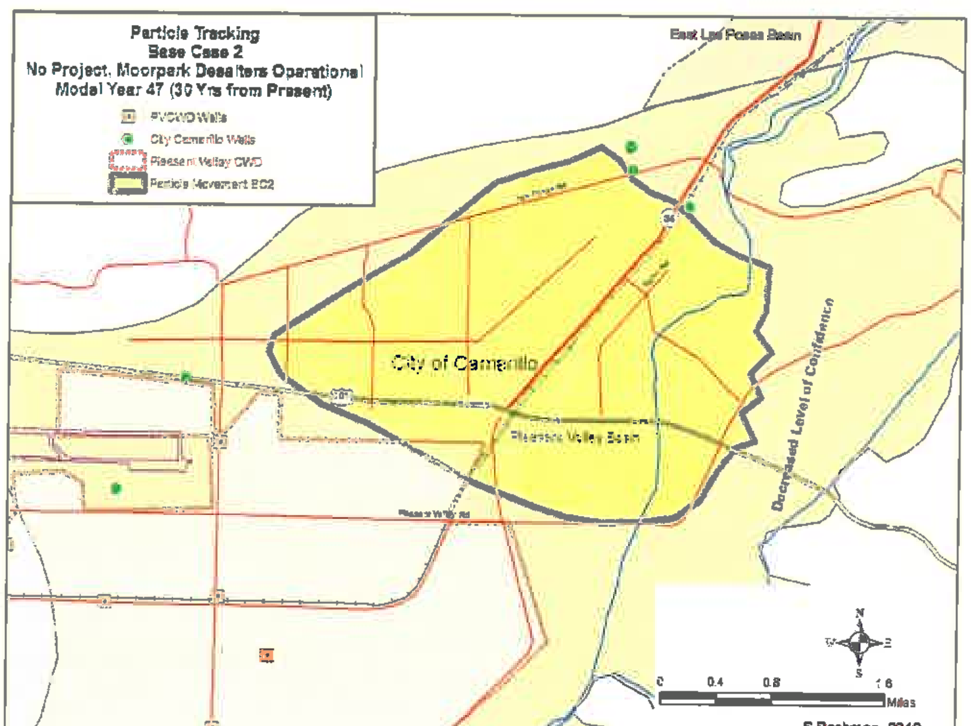



**Figure 62. Particle tracking results for Base Case #2, indicating that by the end of model year 47, the poor-quality water could migrate south of Highway 101 even with Las Posas desalters operating.**

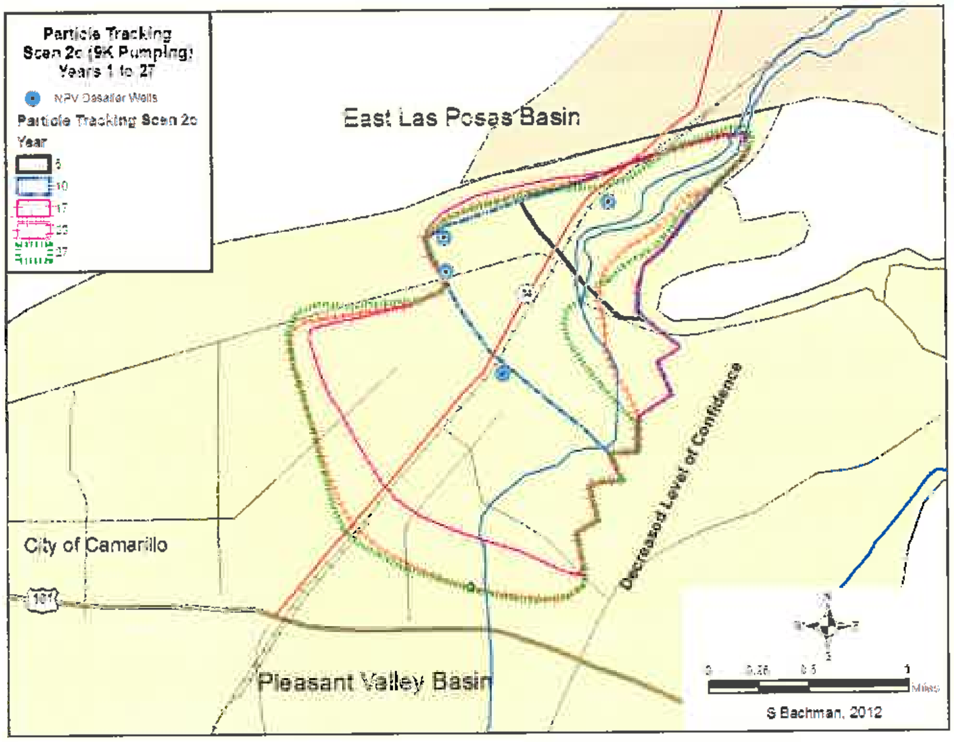



**Figure 63. Particle tracking for Scenario #2c, model years 1 to 27. Particles stop migrating to southwest by model year 23.**

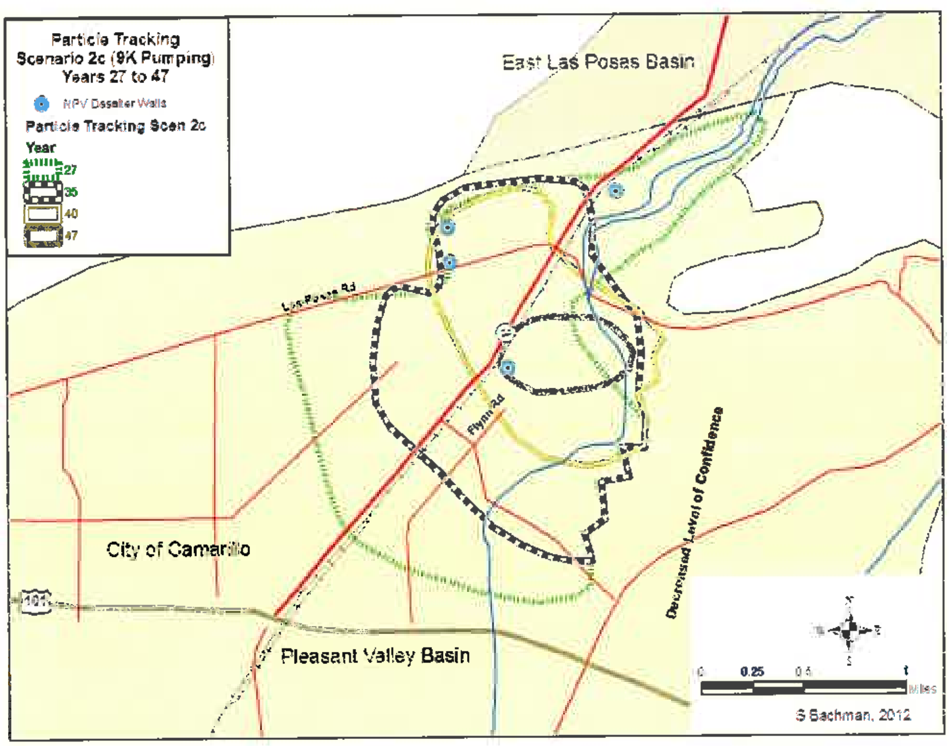



**Figure 64. Particle tracking for Scenario #2c, model years 27 to 47. Potential areas of brackish water are almost eliminated by model year 47. For a 25-year project (ending in model year 42), an interpolation can be made between arcs for 40 and 47 years.**

# 6 Using Model Results

Modeling is used to simulate actual behavior in the aquifer. When interpreting model results, it is important to determine how well the model does represent aquifer responses. Three methods were used to determine the accuracy of the modeling and how sensitive model results are to inputs such as streamflow.

**Water Level Comparisons** – this was the model calibration process discussed earlier in the report. Because calibration took place during the building of the mound, the model is well suited for simulating depletion of the mound over the same water level range (i.e., the model is operated within its calibrated range).

**Water Quality Comparisons** – water quality measured in wells can be compared to the results of the particle tracking analysis. In theory, you could compare water quality changes throughout the historical period. In practice, there were few wells within the city limits of Camarillo during the 22-year period when model results could be compared to measured results. There is the opportunity to do this with Camarillo's wells A and B – they are within the mound of poor-quality water and there are abundant water level and water quality data during this period. In these wells, there is a lag time of 5 to 10 years between when water levels started to rise and when increased salts reached the wells. MODFLOW and MODPATH model results predict that particles released in the area of baseflow infiltration along the arroyo would reach wells A and B in a similar time frame. Thus, there is agreement between observed and modeled results.

**Sensitivity Analysis** – the sensitivity of model parameters such as aquifer properties was part of the model calibration – the model parameters were optimized for calibration to measured groundwater elevations. The sensitivity of the model to major input and outputs such as pumping and recharge need to be addressed separately for this model. Groundwater pumping in the model is from data reported by pumpers to the FCGMA. Although there has been long discussion on the accuracy of this self-reporting, the amount of pumping in the model does not vary between scenarios except for City of Camarillo and desalter pumping. Thus, the changes in aquifer response between the various scenarios, where only desalter pumping is varied, are likely to be fairly representative of actual changes.

The significant input to the model is percolation from streamflow. In particular, the amount of baseflow (brackish water) is important in determining both groundwater elevations and particle tracking. To test the sensitivity of the model to variations in the amount of baseflow, baseflow was varied by ± 20% for Scenario #2c. The largest effect in groundwater elevations in the sensitivity analysis is in the area where baseflow percolation occurs (Figure 65). Farther from the area of percolation, the effects of changing baseflow become more muted (Figure 66 and Figure 67). At reduced baseflow, particles do not extend as far southwest as in Scenario #2c and the area of "stranded brackish water" at model year 47 is eliminated (Figure 68). With increased baseflow, particles extend farther southwest and the area of "stranded brackish water" at model year 47 is larger (Figure 69). This information is integrated into the analysis of the project in the following chapter.

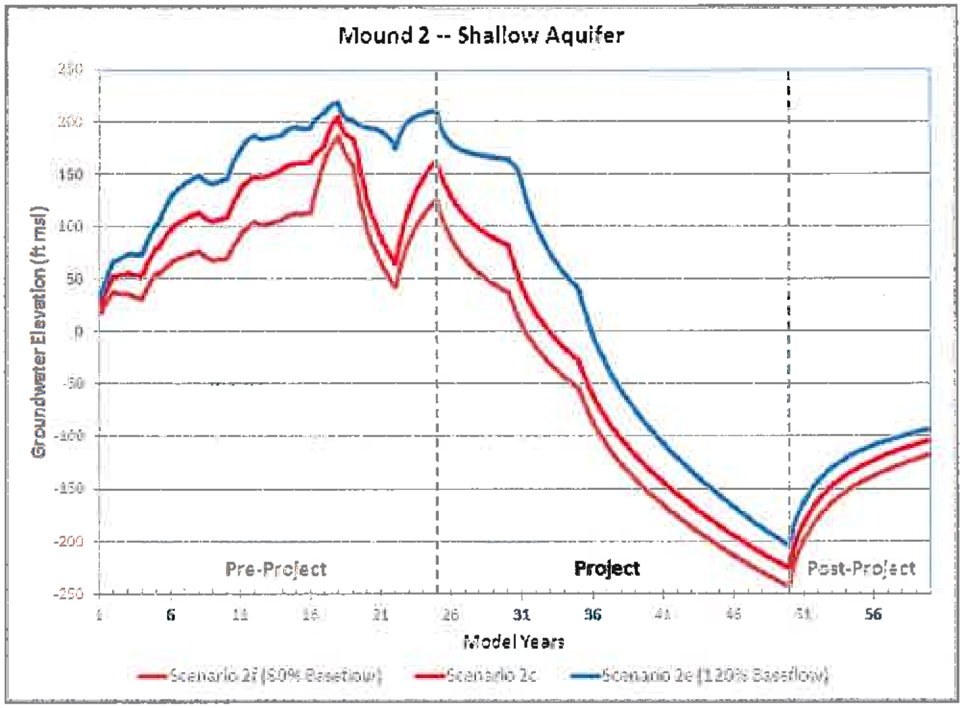



**Figure 65. Sensitivity analysis at observation point Mound #2 (Figure 47) by changing baseflow by ± 20% for Scenario #2c.**

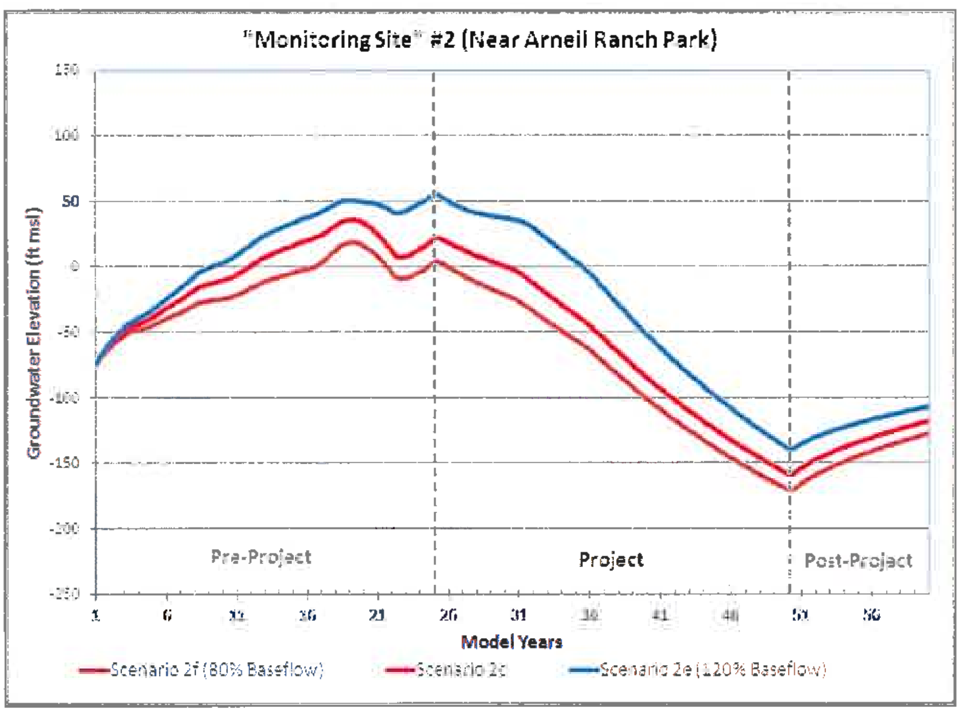



**Figure 66. Sensitivity analysis at observation point MW #2 (Figure 47) by changing baseflow by ± 20% for Scenario #2c.**

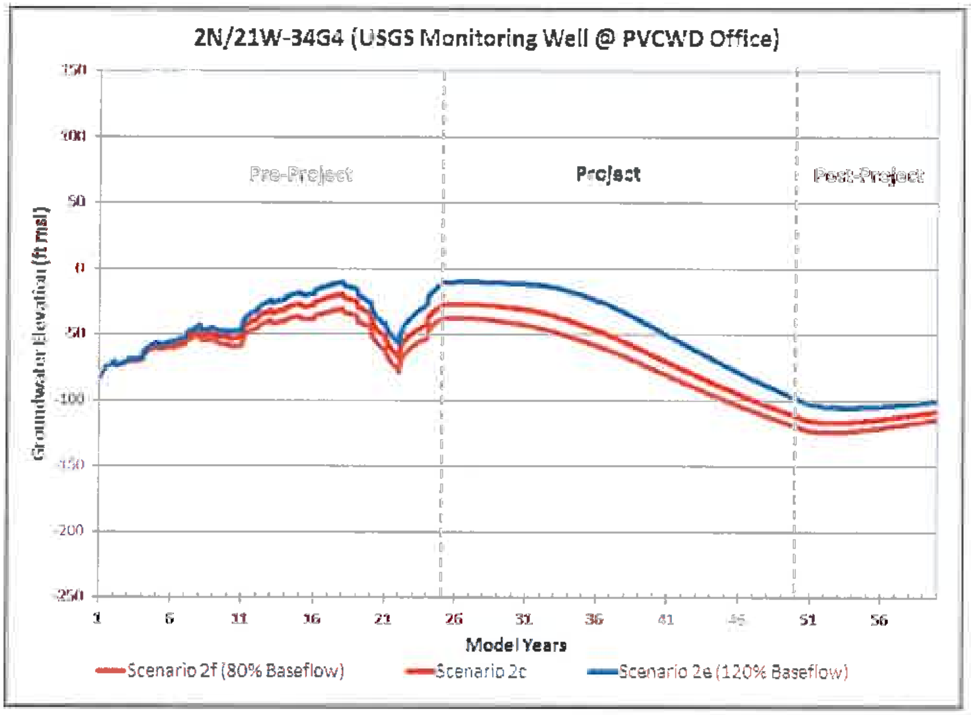



**Figure 67. Sensitivity analysis at monitoring well 34G4 (at location 34G3 in Figure 47) by changing baseflow by ± 20% for Scenario #2c.**

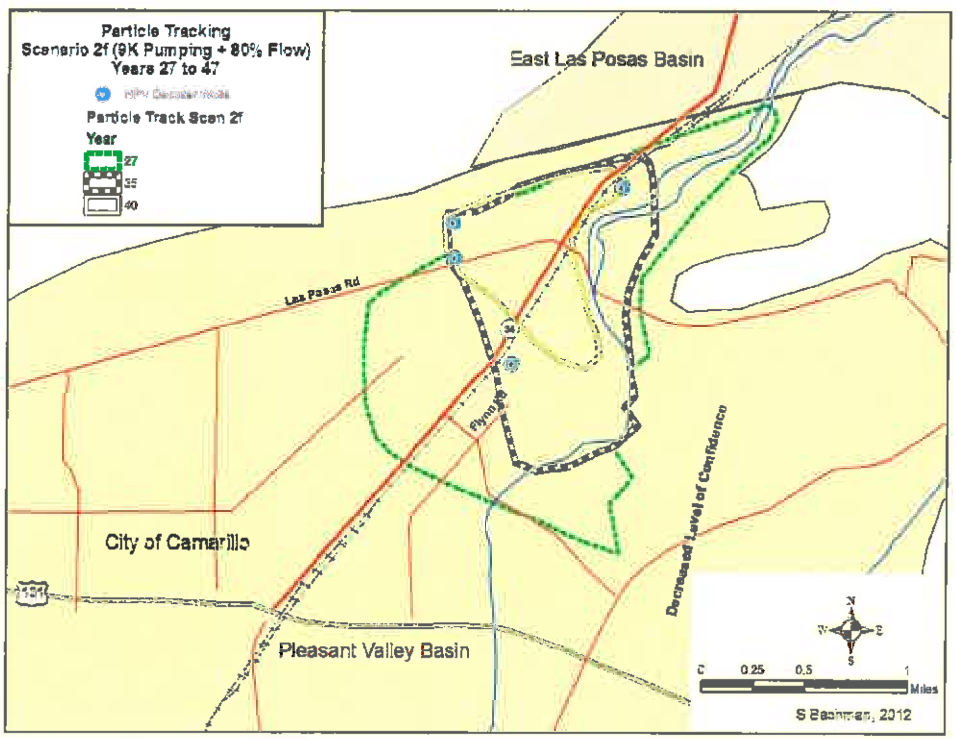



**Figure 68. Sensitivity analysis for particle tracking for Scenario #2f (Scenario #2c with 80% baseflow infiltration). Compare results to those shown on Figure 64 for Scenario #2c.**

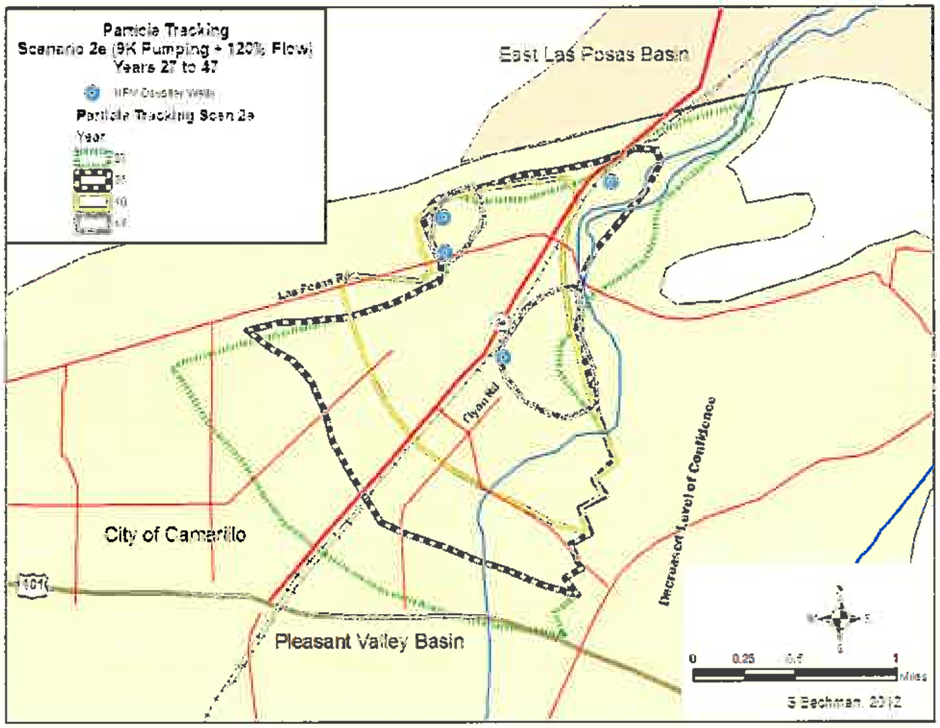



**Figure 69. Sensitivity analysis for particle tracking for Scenario# 2e (Baseflow 120%). Compare results to those shown on Figure 64 for Scenario #2c.**

# 7 Analysis of Results

Modeling results indicate that with no desalter pumping in NPV and/or the Las Posas basin, poor-quality water could continue its migration towards and into the agricultural areas of the main Pleasant Valley basin. NPV desalter pumping largely eliminates that threat to the aquifers. Both Scenario #1 options (no desalter pumping in the Las Posas basin) and Scenario #2 (reduced flow in arroyo caused by upstream desalter projects) were evaluated in this study. Base Case #1 and Scenario #1c project scenarios were used to determine project effects compared to current conditions. Base Case #2 project scenarios were used to assess worst-case effects for the NPV desalter project. The effect of project pumping on the Pleasant Valley basin is summarized in this section.

