APPENDIX A: NOTIFICATION

Following are 60-day notifications to the City of Camarillo, the City of Thousand Oaks, and the County of Ventura; CWD Resolution 21-10 Adopting the 2020 UWMP; and a public notice of the 2020 UWMP draft availability.

NOTICE OF PUBLIC HEARING
URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that a Public Hearing with the Camrosa Water District Board of Directors will be held:

---Thursday, June 24, 2021 at 5:00 PM ---

CAMROSA WATER DISTRICT
7385 Santa Rosa Rd. Camarillo, CA. 93012
(805) 482-4677

DUE TO CONTINUING COVID PRECAUTIONS,
THE PUBLIC IS AVAILABLE TO ATTEND VIA ZOOM:
https://us02web.zoom.us/j/9235309144
phone: (669) 900-6833; **meeting ID: 923 530 9144**

The purpose of this Public Hearing is to give the public the opportunity to submit written comments regarding the 2020 Urban Water Management Plan (UWMP) for the Camrosa Water District. The UWMP provides a comprehensive assessment of Camrosa's water resource needs for a 20-year planning period and provides the Department of Water Resources with information on present and future water supplies and demands. Copies of the UWMP are available for public review at **www.camrosa.com/uwmp**.

Written comments on the Plan are to be submitted by Monday, June 21, 2021 at 5:00PM to:

Mr. Ian Prichard, Assistant General Manager
IanP@camrosa.com
7385 Santa Rosa Road
Camarillo, CA 93012

To be published in the *Ventura County Star*: June 10th, 13th, and 20th, 2021.

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

Board of Directors
Al E. Fox
Division 1
Jeffrey C. Brown
Division 2
Timothy H. Hoag
Division 3
Eugene F. West
Division 4
Terry L. Foreman
Division 5
General Manager
Tony L. Stafford

Resolution No: 21-10

A Resolution of the Board of Directors
of Camrosa Water District

Adopting Camrosa Water District's 2020 Urban Water Management Plan

Whereas, the Urban Water Management Planning Act (Water Code Sections 10631-10633, 10635, 10642 et seq.) requires urban water suppliers providing municipal water directly or indirectly to more than 3,000 customers, or who supply more than 3,000 acre-feet of water annually, to adopt an Urban Water Management Plan; and,

Whereas, the Urban Water Management Planning Act further requires review of the Urban Water Management Plan at least once every five years; and,

Whereas, the Act mandates that the Urban Water Management Plan and amended versions be filed with the California Department of Water Resources; and,

Whereas, the District is an urban supplier of water serving a population of approximately 33,000; and,

Whereas, the District has therefore prepared and circulated for public review a draft Urban Water Management Plan; and,

Whereas, a properly noticed public hearing regarding said Plan was held by the Board of Directors on June 24, 2021; and,

Whereas, Camrosa Water District did prepare and shall file said Plan with the California Department of Water Resources by July 1, 2021;

Now, Therefore, Be It Resolved by the Camrosa Water District Board of Directors that the attached 2020 Urban Water Management Plan is hereby adopted this date.

Adopted, Signed, and Approved this 24th day of June, 2021.

____
Eugene F. West President
Board of Directors
Camrosa Water District

Tony Stafford
______________________________ (ATTEST)
Tony L. Stafford, Secretary
Board of Directors
Camrosa Water District

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

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Eugene F. West
Division 4
Terry L. Foreman
Division 5
General Manager
Tony L. Stafford

Jeff Pratt, Director of Public Works
County of Ventura
800 S. Victoria Ave.
Ventura, CA 93009

March 1, 2021

Mr. Pratt:

This letter is to inform you, pursuant to California Water Code Section 10621, that the Camrosa Water District is preparing a 2020 Urban Water Management Plan. A draft plan will be availale for review and comment at least two weeks prior to adoption. A public hearing will be held no sooner than June 10, 2021 and no later than June 24, 2021. Notice of the public hearing will be made pursuant to Govenrment Code 6066.

If you have any questions ahead of time or would like to request a copy of the draft UWMP, please contact me at 805.482.6562 or IanP@camrosa.com.

Thank you,

Ian Prichard, Assistant General Manager

7385 Santa Rosa Road
Camarillo, CA 93012

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

Cliff Finley, Director of Public Works
City of Camarillo
2100 Thousand Oaks Blvd.
Thousand Oaks, CA 91362

March 1, 2021

Mr. Finley:

This letter is to inform you, pursuant to California Water Code Section 10621, that the Camrosa Water District is preparing a 2020 Urban Water Management Plan. A draft plan will be available for review and comment at least two weeks prior to adoption.

A public hearing will be held no sooner than June 10, 2021 and no later than June 24, 2021. Notice of the public hearing will be made pursuant to Government Code 6066.

If you have any questions ahead of time or would like to request a copy of the draft UWMP, please contact me at 805.482.6562 or IanP@camrosa.com.

Thank you,

Ian Prichard, Assistant General Manager

7385 Santa Rosa Road
Camarillo, CA 93012

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

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Division 4
Terry L. Foreman
Division 5
General Manager
Tony L. Stafford

Lucie McGovern,Deputy Director of Public Works
City of Camarillo
601 Carmen Drive
Camarillo, CA 93010

March 1, 2021

Ms. McGovern:

This letter is to inform you, pursuant to California Water Code Section 10621, that the Camrosa Water District is preparing a 2020 Urban Water Management Plan. A draft plan will be availale for review and comment at least two weeks prior to adoption. A public hearing will be held no sooner than June 10, 2021 and no later than June 24, 2021. Notice of the public hearing will be made pursuant to Govenrment Code 6066.

If you have any questions ahead of time or would like to request a copy of the draft UWMP, please contact me at 805.482.6562 or IanP@camrosa.com.

Thank you,

Ian Prichard, Assistant General Manager

7385 Santa Rosa Road
Camarillo, CA 93012

APPENDIX C: ORDINANCE 40-21

Following is Camrosa's Ordinance 40-21, Rules and Regulations Governing the Provision of Water and Sanitary Service

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

Ordinance 40-21

Rules and Regulations

Governing the Provision of

Water and Sanitary Services

Adopted:

February 11, 2021

ORDINANCE 40-21

An Ordinance of the Camrosa Water District
Repealing Ordinance 40-20
And Establishing Rules and Regulations
Governing the Provision of
Water and Sanitary Services

The Board of Directors of the Camrosa Water District do ordain as follows on pages 3 through 31, attached:

By Motion of Director Terry L Foreman, Second by Director Timothy H Hoag, this ordinance is

ADOPTED, SIGNED, AND APPROVED this February 11, 2021.

Eugene F. West, President
Board of Directors
CAMROSA WATER DISTRICT

ATTEST:

Tony Stafford

Tony L. Stafford, Secretary
Board of Directors
CAMROSA WATER DISTRICT

Table of Contents

Camrosa Water District Rules and Regulations
Governing Water and Sanitary Services

1. PURPOSE

The purpose of this ordinance is to establish the terms and conditions of Camrosa's Water and Sanitary Services. These terms and conditions are intended to both assure the individual Customer of fair and equitable service and protect the community Camrosa serves from the undue exposure to liability. Water, Sewer, and Non-Potable Water service shall be available only in accordance with the Rules and Regulations contained herein, and in conformance with applicable federal, state and local statues, ordinances, regulations, and contracts.

2. GENERAL

Water and sanitary service by Camrosa Water District is subject to the availability of facilities, adequate capacity of facilities, and compliance with the terms and conditions herein set forth, or as may be augmented and set forth in any agreement or permit issued by the District.

3. DEFINITIONS

"Acre Foot" shall mean 43,560 cubic feet, which is equal to 435.6 Units or 325,851 gallons.

"Camrosa" or "District" shall mean Camrosa Water District.

"Customer" shall mean the applicant of record for water services rendered by District.

"Certified Backflow Device" shall mean equipment with proper and current certification, designed to prevent the reverse flow of Customer's system into District system.

"Cross-Connection" shall mean any unprotected connection between any part of a water system used or intended to supply water for drinking purposes and any source or system containing water or substance that is not or cannot be approved as safe, wholesome, and potable for human consumption.

"Guarantor" is the individual or entity that agrees to be responsible for the charges incurred by a Customer.

"Non-Potable Water" shall encompass Non-Potable Irrigation Water and Recycled Water, and mean groundwater, surface water, or recycled water that is intended for use for irrigation and other accepted uses for which potable water is not required.

"Non-Potable Irrigation Water" shall mean surface water diverted from the Conejo Creek, untreated groundwater pumped for distribution in the Non-Potable Irrigation Water Distribution System, and any other water source that does not meet Potable Water quality requirements, is not certifiable as Recycled Water, and is distributed in the Non-Potable Irrigation Water Distribution System.

"Non-Potable Irrigation Water Distribution System" shall mean the transmission and distribution piping and appurtenances that transport Non-Potable Irrigation Water.

"Potable Water" shall mean water that is intended for all general uses including human consumption, and, therefore, water that meets all primary drinking water standards set forth by the California Department of Drinking Water.

"Potable Water Distribution System" shall mean the transmission and distribution piping and appurtenances that transport potable water from the various potable water sources to the Customer.

"Pressure Zone" shall mean a hydraulic pressure subdivision within the Potable Water Distribution System and the Non-Potable Irrigation Water Distribution System that is hydraulically isolated from other pressure zones, demonstrates unique hydraulic pressure characteristics, and has unique energy requirements for delivery.

“Property” shall mean a parcel of land assigned a separate Assessor’s Parcel Number by the County of Ventura.

“Recycled Water” shall mean treated wastewater that meets State of California Title 22 standards at the discharge point of the Camrosa Water Reclamation Plant. Title 22 standards are established by the State of California and are not guaranteed beyond the plant’s point of discharge.

“Recycled Water Distribution System” shall mean the transmission and distribution piping and appurtenances, which transport effluent water from the Camrosa Water Reclamation Facility.

“Surplus Water” shall mean for the purposes of this Ordinance, water in excess of the current water demands within the boundaries of the District as determined by Camrosa Water District.

“Unit of Water” shall mean for the purposes of this Ordinance, one hundred cubic feet of water, which is equal to 748 gallons.

WATER SERVICE

4. ELIGIBILITY FOR WATER SERVICE

Camrosa provides Potable and/or Non-Potable Water Service to “Properties” within the District. To be eligible for Water Service the Customer shall satisfy both the General Requirements of Water Service and the requirements of the Type and Classification of Water Service listed below.

The District shall devote its best efforts to plan for and, on a case-by-case basis if necessary, prioritize provision of water services to proposed low-income housing developments pursuant to Government Code Section 65589.7.

Development projects that include low-income housing units shall not be denied approval of an application for service, nor shall conditions be imposed thereon or services reduced that are applied for, unless the District makes specific written findings that the denial, condition, or reduction is necessary due to the existence of one or more of the following:

1. Insufficient water supply or insufficient water treatment, distribution, or storage capacity;
2. A State Department of Public Health order prohibiting new water connections; and/or
3. The proposed development applicant has failed to agree to reasonable terms and conditions.

The District shall not discriminate in any manner when processing and considering requests for services by proposed developments that include low-income housing units.

4.1. General Requirements of Water Service

Water service is a Property-related service. The Property to be served shall be within the Camrosa Water District boundaries. The Property shall have an established water connection with a Camrosa water meter of adequate size and capacity, as determined by Camrosa, to serve the Property’s water needs without causing undue wear to the Camrosa metering facilities or interfering with Camrosa’s ability to provide reliable service to other Properties. The Customer shall have completed and submitted an application for water service, and paid any deposit that may be required as defined in this Ordinance and/or the “Schedule of Rates, Fees and Charges for Water and Sanitary Services” (located on the District’s web site, www.camrosa.com). The Customer must establish and maintain an active water service account that is current and free of any delinquent fees and charges. All applicable fees and charges must be paid in advance of receiving any of the following classifications of water service, including any classification-specific charges outlined below.

4.2. Types and Classifications of Water Service

Camrosa provides two (2) types of water service: Potable Water Service and Non-Potable Water Service. For each type of water service, Camrosa provides water based upon service classification. Specific terms and requirements for water service are based upon the type and classification of the Customer’s intended water use. Failure to continuously comply with any requirement for water service may result in re-classification of the service and/or termination of service.

4.2.1. Potable Water Service

To be eligible for Potable Water Service, the Customer shall satisfy both the General Requirements of Water Service contained in Section 4.1 and the following requirements of the classification of water use.

4.2.1.1. Municipal Water Service Classifications

The Municipal Water Service classification is intended to meet long-term potable water needs. It is considered uninterruptible service. To obtain this classification of water, Customers must meet the requirements of Camrosa's Will-Serve Policy.

4.2.1.1.1. Residential Water Service (Class I)

Residential Water Service (Class I) is intended for all general uses both indoor and outdoor. To be eligible for Residential Water Service, Class I the Property served must include a dwelling or other structure suitable for occupancy and meet all the General Requirements of Water Service. For purposes of the Policy on Discontinuation of Residential Domestic Water Service for Nonpayment (Section 6.9), Class I is considered "residential domestic" service and is subject to that policy.