## 7.1 Project Effects Relative to Current Conditions

To evaluate the project relative to current (no project) conditions, groundwater model Base Case #1 model runs were used to project effects over the 25-year life of the project. Base Case #1 continues the current flows in Arroyo Las Posas during this 25-year project period because there are currently no approved projects in the Las Posas basin that would decrease that flow. Project Scenario #1c (same base flow, 9,000 AFY desalter pumping) was then compared to Base Case #1 results at four different sites in the northern Pleasant Valley basin – two very near project pumping (Figure 70, Figure 71) and two in the closest down-gradient areas of private pumping (Figure 72, Figure 73).

Near project pumping wells, modeled groundwater elevations at the end of the 25-year project dropped about 170 ft from their historical highs – highs created by the growth of the mound of brackish water over the last decades. During the life of the project, as modeled no-project groundwater elevations rise as the mound of brackish water continues to degrade the aquifer, project groundwater elevations are as much as 225 ft lower than no-project elevations. Project groundwater elevations remain near pre-mounding elevations and well above measured historical low elevations in these wells (Figure 70, Figure 71). Thus, the effect on these nearby wells is an increased pumping lift, but there would be no negative effect on the wells themselves – groundwater elevations would remain within historical fluctuations. Nearby well owners would also benefit over time from improved water quality, potentially more than offsetting any increased pumping lift.

In the nearest down-gradient wells, the model predicts that project groundwater elevations would drop no more than 80 ft below historical high levels caused by the mounding of brackish groundwater (Figure 72, Figure 73). The potential overall decrease in groundwater elevations is near the range of the semi-annual fluctuations in groundwater elevations from wet to dry portions of the year. Groundwater elevations would remain above pre-mounding elevations, and greater than 90 ft above historical low groundwater elevations. Well owners in these areas would also likely avoid the arrival of the mound of brackish water that is predicted to degrade their water quality in the future if the project is not implemented (Figure 76).

## 7.2 Effect on Existing Wells

To determine the potential worst-case effect on existing wells, pumping for Scenario #2c was used (this scenario has reduced base flow in the arroyo) in the analysis. Wells in the vicinity of the NPV Desalter project are shown on Figure 74. The closest well is operated by the Pleasant Valley Mutual Water Company (19E1). Model results indicate that water levels in this well would drop below historical low levels near the end of the project, but then recover to above historical lows after project completion (Figure 75). Other nearby wells would likely see a similar pattern in groundwater elevations. The Bell Ranch well is shown on Figure 74. It is not clear at this time which basin that well is in – if it in the Pleasant Valley basin, the well would also likely see drawdown from the NPV Desalter project.

Another potential effect of NPV desalter pumping would be on the largely agricultural pumpers south of the Camarillo city limits. Wells along this southern boundary were used to estimate project effects. Modeled groundwater elevations at the USGS monitoring well at PVCWD's office (Figure 55) and other locations away from the project (Figure 56, Figure 57) indicate that groundwater elevations would remain above historical low groundwater elevations.

## 7.3 Removal of Brackish Water

Particle tracking results suggest that much of the poor-quality water that has infiltrated into NPV can be recaptured by NPV Desalter pumping. The set of particle tracking maps (Figure 64, Figure 68, Figure 69) suggests that there would continue to be some poor-quality water remaining, although in practice the shape and location of this remaining water may be complicated and only monitoring of the mound will ultimately indicate the extent of poor-quality water remaining. The actual amount of brackish baseflow infiltrating into NPV will be an important factor in the amount of the brackish water remaining in NPV.

It is important to note that particle tracking has its limitations and that conclusions based on the particle tracking should be tempered by these limitations. The limitations are that particle tracking inherits any errors from the main MODFLOW results, particle movement is plug flow and has no components of mixing processes (dispersion, diffusion), the brackish baseflow could be stratified in the aquifer and groundwater pumped could be a mix of brackish water and ambient better-quality groundwater, and individual wells could be pulling in brackish water from one direction and better-quality well from another direction. Thus, the actual water quality pumped by any desalter well may vary in salt concentration. This variation in concentration may be more pronounced in later stages of the project, when the brackish water may have taken complex travel paths from infiltration to extraction.

## 7.4 Effect on Water Quality and Seawater Intrusion

The most noticeable water quality problems in the Oxnard Plain and Pleasant Valley basins are seawater intrusion near the coastline and the mound of brackish groundwater that is migrating southwestward from the opposite side of the basin. Removal of this later mound is the purpose of the proposed project – its effectiveness was discussed in the previous section. The effect of not doing the project is serious for the basin – the mound of brackish water will migrate into the main agricultural portion of the Pleasant Valley basin (Figure 76). Therefore, a no-project scenario has a serious negative water quality effect on the basin.

The second water quality problem is the long-recognized seawater intrusion at the coastline. The Lower Aquifer System of the Oxnard Plain and Pleasant Valley basins has been characterized over the past decades as being below sea level in coastal areas, with a significant pumping depression along the boundary between the two basins (Figure 77). This has caused intrusion of seawater in local areas along the coast near offshore submarine canyons. To predict the effects of the project on seawater intrusion, two set of model results were combined:

1) In the northeastern half of the area of contours in where the project and modeled pumping wells were located, contours of groundwater elevations were derived directly from model results for Scenario #1c for the last year of the project.
2) Southwest of the above area, the large number of pumping wells were not modeled (outside the scope of the modeling effort), but the residual effect of the project can be determined as the difference between Base Case 1 (no project) and Scenario #1c (with project). This difference (which varied from a few 10s of feet to less than a foot) was then subtracted from the Fall 2013 groundwater elevations to approximate the effect of the project on the pumping depression.

With no project, the groundwater gradient from NPV to the southwest increases in steepness from Fall 2013 as the mound of brackish water extends to the southwest (Figure 78). With the project operating for 25 years, groundwater gradients in NPV flatten somewhat from Fall 2013 and the pumping depression deepens. There is a groundwater high divide (-60 ft contour) that separates the regional pumping depression from the project area.

A continued southwest gradient predicted to be towards the regional pumping depression would not allow either seawater or poor-quality water in or near the pumping depression to migrate towards the project. Thus, the modeling indicates that the project would not provide a pathway for seawater intrusion to cross the regional groundwater divide.

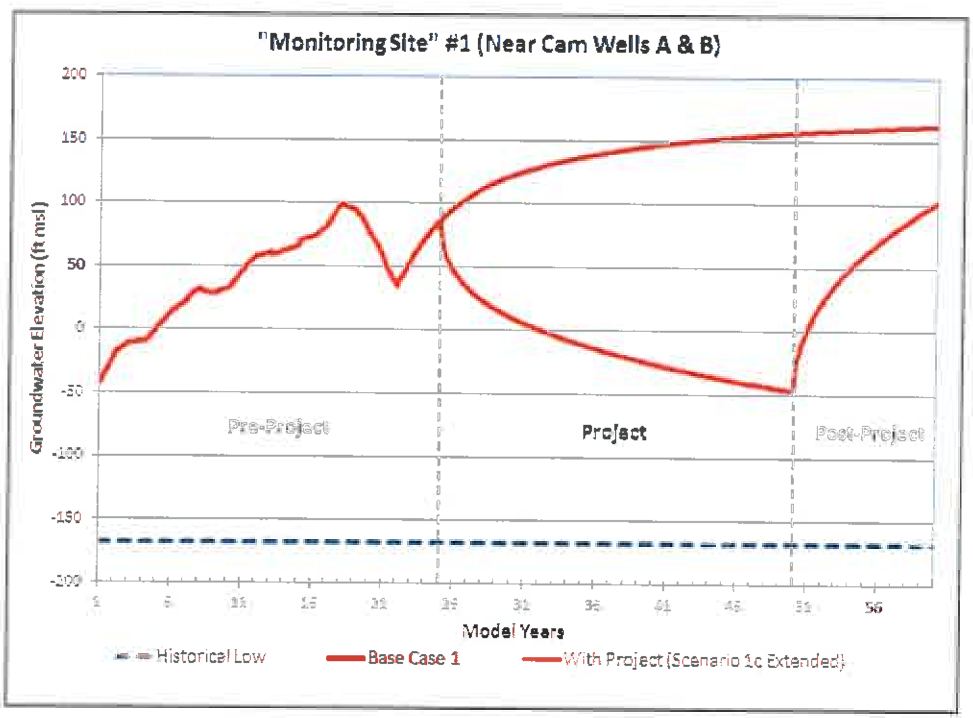



**Figure 70. Modeled groundwater elevations near project pumping wells for no project (Base Case #1, current conditions with no change in arroyo base flow) and project (Scenario #1c-9,000 AFY-25 yr). Historical low is for well 2N/20W-19M4.**

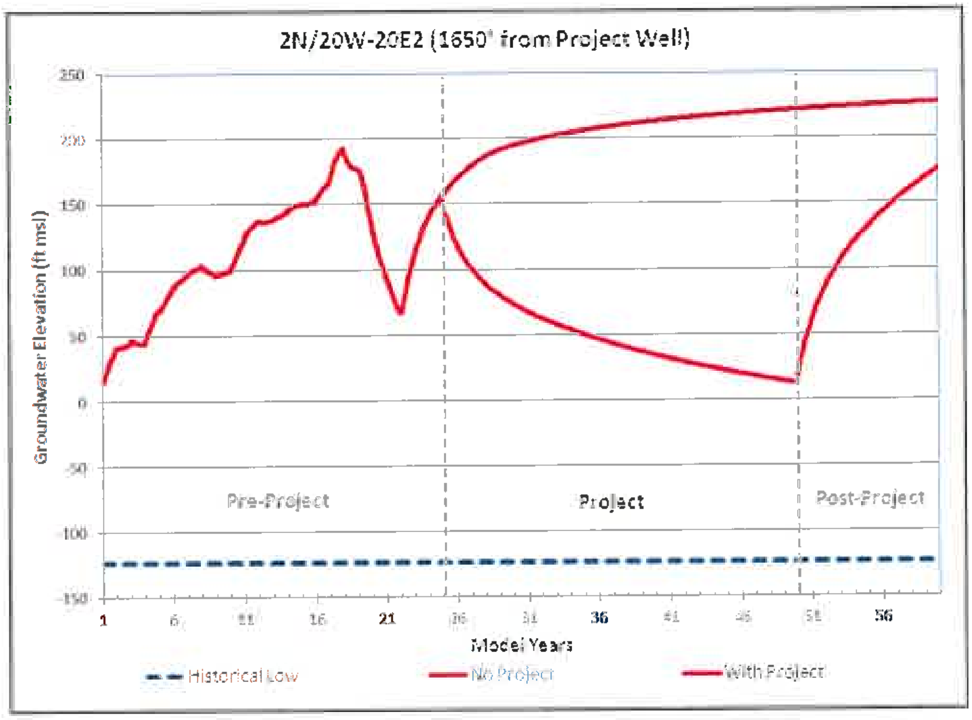



**Figure 71. Modeled groundwater elevations 1650 feet from project pumping wells for no project (Base Case #1, current conditions with no change in arroyo base flow) and project (Scenario #1c-9,000 AFY-25 yr). See Figure 1 for location.**

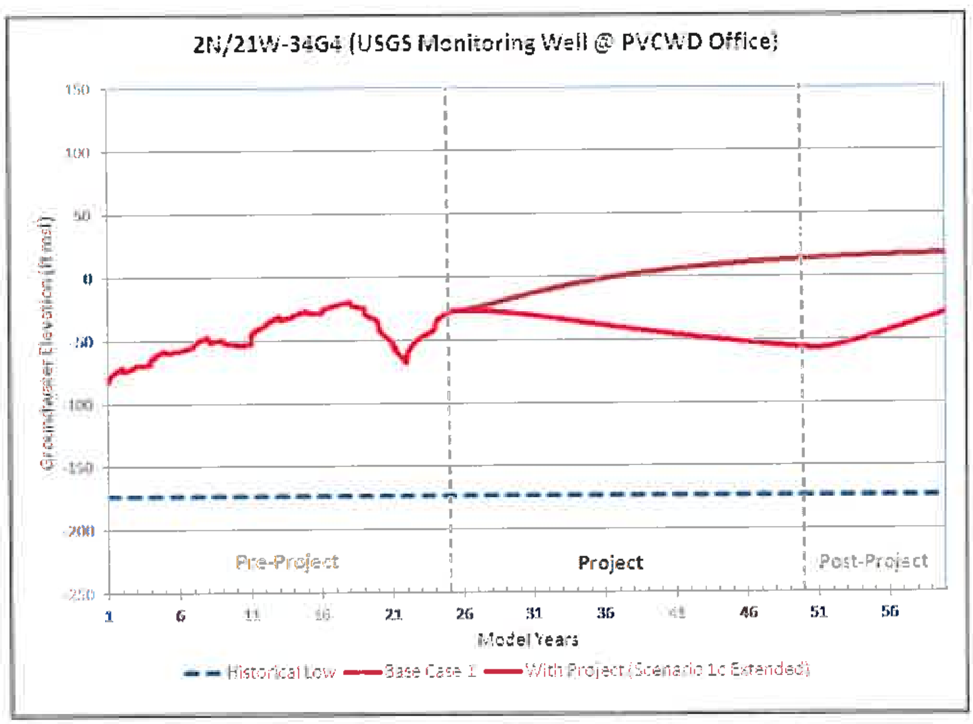



**Figure 72. Modeled groundwater elevations south of Highway 101 for no project (Base Case #1, current conditions with no change in arroyo base flow) and project (Scenario #1c-9,000 AFY-25 yr). Location shown in Figures 1 and 47 (same location as 34G3).**

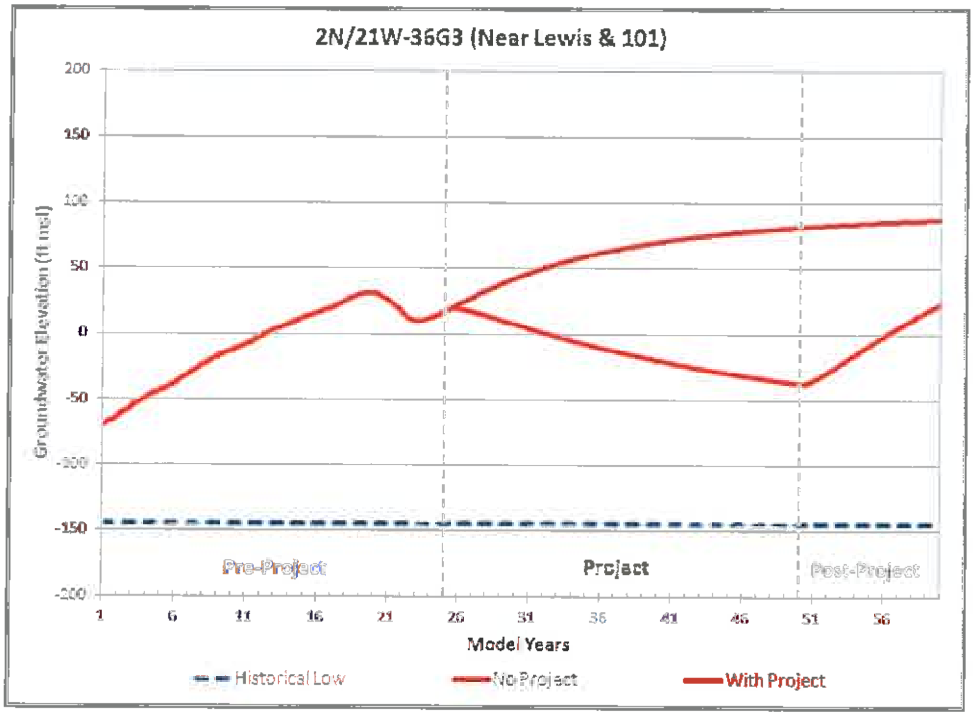



**Figure 73. Modeled groundwater elevations south of Highway 101 for no project (Base Case #1, current conditions with no change in arroyo base flow) and project (Scenario #1c-9,000 AFY-25 yr). Historical low is for nearby well 2N/21W-36L2. Location shown in Figures 1 and 34.**

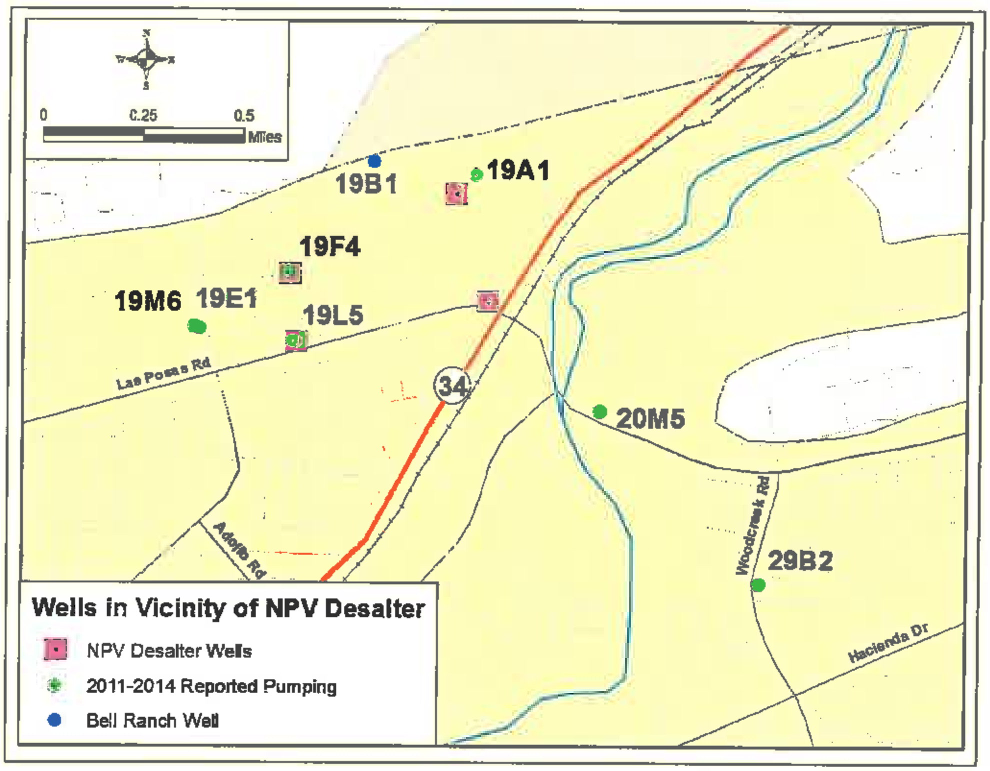



**Figure 74. Map of wells in vicinity of desalter project. Well 19A1 has subsequently been reported as destroyed by the FCGMA.**

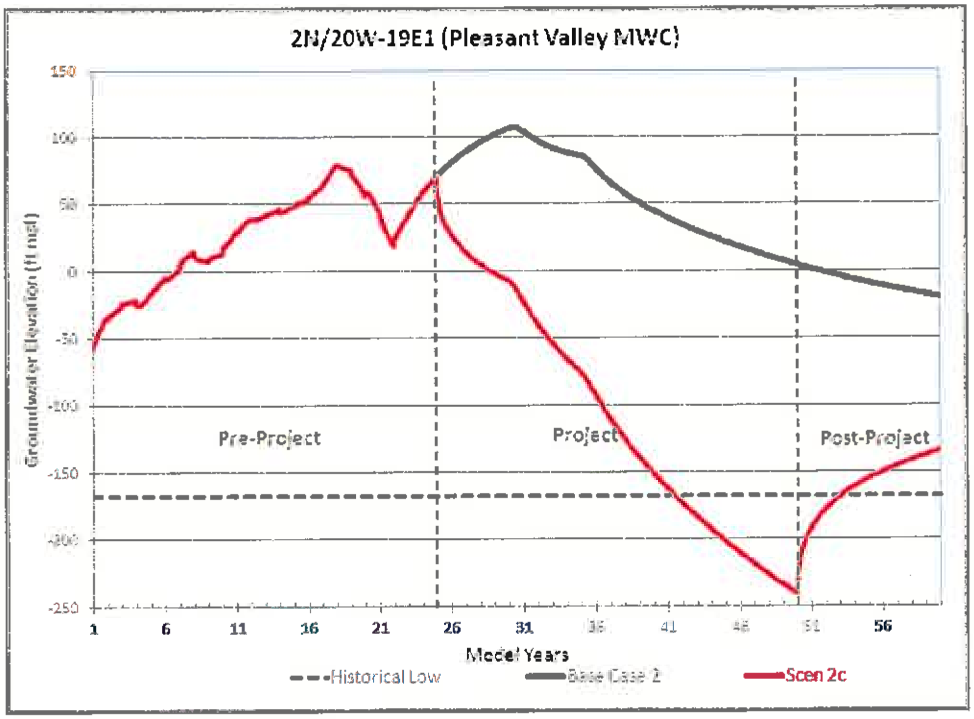



**Figure 75. Effect of project on closest well using Base Case 2 baseflow (upstream desalters eliminate baseflow into NPV). Groundwater elevations partially recover following completion of the project. Historical low is from nearby well 2N/20W-19M4, which has a longer historical record (well 19M4 adjacent to wells 19M5 and 19M6). See Figure 74 for locations.**

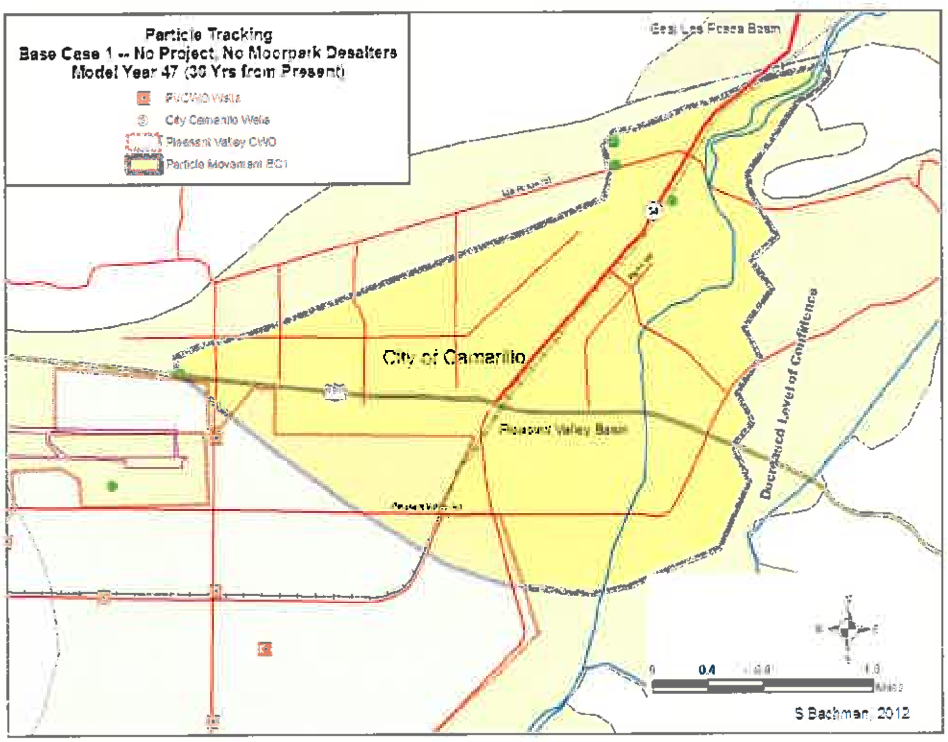



**Figure 76. Base Case #1 particle tracking results indicating the potential movement of the plume of brackish water into the main agricultural portion of the Pleasant Valley basin if a desalting project is not completed.**

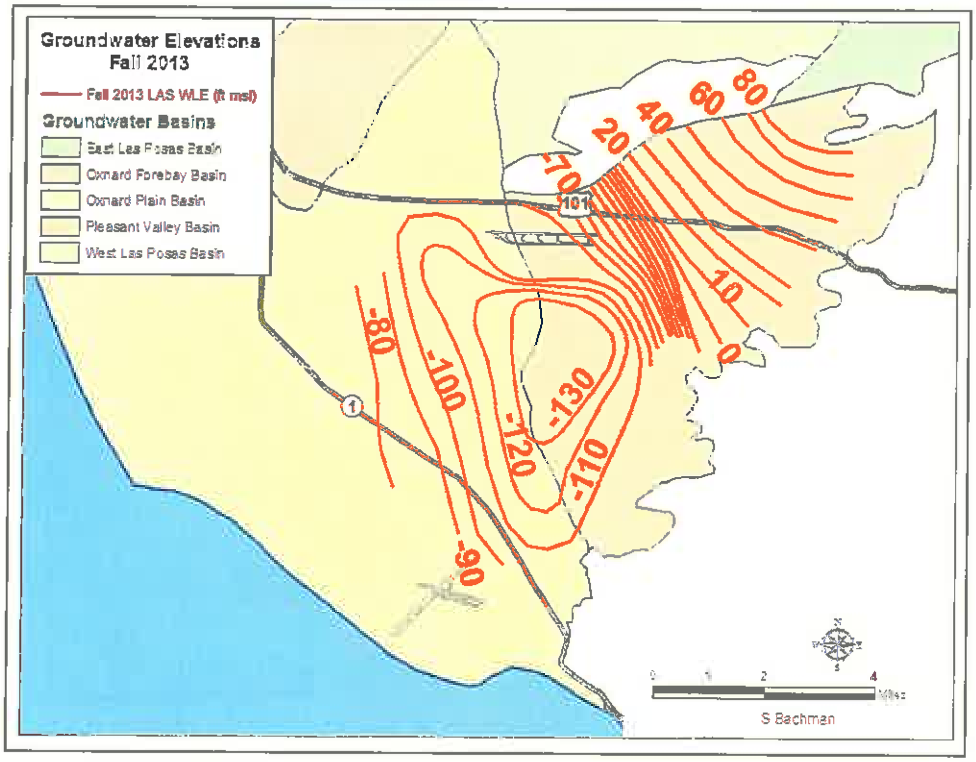



Figure 77. Contours of measured groundwater elevations in wells in Fall 2013. Note the pumping depression that has formed along the boundary between the Pleasant Valley and Oxnard Plain basins. This pumping depression forms a landward groundwater gradient from the coastline to the basin boundary.

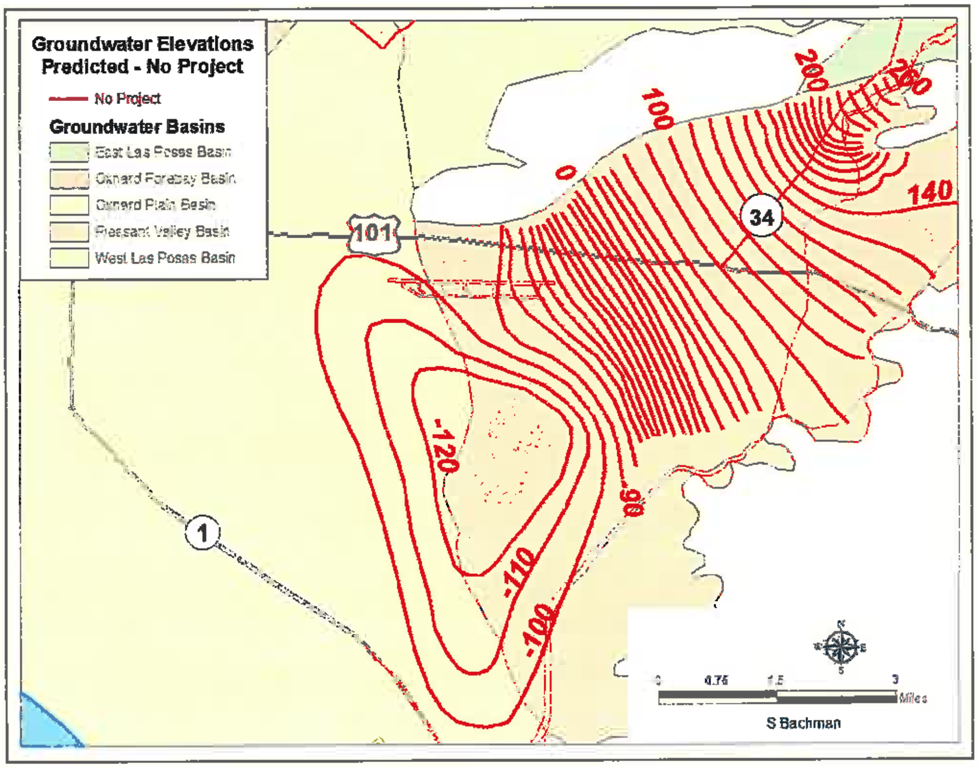



**Figure 78. Groundwater elevations predicted in model year 50 under no-project alternative, based on the groundwater modeling, under current conditions (no change in base flow in the arroyo). The groundwater gradient from NPV to the southwest increases in steepness from Fall 2013 as the mound of brackish water extends to the southwest.**

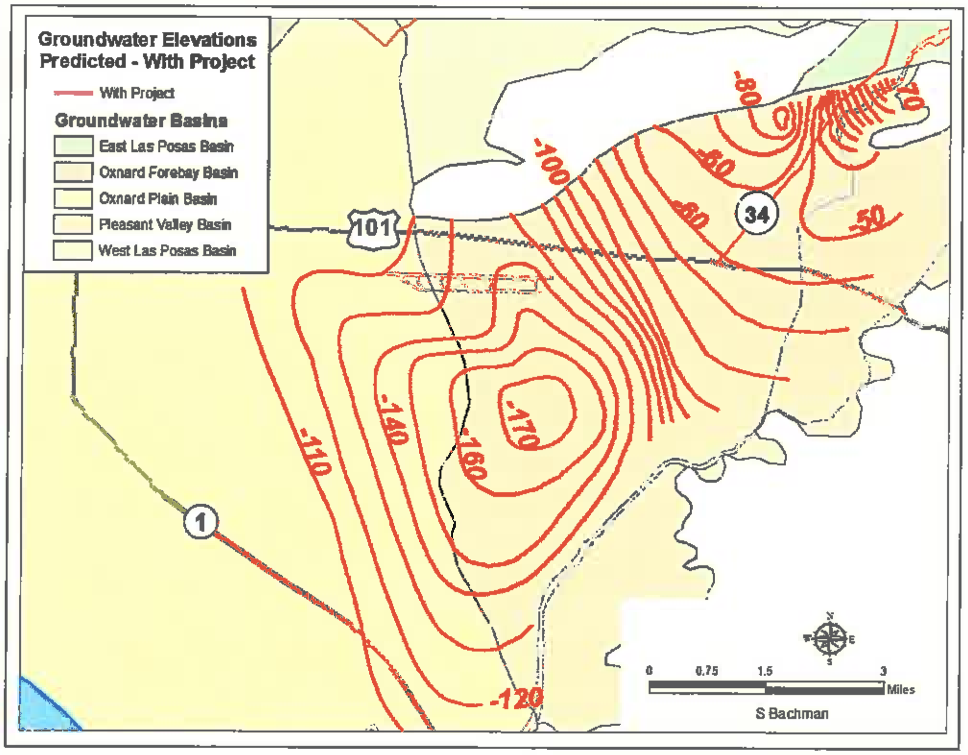



Figure 79. Groundwater elevations predicted in model year 50 with project operating (end of 25-year project, Scenario #1c), based on the groundwater modeling. Groundwater gradients in NPV have flattened somewhat from Fall 2013 and the pumping depression has deepened. There is a groundwater high divide (-60 ft contour) that separates the regional pumping depression from the project area.

# 8 Margin of Error

The margin of error in the analysis is made up of uncertainty in the model inputs and the accuracy of the measured data used for model calibration. The accuracy of model results is meant in this context as how accurately groundwater elevations are predicted in the model.

Measured data are used as inputs into the model (e.g., pumping, streamflow) and for calibration of the model (groundwater elevations). The accuracy of these data can vary upon how (and how often) they are measured. DWR has estimated the accuracy of these data in general; pumping is better measured within the FCGMA and is reflected in Table 7.

Besides pumping and streamflow, model inputs include aquifer geometry, hydraulic conductivity, streamflow percolation, and storativity (amount of aquifer volume filled with extractable water). These inputs were estimated based on a limited number of available measurements within study area. The measurement uncertainty for these inputs is also affected by the fact that the variability in these inputs throughout the model domain cannot be characterized by a limited number of point measurements.

The uncertainty associated with the model inputs is reduced through the process of model calibration. However, because different combinations of inputs can result in similar levels of calibration, all models are non-unique and uncertainty (potential error) in the model results remains, even with the very best calibrated models. The best method to evaluate potential error in the model results is through sensitivity analyses[8] – that is, change input values in the calibrated model and see what the effect is on modeled groundwater elevations. The results of this analysis are shown in Table 8.

The sensitivity analyses indicate that the input values most likely to affect model results are pumping, streamflow, and layer 2 horizontal hydraulic conductivity and storativity. However, the actual margin of error in the model is reduced by the calibration process, as discussed earlier. The root mean square error of the calibrated model – that is, the difference between model results and measured groundwater elevations in the calibration period – is 16.5 ft.

| Data Type | DWR[9] | Within Project Area |
|---|---|---|
| Pumping | ± 20-100% | ± 15% |
| Streamflow-gaged | ± 5-10% | ± 10% |
| Streamflow-ungaged | ± 10-200% | ± 20% |
| Groundwater Elevation | ± 5% | ± 5% |

**Table 7. Potential accuracy of measured data.**

| Input Type | Sensitivity Analysis | Change in Modeled Groundwater Elevation (ft) |
|---|---|---|
| Pumping | ± 25% | ± 27 ft |
| Streamflow | ± 20% | ± 20 ft |
| Horizontal Conductivity (Lyr 1) | 500% | 1.6 ft |
| Horizontal Conductivity (Lyr 2) | 500% | 14.8 ft |
| Vertical Conductivity (Lyr 1) | 500% | <<1 ft |
| Vertical Conductivity (Lyr 2) | 500% | <<1 ft |
| Storativity (Lyr 1) | 500% | 1.25 ft |
| Storativity (Lyr 2) | 200% | 18 ft |

**Table 8. Sensitivity of model to changes in input values.**

[8] US Environmental Protection Agency, Office of Science Advisor, 2009, *Guidance on the Development, Evaluation, and Application of Environmental Models*, EPA/100/K-09/003. "Sensitivity analysis is recommended as the principal evaluation tool for characterizing the most and least important sources of uncertainty in environmental models."

[9] California Department of Water Resources, 1981, Table 28 from Peters, short course notes on water budgets.

# 9 Potential for Land Subsidence During Project

Land subsidence can occur when pumping causes groundwater elevations to drop sufficiently to dewater sediments in the basin or to create pressure gradients where water flows out of the sediments. It is the fine-grained sediments (e.g., mudstone) which may be present both within the aquifers and as low-permeability layers between the aquifers that cause land subsidence – water lost from these sediments is permanent and causes compaction of the material. In contrast, water lost from coarser-grained sediments (e.g., sand and gravel) causes minimal compaction and water can re-enter the pore spaces when water levels rise.

Repeated cycling of groundwater elevations caused by drought/wet periods or pumping/recharge periods is less likely to cause further subsidence as long as groundwater elevations remain above historical lows. In NPV, groundwater elevations reached their lowest level prior to 1994, and then rose substantially after that time (e.g., Figure 80). Thus, the potential for land subsidence is significantly reduced if project groundwater elevations remain above historical low elevations. If groundwater elevations drop below historical lows, then the land surface elevation in the area of the low groundwater elevations should be monitored regularly to detect any subsidence.

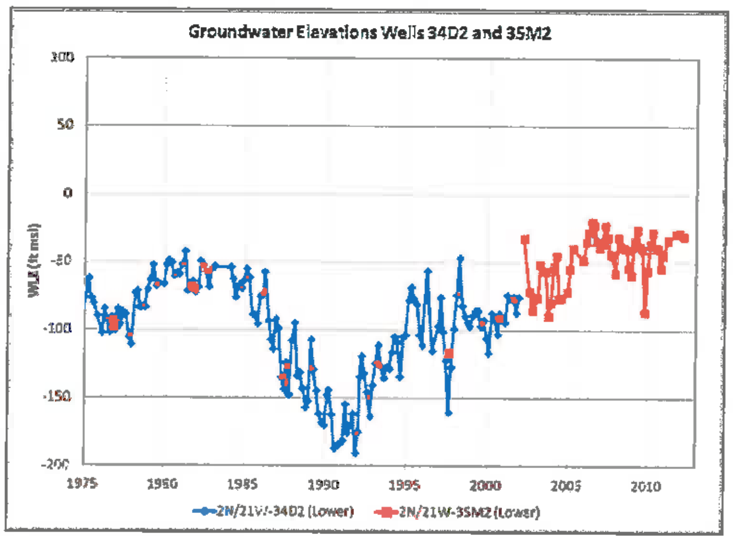



**Figure 80. Example of historical low groundwater elevation prior to 1994. Locations shown in Figure 1.**

# 10 Monitoring and Contingency Plan

A Monitoring and Contingency Plan serves the multiple purposes of assisting Project operators in fine-tuning operation of the Project, providing a basis for compliance with FCGMA requirements, and providing a level of comfort for other pumpers in the NPV. Three areas of concern have been identified for monitoring and contingency actions. They are: 1) effect on nearby wells; 2) changes in water quality; and 3) effect on seawater intrusion. The Plan is discussed in two parts in the following sections – Monitoring Plan and Contingency Plan.

## 10.1 Monitoring Plan

The recommended monitoring plan for the desalter project includes drilling new monitoring wells, monitoring water levels and water quality in existing wells, monitoring water quality and flow at one stream location, and analyzing/reporting results annually.

### Wells as Monitoring Points

**Dedicated Monitoring Wells** – It is recommended that four monitoring wells be used – three new wells and one existing well. The purpose of the monitoring wells is two-fold: establishing baseline information and tracking the progress of the desalter project as it pulls salts from the basin. The recommended approximate locations of the monitoring wells are indicated in Figure 81. Three monitoring wells would be located down gradient, and one monitoring well would be located up gradient of the proposed project location. The three down gradient wells would be nested at each location in order to be able to obtain groundwater information from various aquifer zones of the basin.

There were limitations with the location of the upgradient monitoring well. The regional structure becomes quite complex in this area of the basin, with a regional anticline and faulting (Figure 3). Desalter wells that will be monitored during the life of the project are already near this area of complex structure – the only existing well upgradient from the desalter wells is the nearby inactive 2N/20W-20E2 well (Location D in Figure 81), for which monitoring of the desalter well will provide information on project effects in that area.

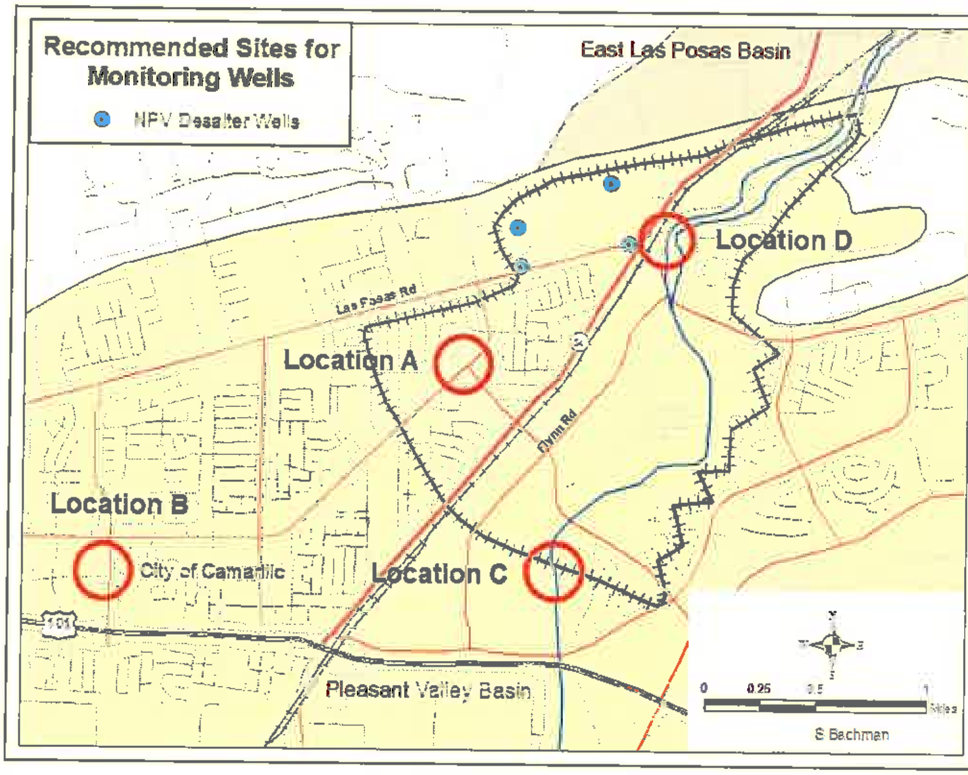



**Figure 81. Recommended sites (circles) for installation of monitoring wells. Locations A, B, and C would be new dedicated monitoring wells; location D would be an existing well.**

It is recommended that the new monitoring wells be completed at multiple depths (e.g., typical U.S. Geological Survey monitoring well), with each sampled zone sealed from the rest of the well (e.g. Figure 82). The approximate depth and screened intervals at each well location as indicated in Table 9; the actual screened intervals will have to be determined after a geophysical log is run between the time the well is drilled and it is cased. Each screened interval is continuously gravel-packed from 10 to 20 feet below the screen to 10 to 20 feet above the screen. A bentonite seal is placed at the bottom of the hole and between each screened interval (Figure 82).

| Well Location | Total Depth | Shallow Aquifer Screen | Hueneme Screen | Fox Canyon Screen |
|---|---|---|---|---|
| A | 1050' | 60-170' | 430-640' | 680-1030' |
| B | 1000' | none | 480-590' | 630-960' |
| C* | 1100' | 60-140' | none | 660-1080' |
| D | 890' | none | none | 479-875' |

**Table 9. Approximate depth and screened intervals for recommended monitoring wells. Actual screened intervals would be based on electric logs run prior to casing the holes. *May be less expensive to drill two separate smaller-diameter wells.**

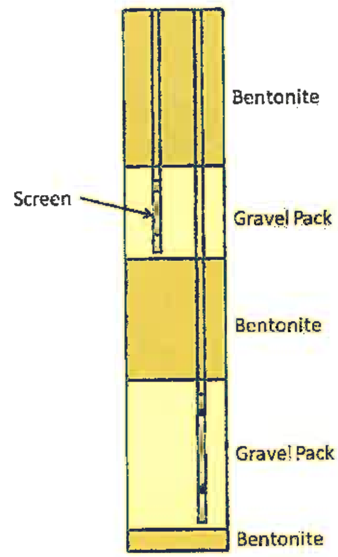



**Figure 82. Monitoring well completion schematic. Each screened interval is isolated above and below by a bentonite seal. Gravel pack extends 10 to 20 feet above and below screen.**

The screen length in a monitoring well can vary from tens of feet (targeting a specific zone within an aquifer) up to hundreds of feet (targeting most or all of an aquifer's thickness). Each end member has its own advantages and disadvantages. The purpose of the recommended monitoring wells is to determine the salt content in each of the major units and how they change with time. Thus, a relatively thick interval is sampled in each recommended screen interval (particularly in the Fox Canyon Aquifer, which is the primary water-producing zone in NPV and is the target of the desalter project). Thus, sampling results should be similar to what would be detected in a typical Fox Canyon production well and in desalter project extraction wells.

The monitoring wells should be designed such that a transducer can be installed and a submersible pump temporarily lowered in each well for sampling. A 2-inch PVC casing and screen are generally used for each screened interval. This allows multiple screened intervals to be completed in each well bore. However, if depth to groundwater is expected to exceed 200 ft, the casing size should be increased to 4-inch to accommodate a larger sampling pump that can adequately lift water to the surface. If 4-inch wells are required, it may be more practical to drill each well separately rather than nesting the wells.

A transducer/data logger should be installed in each screened casing, with data either downloaded periodically or integrated into the City's SCADA system. It might be advantageous for the transducers to measure both water levels and electrical conductivity – the movement of brackish groundwater may be more complex than periodic water quality sampling can detect. Recommended sampling intervals are shown in Table 10.

There is an existing USGS monitoring well cluster located near Highway 101 and Las Posas Rd (2N/21W-34G). The cluster has screened intervals appropriate to this project and is already being monitored by United Water Conservation District for both water levels and water quality. These data should be included and analyzed in the Annual Monitoring Report.

The following table shows monitoring information gathered for the four monitoring wells in order to address water quality, groundwater movement, and subsidence concerns raised by FCGMA. Water quality analyses would be performed by a State of California Certified analytical laboratory. The information generated would be reported annually to FCGMA.

| Monitoring Wells | | |
|---|---|---|
| **Parameter** | **Sample Type** | **Frequency** |
| Total Dissolved Solids (mg/L) | Grab | quarterly |
| Chloride (mg/L) | Grab | quarterly |
| Sulfate (mg/L) | Grab | quarterly |
| Manganese (mg/L) | Grab | quarterly |
| Groundwater level – each zone | Grab | quarterly |
| Groundwater level – each zone | Continuous | transducer – 3hr intervals downloaded every quarter |
| Conductivity (EC) – each zone | Field - grab | quarterly |
| Conductivity (EC) – each zone | Continuous | transducer – 3hr intervals downloaded every quarter |

**Table 10. Recommended monitoring well sampling for desalter project.**

**Monitoring in Project Area** – In the project area (Figure 83), it is recommended that three existing production wells be monitored. One of Pleasant Valley Mutual Water Company's wells (19M6 or 19E1) and the Bell Ranch well (19B1) are the closest to the likely desalter wells, and will indicate localized effects of pumping for the desalter. An additional well is recommended to be chosen among the wells farther to the east. If allowed by the well owner, a transducer/data logger should be installed in each production well. Recommended sampling intervals are shown in Table 11.