4.2.1.1.2. Master Metered Residential Service (Class II)

Master Metered Residential Service (Class II) is intended for all general uses both indoor and outdoor. To be eligible for Master Metered Residential Service, the Property served must include multiple dwelling units, have a common plumbing system, be managed by a formal homeowners association (HOA), and have water service provided through one or more meters serving the common water system. The Property served must meet all the General Requirements of Water Service. The property must secure the approval of the General Manager in the will-serve process to qualify for Master Metered Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification. For purposes of the Policy on Discontinuation of Residential Domestic Water Service for Nonpayment (Section 6.9), Class II is considered "residential domestic" service and is subject to that policy.

4.2.1.1.3. Commercial and Industrial Water Service (Class III)

Commercial and Industrial Water Service (Class III) is intended for all general uses both indoor and outdoor at privately operated services, manufactories, or other businesses. To be eligible for Commercial and Industrial Water Service the Customer must provide a copy of a current business license and a Guarantor for the account. The primary water use must be a use other than irrigation. The Property must also meet all the General Requirements of Water Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification.

4.2.1.1.4. Public Water Service (Class IV)

Public Water Service (Class IV) is intended for all general uses both indoor and outdoor for public services, such as public schools, recreation facilities, hospitals, government services, and public safety services. To be eligible for Public Water Service the Property served must be publicly operated, and the primary water use must be a use other than landscape irrigation. The Property must also meet all the General Requirements of Water Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification.

4.2.1.1.5. Municipal/Residential Irrigation Service (Class V)

Municipal/Residential Irrigation Service (Class V) is intended for all general landscape irrigation needs where the primary use of water is to maintain large turf areas and other landscape for parks, golf courses, common areas, medians, open spaces and similar areas. To be eligible for Municipal/Residential Irrigation Service, the Property served must meet all the General Requirements of Water Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification.

4.2.1.1.6. Fire Service (Class VI)

Fire Service (Class VI) is intended to provide water for private fire flow needs either within a private complex to which Camrosa does not provide public fire hydrants, or for supplementary indoor fire flows. To be eligible for Fire Service, the Property serviced must maintain a separate and isolated fire service water system, and, rather than a conventional water meter, the service must include a fire flow detector meter that will detect the use of water on the fire flow system. Use of water through the fire flow system for other than fire protection shall disqualify the service from fire service classification and require compliance with a conventionally metered municipal service classification. The Property must also meet the General Requirements of Water Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification.

4.2.1.2. Agricultural Water Service Classifications

Agricultural Water Service is a class of service intended to serve commercial agriculture. This service, unlike Municipal Water Service, is interruptible. Agricultural Water Service may be interrupted for extended periods due to general water shortages, drought, maintenance requirements, and/or operational requirements. Agricultural Water Service may not be promptly restored following emergencies. Therefore, Agricultural Water Service shall not be eligible for conversion to Municipal Service without satisfying all will-serve requirements as set forth in the District’s will-serve policy.

4.2.1.2.1. Agricultural Irrigation Water Service

Agricultural Irrigation Water Service is intended for commercial agricultural properties that raise food crops, floral crops, nursery crops, and/or commercial livestock. It is not the intent of this ordinance to classify home gardens, home orchards, or pets as agricultural operations. To be eligible for Agricultural Irrigation Water Service, the Property must include a minimum of one (1) full, contiguous, irrigated acre dedicated to commercial agriculture, and the Customer must provide a copy of a current business license and a Guarantor for the account. The Property must meet all the General Requirements of Water Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification.

4.2.1.2.2. Domestic Agricultural Water Service

Domestic Agricultural Water Service is intended for commercial agricultural properties which raise food crops, floral crops, nursery crops, and commercial livestock, where the Property includes a dwelling or dwellings in which the residential water requirements are incidental to the agricultural operation. It is not the intent of this ordinance to classify home gardens, home orchards, or pets as agricultural operations. To be eligible for Domestic Agricultural Water Service, the Property must include a minimum of one (1) full, contiguous, irrigated acre dedicated to commercial agriculture, and the Customer must provide a copy of a current business license and a Guarantor for the account. The Property must meet all the General Requirements of Water Service. A certified backflow prevention device must be installed to Camrosa specifications, and be re-certified annually, in order to qualify for this classification.

4.2.1.3. Temporary Service

Temporary Water Service is service intended for Customers having short-term water use needs.

4.2.1.3.1. Temporary Construction Water

Temporary Construction Water Service is intended for dust abatement, general construction site use, and other construction related needs. The Property shall meet all the General Requirements of Water Service; a site, approved by Camrosa, shall be specified for installation of a Temporary Meter Service; the temporary meter installed; suitable backflow prevention techniques, approved by Camrosa, must be employed; and the Customer shall have completed and submitted an application for Construction Water Service. Construction Water Service shall be for a term no longer than six (6) consecutive months. On a case-by-case basis, the General Manager may authorize longer terms and determine the requirements of such terms.

4.2.1.3.2. Temporary Municipal Water

Temporary Municipal Water Service is intended for short-term needs for Potable Water Service, such as special events or community sponsored functions, which may require water service for a period not to exceed 30 days. On a case-by-case basis, the General Manager may authorize longer terms, and determine the requirements of such terms.

4.2.1.3.3. Temporary Agricultural Water

Temporary Agricultural Water Service is intended to provide short-term water service to agriculture operations, which do not have service to the Property and require water to supplement the primary water source for a term not to exceed one (1) year. On a case-by-case basis, the General Manager may authorize longer terms and determine the requirements of such terms.

4.2.1.4. Emergency Water Service

Emergency Water Service is intended to provide water for the protection of the health, safety, and/or property for a Customer unable to satisfy the requirements and conditions of Potable Water Service. Emergency service may be provided only after the General Manager has determined that the situation warrants an Emergency Water Service, and all fees and charges have been paid. Camrosa shall determine any additional terms and conditions as established in Camrosa’s *Schedule of Rates, Fees and Charges for Water and Sanitary Services*.

4.2.1.5. Surplus Water/Out of Bounds Service

Surplus Water may be served for any useful purpose outside the boundaries of the District by special agreement as authorized by the General Manager, and in accordance with LAFCO guidelines.

4.2.2. Non-Potable Water Service

Camrosa provides Non-Potable Water for a variety of irrigation, industrial, and commercial purposes. Non-Potable Water includes both Non-Potable Irrigation Water and Recycled Water. All Non-Potable Water Service is interruptible due to non-availability of water, system maintenance requirements, or operational requirements.

To be eligible for any of the following classifications of Non-Potable Water Service, the Customer shall satisfy the General Requirements of Water Service contained in Section 4.1, the Property must have access to one of the Non-Potable Water Distribution Systems, and the Property to be served must either have no Potable Water Service, or have a certified backflow prevention device on the Potable Water Service, and a separate non-potable plumbing system with no existing or potential cross-connections. If a backflow prevention device is required, it must be installed per Camrosa specifications and be re-certified annually.

Customers must have a beneficial use for Non-Potable Water approved by Camrosa and meet the requirements of the specific Non-Potable Water classification of water use.

The District has entered into separate agreements for delivery of Non-Potable Water and may again enter into such agreements.

Qualifications and requirements for use of Non-Potable Water by individual residents may require approval by the Department of Drinking Water (DDW) before Camrosa provides service. In addition, DDW and/or Camrosa may require periodic inspections of privately operated non-potable irrigation water systems to assure that no cross-connections exist.

4.2.2.1. Non-Potable Irrigation Water Description and Classification

Non-Potable Irrigation Water is water diverted from the Conejo Creek and/or untreated groundwater introduced into the Non-Potable Irrigation Water Distribution System. The Conejo Creek is composed primarily of wastewater effluent from the Hill Canyon Wastewater Treatment Plant (HCTP), located seven miles upstream of the diversion structure in the City of Thousand Oaks, and supplemented by the North and South Forks of the Conejo Creek, which carry runoff from the city and surrounding watershed. While HCTP effluent is treated to tertiary levels and is certified as Title-22 recycled water, after entering a naturally occurring waterway it is considered non-potable “surface” water and is not regulated in the same manner as Recycled Water and must be distributed in a separate distribution system. The following outlines the classifications of Non-Potable Water Service available from Camrosa Water District.

4.2.2.1.1. Commercial Agricultural (Class I)

Commercial Agricultural (Class I) is intended for general irrigation purposes on lands requiring water to irrigate commercial crops. To receive water under this classification, the lands must be primarily used for production of commercial crops, and the Customer must provide a copy of a current business license and a Guarantor for the account.

4.2.2.1.2. Landscape Irrigation (Class II)

Landscape Irrigation (Class II) is intended for commercial operations, public landscaping such as public parks, medians, playing fields and schools, and common-area landscaping needs of homeowners' associations where large amounts of irrigation water are needed to maintain turf areas or other landscaping. To qualify for this class, the Property must be primarily turf or other high-water-demand landscaping, and the Customer must provide a copy of a current business license and a Guarantor for the account.

4.2.2.1.3. Residential Landscaping (Class III)

Residential Landscaping (Class III) is intended for irrigation of landscape, gardens, orchards, and other appropriate outdoor water uses.

4.2.2.1.4. Temporary Construction Water (Class IV)

Temporary Construction Water (Class IV) is intended for uses related to general construction such as dust abatement, compaction, and roadway cleaning. To be eligible for Class IV Non-Potable Service: (1) a construction site must have access to a Non-Potable Water supply; (2) the Property must be permitted by Camrosa for use of Non-Potable Water; (3) the Customer shall make deposits and pay any special fees and charges as set forth in the Schedule of Rates, Fees and Charges for Water and Sanitary Services; and (4) the Customer shall agree to comply with all State and County Department of Public Health requirements for uses of Non-Potable Water.

4.2.2.1.5. Commercial Agricultural (Class VI)

This class is reserved for Customers that have contractual commitments with Camrosa for long-term Non-Potable Irrigation Water Service. Minimum requirements for Class VI service are: (1a) the parcel served is a minimum of 20 acres; or (1b) the parcel is joined with a larger parcel totaling 20 acres and is considered part of the larger parcel's operation as determined by Camrosa; (2) the lands are primarily used for production of commercial crops; (3) the owner of the land has endorsed, submitted, and secured approval of a Non-Potable Irrigation Service Agreement with Camrosa Water District on or before December 31, 1994; and (4) the Customer must provide a copy of a current business license and a Guarantor for the account.

4.2.2.1.6. Blended Ag (Class VII)

Blended Ag water service is a classification of Non-Potable Water blended with potable water to control for chlorides. It is limited by facility constraints to those parcels receiving delivery from Pump Station #4. The District strives to maintain a chloride concentration of approximately 115 mg/L in the Blended Ag system.

4.2.2.2. Recycled Water Description and Classification

Recycled Water is water produced at the Camrosa Water Reclamation Facility, a Department of Drinking Water (DDW)-certified water reclamation facility and treated to tertiary standards as defined by Title 22 of the California Water Code. Recycled Water is not suitable for human or livestock consumption or recreational impoundment, and may not be suitable for certain crop types, among other limitations. Camrosa is required to meet Title-22 Recycled Water quality standards at the point of discharge from the Camrosa Water

Reclamation Facility but cannot guarantee the quality of Recycled Water at the point of delivery. Use of Recycled Water must comply with California Code of Regulations Title 22, which is summarized in Camrosa's Recycled Water Manual, available in English and Spanish upon request.

Camrosa provides Recycled Water for a variety of irrigation, industrial, and commercial purposes. Currently the District does not deliver Recycled Water to residential parcels; should a residential distribution system be developed, it will fall under Class II, Landscape Irrigation Water, until a new classification is developed.

To be eligible for Recycled Water Service Customers must: (1) have a beneficial use for Recycled Water; (2) meet the requirements of the specific classification of Recycled Water; (3) satisfy the General Requirements of Water Service contained in Section 4.1 above; (4) have available and agree to operate an approved Recycled Water facility in accordance with Camrosa's Recycled Water Manual and Ordinance with 41, Standards for Maintenance and Operation of Recycled Water Facilities; (5) execute (or receive an executed copy from the landowner of) an approved Agreement for Recycled Water Service with Camrosa Water District; and (6) have a compliant Recycled Water Inspection on file with Camrosa. The provisions of Ordinance 41 are fully incorporated by reference into these rules and regulations.

Qualifications and requirements for use of Recycled Water by individual residents may require approval by the DDW before Camrosa provides service. All applications of Recycled Water must be visibly and legibly posted in accordance with Department of Drinking Water regulations for use of Recycled Water in areas open to the general public.

The following outlines the classifications of Recycled Water service available from Camrosa Water District.

4.2.2.2.1. Commercial Agricultural (Class I)

Commercial Agricultural (Class I) is intended for lands requiring large amounts of water for irrigation of commercial crops. To receive water under this classification, the lands must be primarily used for production of commercial crops, and the Customer must provide a copy of a current business license and a Guarantor for the account.

4.2.2.2.2. Landscape Irrigation Water (Class II)

Landscape Irrigation Water (Class II) is intended for non-agricultural commercial, industrial, and/or public Customers, including parks, golf courses, and other sites with large areas of turf and/or landscaping. The Property to be served must be used primarily for recreational, decorative, or other purposes approved by the District. The Customer must provide a copy of a current business license and a Guarantor for the account.

4.2.2.2.3. Commercial Agriculture (Contractual) (Class IV)

Commercial Agriculture (Class IV) is intended for lands requiring large amounts of water for commercial crops and contractual commitments with Camrosa for long-term Recycled Water Service. To be eligible for Class IV Service, the Property to be served must be used primarily for the production of commercial crops, the owner of the land must have endorsed, submitted, and secured approval of a Recycled Water Service Agreement with Camrosa Water District on or before December 31, 1994, and the Customer must provide a copy of a current business license and a Guarantor for the account.

4.2.2.2.4. Surplus Recycled Water (Served outside District)

Surplus Recycled Water may be served for any of DDW-approved use outside the boundaries of the District by special agreement, as authorized by the General Manager.

5. CONDITIONS OF WATER SERVICE

In addition to the General Requirements of Water Service contained in this ordinance, the Customer agrees, upon receiving service, to the conditions contain in this ordinance. Failure to meet the conditions contained herein may result in termination of service.

5.1. Cross-Connection Control (Backflow)

The Customer shall be responsible for the prevention of cross-connections of the Customer's system with sources of potential contamination. Any Customer that has an alternate source of water to the Property served by Camrosa, regardless of classification, shall maintain the water systems separately, and shall maintain a certified backflow prevention device at the Property's potable water service meter. At the discretion of the District, Camrosa may require the installation of a backflow device on any service provided by the District. Customers required to maintain backflow prevention equipment shall certify the equipment annually, except in those instances where the backflow prevention devices are maintained by Camrosa. In those instances, Camrosa shall test and certify the equipment annually and charges shall apply in accordance with Camrosa's Schedule of Rates, Fees, and Charges.

5.2. Water Pressure and Surges

Camrosa is not responsible for damages resulting from pressure variations or surges. It is the responsibility of the Customer to protect the Property from variations in water system pressure and water system surges. The Customer shall not operate the Property's system in a manner which may cause surges to the Camrosa water system.

5.3. Water Leaks

Camrosa's control and responsibility ends at the curb shutoff or meter, and the District will in no case be liable for damage caused by, or in any way arising out of, the running or escape of water from open faucets, burst pipes, or faulty fixtures on the premises. The Customer shall maintain the Property's water system to avoid leaks and shall repair leaks within 48 hours of discovery or notification or as required by the current Water Shortage Contingency Plan stage.

5.4. Meters, Metering Facilities and Hydrants

The meter and the metering facility are the property of the Camrosa Water District. Any piping or equipment on the Customer's side of the meter is the full responsibility of the Customer. All water that passes through the meter is the responsibility of the Customer.

Any damage to District equipment, such as meters and hydrants, caused either purposely or accidently, will be the financial responsibility of the Customer and/or the party causing such damage, as well as any water loss resulting from such damage.

5.4.1. Meter Testing

Any Customer may request that their water meter be examined and tested by the District for the purpose of determining its accuracy. Such a request shall be in writing and shall be accompanied by a deposit equal to the charge for testing. Upon receipt of such demand and deposit, the District will have the meter examined. If the meter is found to register one and one half percent (1.5%) more water than actually passes through it, the meter will be properly adjusted or another meter substituted therefor, the deposit will be returned, and the water bill for the current month will be adjusted proportionately. If the meter should be found to register no more than one and one-half percent (1.5%) more water than actually passes through it, the deposit will be retained by the District to offset the expense of performing the test.

5.4.2. Obstruction of, or Deposit of Material in, on, or around Meter Boxes or Hydrants

No person shall place, dispose or deposit or permit the placement, disposal or deposit of oil, toxic hazardous or contaminated liquid or waste, trash, dirt building materials or other substances, objects or obstructions in on or around meter boxes or hydrants. It shall be the responsibility of the Customer to prevent meter boxes, District hydrants, or other District facilities, from becoming obstructed or obscured by fencing, trees, shrubs, plants, or in any other manner so as to impede their use or access to them, or make their location difficult to determine. If such objects or obstructions are not cleaned or removed, the District may, after providing reasonable notice to the Customer, accomplish the cleaning and removal of any objects, and charge the Customer for the cost of doing so.

5.4.3. Change of Meter Location

Any change to the location of a meter and service must be approved by the District prior to construction. The cost of making such a change, including inspection fees, will be paid for by the Customer.

5.5. Resale of Water

The Customer shall not resell water received through their meter service to a third party except by express written consent of the District. In the case where the Customer has established a Master Metered account for a property, or where a Customer is leasing their property to another and still maintains the water account for the property in the Customer’s own name, the Customer shall not resell water to others at a volumetric rate higher than the District charges the Customer.

5.6. Exporting Water

The Customer shall not export water from the Property assigned service by Camrosa to any other Property without the express written permission of Camrosa. This prohibition includes other Properties under the same ownership.

5.7. Water Quality

5.7.1. Potable Water

Potable water provided by Camrosa meets or exceeds all primary drinking water requirements set forth by the California Department of Public Health. Camrosa water does contain minerals that contribute to “hardness,” which may result in the accumulation of mineral deposits. Camrosa is not liable for discoloration, spotting, or any other damages resulting from the mineral content of the water.

5.7.2. Non-Potable Water

Non-Potable Water—both Non-Potable Irrigation Water and Recycled Water—is not suitable for human or livestock consumption and may not be suitable for certain crop types. Camrosa is not responsible for any damages to crops or plants, or any other liability, resulting from the use of Non-Potable Water delivered by Camrosa.

Non-Potable Irrigation Water may contain surface water diverted from Conejo Creek and groundwater, both of which are unfiltered and untreated. Non-Potable Irrigation

Water is not suitable for human or livestock consumption and may not be suitable for certain crop types.

Camrosa is required to meet Title-22 Recycled Water quality standards at the point of discharge from the Camrosa Water Reclamation Facility but cannot guarantee the quality of Recycled Water at the point of delivery. Use of Recycled Water must comply with California Code of Regulations Title 22 governing the use of recycled water, which is summarized in Camrosa's Recycled Water Manual, available in English and Spanish upon request.

5.8. Interruptions in Service for System Maintenance

Camrosa may interrupt service from time to time for routine maintenance, repairs, and meter testing. Camrosa is not responsible for any damages to the Customer or Property, or other losses as a result of such interruptions.

5.9. Automatic Fire Sprinkler Service Connections

When an Automatic Fire Sprinkler Service Connection is installed, the control valve for the sprinkler system will be left closed and sealed until a written request to turn on the water is received from the Customer. After the water is turned on, the District shall not be liable for damages of any kind that may occur due to the installation, maintenance or use of such service connection, or because of fluctuation of pressure or interruption of water supply. Water shall not be used through an Automatic Fire Sprinkler Service Connection for any purpose other than the extinguishing of fires, or a purpose related thereto.

5.10. Access to District-Owned Facilities

Camrosa shall have access to all District-owned meters, pipelines, and appurtenant facilities at all times. No person shall willingly obstruct or prevent access to District-owned facilities.

5.11. Right of Inspection of and Access to Customers Premises

By accepting service from Camrosa, the Customer agrees that authorized representatives of the District may enter upon the Customer's premises for the purpose of:

1. Facilitating the enforcement of this Ordinance.
2. Performing duties associated with meter reading, repair, or replacement.
3. Determining the existence, operation, maintenance, and/or use in, on, or about buildings, grounds, or premises of:
    a. Any plumbing or water piping that may cause, create or permit backflow, back-siphonage or any other condition affecting or likely to affect the purity and/or potability of the water supply furnished by the District;
    b. Any private source of water supply which may be connected to the water supply system of the District; or,
    c. Any source of pressure, vacuum, contamination, or pollution affecting or likely to affect the purity and/or potability of the water supply furnished by the District.

5.12. Tampering with Metering Facilities

Tampering with any Camrosa facility in any manner that results in damage to the facility, loss of water by leakage, meter malfunction, and/or theft may result in immediate termination of service and both civil and criminal prosecution.

5.13. Water-Use Prohibitions

No person shall cause or permit water under his/her control to be used in violation of the District's water-use prohibitions. Violating water-use prohibitions may result in additional fees, charges and/or termination of service as authorized by the General Manager.

The following prohibitions are in effect at all times, regardless of whether any declared Water Supply Shortage or Water Emergency (see Section 5.16) is in effect:

1. Runoff/Outdoor Landscapes: No person shall use or permit the use of any water furnished to any property within the District in a manner that causes runoff such that water flows onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures, from any hose, pipe, valve, faucet, sprinkler or irrigation device into any gutter or to otherwise escape from the property, if such running or escaping can reasonably be prevented.
2. Leaks: No person shall permit leaks of water that he/she has the authority to eliminate. Any detected leak, break, or malfunction shall be corrected within 48 hours after a person discovers or receives notice from the District.
3. Positive Hose-end Shutoff: All garden and utility hoses shall be equipped with a shutoff nozzle.
4. Vehicle Washdown: Vehicles, including but not limited to any automobile, truck, van, bus, motorcycle, boat, or trailer, shall be cleaned only by use of a hand-held bucket or a hand-held hose with a shutoff nozzle.
5. Restaurant Equipment: Restaurants are required to use water-conserving dish-washing spray valves in all food preparation and utensil cleaning areas.
6. Drinking Water Served Only Upon Request: Drinking water must be served only upon request in eating or drinking establishments, including but not limited to restaurants, hotels, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased.
7. Water Fountains and Decorative Water Features: Operating a water fountain or other decorative water feature that does not use re-circulated water is prohibited.
8. Single-Pass Cooling Systems: Installation of single pass cooling systems in buildings requesting new water service is prohibited.
9. Hardscape Washdown: The application of potable water to driveways and sidewalks is prohibited.
10. Rain Events: The application of potable water to outdoor landscapes during or within 48 hours after measurable rainfall is prohibited.
11. Medians: The irrigation with potable water of ornamental turf on public street medians is prohibited.
12. New Construction: Landscapes outside of newly constructed homes and buildings must be consistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.
13. Hotel Operators: Operators of hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily. The hotel or motel shall prominently display notice of this option in each guestroom using clear and easily understood language.

5.14. Mandatory use of Non-Potable Water Where Available

Where Non-Potable Water is available to a property served by Camrosa, the property shall utilize such water in lieu of Potable Water, wherever practicable. Non-Potable Water must be used for construction purposes, when available.

5.15. Water Shortage Contingency Plan Stages

State law requires that urban water suppliers maintain Water Shortage Contingency Plans to prepare for and respond to water shortages. Camrosa's Water Shortage Contingency Plan is described in full in its Urban Water Management Plan; this section describes the stages of action to be undertaken in response to water supply shortages, and the process by which the Board of Directors may implement those stages.

Two (2) contingencies can trigger the Water Shortage Contingency Plan: a "Water Supply Shortage" and a "Water Emergency."

A Water Supply Shortage is a condition in which Camrosa Water District determines that drought, state or regional mandate, or other circumstance compromises, or threatens to compromise, the District's supplies in such a way that a reduction in Customer demand and/or supply production is necessary.

A Water Emergency is a condition resulting from a catastrophic event or events that causes, or threatens to cause, an impairment, reduction, or severance of the District's water supplies or access thereto, in a manner that results in, or may result in, the District's inability to meet ordinary water demands for Potable Water Service.

In the event of either contingency, the General Manager shall report to the Board of Directors on the cause, extent, severity, and estimated duration of the supply shortage or emergency. The Board may activate one (1) of the following stages by declaring, by resolution, a Water Supply Shortage or Water Emergency, modifying it as necessary to accommodate specific requirements or eventualities not anticipated by this policy. The District shall notify its Customers of this declaration via its Web site, newspaper, radio, television, direct mail, or any other means determined by the District to be prudent.

5.16. Stage One Water Supply Shortage or Water Emergency

The goal of a Stage One Water Supply Shortage or Water Emergency is to reduce potable water production by up to 15 percent to preserve water supplies for the District and/or the region, until the shortage or emergency has ended. In addition to the prohibited uses of water outlined in Section 5.14, the following water conservation requirements apply during a declared Stage One Water Supply Shortage or Water Emergency;

1. Limits on Watering Hours: Watering or irrigating of lawn, landscape or other vegetated area with potable water shall be prohibited between the hours of 9:00 A.M. and 5:00 P.M. on any day.
2. Other Prohibited Uses: The District may implement other water-use requirements as determined appropriate to meet water supply shortages or water emergency conditions.

5.17. Stage Two Water Supply Shortage or Water Emergency

The goal of a Stage Two Water Supply Shortage or Water Emergency is to reduce potable water demands by 15 to 30 percent, while preventing the loss of property and protecting the health and safety of the community and region. In addition to the prohibitions listed in the Stage One Water Supply Shortage or Water Emergency, the following water conservation requirements to prudently preserve water supplies shall be observed:

1. Leaks: No person may permit leaks of water that he/she has the authority to eliminate. Any detected leak, break, or malfunction shall be corrected within 24 hours after a person discovers or receives notice from the District.
2. Limits on Watering Days: Water or irrigating of landscape or other vegetated area with potable water shall be limited to three (3) days per week on a schedule established and posted by the District.
3. Limits on Filling Residential Swimming Pools & Spas: Use of water to fill or refill swimming pools and spas may be limited to maintain the level of water only when necessary. Draining of pools and spas or refilling shall be done only for health or safety reasons.
4. Other Prohibited Uses: The District may implement other water use requirements as determined appropriate to meet water supply shortages or water emergency conditions.