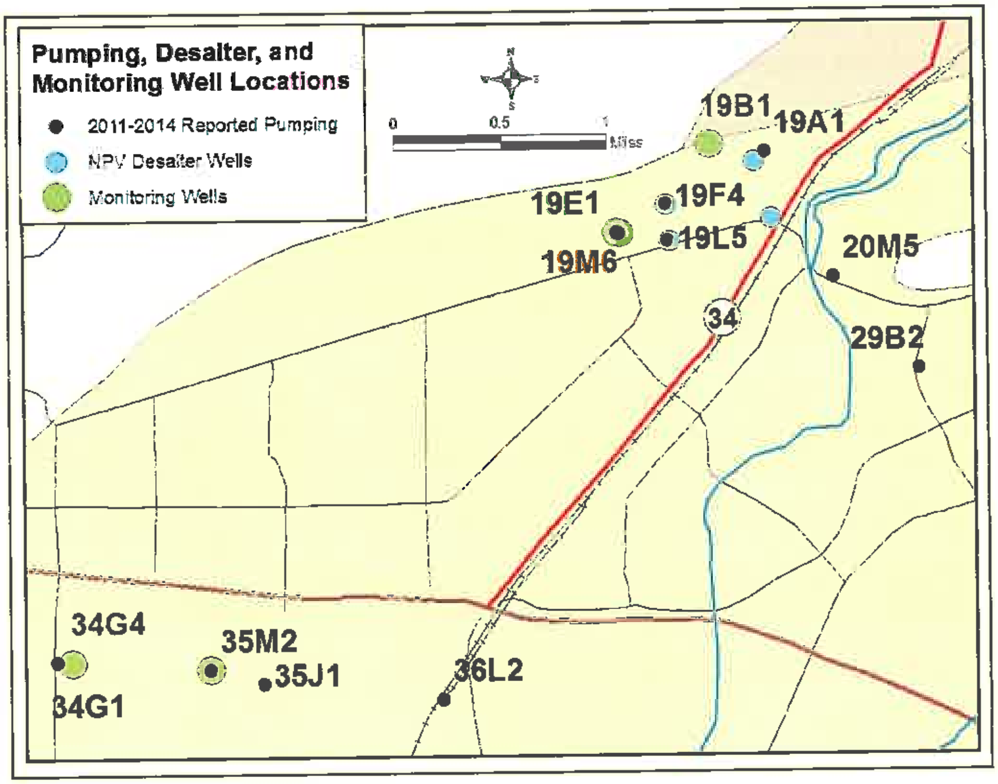



Figure 83. Monitoring well locations.

| Wells – Within ¼ mile from Extraction Wells | | |
|---|---|---|
| **Parameter** | **Sample Type** | **Frequency** |
| Total Dissolved Solids (mg/L) | Grab | Semi annually |
| Chloride (mg/L) | Grab | Semi annually |
| Sulfate (mg/L) | Grab | Semi-annually |
| Manganese (mg/L) | Grab | Semi annually |
| Groundwater level – each zone | Continuous | transducer – 3hr intervals downloaded every quarter |
| Conductivity (EC) – each zone | Continuous | transducer – 3hr intervals downloaded every quarter |

Table 11. Recommended extraction well sampling for desalter project.

**Desalter Extraction Wells** – Extraction wells used in the desalter project should be equipped with transducers/data loggers unless SCADA hardware already measure water levels. Recommended sampling intervals are shown in Table 12.

| Desalter Extraction Wells | | |
|---|---|---|
| **Parameter** | **Sample Type** | **Frequency** |
| Total Dissolved Solids (mg/L) | Grab | monthly |
| Chloride (mg/L) | Grab | monthly |
| Sulfate (mg/L) | Grab | monthly |
| Manganese (mg/L) | Grab | monthly |
| Groundwater level - static | Grab | monthly |
| Groundwater level | Grab | monthly |
| Conductivity (EC) | Grab | monthly |
| Monitoring consistent with DDW permit | | |

**Table 12. Recommended sampling for desalter extraction wells.**

**Monitoring for Regional Groundwater Trend Evaluation** – Monitoring is important so that regional trends (e.g., drought conditions, regional water quality changes) can be detected. In particular, any effect of the project on seawater intrusion must be identified. Both the County of Ventura and United Water Conservation District regularly monitor a set of wells in the Pleasant Valley basin; results of this monitoring should be obtained and used annually for identifying both regional water level and water quality trends. In addition to the monitoring discussed above, an existing production well should be fitted with a transducer and recording device just south of Highway 101 to determine details of groundwater trends and any effects that may be related to the project. It is recommended that the 35M2 well be used for this purpose (Figure 83). This monitoring well will also be used in determining any actions undertaken under the Contingency Plan. Monitoring parameters and frequency are shown in Table 13.

| Regional Wells (to be gathered by others) | | |
|---|---|---|
| **Parameter** | **Sample Type** | **Frequency** |
| Groundwater level – each zone | grab | Semi annually |
| Conductivity (EC) – each zone | grab | Semi annually |

**Table 13. Sampling of regional wells.**

### Surface Water Monitoring

It will be important to the project to periodically review the amount of dry-weather base flow into NPV along Arroyo Las Posas. Because this baseflow is the source of the brackish water that infiltrates into NPV, the amount of baseflow in the future will determine whether NPV will continue to be degraded or, if upstream desalters capture much of this water, when the degradation may cease and the NPV desalter project can complete its extraction of the brackish mound in NPV.

Monitoring of the baseflow leaving the Las Posas basin when an upstream desalter is completed will likely be a monitoring element for the upstream desalter. It is recommended that information from that monitoring be obtained on a regular basis and included in the recommended Annual Report. There is currently a periodic monitoring program of flow and water quality at a series of locations along the arroyo that is contracted by Calleguas MWD which will provide baseline data for the NPV monitoring program.

### Monitoring Data Analysis

Transducer data from wells near project area, extraction wells, and the monitoring wells should be downloaded quarterly and examined for overall trends and potential trigger values. When water quality analyses are received, a similar examination is warranted. Water level, streamflow, and quality data should be maintained in digital form for annual analyses and determination of trends and trigger values. All these data should be included in the Annual Report.

### Reporting

An Annual Report is to be prepared following the end of the calendar year and submitted to FCGMA and interested parties by April 1. The Annual Report would include the following information:

- A summary of desalter operations.
- Data analyses and graphs, monitoring data obtained from extraction wells, monitoring wells, wells near project area, conclusions formed from the analyses, and recommendations for future operations and monitoring.
- Correlation/analysis of the salt plume, using information obtained from the extraction wells and monitoring wells, would be characterized in a tabular form.
- Surface water monitoring obtained by other upstream project proponents, and in coordination with the Calleguas Creek Watershed (salts TMDL), future upstream desalter projects, and Las Posas Group.
- Regional maps of groundwater elevation contours to document any effects of the project on the wider Pleasant Valley basin. These maps can be constructed by either United Water Conservation District or specifically for the Annual Report using the regional groundwater elevation measurements made by United Water and the County of Ventura.

In addition to the annual reporting, the FCGMA will be notified within one month of any unexpected or critical results from project monitoring. Examples of such results include rapidly dropping water levels, approach of target groundwater elevations, and unexpected water quality analyses.

## 10.2 Contingency Plan

The Contingency Plan addresses issues that may arise during operation of the project, including unexpected water level declines, changes in water quality, seawater intrusion, and subsidence.

### Contingency Plan for Groundwater Elevations

#### *Contingency Triggers for Nearby Wells*

Contingency triggers are numerical values for groundwater elevations /water quality concentrations beyond which a contingency plan is implemented. There are several factors that must be considered in devising triggers for the desalter project that would result in implementing project contingencies.

- ❖ Groundwater elevations rose for decades in the project area as the aquifers were filled with a large mound of non-native brackish water (discharge from wastewater treatment plants, dewatering of shallow aquifers) that spilled over from the Las Posas basin. Without this recharge, groundwater elevations in the project areas would currently be much lower. Recovery of this brackish water would be expected to lower groundwater elevations.
- ❖ There is a water quality benefit to all pumpers who would potentially be affected by future movement of the brackish water if the desalter project is not built. This benefit must be balanced against lower groundwater elevations that the pumpers may experience. The benefit applies to both municipal pumpers (sulfates exceeding drinking water standards) and agricultural pumpers (chlorides exceeding tolerance levels in salt-sensitive crops).
- ❖ Groundwater elevations in the project area may be lower in the future from causes unrelated to desalter pumping – such as current overdraft of the basin and/or increased pumping related to crop changes.

It is reasonable that contingency planning be based upon historical groundwater elevations. Figure 84 indicates historical groundwater elevations in the project area. The historical low was -168 ft msl in the now-destroyed 19M4 well. If groundwater elevations in adjacent wells to the 19M4 well were to approach and/or drop below the historical low groundwater elevation, a set of Contingency Actions would take place.

To ensure that pumping activities by others in the project area do not draw down groundwater elevations excessively, project operators will ask the FCGMA to limit new pumping in the project area so that overall pumping does not exceed an annual use of 2 AF/acre.

#### *Contingency Actions for Nearby Wells*

Contingency actions are taken when groundwater elevations measured in the Monitoring Plan approach or are deeper than a groundwater elevation trigger. The actions are progressive, from informational/planning to modifying project operations.

When static (non-pumping) groundwater elevations reach -126 ft msl in a well monitored in the project area, automatic cutbacks in pumping from extraction wells would be implemented. The percent pumping cutbacks would be based on water elevations observed at the extraction wells in the sequence indicated in Table 14. If water levels recover, pumping can then be increased using the same sequence shown above. When this contingency is applied to the Scenario #2c model, dropping groundwater elevations are mitigated prior to groundwater elevations reaching historical low (Figure 85).

| Static Groundwater Elevation Measured (msl) | Percent Pumping Reduction (%) |
|---|---|
| -126 | 10 |
| -140 | 20 |
| -150 | 30 |
| -153 | 40 |
| -157 | 50 |
| -160 | 75 |
| -168 | 100 |

**Table 14. Pumping reductions required in Contingency Plan.**

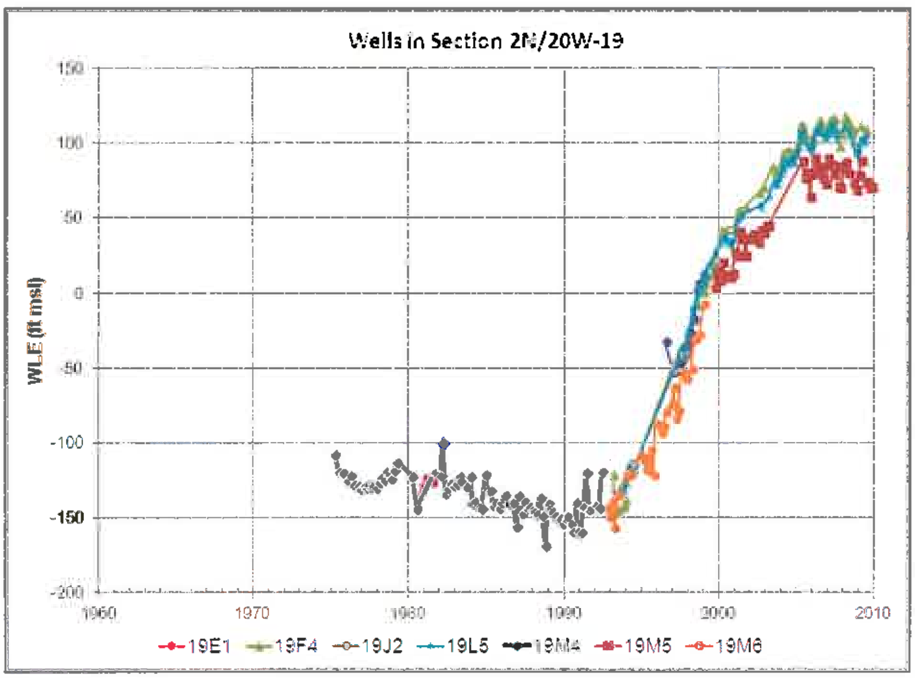



**Figure 84. Groundwater elevations for wells in project area for which there are data available. See locations in Figure 83.**

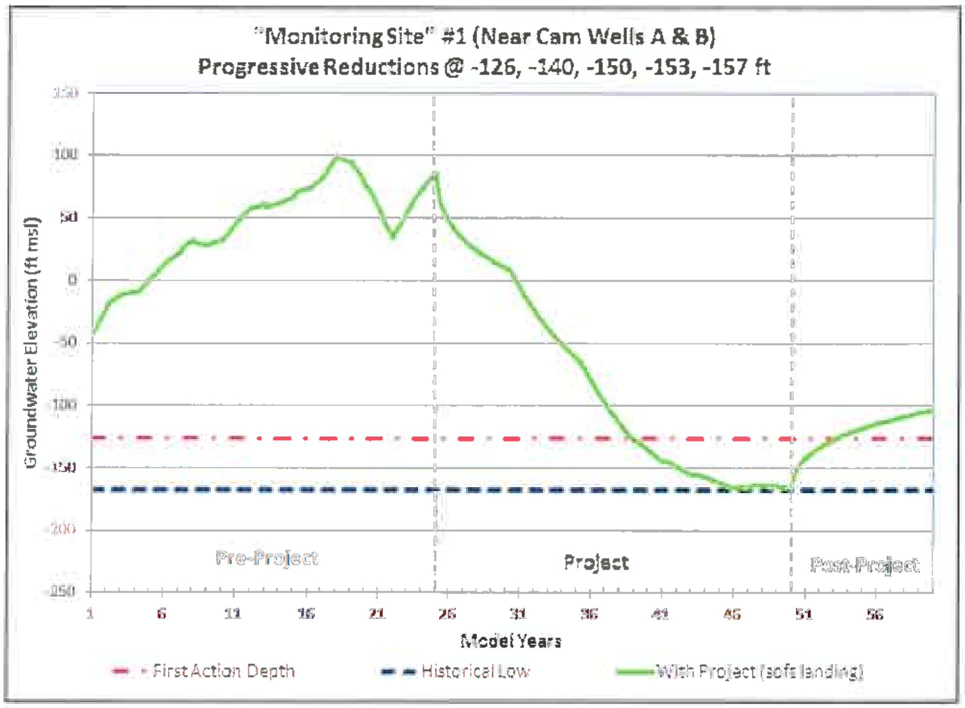



**Figure 85. Modeled groundwater elevations in project area, Scenario #2c with Contingency Plan pumping reductions applied.**

## Contingency Plan for Groundwater Quality

The purpose of the Desalter Project is to pump brackish water, treat it to remove salts, and discharge the salts from the watershed. It is an expectation of the Project that the FCGMA will extend its policy from the Las Posas basin that allows pumping and treating of this brackish without the use of FCGMA allocations or credits. The movement of salts can be more complex than modeled for this Project – particle tracking assumes plug flow (no dispersion or dilution) – and the aquifer is very likely to be more complex in its geometry and internal bedding than can be modeled. In reality, the water extracted for desalting may vary in salt content from day-to-day and month-to-month. Such variation is expected, cannot be avoided, and does not detract from the goals of the Project or the benefits of the Project to the aquifer.

As the Project matures and the travel paths of brackish water become more complex as the salts are recovered from aquifer areas further away from Project pumping, there are likely to be episodic periods when individual wells pump fresh water. Although this cannot be avoided when attempting to clean up the entire area of brackish groundwater, a contingency plan for FCGMA allocations and credits is prudent. The purpose of the contingency plan is to differentiate between extended pumping of fresh groundwater (which would require the use of FCGMA allocations and/or credits) and pumping of primarily brackish groundwater (which would fit under the FCGMA policy related to pumping and treating brackish groundwater).

Analytical test results can be variable, and single water quality test results cannot characterize the duration, magnitude, or frequency of the measured quality. Therefore, it is recommended that single water quality test results should be used as triggers to initiate a response, rather than only as a means to determine whether brackish water is being pumped.

**Pumping of Primarily Brackish Groundwater** – As discussed previously, the salt content of brackish groundwater pumped by the Project is likely to vary episodically with time. Thus, the determination of primarily brackish groundwater must take this into account. For purposes of defining primarily brackish groundwater, four components were examined – manganese, chloride, sulfate, and Total Dissolved Solids (TDS). In all cases, concentrations were lower prior to the influence of the brackish water and considerably higher after the introduction of brackish water (Figure 86 to Figure 89). Water Quality Objectives[10] and/or drinking water MCLs are currently being exceeded for all four constituents.

High sulfate concentrations are problematic for municipal drinking water, whereas high chloride concentrations are problematic for agricultural irrigation. To reflect both concerns, Manganese and TDS are used here as the benchmark for project water quality. It is recommended that the criteria for brackish water be a threshold of 700 mg/L of TDS to reflect both historical concentrations and the Basin Plan Objective, and the Manganese criteria for brackish water be a threshold of 50 ug/L to reflect historical concentrations and the secondary drinking water MCL. Using these thresholds, pumped groundwater with TDS and Manganese concentrations above 700 mg/L and 50 ug/L respectively would be considered brackish water and their removal beneficial to the aquifers.

**Extended Pumping of Fresh Groundwater** – At some time in the future, Project wells will likely start pumping a mixture of brackish and ambient groundwater as the brackish water is removed. It is unlikely that the transition from brackish to ambient groundwater will be a sharp break – it is most likely to be transitional, with periods of pumping brackish and fresher water. Given this scenario, there must be criteria for determining how this transition is considered. It is recommended that when TDS concentrations drop below 700 mg/L and manganese concentrations drop below 50 ug/L in any project extraction well, a verification period would begin to ensure that brackish water has indeed been removed from the portion of the aquifer supplying water to the well. This verification period would be one year in duration, with water quality testing increased to monthly during the period. If, after one year, TDS concentrations remained below 700 mg/L and manganese remained below 50 ug/L, then subsequent pumping would be considered as pumping fresh groundwater subject to the FCGMA allocation system. This contingency is illustrated in Table 15.

If future pumping of water from a Project well that has transitioned from brackish to fresh water returns to a brackish water condition, then the verification period would be reversed – it would require one year of verified pumping of groundwater above 700 mg/L TDS and manganese above 50 ug/L to return the well to a brackish water status. These criteria are summarized in the table below. This information would be provided to the FCGMA in the Annual Report.

[10] *Water Quality Control Plan Los Angeles Region*, 1995, Los Angeles Regional Water Quality Control Board, p. 3-19.

| Contingency | Project well pumping brackish water has TDS drop below 700 mg/L and manganese below 50 ug/L | Project well pumping fresh water has TDS increase to above 700 mg/L and manganese to above 50 ug/L |
|---|---|---|
| Action | Begin one year verification period | Begin one year verification period |
| Considered Fresh Water | Monthly testing remains below 700 mg/L for TDS and 50 ug/L for manganese during verification period | Any monthly test is below 700 mg/L TDS and 50 ug/L manganese |
| Addt'l Evaluation | Evaluate whether regional conditions contributed to drop | Evaluate whether regional conditions contributed to increase |
| Considered Brackish Water | Any monthly test exceeds 700 mg/L TDS and 50 ug/L manganese | Monthly tests remain above 700 mg/L TDS and 50 ug/L manganese for verification period |
| Termination of Action | One year of pumping below 700 mg/l TDS and 50 ug/L manganese (reverts to fresh water) or any monthly test greater than 700 mg/L TDS and 50 ug/L manganese (remains brackish water) | One year of pumping above 700 mg/L TDS and 50 ug/L manganese (reverts to brackish water) or any test less than 700 mg/L TDS and 50 ug/L manganese (remains fresh water) |
| FCGMA Allocation | No allocation required | Prorated use of allocation* |
| Sunset Provision | If well pumps fresh water for 24 consecutive months, well permanently reverts to fresh water status | |

**Table 15. Contingency actions for water quality. * If any monthly measurement is greater than 700 mg/L TDS and 50 ug/L manganese, then allocation is prorated across reporting year (e.g., if TDS is greater than 700 mg/L and manganese greater than 50 ug/L for two of the twelve months, then pumping for those two months does not require an allocation).**