5.18. Stage Three Water Supply Shortage or Water Emergency

The goal of a Stage Three Water Supply Shortage or Water Emergency is to reduce potable water demands by 30 percent or more, while protecting the health and safety of the community and the region. In addition to the actions and requirements of a stage two emergency, the following water conservation requirements to prudently preserve water supplies must be observed:

1. Irrigation Restrictions: Watering or irrigation of lawn, landscape or other vegetated area with potable water may be prohibited by the Board of Directors.
2. New Potable Water Service: No new Potable Water Service, new temporary meters, or permanent meters will be provided, and no statements of immediate ability to serve or provide Potable Water Service will be issued without mitigation measures approved by the General Manager that will offset the new demand.
3. Other Prohibited Uses: The District may implement other water use requirements as determined appropriate to meet water supply shortages or water emergency conditions.

5.19. Declaration of Emergency State

The Board of Directors may move from stage to stage as necessary to best manage the water supply shortages or water emergencies. Once a water supply shortage or water emergency condition has subsided and water supplies have returned to normal, the Board of Directors shall by resolution declare an end to the emergency and restore service to pre-emergency conditions.

5.20. Violations of Prohibitions

Violation of any water-use prohibition during a Stage Three emergency may result in fines. Repeated violations may result in water capacity restrictions to the property or termination of service.

1. **First Violation:** The District will issue a written notice to the Customer indicating a violation of one or more of the water-use prohibitions or restrictions.
2. **Second Violation:** If the first violation is not corrected within the time frame specified by the District, or if a second violation occurs within the following twelve (12) months after the first violation notice, a second notice of violation will be issued and a fine of one hundred dollars ($100.00) shall be levied for the second violation.

3. **Third Violation:** A third violation within the following twelve (12) months after the date of issuance of the second notice of violation will result in a third violation and a fine of two hundred fifty dollars ($250.00).
4. **Fourth and Subsequent Violations:** A fourth violation within the following twelve (12) months after the date of issuance of the third notice of violation will result in a fourth violation and a fine of five hundred dollars ($500.00). Each day that a violation occurs beyond the remedy allowance provided for in the fourth notice of violation results in a new violation and a fine of five hundred dollars ($500.00) per day.

   In addition to the fines outlined above, water service may be turned off or installation of a flow restrictor on the service line or lines may be required. Such an order shall be written and subject to appeal pursuant to Section 5.19, Appeals and Exceptions. Any appeal shall be heard as quickly as possible to allow a flow restrictor to be removed promptly should the Board of Directors grant the appeal.

   a. **Cost of Flow Restrictor and Disconnecting Service:** The Customer determined to be in violation of this Ordinance is responsible for payment of the District's costs for installing and/or removing any flow restrictors.
   b. **Payment of Fines:** The Customer determined to be in violation of this Ordinance is responsible for the full payment of any and all fines. Each fine shall be applied to the Customer's monthly water bill. Payment of the fine will be the responsibility of the individual named on the water account. Non-payment of fines will be subject to the same remedies as non-payment of basic water service, in accordance with this Ordinance.

5.21. Appeals and Exceptions

Any Customer may appeal a fine imposed under this Ordinance to the Board of Directors by filing a written appeal with the District within 30 days of the notice of violation.

5.22. Reasonable Attorney Fees Paid by Customer

In the event an action is commenced in a court of law by the District to collect any obligations incurred by the use of water or sewer service, the Customer shall be required to pay reasonable attorney's fees if said action by the District is successful.

FEES AND CHARGES

6. WATER SERVICES RATES, FEES, AND CHARGES

Camrosa shall establish, by Resolution of the Board, after holding a public hearing in accordance with Government Code 53756, a Schedule of Rates, Fees and Charges for Water and Sanitary Service. The schedule for services may cover a period not to exceed five (5) years. The Schedule of Rates, Fees and Charges for Water and Sanitary Services may provide for automatic adjustments that pass through to the Customer the adopted increases or decreases in the wholesale charge for water established by another public agency. Notice of any automatic adjustments pursuant to the schedule shall be given not less than 30 days before the effective date of the adjustment.

The Customer must pay all assigned rates, fees, and charges for the type and class of service provided in the manner and within the times set forth in this Ordinance and the Schedule of Rates, Fees and Charges for Water and Sanitary Services. Failure to make timely payment may result in the installation of a flow restriction device, discontinuation of water service, or termination of service, upon notice, as may be required by law.

Reestablishment of service to the Property may be withheld until the General Requirements of Water Service are met.

6.1. Application for Service

An application provided by the District must be completed and signed by the Customer. The applicant must provide the following information:

1. Government issued photo identification;
2. Date of birth;
3. Social Security Number or Tax ID Number (for Commercial customers); and
4. Verification that applicant is the Property owner.
5. Applicants for commercial/industrial/institutional accounts must provide a current business license and a Guaranty signed by a Guarantor who is acceptable to the District.

Such application shall contain the following provisions:

1. Applicant shall agree to accept the services applied for subject to the rules and regulations of the District and to pay therefore at regular rates. Should the applicant subsequently cancel one or more items of service, such cancellation shall not change or affect the terms of his application in respect to the remaining item or items of service.
2. Applicant shall also agree to give at least 24 hours' notice to the District before service is to be discontinued. The provisions of the application, obligating the applicant to accept and pay for service shall remain in force until said notice is given and all bills shall be paid in full to date of receipt of said notice by the District.
3. Applicant shall further agree to assume all liability for any damage occurring on the premises served, by reason of open faucets, faulty fixtures, or broken pipes on such premises at or after the time when service is turned on, whether or not at that time there is any responsible interested person on the premises.

In cases where the applicant is not the Property Owner, the District may require that the application be completed by the proposed Customer and signed by the proposed Customer and the Property Owner as a co-applicant. If the Property is occupied by a tenant or other Customer who is not the Property Owner, and the agreement between the Customer and the Property Owner provides for the Customer to pay for water service, both the Customer and the Property Owner may be required to sign the application as co-applicants. In the event that the Customer becomes delinquent on payment, the Customer and the Property Owner are jointly and severally liable for the service charges incurred on the Property.

6.2. Use of Water without Regular Application for Service

Any person, firm, or corporation taking possession of premises where the water supply has been shut off and the curb cock or valve sealed, must make proper application to the District to have the water supply turned on. In the event the Customer turns on the water supply or suffers or causes it to be turned on without first having made such application, the Customer will be held liable for all damages resulting therefrom, including, but not limited to all charges for the water service rendered, the amount thereof to be determined, at the election of the District, either by the meter reading or on the basis of the estimated consumption for the length of time service was received by the Customer without proper application. When the District finds that water is being used without proper application, service will be terminated immediately and prosecution may occur.

6.3. Deposit from Applicant

A prepaid Deposit shall be required in an amount equal to two (2) times the estimated average monthly bill. After twelve (12) months of maintaining a current account, the average monthly bill of the current account will be calculated. One month's average bill will be retained as deposit; the remainder will be applied to the Customer's account. The remaining deposit will be applied to the final bill when service is terminated. Any unused deposit will be returned to the Customer within 30 business days.

Any Customer who has established a pattern of delinquency which results in shutoff may be required to reestablish service by paying a deposit equal to two (2) times the average bill during the past twelve (12) months.

Any Customer who, during a twelve month period, has two (2) or more returned checks shall be required to pay all billings for a period of one (1) year with cash, cashier's check, money order, automatic bank withdrawals (EZ Pay), or credit card. A deposit amount equal to two (2) times the average bill may also be collected and the cash-only requirement may be continued indefinitely for Customers with an established pattern of multiple returned checks.

Any Deposit refunds and/or Credit forward balances for water service normally due to a former Customer shall not be credited to the account of the new Customer at the same service address. Said credit balances shall be refunded to the former Customer when a forwarding address is available. When there is not a forwarding address available, said credit balances shall be deposited in the District's Trust Fund and shall be thereafter refunded to the former Customer upon written request to the District. If no such request is submitted within one (1) year, the Deposit refund/Credit forward balance shall be credited to the District's General Fund.

6.4. Time and Manner of Payment

All bills and charges for Water and Sewer Service are due and payable upon presentation. Such bills and charges shall be deemed to be presented upon having been deposited in the United States Mail, postage paid, and addressed to the Customer owner reflected in the records of the District. Payments may be made in person, by mail, by telephone, on-line, or by electronic transfer of funds to the District. Payment must be received before close of business of the delinquent specified on the bill. Postmark date will not be considered as receipt date.

6.5. Delinquent Fees and Charges

Monthly bills are considered delinquent when payment is not received in full for the billed amount by close of business of the delinquent date specified on the bill. The delinquent balance shall be assessed a ten percent (10%) late charge the next business day. Interest shall accrue on the delinquent balance at the rate of 1.5% per month from the delinquent date until the account is brought current. In addition, charges shall be imposed for noticing the Customer of a pending shutoff due to non-payment, and for disconnection of service as a result of delinquency, as provided in Camrosa's *Schedule of Rates, Fees and Charges for Water and Sanitary Services*. The Customer will also be liable for any attorney's fees incurred by the District in attempting to collect payment of a delinquent account, whether a lawsuit is filed or not. In the event the District files a lawsuit or other legal proceeding to collect a delinquent account, the prevailing party in that proceeding shall be entitled to recover its attorney's fees and costs of suit, in addition to any other remedies recovered.

6.6. Discontinuation of Non-Residential Service or Installation of Flow Restrictor for Nonpayment

For all other water services excluding residential domestic water service, including residential irrigation meters, if the delinquent amount and any accrued late charges, interest, or other charges are not paid in full within fifteen (15) days of delinquency, water service may be discontinued upon notification to the Customer. At least 48 hours prior to termination of service, the District shall attempt to notify the Customer by telephone, mail, email, or delivery of a door hanger at the service location stating that water service shall be shut off. If full payment is not received by 9:00 A.M. on the shut off date, water service will be discontinued and the account will be charged a Disconnection Fee.

The General Manager is authorized to disconnect water service due to non-payment prior to the standard shutoff date if the General Manager concludes, in his sole discretion, that the continued use of water by the delinquent account holder poses a substantial financial risk to the District.

If water service is disconnected due to a delinquency, a deposit equal to two (2) times the average bill during the past twelve-month period will be collected prior to reestablishing service.

The late charges, interest, and other charges herein are based upon a good faith estimate of the operating expenses incurred by the District in administering delinquent accounts, including, but not limited to providing notification of delinquency, in processing and collecting delinquent accounts, and in providing notification and processing the disconnection of water service.

Prior to the disconnection of water service, a Customer may contact the District’s billing office and make a written request for an alternate payment plan. If a payment plan is approved by the General Manager or authorized designee, the General Manager may agree to terms to continue water service and avoid a disconnection fee. If the Customer fails to meet the agreed upon terms of the alternate payment plan, water service shall be disconnected immediately. The General Manager or authorized designee may waive delinquent fees, late charges, and other fees and charges, if such waiver is deemed to be in the best interest of the District.

The decision to install a flow restriction device or to disconnect a water service will be at the General Manager or authorized designee’s discretion and dependent upon any relevant local or State mandates concerning such actions, available resources, and other pertinent considerations at the time. In the event a flow restriction device is to be installed, the customer will receive a 48-hour door hanger, subject to the adopted fee schedule, prior to the installation. The flow restrictor will remain in place until the past due balance is paid.

The Policy on Discontinuation of Residential Domestic Water Service or Installation of Flow Restrictor for Nonpayment can be found at Section 6.9 below.

6.7. Liens

The District may, in its sole discretion, continue service on a delinquent account on the condition that the Customer and/or Property Owner sign a lien, to be recorded in the office of the Ventura County Recorder. Such lien shall encumber all real property interests owned by the Customer and/or Property Owner in the County of Ventura, and shall secure payment of the delinquent amount and any subsequently accruing charges, including interest, attorney’s fees, and any other fees or charges incurred by the District in connection with collecting the amounts owed.

6.8. Pressure Zone Surcharges

Water Services may be subject to surcharges if the areas to be served are above the first hydraulic lift. Zone Surcharges are intended to reflect the actual cost of any additional pumping and shall be reviewed annually to assure that they reflect current costs.

6.9. Policy on Discontinuation of Residential Domestic Water Service or Installation of Flow Restrictor for Nonpayment

This Policy on Discontinuation and Flow Restriction of Residential Water Service for Nonpayment ("Policy"), required by state law with the passage of Senate Bill 998 (2018), applies to all District residential domestic water accounts (Classes I and II in Section 4.2.1); it does not apply to accounts for nonresidential water service or for irrigation meters at residential parcels. See Section 6.6 for nonresidential services.

6.9.1. Contact

District Customer Service can be reached at (805) 388-0226. Customers can also visit the District office Monday-Friday 9:00 A.M. to 4:30 P.M., except on District holidays.

6.9.2. Delinquency

As with bills for all water service, residential domestic water bills are due upon receipt and become delinquent when payment is not received in full for the billed amount by close of business of the delinquent date specified on the bill.

Delinquent balances for residential domestic water service are assessed late fees and accrue interest in accordance with Section 6.5.

Interest charges on delinquent bills will only be waived for customers who demonstrate a household income below 200 percent of the federal poverty level, as defined in Section 6.9.6, and will only be waived once every 12 months.

6.9.3. Discontinuation of Water Service for Nonpayment

If a bill is delinquent for at least sixty (60) days, the District may discontinue water service to the service address.

6.9.3.1. Written Notice to Customer

The District will provide a mailed notice, containing the following information, to the customer of record at least seven (7) business days before discontinuation:

a. The name and address of the customer

b. The amount of the delinquency

c. The date by which payment or payment arrangements must be made to avoid discontinuation of service

d. A description of the procedure to petition for bill review and appeal

e. A description of the procedure by which the customer may request an alternative payment arrangement as described in Section 6.9.3.6.

6.9.3.2. Written Notice to Occupants or Tenants

If the District furnishes water through a master meter, provides individually metered service to a single-family dwelling, multi-unit residential structure, mobile home park, or farm labor camp, and the property owner or manager is the customer of record, or if the customer of record's mailing address is not the same as the service address, the District shall send a notice to the occupants living at the service address at least ten (10) business days before discontinuation of water service.

The notice shall be addressed to “Occupant,” contain the information in Section 6.9.3.1 above, and inform the residential occupants that they have the right to become customers of the District without being required to pay the amount due on the delinquent account. Terms and conditions for occupants to become customers are provided in Section 6.9.7.

6.9.3.3. Notice by Telephone

The District shall make a reasonable, good faith effort to contact the customer of record or an adult person living at the service address in person or by telephone at least seven (7) business days before discontinuation of service. The District shall offer to provide a copy of this Policy and to discuss options to avert discontinuation of water service for nonpayment, including the possibility of an alternative payment arrangement.

6.9.3.4. Posting of Notice at Service Address (door hanger)

If the District is unable to make contact with the customer or an adult person living at the service address by telephone and the mailed notice is returned as undeliverable, the District shall make a good faith effort to leave a notice of imminent discontinuation of residential service and a copy of this Policy or instructions on how to obtain one in a conspicuous place at the service address. The notice and copy of this Policy or instructions on how to obtain one shall be left at the residence at least forty-eight (48) hours before discontinuation of service. The notice shall include the information in Section 6.9.3.1.

6.9.3.5. Circumstances Under Which Service Will Not Be Discontinued

Per state law, exemptions from discontinuation of residential domestic water service due to nonpayment will be granted under the following circumstances:

a. During local, state, or national emergency, as defined and declared by the appropriate level of government, that provides for a moratorium on water shutoffs.

b. During an investigation by the District of a customer dispute or complaint

c. During an appeal

d. During the period of time in which a customer’s payment is subject to a District-approved alternative payment arrangement and the customer remains in compliance with the approved payment arrangement

e. Provided a customer meets all of the following special medical and financial conditions:

    i. The customer, or a tenant of the customer, submits to Camrosa the certification of a primary care provider, as that term is defined in subparagraph (A) of paragraph (1) of subdivision (b) of Section 14088 of the State Welfare and Institutions Code, that discontinuation of residential service will be life threatening to, or pose a serious threat to the health and safety of, a resident of the premises where residential service is provided.

    ii. The customer demonstrates that he or she is financially unable to pay for residential service within Camrosa’s normal billing cycle. The customer shall be deemed financially unable to pay for residential service within Camrosa’s normal billing cycle if any member of the customer’s household is a current recipient of CalWORKs, CalFresh, general assistance, Medi-Cal, Supplemental Security Income/State Supplementary Payment Program, or California Special Supplemental Nutrition Program for Women, Infants, and Children, or the customer declares under penalty of perjury that the household's annual income is less than 200 percent of the federal poverty level.

iii. The customer is willing to enter into an alternative payment arrangement.

If the special medical and financial conditions described above are met, the District shall offer the customer an alternate payment arrangement.

6.9.3.6. Alternative Payment Arrangements

The General Manager or authorized designee may agree to terms with a customer that is unable to pay to continue water service, restart service, and/or avoid a disconnection fee. If the Customer fails to meet the agreed-upon terms of the alternate payment plan, water service will be disconnected. The General Manager or authorized designee may waive delinquent fees, late charges, and other fees and charges, if such waiver is deemed to be in the best interest of the District. During alternative payment arrangements, water service may be limited, by the installation of a flow restriction device, to supplies adequate for human consumption, cooking, and sanitary purposes.

6.9.3.6.1. Requests

If a customer is unable to pay a bill during the normal payment period, the customer may request an alternative payment arrangement. It is the customer's responsibility to demonstrate that special medical and financial conditions, as described 6.9.3.5.a.i, exist. Requests must be submitted at least 48 hours prior to the disconnection date. The District will review requests within seven (7) business days; water service will not be discontinued during this time.

6.9.3.6.2. Alternative Payment Schedule

If approved by the District, a customer may pay the unpaid balance pursuant to an alternative payment schedule as determined by the District's General Manager or authorized designee that will not exceed twelve (12) months. During the period of the alternative payment schedule, the customer must remain current on all water service charges accruing during any subsequent billing periods. The alternative payment schedule and amounts due shall be set forth in writing and provided to the customer for their required signature indicating agreement and adherence to the schedule.

6.9.3.6.3. Failure to Comply

The customer must comply with the agreed upon payment schedule and remain current as charges accrue in each subsequent billing period. The customer may not request another payment schedule for any subsequent unpaid charges while paying delinquent charges pursuant to a previously agreed upon schedule. If the customer fails to comply with the terms of the agreed upon schedule for sixty (60) days or more, or fails to pay their current service charges for sixty (60) days or more, the District may discontinue water service to the customer's property.

6.9.3.6.4. Final Notice

The District will post a final notice of intent to disconnect service in a prominent and conspicuous location at the service address at least five (5) business days before discontinuation of service. The final notice will not entitle the customer to any investigation or review by the District.

6.9.3.6.5. Reductions/Waivers/Deferrals

Reductions, waivers, or deferrals of water service charges are not available.

6.9.3.6.6. Limits

Customers may only enter into one alternative payment arrangement at a time.

6.9.3.6.7. State of Emergency Exception

During a local, state, or national emergency, as defined and declared by the appropriate level of government, that provides for a moratorium on water shutoffs, failure to comply may result in water service being limited, by use of a flow restrictor or other measure, to supplies adequate for human consumption, cooking, and sanitary purposes.

6.9.3.7. Restoration of Service

Customers whose water service has been discontinued may contact the District by telephone or in person regarding restoration of service. Restoration shall be subject to payment of: (a) any past-due amounts, including applicable interest or penalties; (b) any reconnection fees, subject to the limitations in Section 6.9.6, if applicable; (c) and a security deposit, if required by the District. Payment must be made in cash, money order, debit card, or credit card. Check payments will not be accepted.

6.9.4. Installation of Flow Restrictors

At the discretion of the General Manager, flow restrictors may be used in circumstances that warrant continuation of water service at a limited flow rate. Flow restrictors limit the flow of water through a meter, maintaining customer access to water sufficient for health and sanitary uses while limiting the nonrevenue water loss due to customers who are not paying their bill.

This section applies to all customer types and services.

6.9.4.1. Notice

Customers will be noticed by door hanger at the service address 48 hours prior to the installation of the flow restrictor.

6.9.4.2. Removal

The flow restrictor will be removed and full service restored once the account has been brought current, an alternative payment arrangement has been agreed upon, or as determined by the General Manager or designee.

6.9.5. Procedures to Contest or Appeal a Bill

6.9.5.1. Initiation

A customer may initiate a complaint or request an investigation regarding the amount of a bill within ten (10) days of receiving a disputed bill. For purposes of this Policy, a bill shall be deemed received by a customer five (5) days after mailing.

6.9.5.2. Review by District

A timely complaint or request for investigation shall be reviewed by a manager of the District, who shall provide a written determination to the customer. The review will include consideration of whether the customer may receive an alternative payment arrangement. The District may at its discretion review untimely complaints or requests for investigation.

6.9.5.3. Appeal

Any customer whose timely complaint or request for an investigation resulted in an adverse determination by the District may appeal the determination. A written notice of appeal must be received by the District within ten (10) business days of the District's mailing of its determination. Following receipt of a request for an appeal or review, a hearing date shall be promptly set before the General Manager or authorized designee. After evaluation of the evidence provided by the customer and the information on file with the District concerning the water charges in question, the General Manager or authorized designee shall render a decision as to the accuracy of the water charges set forth on the bill and shall provide the appealing customer with a brief written summary of the decision.

6.9.6. Reconnection Fee Limits and Waiver of Interest for Low-Income Customers

The District will deem a residential customer to have a household income below 200 percent of the federal poverty line if: (a) any member of the household is a current recipient of CalWORKs, CalFresh, general assistance, Medi-Cal, Supplemental Security Income/State Supplementary Payment Program, or California Special Supplemental Nutrition Program for Women, Infants, and Children, or (b) the customer declares under penalty of perjury that the household's annual income is less than 200 percent of the federal poverty level. The District reserves the right to request documentation verifying the member of the household receives benefits at the property.

For residential customers who demonstrate to the District a household income below 200 percent of the federal poverty line, the District shall charge the standard rate for reconnection with the following limits:

a. Limit any reconnection fees during normal operating hours to fifty dollars ($50), and during non-operational hours to one hundred fifty dollars ($150). The limits will only apply if the District's reconnection fees actually exceed these amounts. These limits are subject to an annual adjustment for changes in the Bureau of Labor Statistics' Consumer Price Index for All Urban Consumers (CPI-U) beginning January 1, 2021.

For residential customers who demonstrate to the District a household income below 200 percent of the federal poverty line request an interest waiver, the District shall waive interest charges on delinquent bills once every 12 months.

6.9.7. Procedures for Occupants or Tenants to Become Customers

6.9.7.1. Applicability

This section applies only when the property owner, landlord, manager, or operator of a residential service address is listed as the customer of record and has been issued a notice of intent to discontinue water service due to nonpayment.

6.9.7.2. Agreement to District Terms and Conditions of Service

The District shall make service available to the occupants if each occupant agrees to the terms and conditions of service and meets the requirements of the District's rules and regulations, including deposit requirements. However, if at least one of the occupants is willing to assume responsibility for all subsequent charges, or if there is a physical means of discontinuing service to those occupants who do not meet the District's rules and requirements, then the District shall make service available to the occupants who do meet them.

6.9.7.3. Verification of Tenancy

To be eligible to become a customer without paying the amount due on the delinquent account, the occupant shall verify that the delinquent account customer of record is or was the landlord, manager, or agent of the dwelling. Verification may include, but is not limited to, a lease or rental agreement, rent receipts, a government document indicating that the occupant is renting the property, or information disclosed pursuant to Section 1962 of the Civil Code, at the discretion of the District.

6.9.8. Other Remedies

In addition to discontinuation of water service, the District may pursue any other remedies available in law or equity for nonpayment of water service charges, including, but not limited to: securing delinquent amounts by filing liens on real property, filing a claim or legal action, or referring the unpaid amount to collections. In the event a legal action is decided in favor of the District, the District shall be entitled to the payment of all costs and expenses, including attorneys' fees and accumulated interest.

6.9.9. Discontinuation of Water Service for Other Customer Violations

The District reserves the right to discontinue water service for any violations per District ordinances, rules, or regulations other than nonpayment.

SEWER SERVICE

7. SEWER SERVICE GENERAL

The District protects the health, welfare and safety of the local residents by constructing, operating and maintaining a system of local sewers and laterals, trunk sewers and interceptors, and liquid waste treatment and disposal facilities to serve the homes, industries and commercial establishments throughout the District and surrounding environs as required by State and Federal law.

The District shall devote its best efforts to plan for and, on a case by case basis if necessary, prioritize provision of sewer services to proposed lower income housing developments pursuant to Government Code Section 65589.7.

Development projects that include lower income housing units shall not be denied approval of an application for service, nor shall conditions be imposed thereon or services reduced which are applied for, unless the District makes specific written findings that the denial, condition or reduction is necessary due to the existence of one or more of the following:

1. Insufficient sewer treatment or sewer collection capacity;
2. A Regional Water Quality Control Board order prohibiting new sewer connections; and/or
3. The proposed development applicant has failed to agree to reasonable terms and conditions.

The District shall not discriminate in any manner when processing and considering requests for services by proposed developments that include lower income housing units.

7.1. Sewer Service Area

Camrosa Water District has facilities capable of providing Sanitary Service to approximately 50 percent of its Customers. The boundaries of the existing sewer service area are the US-Highway 101 north to Worth Way, between Calleguas Creek on the west and Tuscan Grove on the east. Camrosa also sewers California State University Channel Islands and other adjacent Properties.

7.2. Demarcation of Sewer Service Responsibilities

7.2.1. Demarcation of District Facilities

For the purpose of defining the location at which District facilities end and private facilities begin, the cleanout on sewer lateral connections to private property, located behind the curb, gutter, or sidewalk, shall serve as the point of demarcation.

7.2.2. Customer Responsibility

The point of demarcation of District facilities shall not serve as the point where obstructions causing a backup of wastewater within the lateral cease to be the responsibility of the Customer. It is the responsibility of the Customer to maintain clear and free flow in the lateral from their property all the way to the District sewer main. This includes clearing obstructions caused by something flushed or dropped into the lateral or caused by root intrusion from nearby landscaping. Simply causing the obstruction to pass the demarcation point does not then place the responsibility for correction of the problem onto the District. Root intrusion caused by City or County placed trees or shrubs is, likewise, the Customer’s responsibility to correct and then, if so inclined, to file a claim with the appropriate agency.