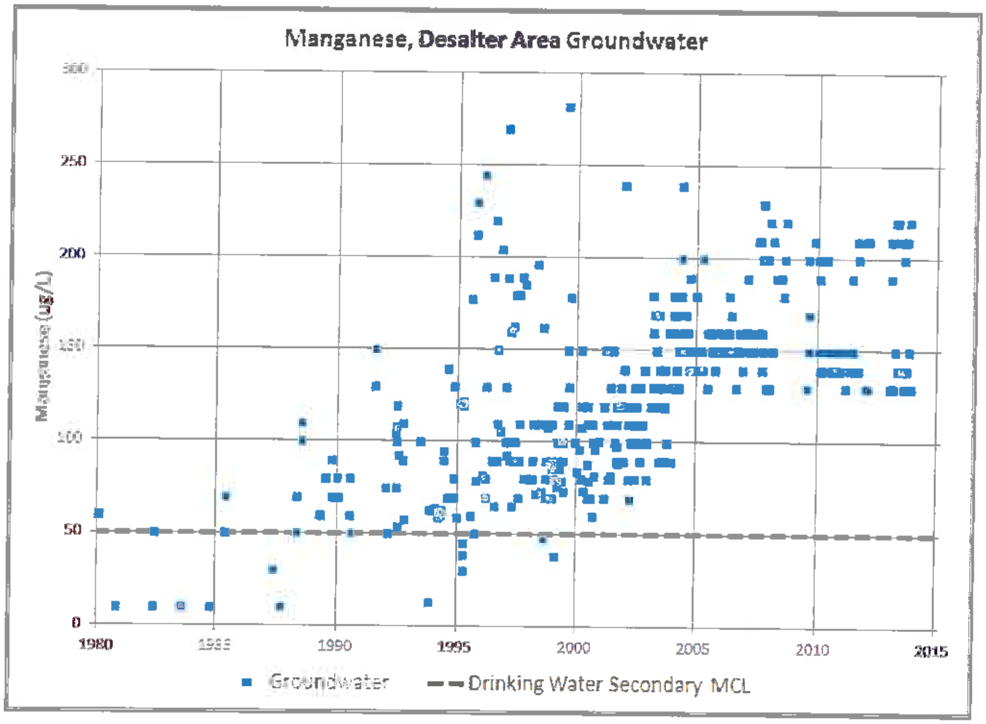



**Figure 86. Historical manganese concentrations in project area.**

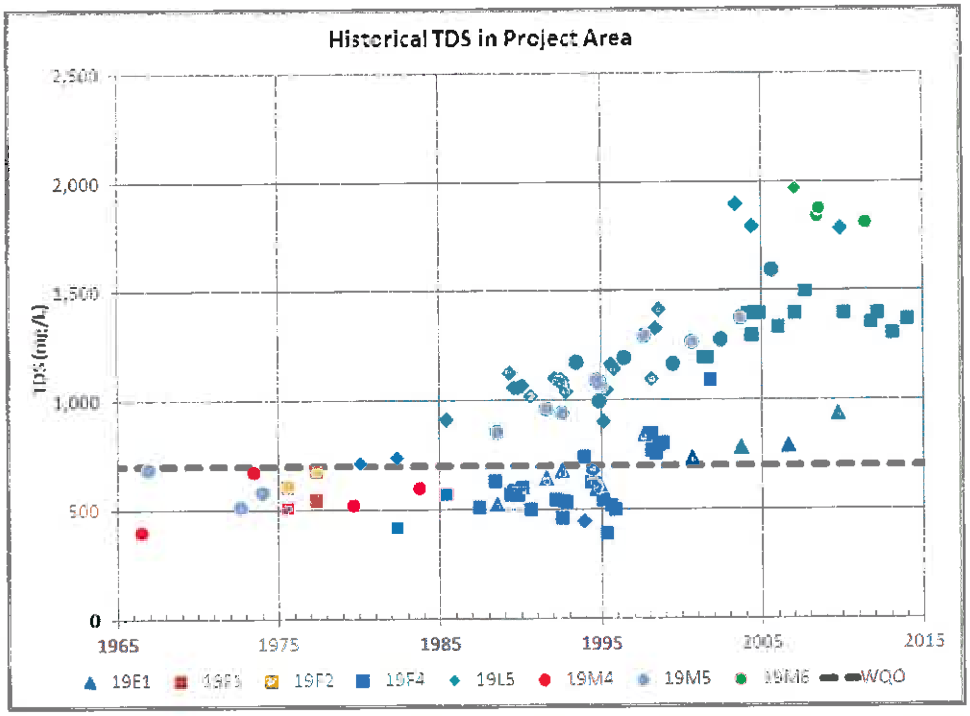



**Figure 87. Historical TDS concentrations in project area. WQO is Regional Board's water quality objective for groundwater in the Pleasant Valley basin.**

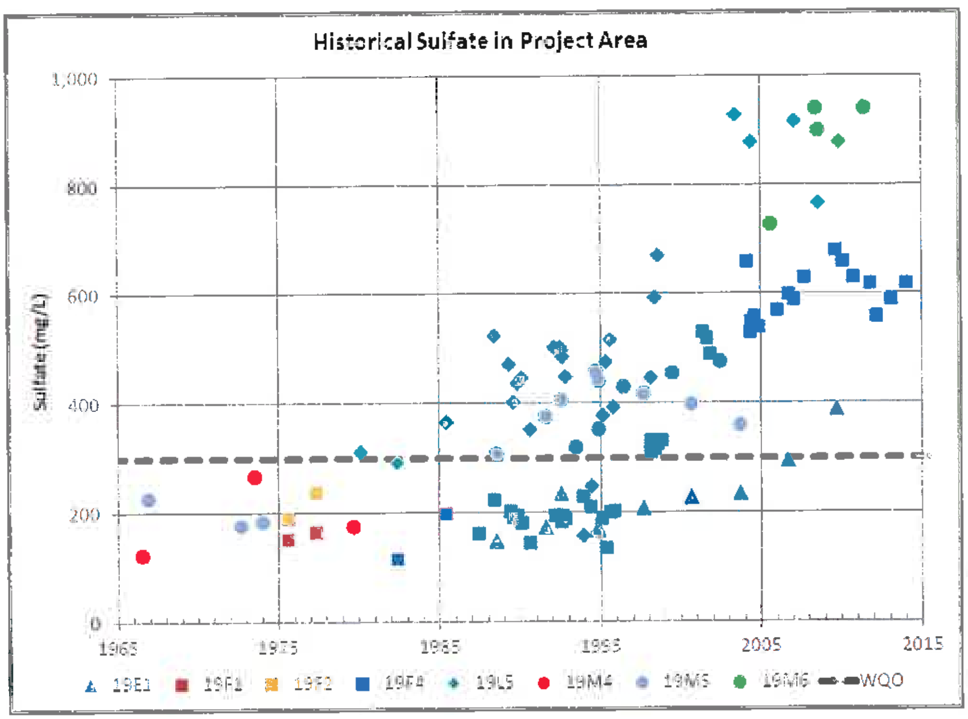



**Figure 88. Historical sulfate concentrations in project area. WQO is Regional Board's water quality objective for groundwater in the Pleasant Valley basin.**

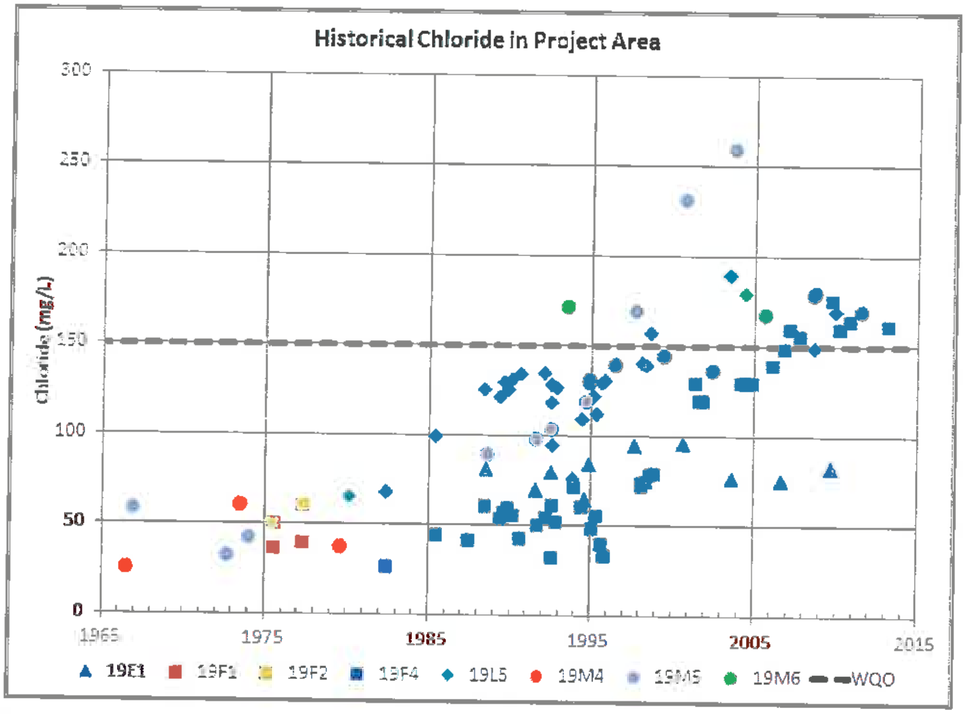



**Figure 89. Historical chloride concentrations in project area. WQO is Regional Board's water quality objective for groundwater in the Pleasant Valley basin.**

## Contingency Plan for Seawater Intrusion

As discussed in the accompanying report on modeling of the NPV Desalter, it was noted that any potential effect on seawater intrusion from a project so far from the coast would be through the extension of the pumping depression towards the project area. To that end, the contingency for seawater intrusion is based on the groundwater gradient between the project and the pumping depression. The critical area for this gradient is where there is currently a sharp groundwater gradient towards the pumping depression (between the two monitoring point shown in Figure 90). This gradient prevents the pumping depression from expanding eastward and increasing the size and depth of the depression. Thus, the contingency focuses on maintaining a gradient towards the pumping depression.

To calculate this gradient, two wells were selected – one an existing USGS monitoring well (2N/21W-34G4) and the other a new monitoring well to be constructed as part of this project (project Monitoring Well B, located near City Hall). The contingency criteria are listed in Table 16.

| Observation | Action |
|---|---|
| Groundwater elevation in well 34G4 lower than in Monitoring Well B | No action required |
| Groundwater elevation in well 34G4 higher than in Monitoring Well B | Pumping reductions required |

**Table 16. Criteria for seawater gradient contingency.**

The contingency action would be similar to those for the other issues related to groundwater elevations – systematic reduction in project pumping until the groundwater gradient is reversed (groundwater elevation in Well 34G4 lower than in Monitoring Well B). The FCGMA will be informed of the trigger exceedance.

The mitigation would be that project pumping would be re-adjusted so that the project well closest to the affected area would reduce pumping by 10% for a period of six months. If these actions do not mitigate the problem within a six-month period (i.e., prevent further drops in groundwater elevations), then pumping from this project well would be reduced an additional 10% (for a total reduction of 20%) for a period of six months and further evaluated. This step-wise reduction every six months would continue until the problem is mitigated.

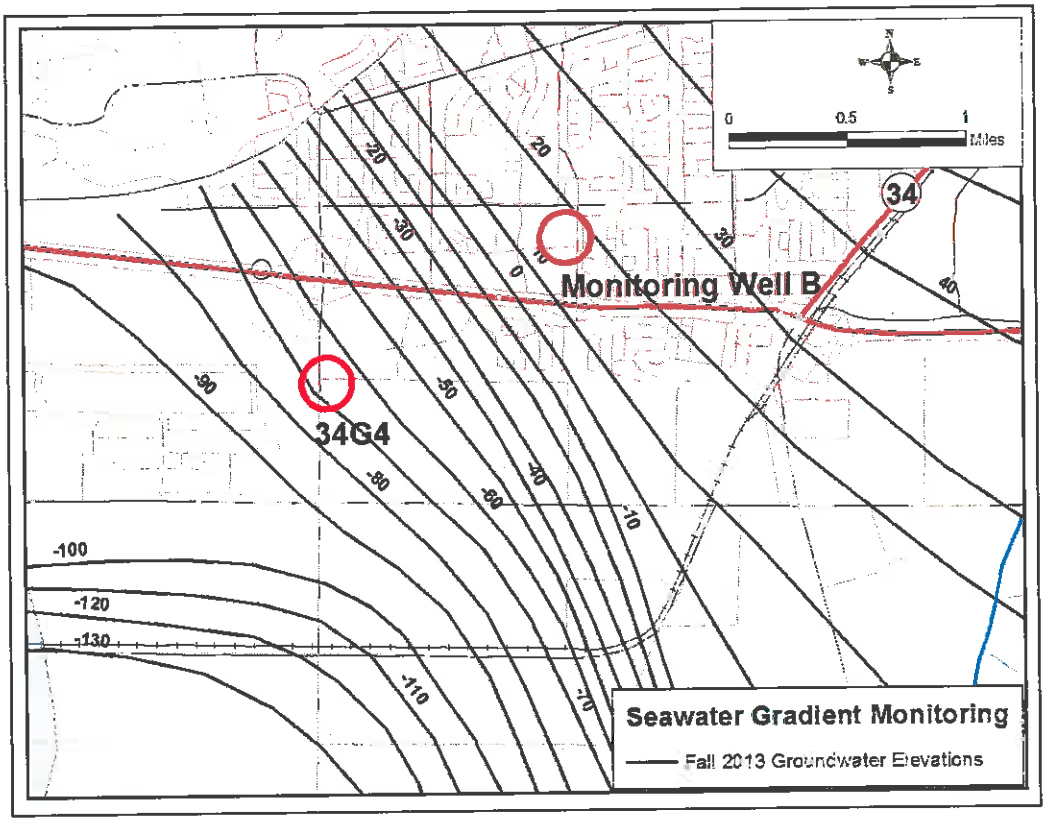



**Figure 90. Monitoring points (red circles) for determining the gradient towards the pumping depression.**

# 11 Recommendations

Analyses and modeling using current data have largely reached the limit of our understanding of the brackish water problem. Recommendations are therefore centered on obtaining additional information for design and subsequent monitoring of the Project. There is sparse measured information outside of the location of Camarillo's production wells on the current location and concentration of the poor-quality baseflow that has infiltrated into NPV. It is recommended that three monitoring wells with pressure and electrical conductivity sensors be installed downstream of the NPV area within the City of Camarillo to measure both groundwater elevations and salt content; an existing production well should be equipped similarly upstream from the project area.

Installing/equipping these wells prior to design of the desalting project would help verify the accuracy of the modeling and particle tracking and allow any necessary adjustments to be made in modeling conclusions. The general locations of recommended monitoring wells are indicated in Figure 81with wells located on either side of the 17-year particle boundary that approximates today's condition. These wells would help verify both current water quality and water level predictions from the model and would be used to track these parameters as the project progresses.

A comprehensive Monitoring Plan should be implemented, as discussed in section 10.1. Besides monitoring the three new monitoring wells, a surface water monitoring point is recommended to be either installed or data obtained from others along Arroyo Las Posas where it crosses the basin boundary into NPV. The data collected for the Monitoring Plan should be analyzed regularly and presented in an Annual Report.

It is also recommended that a Contingency Plan be implemented as discussed in the previous section. The Contingency Plan identifies groundwater elevations in the project area that would trigger a Project response, as well as a groundwater gradient that would have to be maintained between the project and the pumping depression in the Pleasant Valley basin. It also recommends water quality criteria to determine when Project wells are pumping brackish or fresh water.

# 12 Conclusions

The MODFLOW model successfully simulated the historical buildup of the mound of poor quality beneath NPV, so it appears to be an appropriate tool to test various configurations of the NPV Desalter pumping. An unexpected result of the modeling of base case conditions (without project) was the potential threat of migration of poor-quality water into the agricultural areas of the Pleasant Valley basin. This result reinforces the need for desalter projects to prevent further groundwater contamination.

All modeled pumping scenarios indicate that there will be reduction of the mound of poor-quality groundwater, with a resulting decrease in groundwater elevations in NPV. This decrease in groundwater elevations is necessary – there can't be cleanup without it. The extent of the drawdown varies by pumping scenario, but modeling of the 25-year project scenario suggests that only in the area of desalter pumping will groundwater elevations temporarily drop below historical low levels near the end of project pumping. The Contingency Plan discusses actions to be taken before groundwater elevations reach this depth.

Both changes in groundwater elevations and particle tracking simulated by the model suggest that the NPV Desalter project would work as planned – the mound of poor-quality water would be pumped down, there would be a significant amount of water available for desalting, and much of the brackish water that has infiltrated into the aquifer would be recovered. Modeling of the 9,000 AFY, 25-year project suggests that such a project is feasible and would recover most of the "brackish water."

Groundwater modeling and particle tracking are robust tools to predict the effects of desalter pumping, but their limitations and the limitations of the streamflow data indicate that the results should be used cautiously. Monitoring of groundwater elevations and quality is the best method of verifying the results of this model. Monitoring and Contingency Plans recommended here should be implemented. Dedicated monitoring wells recommended as part of the Monitoring Plan should be installed prior to desalter design to verify model results and to analyze the progress of the project.

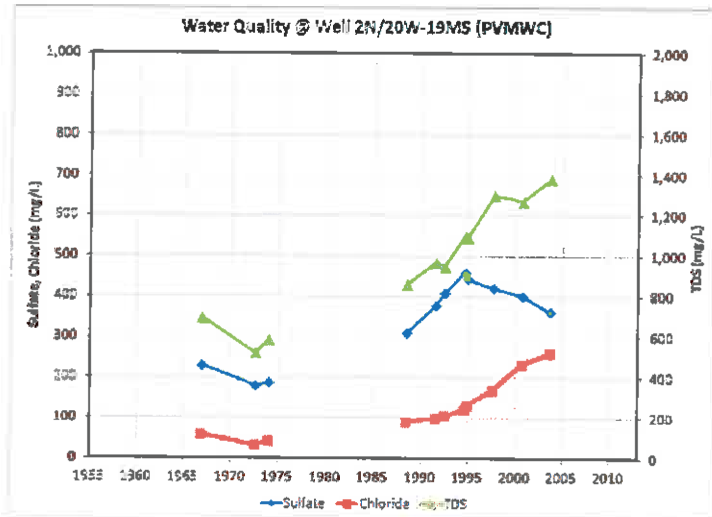
# 13 Limitations

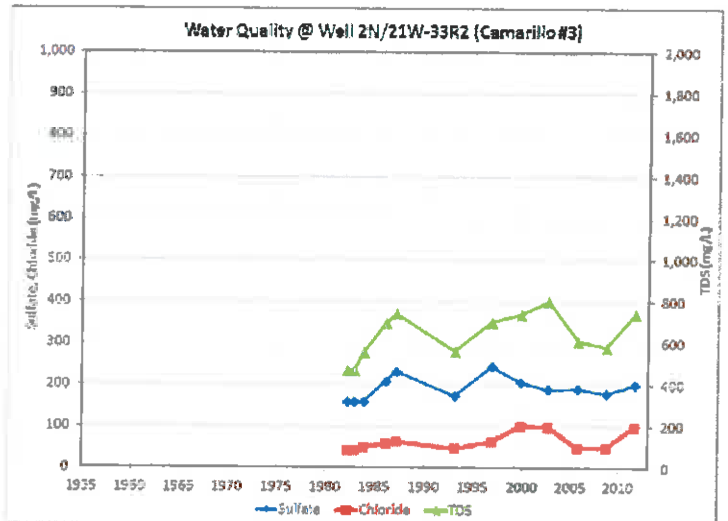
Many of the conclusions in this report are based on groundwater modeling results. It is important to note that modeling of complex hydrogeologic conditions requires simplification of these complex conditions and, thus, modeling results are a simplified approximation of future groundwater conditions. Measurement of actual future conditions utilizing the recommended Monitoring Plan should be the primary guide to the efficacy of the project, and adaptive management based on these monitoring results will be required to ensure that the project meets its objectives.

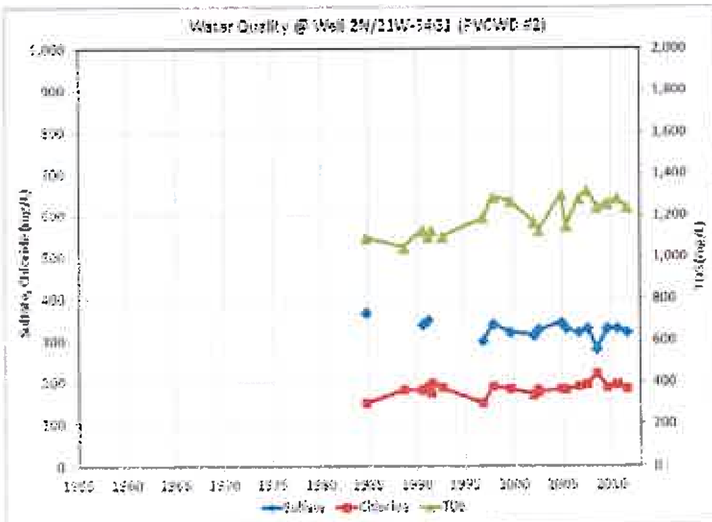
# 14 Appendix

## 14.1 Water Quality Graphs

Additional graphs are shown here. See location map Figure 13.