7.2.3. Liability for Property Damage

The District shall not be liable for damage to private property caused by blockage in a sewer lateral. The District may assume liability only in instances when a backup in the District sewer main causes damage to private property.

7.3. Water Reclamation Policy

The District is committed to a policy of wastewater reclamation and reuse in order to provide an alternate source of water supply and to reduce overall costs of wastewater treatment and disposal. In order to meet California Water Code Title 22 recycled water standards at the CWRF, commercial and industrial sewer Customers are required to meet Camrosa's Ordinance 22 discharge regulations.

7.4. Eligibility for Sewer Service

Connection to the District's sewer facilities is authorized once the prospective Customer has completed the application process, all fees have been paid, the connection meets District construction standards, and the type and volume of discharge is not detrimental to either the collection system or the treatment process. The use of the sewerage system is subject to regulation by the District.

7.5. Regulation of Sewer Service

Camrosa's Ordinance 22, Industrial Waste and Sanitary Service Ordinance Regulating and Controlling Sewage Liquid Waste and Industrial Waste Discharges controls and regulates the discharge of sewage, liquid waste, and industrial waste directly or indirectly into the sewerage system and disposal works of the Camrosa Water District. The provisions of Ordinance 22 are fully incorporated by reference into these rules and regulations, and shall apply to the discharge of all wastes, directly or indirectly, to a public sewer of the District. Ordinance 22 establishes the quality and quantity of discharged wastes; the degree of waste pretreatment required; the issuance of industrial wastewater discharge permits; the establishment of fees and charges; and the establishment of fees, charges, and penalties for violation. Provisions are made within the Ordinance to regulate commercial and industrial waste discharges, comply with State and Federal government requirements and policies, and meet increasingly higher standards of treatment plant effluent quality and environmental consideration. Methods of cost recovery are also established where the industrial waste discharge would impose unreasonable collection, treatment or disposal costs on the District.

CONSTRUCTION SPECIFICATIONS

8. INCLUSION OF SPECIFICATIONS BY REFERENCE

The design and construction of water and sewer lines and other appurtenances within the District's service area shall comply with Camrosa's published specifications.

IMPLEMENTATION

9. IMPLEMENTATION AND PRIOR RULES AND REGULATIONS

This Ordinance supersedes all prior Ordinances and Resolutions relating to rules and regulations for water and sanitary services.

AUTHORITY FOR IMPLEMENTATION

10. DISCRETIONARY AUTHORITY PROVIDED TO THE GENERAL MANAGER

The General Manager is herein provided discretionary authority to interpret this ordinance and implement its provisions. This authority includes the determination of eligibility for service, the availability of facilities and capacity, and compliance with this ordinance; the application of fees; the resolution of billing disputes, and the negotiation of agreements. The Camrosa Board of Directors may address unresolved disputes. The decision of the Board of Directors regarding such disputes is final.

APPENDIX D: CWD WATER RESTRICTIONS RESOLUTIONS

Following is CWD Resolution 12-14 Establishing a Moratorium on Water Availability and Water Will Serve Letters; and CWD Resolution 15-07 Declaring a Stage 3 Water Supply Shortage

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

Resolution No: 15-07

A Resolution of the Board of Directors of Camrosa Water District

Declaring a Stage Three Water Supply Shortage in Accordance with Ordinance 40-10

Whereas, the State of California is in its fourth consecutive year of record-breaking drought, in response to which the Metropolitan Water District of Southern California reduced water allocations to member agencies by fifteen percent; and

Whereas, the State Water Project allocation remains at twenty percent of requested deliveries for calendar year 2015; and,

Whereas, approximately seventy percent of Camrosa's potable water supply is imported from the California State Water Project (SWP) via Calleguas Municipal Water District (Calleguas), a wholesale provider of Metropolitan Water District of Southern California (Metropolitan); and,

Whereas, on January 17, 2014, Governor Edmund G. Brown, Junior, officially proclaimed a State of Emergency due to drought conditions, called on Californians to voluntarily reduce their water use by twenty percent, and directed state officials to take all necessary actions to alleviate drought impacts throughout the state; and,

Whereas, on February 11, 2014, Metropolitan declared a Water Supply Alert calling for cities, counties, member agencies, and retail water agencies to implement extraordinary conservation through drought ordinances and other measures to mitigate use of storage reserves; and,

Whereas, on February 11, 2014, the Camrosa Board of Directors adopted Resolution 14-01 calling all customers to voluntarily reduce water usage by twenty percent of the previous year's usage, to preserve both local and regional water reserves; and,

Whereas, on July 15, 2014, the SWRCB adopted statewide emergency regulations prohibiting water waste and mandatory actions for water purveyors during the drought emergency; and, *__Whereas,__ the Camrosa Water District adopted Ordinance 38-09, an ordinance of the Board of Directors establishing water shortage management policy prohibitions and restrictions on the use of water during periods of water shortage, on June 24, 2009; and,*

__Whereas,__ Ordinance 38 directs the implementation of the appropriate phase of the Water Supply Shortage or Water Emergency Plan contained in Ordinance 40-10, "Rules and Regulations Governing the Provision of Water and Sanitary Services," as determined by the Board of Directors; and,

__Whereas,__ on August 27, 2014, the Camrosa Water District Board of Directors declared a Stage One Water Supply Shortage; and,

__Whereas,__ on April 1, 2015, Governor Brown issued Executive Order B-29-15 ordering the State Water Resources Control Board to implement mandatory water reductions in potable urban usage through February 28, 2016; and,

__Whereas,__ on May 5, 2015, the State Water Resouces Control Board adopted emergency regulations, to remain in effect for 270 days, that categorized water agencies and districts into conservation tiers based on residential per-capita water use in July, August, and September of 2014; and

__Whereas,__ Camrosa is currently in the highest tier, Tier 9, which requires a 36-percent reduction in water use;

__Now, Therefore, Be It Resolved__ by the Camrosa Water District Board of Directors that the District does hereby declare a Stage Three Water Supply Shortage; and,

__Be It Further Resolved__ that the General Manager is authorized to implement a Stage Two Water Supply Shortage contained in Ordinance 40-10, including the following water use restrictions:

1. *Leaks – No person may permit leaks of water that he/she has the authority to eliminate. Any detected leak, break or malfunction shall be corrected within 24 hours after a person discovers or receives notice from the District.*
2. *Limits on Watering Days – Water or irrigating of landscape or other vegetated area with potable water may be limited to three days per week on a schedule established and posted by the District.*
3. *Limits on Filling Residential Swimming Pools & Spas – Use of water to fill or refill swimming pools and spas shall be limited to maintain the level of water only when necessary. Draining of pools and spas or refilling shall be done only for health or safety reasons.*
4. *Substitution of Non-potable Water – No person shall permit the outdoor use of potable water for irrigation or dust abatement where non-potable or recycled water is available.*

Be It Further Resolved *that the General Manager is authorized to implement a Stage Three Water Supply Shortage contained in Ordinance 40-10, including the following water use restrictions:*

1. *Irrigation restrictions – Watering or irrigation of lawn, landscape or other vegetated area with potable water to two days a week.*
2. *New Potable Water Service – No new potable water service will be provided, no new temporary meters or permanent meters will be provided and no statements of immediate ability to serve or provide potable water service will be issued without mitigation measures approved by the General Manager that will offset the new demand.*
3. *Other Prohibited Uses – The District may implement other water use requirements as determined by the District to meet water supply shortage or water emergency conditions.*

Be It Further Resolved *that in addition to the restrictions identified in the declared Emergency Supply Shortage Stage, all restrictions of lesser stages also apply:*

Be It Further Resolved *that urban water users on potable water are required to reduce water use by 36 percent compared to their water use of 2013 and commercial agriculture customers on potable water have a reduction requirement of 16.5 percent.*

Adopted, Signed and Approved *this 28th day of May 2015.*

Eugene F. West, President
Board of Directors
Camrosa Water District

ATTEST:

Tony Stafford

Tony L. Stafford, Secretary
Board of Directors
Camrosa Water District

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

Board of Directors
Al E. Fox
Division 1
Jeffrey C. Brown
Division 2
Timothy H. Hoag
Division 3
Eugene F. West
Division 4
Terry L. Foreman
Division 5
General Manager
Tony L. Stafford

Resolution No: 12-14

A Resolution of the Board of Directors of Camrosa Water District

Establishing a Moratorium on Water Availability And Water Will Serve Letters

Whereas, on June 10, 2009, in response to a third consecutive year of below-average rainfall, statewide drought and the attendant water shortages, including a court-ordered water transfer restriction to protect endangered species in the Sacramento-San Joaquin Delta, the Camrosa Board of Directors adopted a Moratorium on Water Availability and Water Will Serve Letters; and,

Whereas, in July, 2009, the Metropolitan Water District of Southern California implemented a fifteen percent reduction in water allocations to member agencies as a result of the State of California's Department of Water Resources' restriction of water deliveries to thirty percent of ordered amounts; and,

Whereas, it was imperative that the District curtail activities that would result in new water demand during the ongoing water supply shortages to ensure sufficient water supply would continue to be available to meet the existing water demands of the District; and,

Whereas, the moratorium was effective upon adoption, to continue in effect until the 9th day of June, 2012, unless action was taken by the Camrosa Board of Directors to either rescind the moratorium at an earlier date or extend the moratorium beyond its expiration date; and,

Whereas, the Camrosa Board of Directors has determined that the continued uncertainty of imported water supply allocations, due to ecological challenges and infrastructural vulnerabilities of the Sacramento-San Joaquin Delta, necessitates a permanent moratorium to ensure sufficient water supplies; and,

Now, Therefore, Be It Resolved by the Camrosa Water District Board of Directors that a permanent moratorium is hereby declared on the issuance of Water Availability and Water Will Serve Letters for new development that will result in unmitigated new demand upon the Potable Water Distribution System of the District; and,

Be It Further Resolved that the construction of one single-family residence with a meter size requirement of one inch or less, as determined by the District in accordance with existing meter sizing procedures, is determined to have minimal impact upon demand and shall be exempt from this moratorium; and,

Be It Further Resolved that any project that has been issued a Water Availability Letter and has not yet received a Water Will Serve Letter shall be individually reviewed to determine the impact of the project upon existing water resources of the District and whether or not the project is exempt from this moratorium before a water Will Serve Letter is provided; and,

Be It Further Resolved that the General Manager is granted authority to interpret this policy, review individual requests to the District, and render decisions in implementing this policy; and,

Be It Further Resolved that this moratorium is effective upon adoption of this Resolution and shall continue to remain in effect until action is taken by the Board of Directors to rescind this moratorium.

Adopted, Signed and Approved this 27th day of June, 2012.

Al E. Fox, President
Board of Directors
Camrosa Water District

ATTEST:

Tony Stafford

Tony L. Stafford, Secretary
Board of Directors
Camrosa Water District

APPENDIX E: SBX7-7 VERIFICATION

SBX7-7 Verification

SB X7-7 2020 Compliance Form

The SB X7-7 2020 Compliance Form **is for the calculation of 2020 compliance only. All retail suppliers must complete the SB X7-7 Compliance Form.** Baseline and target calculations are done in the SB X 7-7 Verification Form.

The SB X7-7 Verification Form is for the calculation of baselines and targets and is a separate workbook from the SB X7-7 2020 Compliance Form. Most Suppliers will have completed the SB X7-7 Verification Form with their 2015 UWMP and do not need to complete this form again in 2020. See Chapter 5 Section 5.3 of the UWMP Guidebook for more information regarding which Suppliers must, or may, complete the SB X7-7 Verification Form for their 2020 UWMP. 2020 compliance calculations are done in the SB X7-7 2020 Compliance Form.

Process Water Deduction tables will not be entered into WUE Data Portal tables.
SB X7-7 tables 4-C, 4-C.1, 4-C.2, 4-C.3, 4-C.4 and 4-D
A supplier that will use the process water deduction will complete the appropriate tables in Excel, submit them as a separate upload to the WUE Data Portal, and include them in its UWMP.

Where to submit? Suppliers submit the completed table data and UWMPs (including the Water Shortage Contingency Plan) electronically through the WUE Data Portal (https://wuedata.water.ca.gov/). The portal will be updated in Spring 2021 and will be announced to the urban listserv, DWR webpage and WUE Data Portal opening page when it is available for plan and table submittals.

Unlocking templates (use with caution): The templates provided in this workbook are formated to mirror the structure of information that is submitted through the WUE Data Portal for the electronic submission of Submittal Tables in the UWMP. The tables are offered in a protected (locked) version to maintain the structure of the templates. However, for those needing to adjust the tables for their own planning needs beyond the Submittal Tables, the password to 'unprotect' each worksheet is 'dwr' (no quotes). To unprotect the worksheet, go to the Review tab, select Unprotect Sheet, and enter the password 'dwr' in the pop-up (no quotes). Preparers will still need to submit the information using the original template structure provided. To redownload the templates in their original format, visit https://wuedata.water.ca.gov in the Resources button of the Urban Water Management Plan section (no login necessary).

SB X7-7 Table 0: Units of Measure Used in 2020 UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent throughout the UWMP, as reported in Submittal Table 2-3.*
NOTES:

SB X7-7 Table 1 pertains to baselines and targets and is not used in the SB X7-7 2020 Compliance Form.