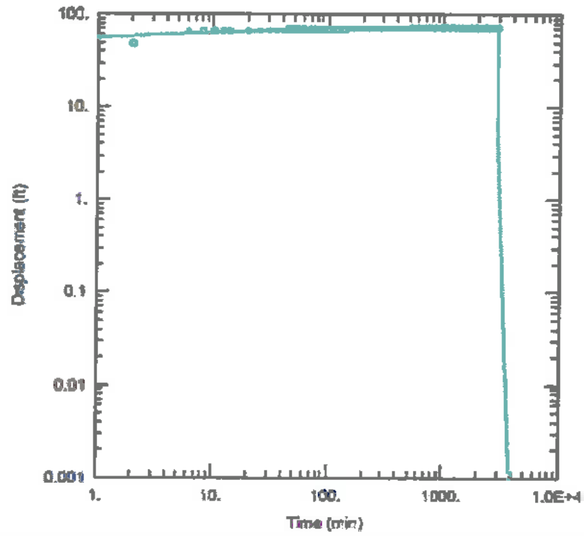

## 14.2 Aquifer Testing

Aquifer testing results contracted by TMR Geological Consulting Services for City of Camarillo. A summary of those results are shown below, with more-detailed results shown in this section and on the attached CD. Reference points, not included in TMR tables, include Camarillo Well A - 206 ft, Camarillo Well B - 210 ft, PVMWC Well #10 - 203 ft, PVMWC Well #11 - 200 ft.

| Date | Length of Test | Pumping Well | Pumping Rate gpm | Observation Wells | Distance to Pumping Well (feet) |
|---|---|---|---|---|---|
| 6/1/2011 | 48 hr | Camarillo Well A | 1840 | Camarillo Well A | 0 |
| | | | | Camarillo Well B | 909 |
| | | | | PVMWC Well 10 | 1265 |
| | | | | PVMWC Well 11 | 1162 |
| | | | | | |
| 6/6/2011 | 48 hr | Camarillo Well B | 1534 | Camarillo Well B | 0 |
| | | | | Camarillo Well A | 909 |
| | | | | PVMWC Well 10 | 1299 |
| | | | | PVMWC Well 11 | 1429 |

| Well ID | Total Depth (ft) | Depth To Top of Screen (ft) | Aquitard Thickness |
|---|---|---|---|
| Well A | 875 | 467 | 307 |
| Well B | 779 | 459 | 315 |
| Well 10 | 920 | 564 | 404 |
| Well 11 | 816 | 540 | 293 |
| Average | 847.5 | 507.5 | |
| | Aquifer Thickness | 340 | 329.75 |

| | | Aquifer Properties | | | Aquitard Properties | |
|---|---|---|---|---|---|---|
| Pumping Well | Observation Wells | Transmissivity | Storativity | Horizontal Hydraulic Conductivity | Vertical Hydraulic Conductivity | Leakage Coefficient |
| | | $ft^2/day$ | | ft/day | ft/day | $min^{-1}$ |
| Camarillo Well A | Camarillo Well A | 4700 | - | - | - | -- |
| | Camarillo Well B | 5772 | 1.1E-04 | 17.0 | 3.3 | 6.9E-06 |
| | PVMWC Well 10 | 10340 | 5.0E-05 | 30.4 | 3.9 | 8.3E-06 |
| | PVMWC Well 11 | 6884 | 4.5E-04 | 20.2 | 4.1 | 8.6E-06 |
| | | | | | | |
| Camarillo Well B | Camarillo Well B | 7052 | - | - | - | -- |
| | Camarillo Well A | 3929 | 3.1E-06 | 11.6 | 1.7 | 3.6E-06 |
| | PVMWC Well 10 | 5821 | 8.8E-06 | 17.1 | 2.5 | 5.2E-06 |
| | PVMWC Well 11 | 5424 | 5.0E-06 | 16.0 | 2.1 | 4.4E-06 |




WELL TEST ANALYSIS

PROJECT INFORMATION

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well A
Test Date: 6/1/11

AQUIFER DATA

Saturated Thickness: 340. ft
Aquitard Thickness (b'): 330. ft

Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. ft

WELL DATA

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well A | 6253685 | 1911929 |

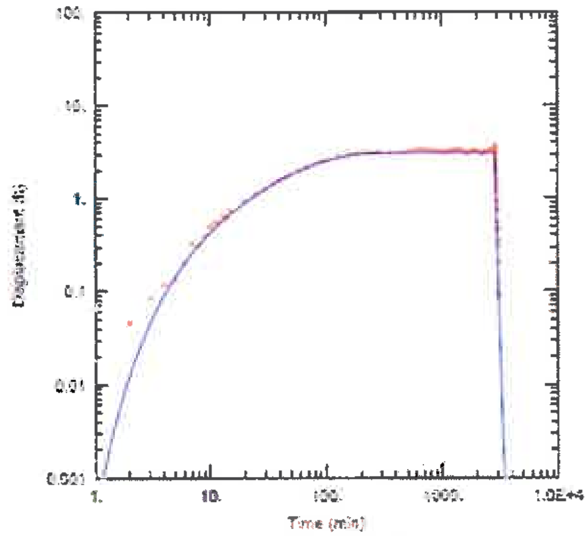
Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| • Camarillo Well A | 6253685 | 1911929 |

SOLUTION

Aquifer Model: Leaky
T = 4700.4 $ft^2/day$
1/B' = 0.0077242 $ft^{-1}$
1/B" = 0. $ft^{-1}$

Solution Method: Hantush
S = 9.701E-5
β'/r = 0.003996 $ft^{-1}$
β"/r = 0. $ft^{-1}$




WELL TEST ANALYSIS

PROJECT INFORMATION

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well A
Test Date: [illegible]

AQUIFER DATA

Saturated Thickness: 340. ft
Aquitard Thickness (b'): [illegible] ft
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. ft

WELL DATA

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well A | [illegible] | [illegible] |

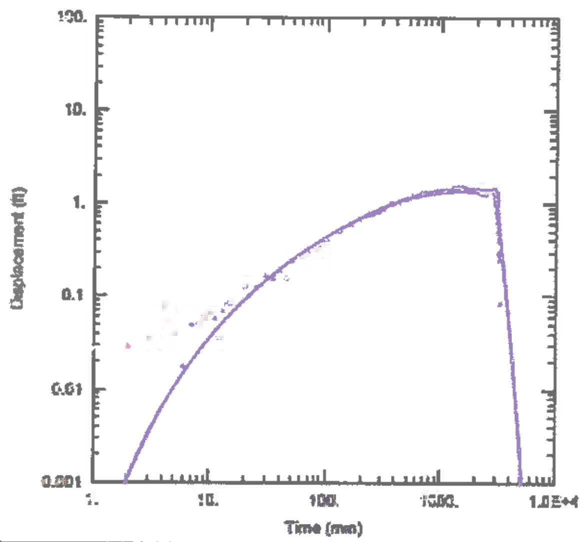
Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well B | [illegible] | [illegible] |

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush

T = [illegible] ft²/day
1/B' = [illegible] ft⁻¹
1/B" = 0. ft⁻¹
S = [illegible]
β/r = [illegible] ft⁻¹
β"/r = 0. ft⁻¹




**WELL TEST ANALYSIS**

**PROJECT INFORMATION**

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well A
Test Date: 6/7/11

**AQUIFER DATA**

Saturated Thickness: 340. ft
Aquitard Thickness (b'): 330. ft
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. ft

**WELL DATA**

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well A | 6253085 | 1911929 |

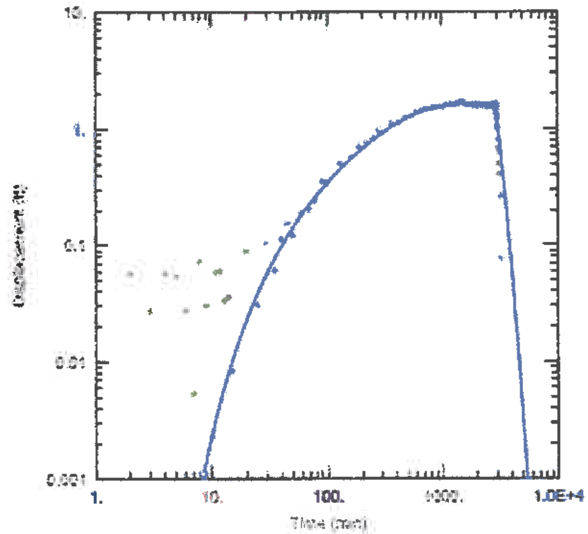
Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| PVMWC Well 10 | 6252463 | 1912256 |

**SOLUTION**

Aquifer Model: Leaky
Solution Method: Hantush

T = 1.334E+4 $ft^2$/day
1/B' = 0.[illegible]1073 $ft^{-1}$
1/B" = 0. $ft^{-1}$
S = 5.0E-5
β'/r = 0.00[illegible]375 $ft^{-1}$
β"/r = 0. $ft^{-1}$




**WELL TEST ANALYSIS**

Data Set: C:\...\PVMWC Pumping Well A City Well Drawdown Data.aqt
Date: 12/05/11 Time: [illegible]

**PROJECT INFORMATION**

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well A
Test Date: 9/1/11

**AQUIFER DATA**

Saturated Thickness: 340. ft
Aquitard Thickness (b′): 330. ft
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b″): [illegible]

**WELL DATA**

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well A | 6253624 | 1911929 |

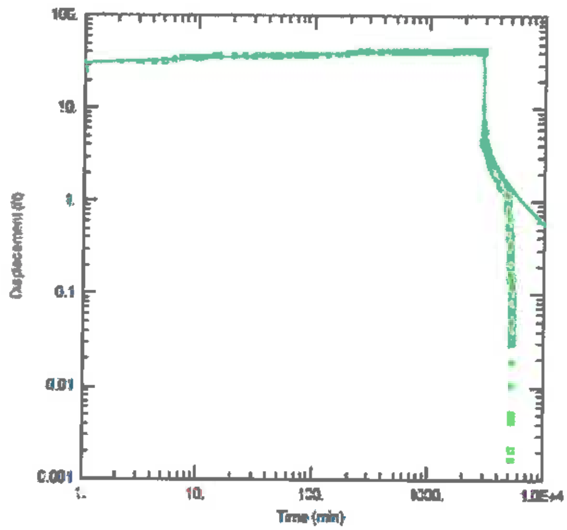
Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| ◦ PVMWC Well 11 | 6252523 | [illegible] |

**SOLUTION**

Aquifer Model: Leaky
Solution Method: Hantush

T = [illegible] ft²/day
S = [illegible]
r/B′ = [illegible] ft⁻¹
β/r = [illegible] ft⁻¹
r/B″ = [illegible] ft⁻¹
S″/S′ = [illegible]




**WELL TEST ANALYSIS**

**PROJECT INFORMATION**

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well B
Test Date: 6/8/11

**AQUIFER DATA**

Saturated Thickness: 340. ft
Aquitard Thickness (b'): 330. ft
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b''): 1. ft

**WELL DATA**

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well B | 6253624 | 1912530 |

Observation Wells

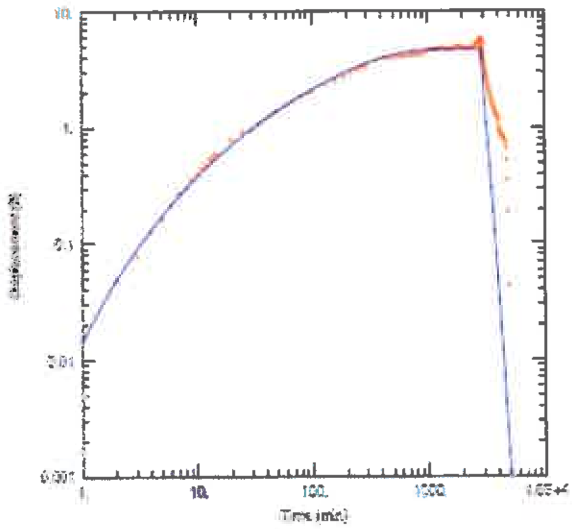
| Well Name | X (ft) | Y (ft) |
|---|---|---|
| ▪ Camarillo Well B | 6253624 | 1912530 |

**SOLUTION**

Aquifer Model: Leaky
Solution Method: Hantush

T = 7051.7 $ft^2$/day
1/B' = 8.347E-4 $ft^{-1}$
1/B'' = 0. $ft^{-1}$

S = 2.308E-5
β/r = 0.01413 $ft^{-1}$
β''/r = 0. $ft^{-1}$




WELL TEST ANALYSIS

Data Set: [illegible] Pumping Well B, Observation Wells [illegible]
Date: [illegible] Time: [illegible]

PROJECT INFORMATION

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well B
Test Date: [illegible]

AQUIFER DATA

Saturated Thickness: 340. ft
Aquitard Thickness (b'): 332. ft
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. ft

WELL DATA

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well B | 6253024 | 1912838 |

Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| ◦ Camarillo Well A | 6253685 | 1911920 |

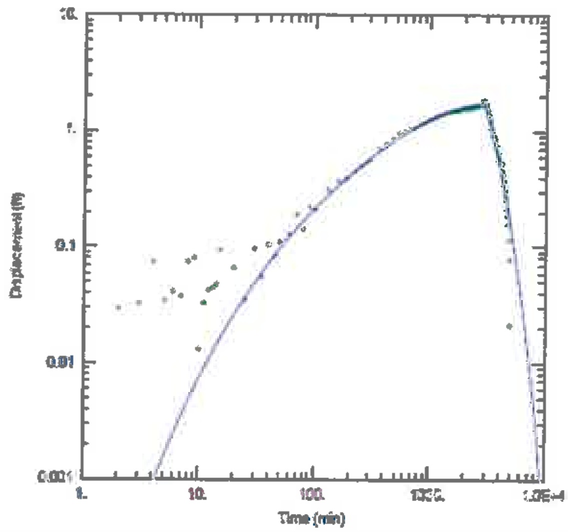
SOLUTION

Aquifer Model: Leaky

$T = 3028.6\ ft^2/day$
$1/B' = 0.001146\ ft^{-1}$
$1/B'' = 0.\ ft^{-1}$

Solution Method: Hantush

S = [illegible]
β' = [illegible]
β'' = [illegible]




**WELL TEST ANALYSIS**

Data Set: C:\...\PVMWC Pumping Well 8_Observation Wells.aqt
Date: 12/02/11 Time: 18:02:25

**PROJECT INFORMATION**

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well B
Test Date: 6/3/11

**AQUIFER DATA**

Saturated Thickness: 340. ft
Aquitard Thickness (b'): 330. ft
Anisotropy Ratio (Kz/Kr): [illegible]
Aquitard Thickness (b"): [illegible]

**WELL DATA**

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well B | 6253024 | 1912838 |

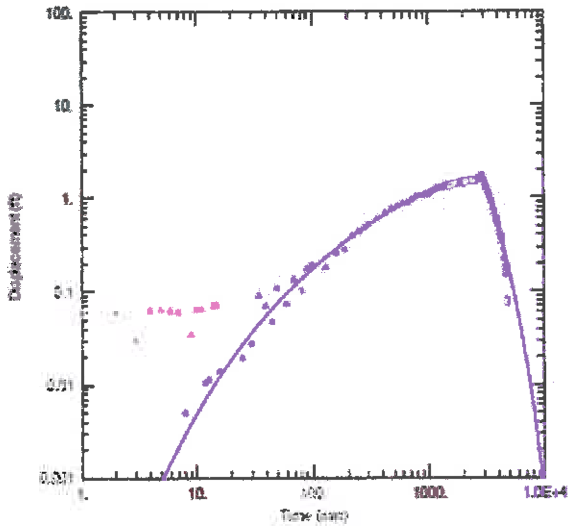
Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| • PVMWC Well 10 | 6252483 | 1912250 |

**SOLUTION**

Aquifer Model: Leaky
Solution Method: Hantush

T = 5821.4 $ft^2$/day
1/B' = [illegible] $ft^{-1}$
1/B" = 0. $ft^{-1}$
S = 8.781E-4
β' = 0.011 $ft^{-1}$
β" = 0. $ft^{-1}$




## WELL TEST ANALYSIS

### PROJECT INFORMATION

Client: City of Camarillo
Location: Camarillo
Test Well: Camarillo Well 8
Test Date: 6/6/11

### AQUIFER DATA

Saturated Thickness: 240. ft
Aquitard Thickness (b'): 325. ft
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. ft

### WELL DATA

Pumping Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| Camarillo Well 8 | 6253624 | [illegible] |

Observation Wells

| Well Name | X (ft) | Y (ft) |
|---|---|---|
| PVMWC Well 11 | [illegible] | [illegible] |

### SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush

T = 5423.6 $ft^2$/day
1/B' = 0.001074 $ft^{-1}$
1/B" = 0. $ft^{-1}$
S = 6.034E-5
β'/r = 0.01113 $ft^{-1}$
β"/r = 0. $ft^{-1}$

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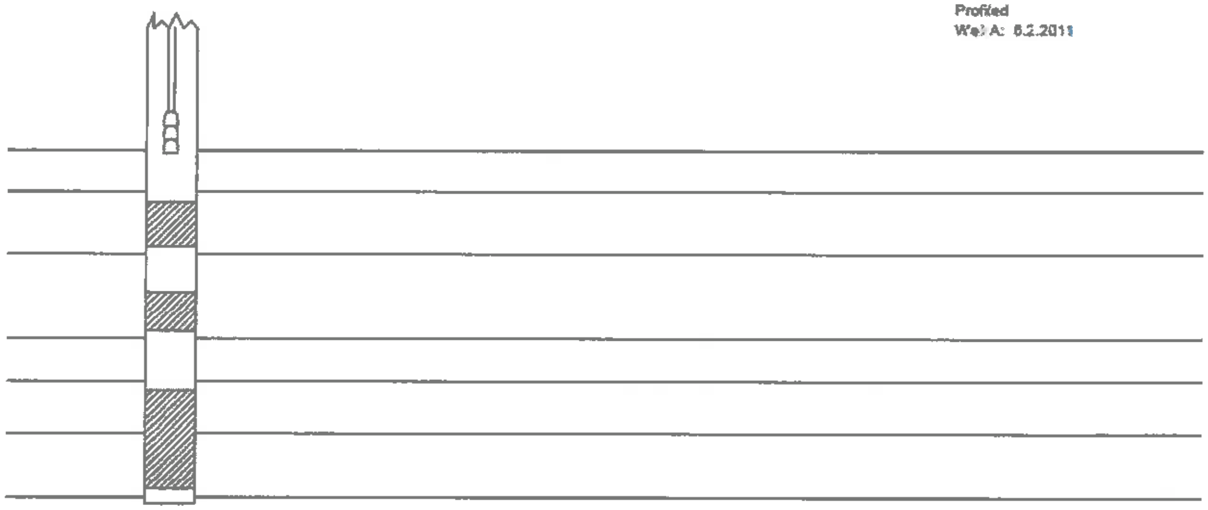
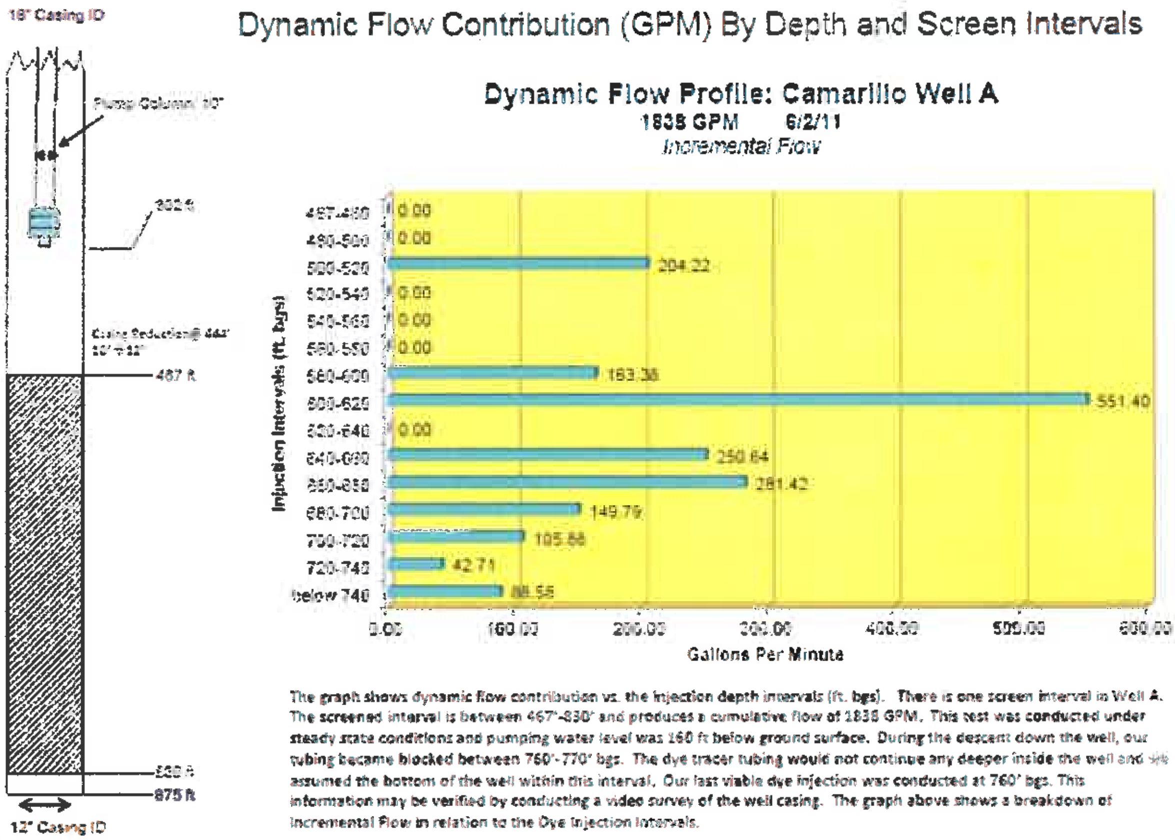
Phone.415.453.2501
Fax.415.453.2509

# Final Report: Dynamic Flow and Chemistry Profile
## City of Camarillo Well A

Profiled
Well A: 6.2.2011



## Dynamic Flow Contribution (GPM) By Depth and Screen Intervals




The graph shows dynamic flow contribution vs. the injection depth intervals (ft. bgs). There is one screen interval in Well A. The screened interval is between 467'-830' and produces a cumulative flow of 1838 GPM. This test was conducted under steady state conditions and pumping water level was 160 ft below ground surface. During the descent down the well, our tubing became blocked between 760'-770' bgs. The dye tracer tubing would not continue any deeper inside the well and we assumed the bottom of the well within this interval. Our last viable dye injection was conducted at 760' bgs. This information may be verified by conducting a video survey of the well casing. The graph above shows a breakdown of Incremental Flow in relation to the Dye Injection Intervals.

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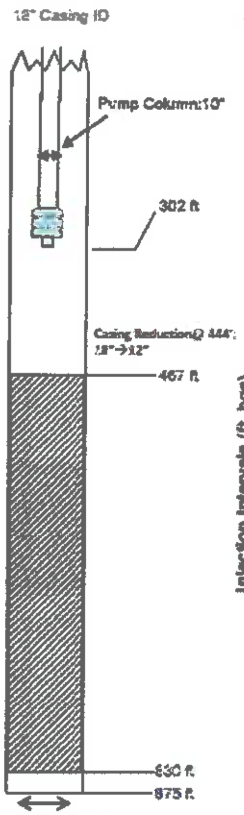
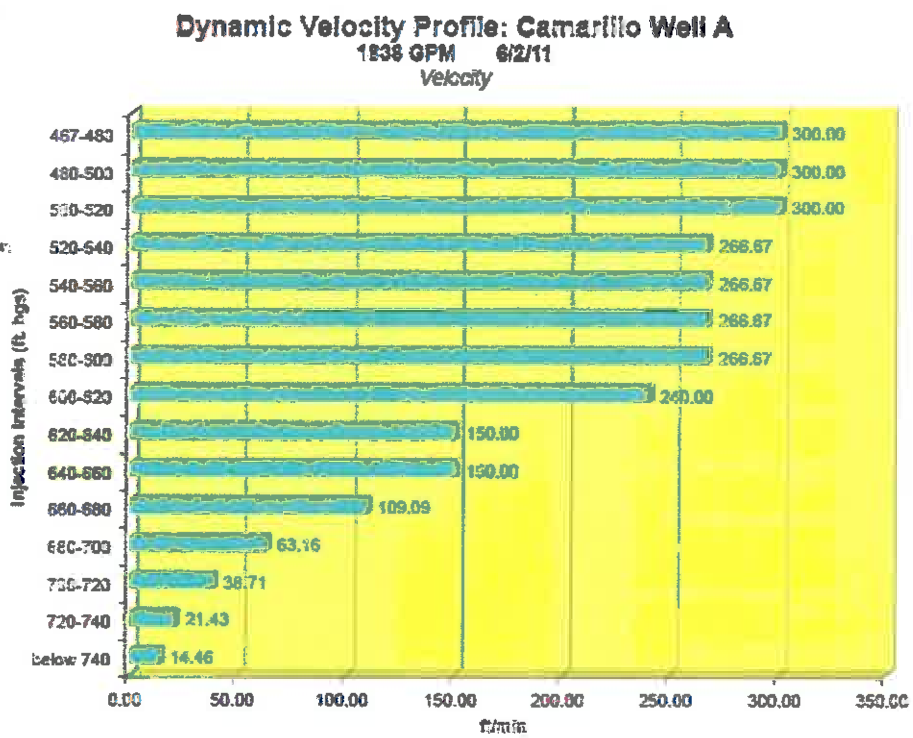
## Dynamic Flow Velocity By Depth and Screen Intervals

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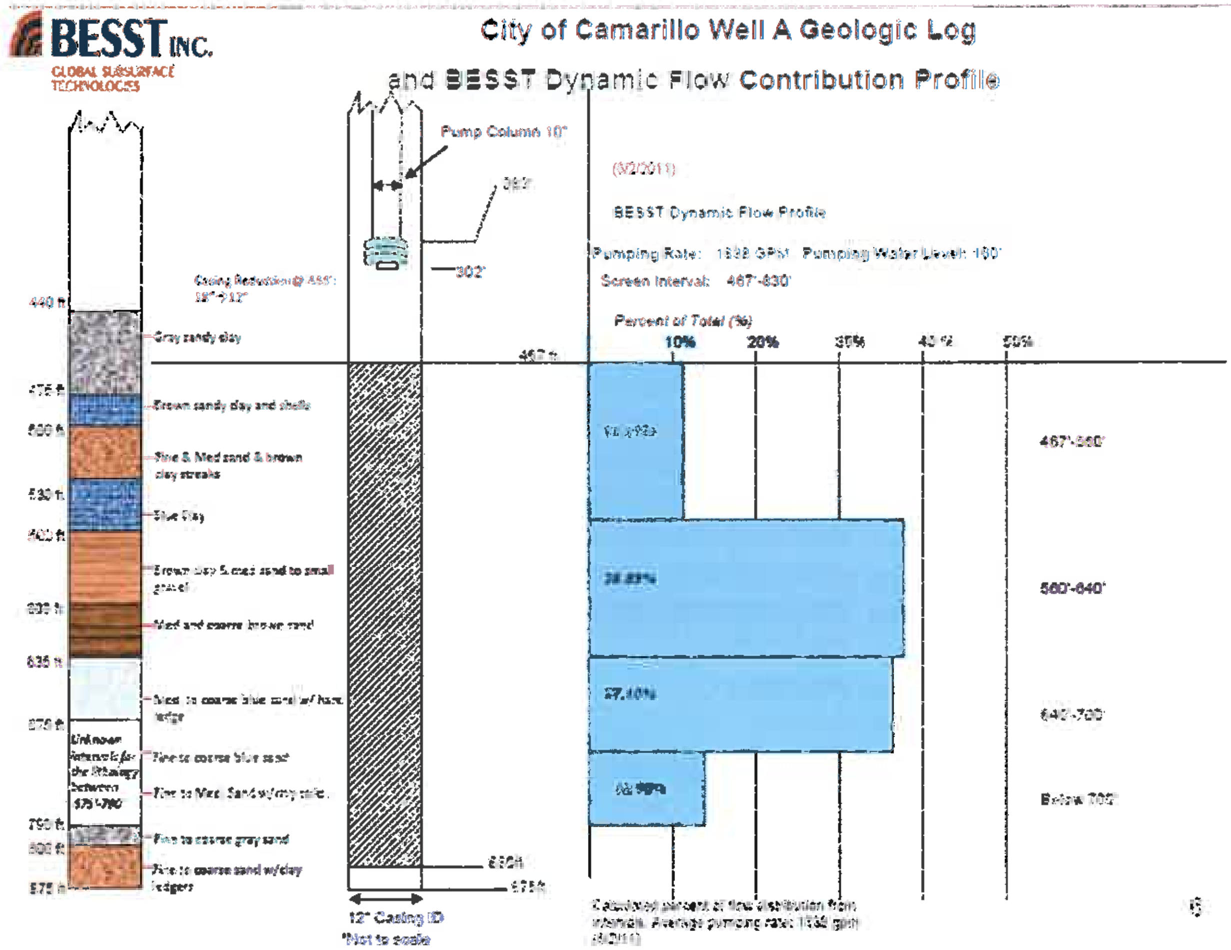
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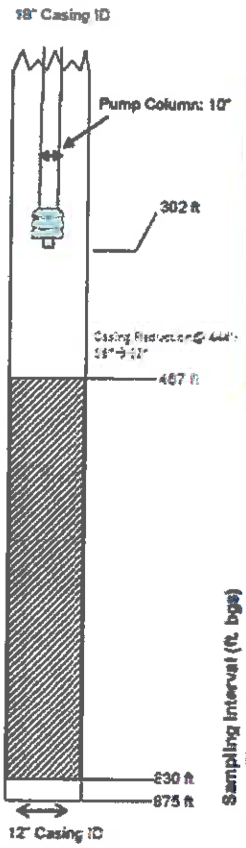
City of Camarillo Well A Geologic Log
and BESST Dynamic Flow Contribution Profile
Pump Column 10"
302'
Gray sandy clay
Brown sandy clay and shells
Fine & Med sand & brown clay streaks
Med and coarse brown sand
Fine to coarse gray sand
Fine to coarse sand w/clay ledgers
12" Casing ID
*Not to scale
BESST Dynamic Flow Profile
Screen Interval: 467'-830'
Percent of Total (%)
10%
20%
50%
27.10%
467'-560'
560'-640'




## Chemical Mass Balance Analysis: Sulfate

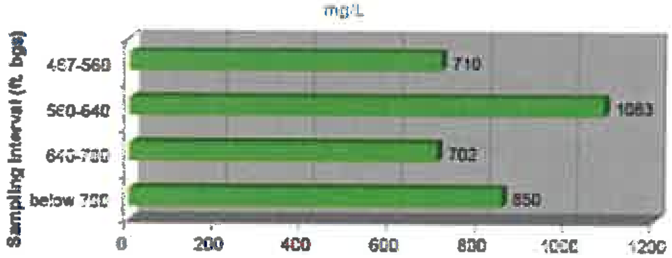
| Sulfate | ft. bgs | ft. bgs | GPM | mg/L | GPM | mg/L | | |
|---|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check | |
| | Top | 487-560 | 1838.00 | 870 | 204.22 | 710 | [illegible] | |
| | 560 | 560-640 | 1633.78 | 880 | 714.78 | 1083 | [illegible] | |
| | 640 | 640-700 | 919.00 | 740 | [illegible] | 702 | [illegible] | |
| | 700 | below 700 | 237.16 | 850 | 237.16 | 850 | [illegible] | |
| | | | | | | | [illegible] | 870 |

**Dynamic Chemical Profile: Camarillo Well A**

1838 GPM 6/2/11

*Sulfate*

mg/L

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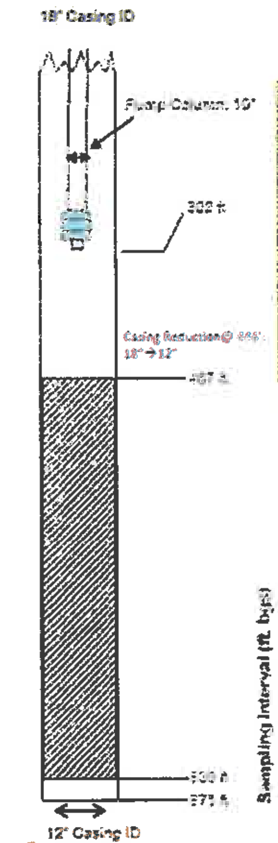
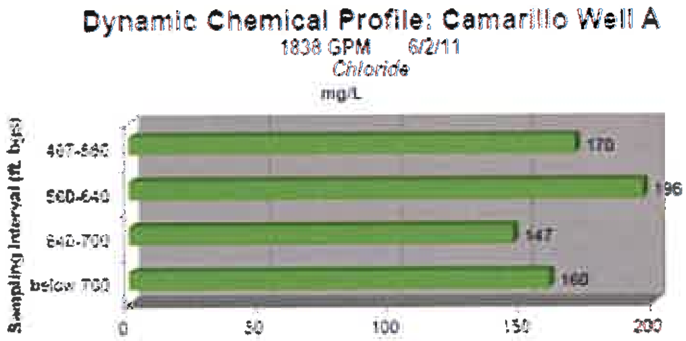



## *Chemical Mass Balance Analysis: Chloride*

| Chloride | ft. bgs | ft. bgs | GPM | mg/L | GPM | mg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 487-560 | 1838.00 | 170 | 204.22 | 170 | 34718 |
| | 560 | 560-640 | 1633.78 | 170 | 714.78 | 196 | [illegible] |
| | 640 | 640-700 | 919.00 | 150 | 681.84 | 147 | 99904 |
| | 700 | below 700 | 237.16 | 160 | 237.16 | 160 | 37946 |
| | | | | | | | 312400 / 170 |




The laboratory has reported a chloride concentration of 540 mg/L for the water sample taken at 560' which appears to be aberrant, evidenced by the cation:anion imbalance reported at this depth. With Tom Regan's consent, we've adjusted the measured concentrations to 170 mg/L to match what we agree is likely the case down hole. Confirmation is found in the agreement with the zonal concentrations seen in the Specific Conductance analysis on the next page.

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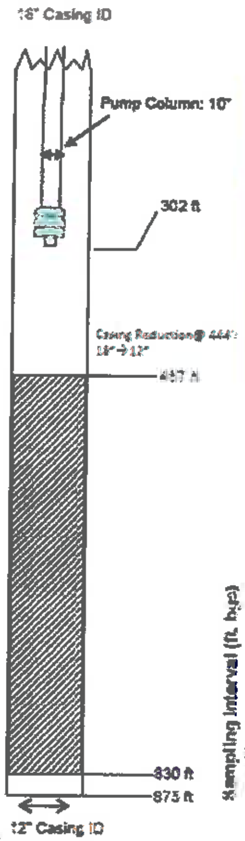
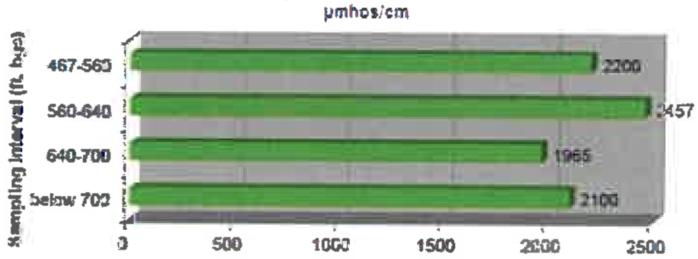



## Chemical Mass Balance Analysis: Specific Conductance

| Specific Conductance | ft. bgs | ft. bgs | GPM | µmhos/cm | GPM | µmhos/cm | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 467-560 | 1838.00 | 2,200 | 204.22 | 2200 | 449289 |
| | 560 | 560-640 | 1633.78 | 2,200 | 714.78 | 2457 | 1756311 |
| | 640 | 640-700 | 919.00 | 2,000 | 681.84 | 1965 | 1339961 |
| | 700 | below 700 | 237.16 | 2,100 | 237.16 | 2100 | 498039 |
| | | | | | | | 4043600 | 2200 |

Dynamic Chemical Profile: Camarillo Well A
1838 GPM 6/2/11
*Specific Conductance*
µmhos/cm

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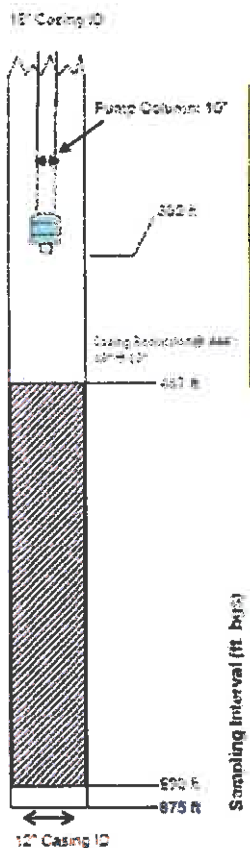



## Chemical Mass Balance Analysis: Total Dissolved Solids

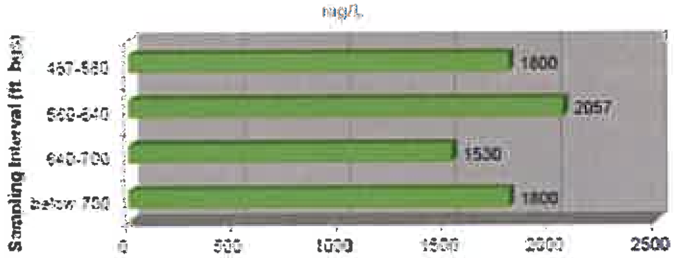
| TDS | ft. bgs | ft. bgs | GPM | mg/L | GPM | mg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | [illegible] Check |
| | Top | 467-560 | 1838.00 | 1,800 | 204.22 | 1800 | 367900 |
| | 560 | 560-640 | 1633.78 | 1,800 | 714.78 | 2057 | 1470300 |
| | 640 | 640-700 | 919.00 | 1,600 | 681.84 | 1530 | 1043310 |
| | 700 | below 700 | [illegible] | 1,800 | 237.16 | 1800 | 426890 |
| | | | | | | | 3308400 / 1800 |

### Dynamic Chemical Profile: Camarillo Well A

1838 GPM 6/2/11

*TDS*

mg/L

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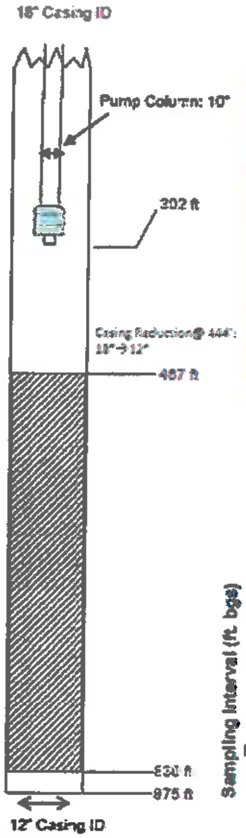



## Chemical Mass Balance Analysis: Iron

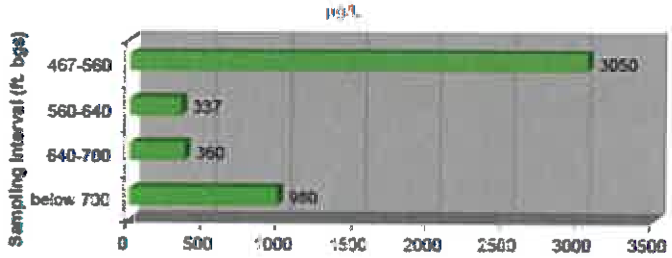
| Iron | ft. bgs | ft. bgs | GPM | µg/L | GPM | µg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 467-560 | 1838.00 | 730 | 204.22 | 3050 | 622878 |
| | 560 | 560-640 | 1633.78 | 440 | 714.78 | 337 | 240882 |
| | 640 | 640-700 | 919.00 | 320 | 681.84 | 360 | 245482 |
| | 700 | below 700 | 237.16 | 980 | 237.16 | 980 | 232418 |
| | | | | | | | 1341740 / 730 |

## Dynamic Chemical Profile: Camarillo Well A

1838 GPM 6/2/11

*Iron*

µg/L

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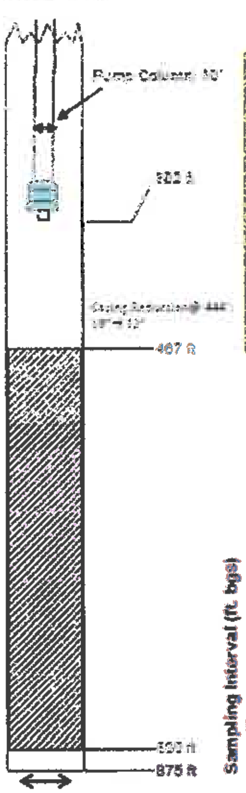
## Chemical Mass Balance Analysis: Manganese



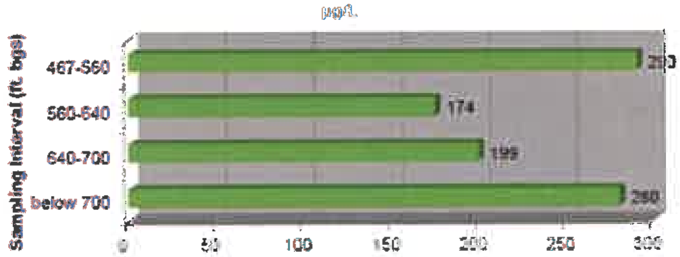

| Manganese | ft. bgs | ft. bgs | GPM | µg/L | GPM | µg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 467-560 | 1838.00 | 210 | 204.22 | 290 | 59224 |
| | 560 | 560-640 | 1633.78 | 200 | 714.78 | 174 | 124379 |
| | 640 | 640-700 | 918.00 | 220 | 631.84 | 199 | 135775 |
| | 700 | below 700 | 237.16 | 280 | 237.16 | 280 | 66405 |
| | | | | | | | 385983 / 210 |

### Dynamic Chemical Profile: Camarillo Well A

1838 GPM 6/2/11

*Manganese*

µg/L

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San Rafael, CA 94901
Toll Free 866.298.8701
Phone 415.453.2501
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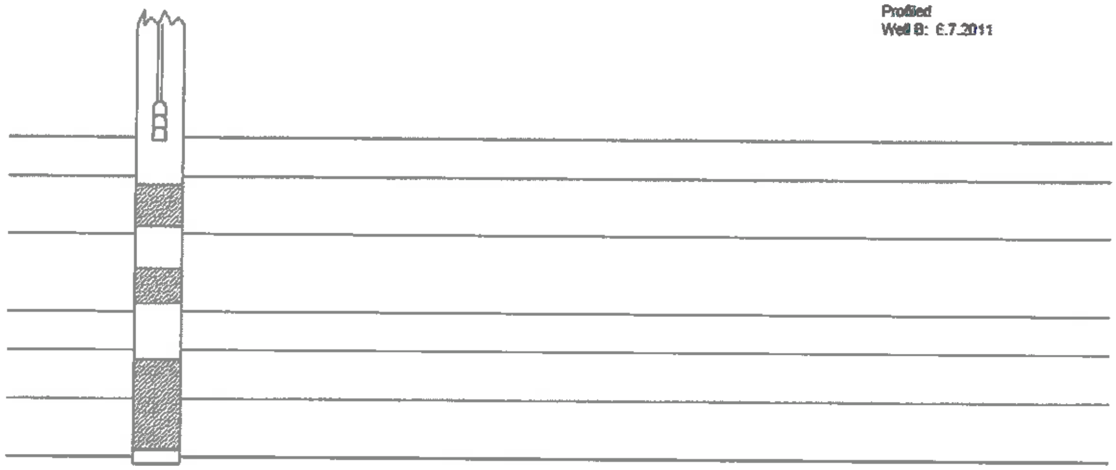
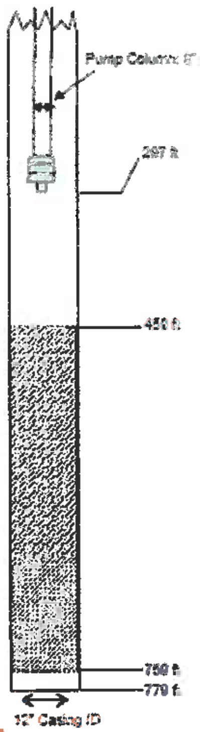
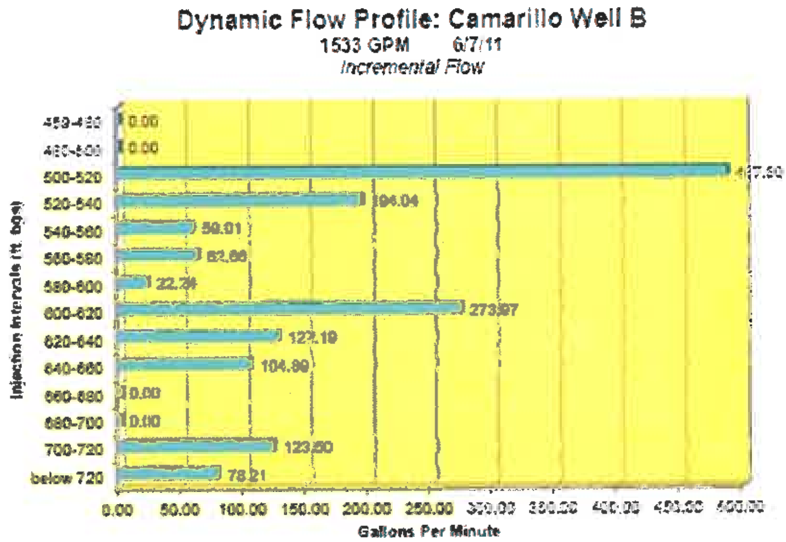
# Final Report: Dynamic Flow and Chemistry Profile
## City of Camarillo Well B

Profiled
Well B: 6.7.2011



## Dynamic Flow Contribution (GPM) By Depth and Screen Intervals




The graph shows dynamic flow contribution vs. the injection depth intervals (ft. bgs). There is one screen interval in Well B. The screened interval is between 459'-759' and produces a cumulative flow of 1533 GPM. This test was conducted under steady state conditions and pumping water level was between 63.1 and 63.6 ft below the top of the access pipe. The graph above shows a breakdown of incremental flow in relation to the Dye Injection intervals.

Note: There was no dye return at the surface when it was injected at or below 480 ft. bgs. This indicates that the vertical flow boundary layer is between 470 and 480 ft. bgs. There is no vertical/upward flow below 480 ft. bgs.

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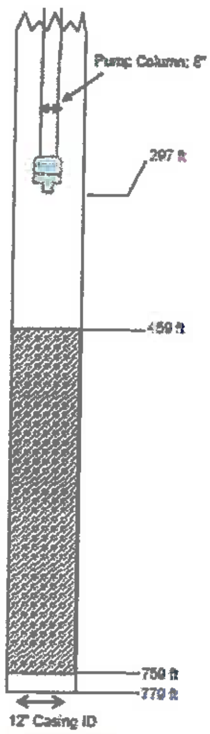
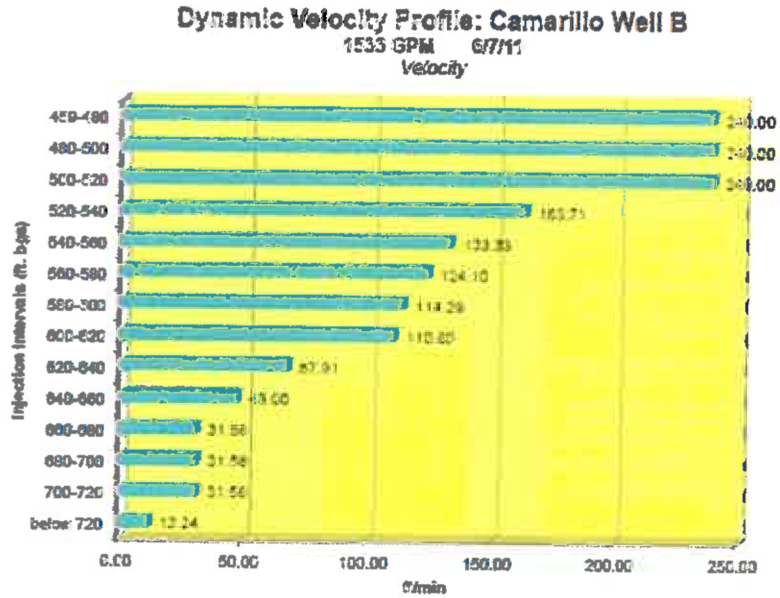
## Dynamic Flow Velocity By Depth and Screen Intervals

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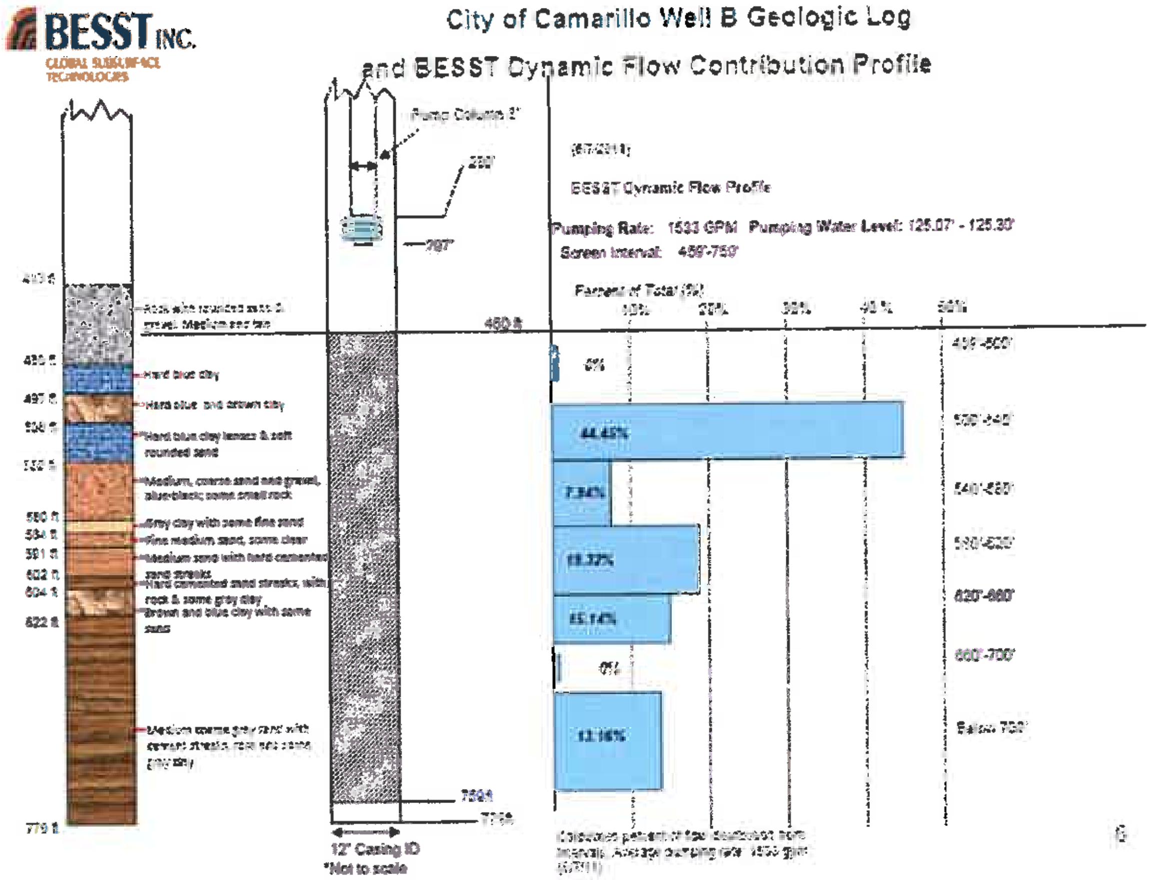
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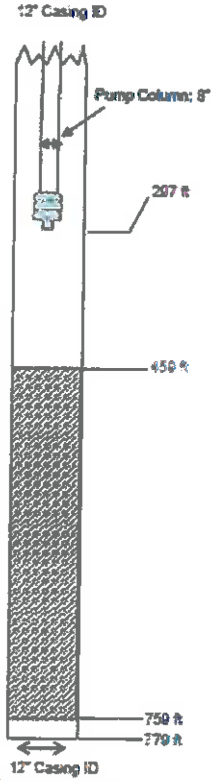
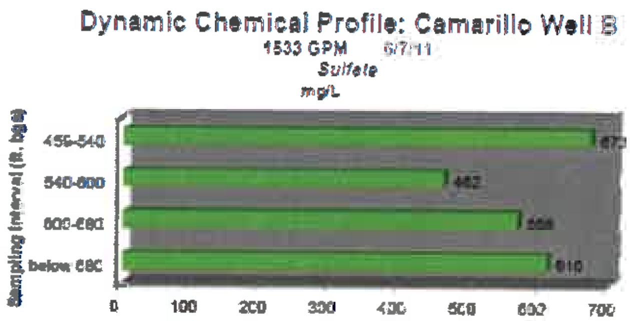
City of Camarillo Well B Geologic Log
and BESST Dynamic Flow Contribution Profile
Pumping Rate: 1533 GPM Pumping Water Level: 125.07' - 125.30'
Screen Interval: 459'-750'
460 ft
0%
44.45%
7.34%
18.32%
15.14%
0%
13.16%
620'-660'
12" Casing ID
*Not to scale
Hard blue clay
Hard blue and brown clay
Medium, coarse sand and gravel, blue-black; some small rock
Grey clay with some fine sand
Fine medium sand, some clear
Medium sand with hard cemented sand streaks
Hard cemented sand streaks, with rock & some grey clay
Brown and blue clay with some sand
497 ft
560 ft
591 ft
602 ft
622 ft
779 ft




## Chemical Mass Balance Analysis: Sulfate

| Sulfate | ft. bgs | ft. bgs | GPM | mg/L | GPM | mg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 459-540 | 1533.00 | 610 | 681.33 | 673 | 458537 |
| | 540 | 540-600 | 851.67 | 580 | 143.91 | 462 | 66435 |
| | 600 | 600-680 | 707.76 | 580 | 506.05 | 568 | 287435 |
| | 680 | below 680 | 201.71 | 610 | 201.71 | 610 | 123043 |
| | | | | | | | 935130 | 610 |

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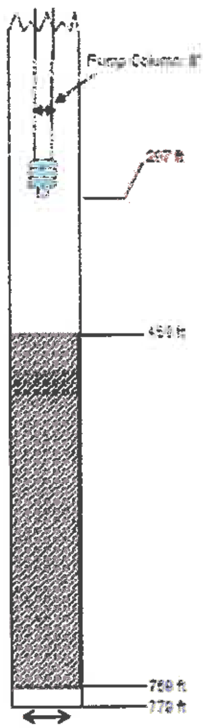


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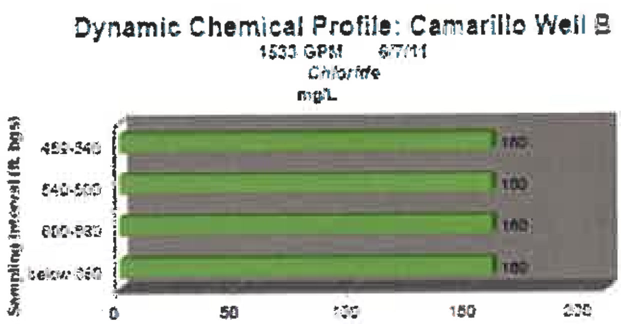
## *Chemical Mass Balance Analysis: Chloride*

| Chloride | ft bgs | ft bgs | GPM | mg/L | GPM | mg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 459-540 | 1533.00 | 160 | 631.33 | 160 | 101013 |
| | 540 | 540-600 | 901.67 | 160 | 143.91 | 160 | 23026 |
| | 600 | 600-680 | 757.76 | 160 | 306.05 | 160 | [illegible] |
| | 680 | below 680 | 201.71 | 160 | 201.71 | 160 | 32274 |
| | | | | | | | 245280 / 160 |

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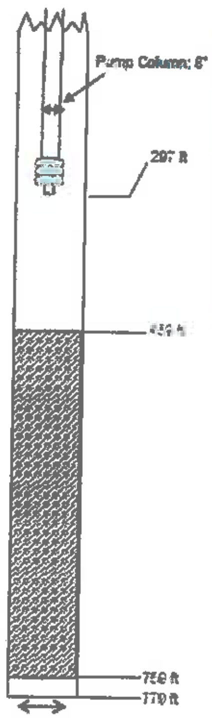


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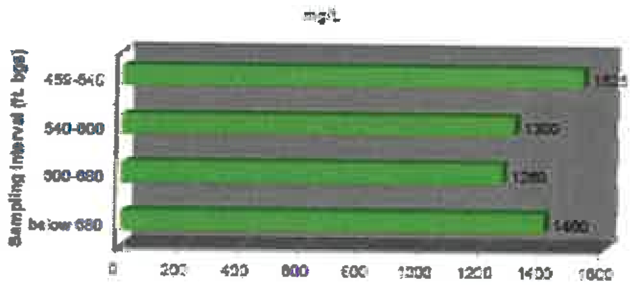
## Chemical Mass Balance Analysis: Total Dissolved Solids

| TDS | ft. bgs | ft. bgs | GPM | mg/L | GPM | mg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 459-540 | 1533.00 | 1,400 | 681.33 | 1525 | [illegible] |
| | 540 | 540-600 | 851.67 | 1,300 | 143.91 | 1300 | [illegible] |
| | 600 | 600-680 | 707.76 | 1,300 | 505.05 | 1260 | [illegible] |
| | 680 | below 680 | 201.71 | 1,400 | 201.71 | 1400 | [illegible] |
| | | | | | | | [illegible] |

Dynamic Chemical Profile: Camarillo Well B
1533 GPM 8/7/11
*TDS*

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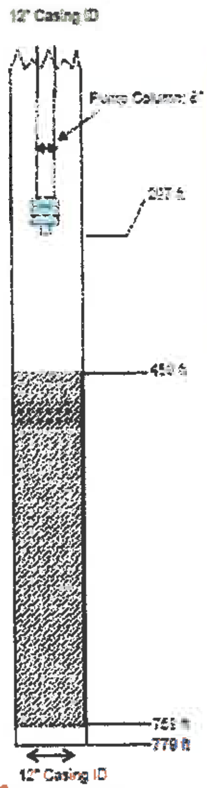


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## *Chemical Mass Balance Analysis: Iron*

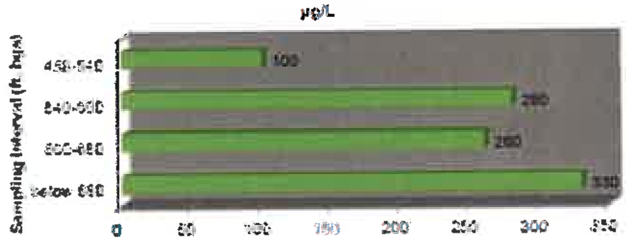
| Iron | ft. bgs | ft. bgs | GPM | µg/L | GPM | µg/L | |
|---|---|---|---|---|---|---|---|
| | Depth | Interval | Cumulative Flow | Measured Concentration | Incremental Flow | Incremental Concentration | Mass Balance Check |
| | Top | 459-540 | 1533.00 | 200 | 681.33 | 100 | 68133 |
| | 540 | 540-600 | 851.67 | 280 | 143.91 | 280 | 40295 |
| | 600 | 600-630 | 707.76 | 250 | 506.05 | 260 | 131607 |
| | 680 | below 680 | 201.71 | 330 | 201.71 | 330 | 66564 |
| | | | | | | | 306600 \| 200 |

### Dynamic Chemical Profile: Camarillo Well B

1533 GPM 6/7/11

*Iron*

µg/L

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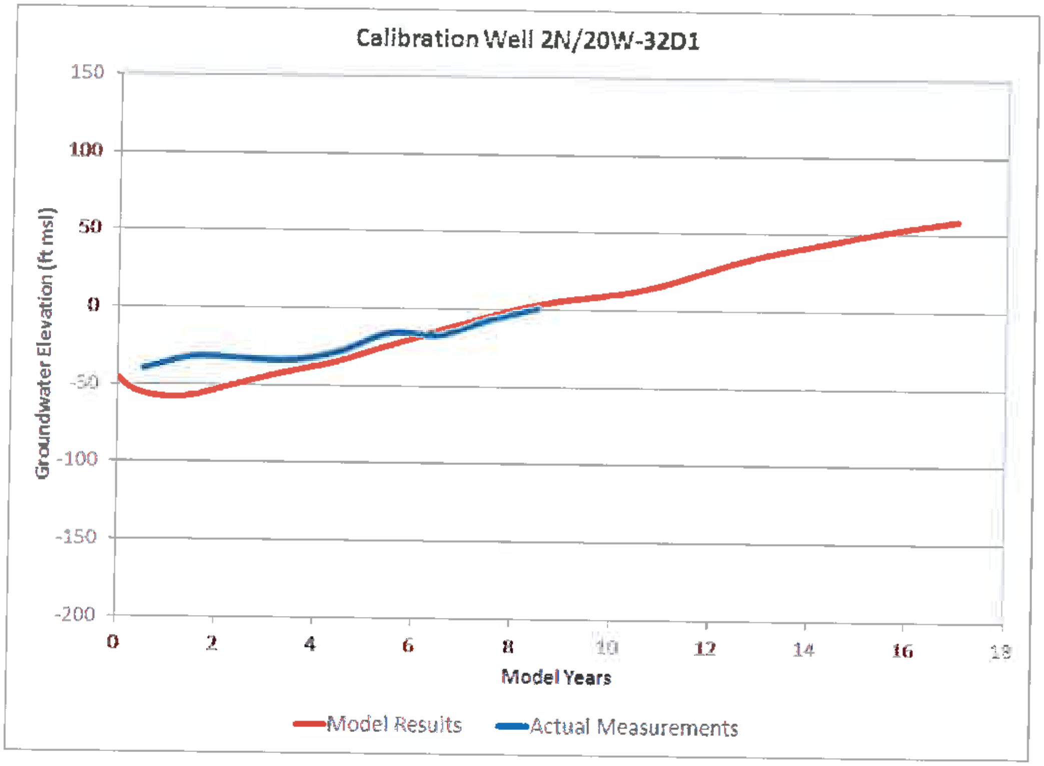
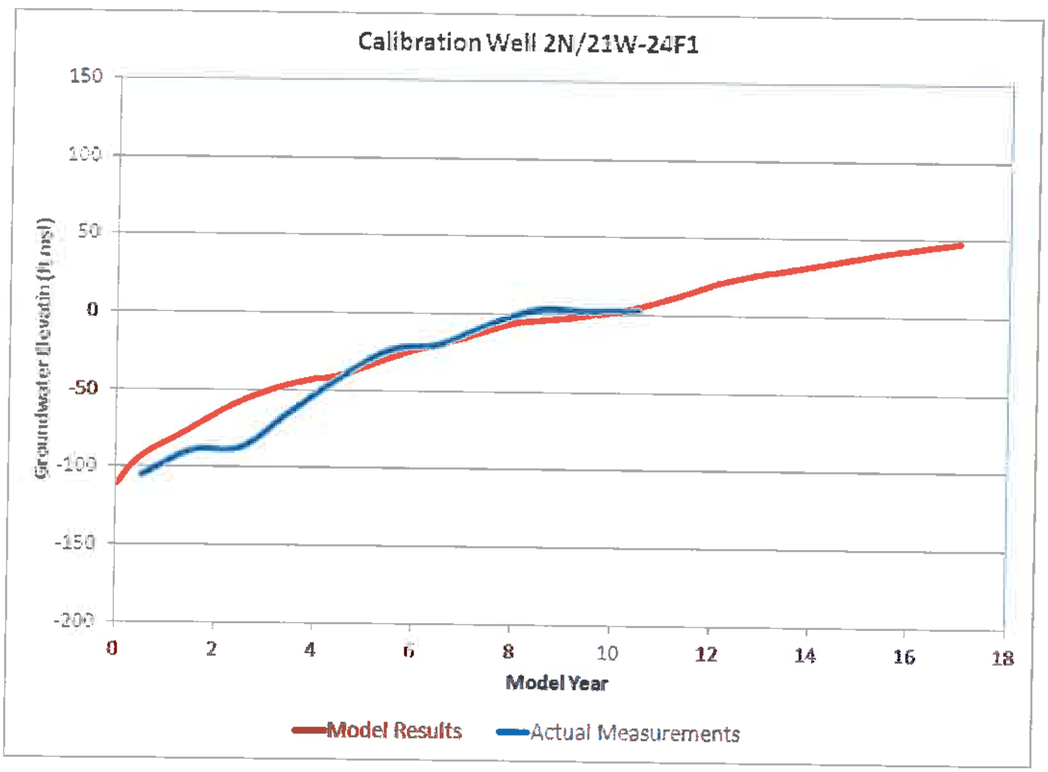
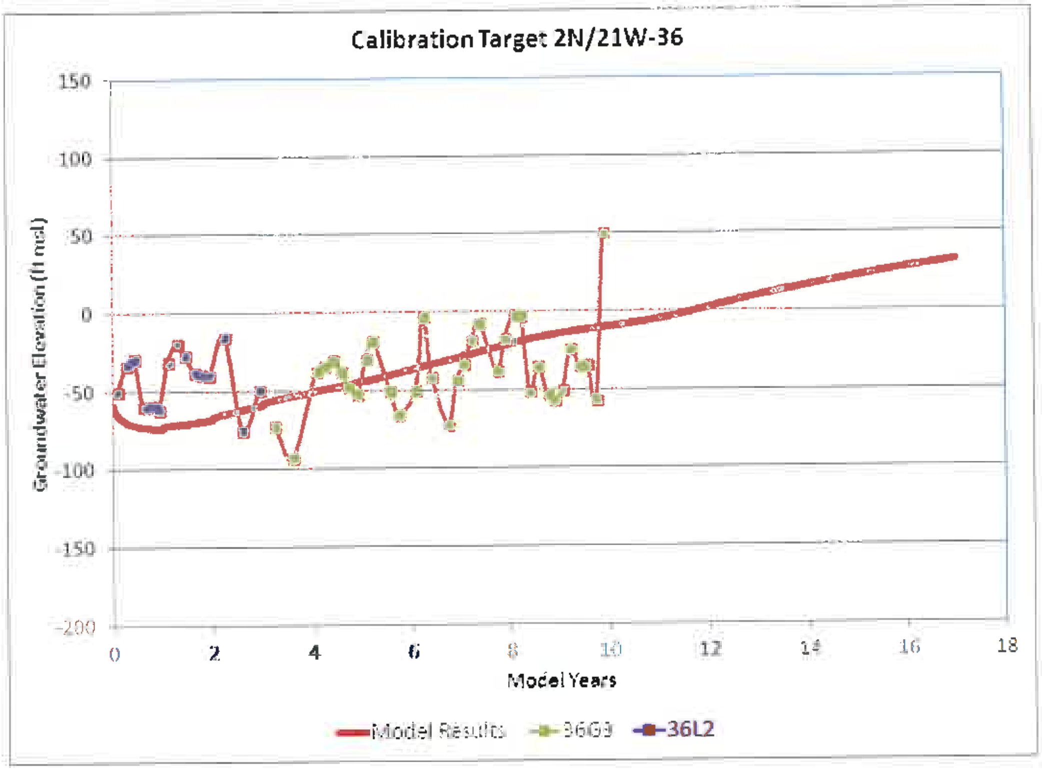
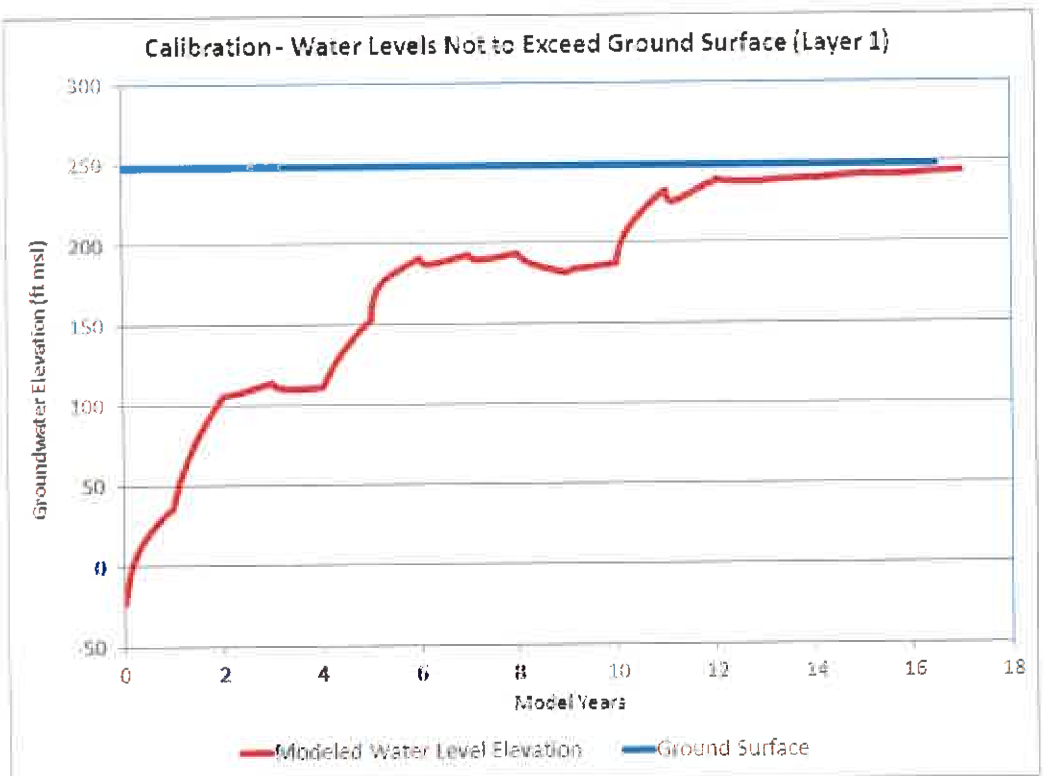
## 14.3 Additional Calibration Wells





Calibration Target 2N/21W-36
150
100
50
0
-50
-100
-150
-200
Groundwater Elevation (ft msl)
0
2
4
6
8
10
12
14
16
18
Model Years
Model Results
36G3
36L2

Calibration - Water Levels Not to Exceed Ground Surface (Layer 1)
300
250
200
150
100
50
0
-50
Groundwater Elevation (ft msl)
0
2
4
6
8
10
12
14
16
18
Model Years
Modeled Water Level Elevation
Ground Surface

## 14.4 Additional Project Results