SB X7-7 Table 2: Method for 2020 Population Estimate	
Method Used to Determine 2020 Population (may check more than one)	
☐	**1. Department of Finance** (DOF) or **American Community Survey** (ACS)
☐	**2. Persons-per-Connection Method**
☑	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: 2020 Service Area Population

2020 Compliance Year Population	
2020	32,700

NOTES:

SB X7-7 Table 4: 2020 Gross Water Use

Compliance Year 2020	2020 Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	2020 Deductions					2020 Gross Water Use
		Exported Water *	**Change in Dist. System Storage*** (+/-)	**Indirect Recycled Water** *This column will remain blank until SB X7-7 Table 4-B is completed.*	**Water Delivered for Agricultural Use***	**Process Water** *This column will remain blank until SB X7-7 Table 4-D is completed.*	
	8,264			-	819	-	**7,445**

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source: Imported SWP Water

This water source is *(check one)* **:**

☐ The supplier's own water source

☑ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
	5,873	-	5,873

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s) Meter Error Adjustment

Complete one table for each source.

Name of Source: Groundwater

This water source is *(check one)* **:**

☑ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
	2,391		2,391

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source: Enter Name of Source 3

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source: Enter Name of Source 4

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 5

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional (+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 6

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional (+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 7

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional (+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 8

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional (+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source Enter Name of Source 9

This water source is *(check one)* **:**

☐ The supplier's own water source
☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source Enter Name of Source 10

This water source is *(check one)* **:**

☐ The supplier's own water source
☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source Enter Name of Source 11

This water source is *(check one)* **:**

☐ The supplier's own water source
☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source Enter Name of Source 12

This water source is *(check one)* **:**

☐ The supplier's own water source
☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 13

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 14

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 15

This water source is *(check one)* **:**

☐ The supplier's own water source

☐ A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-B: 2020 Indirect Recycled Water Use Deduction *(For use only by agencies that are deducting indirect recycled water)*

2020 Compliance Year	2020 Surface Reservoir Augmentation					2020 Groundwater Recharge			Total Deductible Volume of Indirect Recycled Water Entering the Distribution System
	Volume Discharged from Reservoir for Distribution System Delivery[1]	Percent Recycled Water	Recycled Water Delivered to Treatment Plant	Transmission/ Treatment Loss[1]	Recycled Volume Entering Distribution System from Surface Reservoir Augmentation	Recycled Water Pumped by Utility[1,2]	Transmission/ Treatment Losses[1]	Recycled Volume Entering Distribution System from Groundwater Recharge	
			-		-			-	-

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] *Suppliers will provide supplemental sheets to document the calculation for their input into "Recycled Water Pumped by Utility". The volume reported in this cell must be less than total groundwater pumped - See Methodology 1, Step 8, section 2.c.*

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C: 2020 Process Water Deduction Eligibility **(For use only by agencies that are deducting process water) Choose Only One**	
☐	**Criteria 1**- Industrial water use is equal to or greater than 12% of gross water use. Complete SB X7-7 Table 4-C.1
☐	**Criteria 2** - Industrial water use is equal to or greater than 15 GPCD. Complete SB X7-7 Table 4-C.2
☐	**Criteria 3** - Non-industrial use is equal to or less than 120 GPCD. Complete SB X7-7 Table 4-C.3
☐	**Criteria 4** - Disadvantaged Community. Complete SB x7-7 Table 4-C.4
NOTES:	

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.1: 2020 Process Water Deduction Eligibility *(For use only by agencies that are deducting process water using Criteria 1)*

Criteria 1

Industrial water use is equal to or greater than 12% of gross water use

2020 Compliance Year	2020 Gross Water Use Without Process Water Deduction	2020 Industrial Water Use	Percent Industrial Water	**Eligible for Exclusion Y/N**
	7,445		0%	NO

NOTES:

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.2: 2020 Process Water Deduction Eligibility *(For use only by agencies that are deducting process water using Criteria 2)*

Criteria 2

Industrial water use is equal to or greater than 15 GPCD

2020 Compliance Year	2020 Industrial Water Use	2020 Population	2020 Industrial GPCD	**Eligible for Exclusion Y/N**
		32,700	-	NO

NOTES:

Data from this table will not be entered into WUEdata. Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.3: 2020 Process Water Deduction Eligibility

(For use only by agencies that are deducting process water using Criteria 3)

Criteria 3

Non-industrial use is equal to or less than 120 GPCD

2020 Compliance Year	2020 Gross Water Use Without Process Water Deduction *Fm SB X7-7 Table 4*	2020 Industrial Water Use	2020 Non-industrial Water Use	2020 Population *Fm SB X7-7 Table 3*	Non-Industrial GPCD	**Eligible for Exclusion Y/N**
	7,445		7,445	32,700	203	NO

NOTES:

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.4: 2020 Process Water Deduction Eligibility *(For use only by agencies that are deducting process water using Criteria 4)*

Criteria 4

Disadvantaged Community. A “Disadvantaged Community” (DAC) is a community with a median household income less than 80 percent of the statewide average.

SELECT ONE

"Disadvantaged Community" status was determined using one of the methods listed below:

1. IRWM DAC Mapping tool https://gis.water.ca.gov/app/dacs/

☐ If using the IRWM DAC Mapping Tool, include a screen shot from the tool showing that the service area is considered a DAC.

2. 2020 Median Income

☐

California Median Household Income*		Service Area Median Household Income	Percentage of Statewide Average	**Eligible for Exclusion? Y/N**
2020	**$75,235**		0%	YES

*California median household income 2015 -2019 as reported in US Census Bureau QuickFacts.

NOTES

Data from these tables will not be entered into WUEdata. Instead, the entire tables will be uploaded to WUEdata as a separate upload in Excel format.

This table(s) is only for Suppliers that deduct process water from their 2020 gross water use.

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 1*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 2*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 3*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 4*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 5*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 6*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume *Complete a separate table for each industrial customer with a process water exclusion*

Name of Industrial Customer *Enter Name of Industrial Customer 7*

Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume *Complete a separate table for each industrial customer with a process water exclusion*

Name of Industrial Customer *Enter Name of Industrial Customer 8*

Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume *Complete a separate table for each industrial customer with a process water exclusion*

Name of Industrial Customer *Enter Name of Industrial Customer 9*

Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 10*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 5: 2020 Gallons Per Capita Per Day (GPCD)

2020 Gross Water ***Fm SB X7-7 Table 4***	**2020 Population** ***Fm SB X7-7 Table 3***	**2020 GPCD**
7,445	32,700	**203**

NOTES:

SB X 7-7 Table 6 pertains to baselines and targets and is not used in the SB X7-7 2020 Compliance Form.

SB X7-7 Table 7 applies to baseline and target calculations and is not included in the SB X7-7 2020 Compliance Form.

SB X7-7 Table 8 was used for the 2015 Interim Target and is not used in the 2020 UWMP.

SB X7-7 Table 9: 2020 Compliance

Actual 2020 GPCD[1]	Optional Adjustments to 2020 GPCD					2020 Confirmed Target GPCD [1, 2]	Did Supplier Achieve Targeted Reduction for 2020?
	Enter "0" if Adjustment Not Used			TOTAL Adjustments[1]	Adjusted 2020 GPCD [1] *(Adjusted if applicable)*		
	Extraordinary Events[1]	Weather Normalization[1]	Economic Adjustment[1]				
203	-	-	-	-	203	261	**YES**

[1] *All values are reported in GPCD*

[2] ***2020 Confirmed Target GPCD*** *is taken from the Supplier's SB X7-7 Verification Form Table SB X7-7, 7-F.*

NOTES:

APPENDIX F: 2013 SANTA ROSA GROUNDWATER MANAGEMENT PLAN

2013 Santa Rosa Groundwater Management Plan

Prepared for
Camrosa
Water District

Santa Rosa Basin Groundwater Management Plan

August 2013

CAMROSA DISTRICT

MWH®
BUILDING A BETTER WORLD

Santa Rosa Basin Groundwater Management Plan

Final

August 2013

Project Number 10500990

Prepared for:
Camrosa Water District

Prepared by:
MWH
618 Michillinda, Suite 200
Arcadia, CA 91007

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LIST OF ACRONYMS AND ABBREVATIONS

Acronym	Definition
AB	Assembly Bill
Acre-FT	Acre-feet
BGS	Below Ground Surface
BMO	Best Management Objective
CDPH	California Department of Public Health
CIMIS	California Irrigation Management Information System
CSWRB	California State Ware Resources Board
CWC	California Water Code
DBCP	1,2-Dibromo-3-chloropropane
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment Program
EPA	Environmental Protection Agency
ET	Evapotranspiration
ETO	Reference Evapotranspiration
FCGMA	Fox Canyon Groundwater Management Authority
FT	Feet
GMP	Groundwater Management Plan
GPM	Gallons per Minute
HC	Hill Canyon
IFMP	Integrated Facilities Management Plan
In	Inch
mg/L	Milligrams per liter
MGD	Million Gallons per Day
MSL	Mean Sea Level
MWH	MWH Americas, Inc.
ND	Non Detect
NO_3	Nitrate
RO	Reverse Osmosis
RWC	Recycled Water Contribution
SB	Senate Bill
SRGMP	Santa Rosa Basin Groundwater Management Plan
SRMWC	Santa Rosa Mutual Water Company
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WCVC	Watersheds Coalition of Ventura County
WWTP	Wastewater Treatment Plant

Section 1
Introduction

1.1 INTRODUCTION

The Camrosa Water District (District) has developed this Groundwater Management Plan for a portion of the Santa Rosa Groundwater Basin, commonly referred to as the Santa Rosa Groundwater Management Plan (SRGMP).

The SRGMP area, illustrated in **Figure 1-1** and **Figure 1-2**, is located in unincorporated Ventura County between and including parts of the cities of Camarillo and Moorpark. The Basin boundaries coincide with the California Department of Water Resources (DWR) Arroyo Santa Rosa Valley Groundwater Basin, Basin 4-7, boundary as defined in Bulletin 118 (DWR, 2003) and illustrated in **Figure 1-2.** The Arroyo Santa Rosa Valley Groundwater Basin is herein referred to as the Santa Rosa Groundwater Basin. The area to be managed under the SRGMP lies in the eastern portion of the Basin east of the Bailey Fault.

The Santa Rosa Valley covers an area of 12.5 square miles of which the groundwater basin occupies approximately 5.9 square miles (Boyle, 1997). The basin is located in Ventura County, California just north of the City of Thousand Oaks and east of the City of Camarillo.

Santa Rosa Valley is an elliptical, broad, and flat-bottomed valley and is separated from the Tierra Rejada Basin to the east by the narrow Rejada Canyon of Arroyo Santa Rosa and the Conejo Volcanics east of the Basin. Similarly the groundwater basin terminates at the Conejo Volcanics. The Santa Rosa Valley is separated from the larger Pleasant Valley to west by a constriction caused by a low, north-trending ridge of volcanic rocks southwest of the District offices on Santa Rosa Road. This surface constriction extends downward into the subsurface aquifer materials, thins out locally at the western constriction and forms a partial underground barrier that separates the Santa Rosa Groundwater Basin from the larger Pleasant Valley Groundwater Basin (Bailey, 1969).

1.2 REPORT ORGANIZATION

The SRGMP is organized as follows:

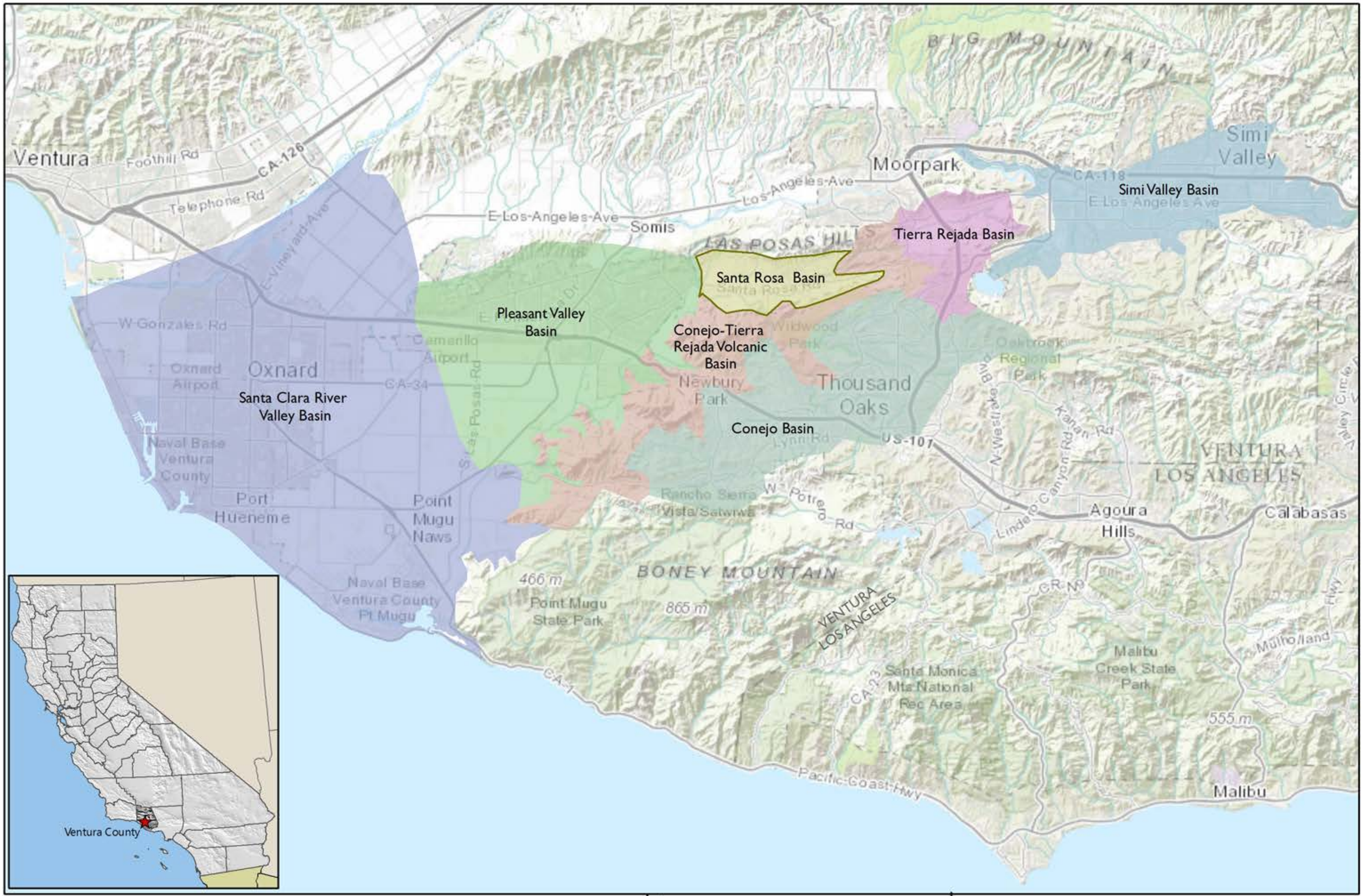
Section 1 – Introduction: Provides information regarding the SRGMP goals, basin background, roles of various agencies, existing groundwater management plans, SRGMP authority, and essential SRGMP components.

Section 2 - Water Resources Setting: In this section information is presented to assist the reader in understanding the availability of different water supplies within the SRGMP area. This section also provides a description of the groundwater basin, highlighting the hydrogeology within the SRGMP area. It also provides information on surface water and groundwater quality.

Section 3 - Basin Yield: A review of previous basin yield evaluations is presented followed by an updated evaluation of the basin yield. The updated evaluation is based on data collected over the last 25 years. This section also defines operational yield and presents methods to increase the yield of the basin by adjusting operations of the basin.

Section 4 - Management Plan Goal and Objectives: This section describes the purpose of the goal statement, Basin Management Objectives (BMOs), and management actions, and how they were prepared, reviewed and finalized. Together the BMOs will result in improving the water quality and supply reliability within the Santa Rosa Valley.

Section 5 - Plan Components: This section identifies the components that constitute a groundwater management plan in accordance with State guidelines. This section also provides categories of plan components and actions as well as potential groundwater projects that meet the BMOs.



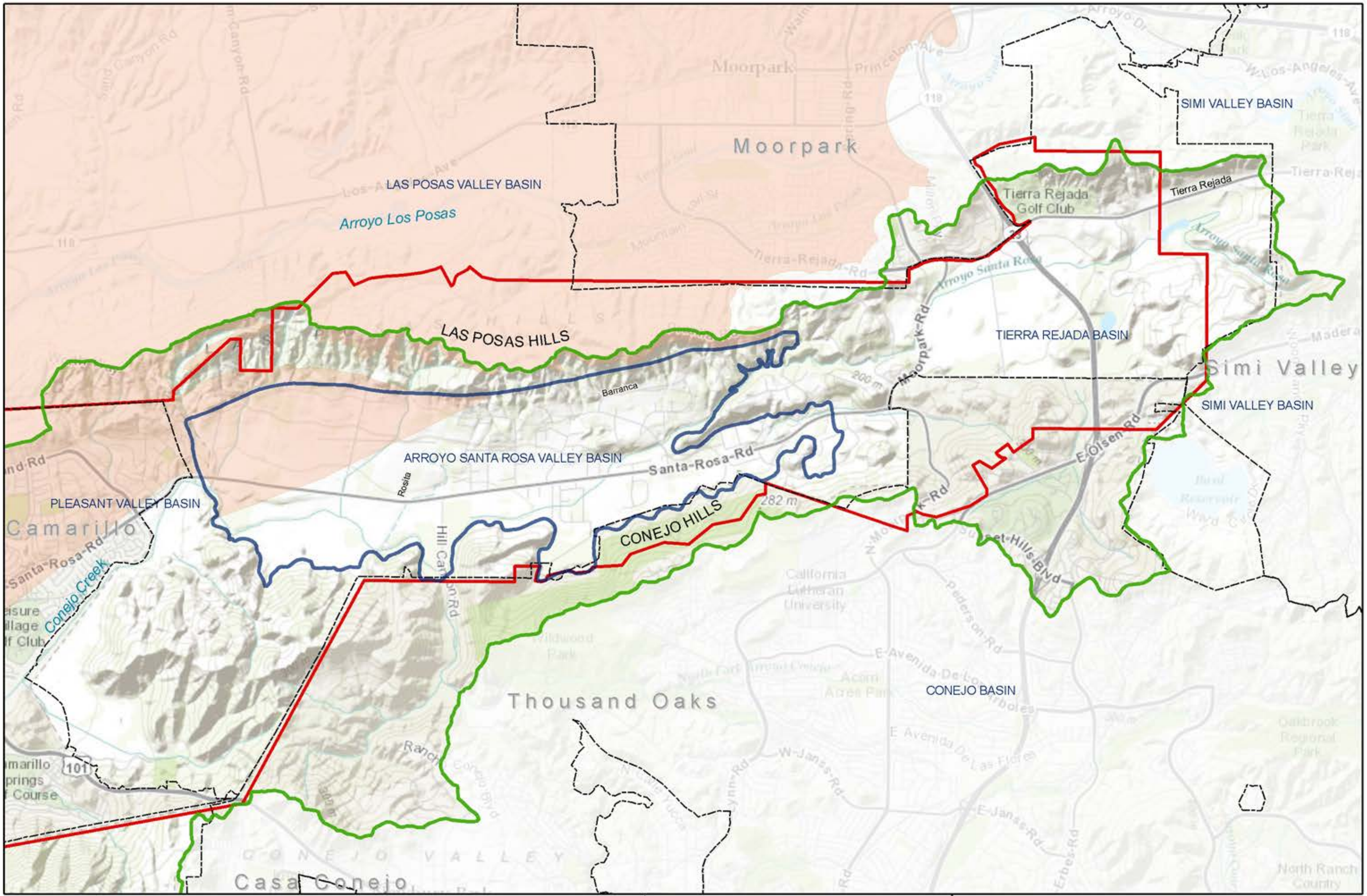
Topographic Imagery Source: ESRI, et al. Groundwater Basin Source: California Groundwater Bulletin 118

Document: \\Uspas1s01\muni\Clients\Camrosa Water District\Santa Rosa GMP\14 e-data_modeling _MXDs\SiteLocation.mxd

MWH

Groundwater Basins Adjacent to the Santa Rosa Valley

Figure 1-1



Key to Features

▭	Santa Rosa Groundwater Basin	▭	Camrosa District Boundary	▨	Fox Canyon Groundwater Management Association
▭	Watershed	⬚	City Boundaries		

Topo Map Source: ESRI

0 0.75 1.5 Miles

N

Document: \\Uspas1s01\muni\Marketing\Marketing Public Access\Camrosa Water District\Santa Rosa Basin GMP (10500900)\14 e-data_modeling_MXDs \Stakeholders.mxd

Adjacent City and Water Agency Service Areas

MWH

Figure 1-2

1.3 PURPOSE AND GOALS OF THE SRGMP

The purpose of the SRGMP is to serve as the initial framework for coordinating the management activities into a cohesive set of BMOs and related actions to improve management of the groundwater resources in the Santa Rosa Basin.

The management goals for the Santa Rosa Basin are to optimize the beneficial uses of groundwater, preserve and enhance water quality, understand and operate within the yield of the basin, and assure preservation of groundwater and environmental resources for future generations. The California Water Code (CWC) states that BMOs and specific actions taken to achieve these objectives, with sufficient specificity, must be developed within a groundwater management plan. The objectives and actions should be quantitative such that they are measurable in implementation through monitoring and management programs. At the same time, the BMOs are intended to be flexible so as to be adaptive to increase knowledge of how the groundwater basin behaves over time as additional monitoring data is collected. To meet these co-equal objectives, general BMO statements have been prepared and are accompanied by specific and measurable methods for implementation. Based on these guidelines, four BMOs have been developed from the Basin management goals and District Strategic Plan (District, 2008). These objectives and their associated actions are detailed in Section 4 and Section 5:

- Protect and enhance groundwater quality
- Sustain a safe, reliable local groundwater supply
- Maximize the beneficial use of groundwater (which is the most cost-effective water supply to stakeholders)
- Maintain public awareness and confidence, and honor the public trust

1.4 BACKGROUND

The following subsection provides background information on the District, other relevant adjacent cities and water agencies surrounding the SRGMP area, and other stakeholders in the region.

1.4.1 Camrosa Water District

The District was organized under the CWC and established on July 24, 1962. The original district boundary, encompassing approximately 8,000 acres, has expanded gradually via annexations to encompass more than 30 square miles within Ventura County. The initial customers in 1965 were typically agricultural interests and took delivery of imported water. After construction of the Camrosa distribution system in 1965, the District has expanded to approximately 10,600 municipal water connections serving a population of approximately 30,000 (District, 2011a).

In 2010, approximately 18,720 acre-feet of water was delivered to District customers for both potable and non-potable use (District, 2011b). Approximately 45 percent of the total water supply (about 8,800 acre-feet) was diverted from Conejo Creek for use as non-potable irrigation supply; 8 percent of the water supply (about 1,565 acre-feet) was produced from the Camrosa Wastewater Treatment Plant and delivered for non-potable use; 29 percent (about 5,670 acre-feet) was imported through the Metropolitan Water District and its wholesale agency, Calleguas Municipal Water District; and the remainder of the water, about 18 percent or 3,520 acre-feet, was pumped from local groundwater basins (District, 2011a). Two basins, the Tierra Rejada Groundwater Basin and the Santa Rosa Groundwater Basin, lie within the District's boundaries (District, 2011a) and are an important supply source for the District.

1.4.2 Fox Canyon Groundwater Management Agency

The Fox Canyon Groundwater Management Agency (FCGMA) is located in Ventura County and manages several coastal basins that underlie Port Hueneme, Camarillo, Moorpark, Ventura, and Oxnard. The agency overlies about 185 square miles. The FCGMA was initially created to manage the groundwater in both over-drafted and seawater-intruded areas within Ventura County. The current objectives of the FCGMA are to preserve groundwater resources for agricultural, municipal, and industrial uses (FCGMA Groundwater Management Plan, 2007). The FCGMA has management jurisdiction over the western portion of the Santa Rosa Groundwater Basin west of the Bailey Fault.

1.4.3 Adjacent Cities

Of the approximately 30 square miles within the District's boundaries, about 7 square miles lie within the City of Camarillo city limits, approximately 1.5 square miles lie within the boundaries of the City of Thousand Oaks and 21.5 square miles lie within the unincorporated area of Ventura County.

The City of Thousand Oaks plays a significant role in groundwater management in the Basin because they supply approximately 50 percent of the annual discharge in Conejo Creek from wastewater treatment facilities. Conejo Creek is a key source of groundwater recharge for the Basin. Related to this discharge, since 1995 the District has a 25-year agreement with the City of Thousand Oaks for primary access to Hill Canyon Wastewater Treatment Plant (WWTP) discharge in Conejo Creek.

1.4.4 County of Ventura

The Santa Rosa Basin is entirely within the County of Ventura. The County of Ventura has many administrative arms that are relevant to groundwater management in the Santa Rosa Groundwater Basin.

The Ventura County Water and Environmental Resources Division, Groundwater Section, oversees the administration of Ventura County Ordinance No. 4184. The purpose of this ordinance is to provide for the construction, maintenance, operation, use, repair, modification, and destruction of wells.

The Ventura County Watershed Protection District collects groundwater data throughout Ventura County, including Santa Rosa Basin, and reports these data to DWR. The

Ventura County Watershed Protection District is the only entity in the County with the jurisdiction to monitor groundwater elevation levels in all the groundwater basins within the County. They currently measure almost 200 wells every six weeks. The District has a database of groundwater level data dating back to the early 1970's.

1.4.5 Watersheds Coalition of Ventura County

The Watersheds Coalition of Ventura County (WCVC) was formed in April 2006 as the water resource management group required by the passage of Propositions 50 and 84, and is managed by County staff. The WCVC is a collaborative entity with interests in improving water quality, water supply reliability, water recycling, water conservation, flood control, recreation and access, wetlands enhancement and creation, and environmental and habitat protection (Ventura County, 2013). The WCVC, and its three watershed committees, are engaged in a variety of local planning efforts designed to address the objectives developed by the watershed committees; the District is a member of the Calleguas Creek committee. These committees form the Integrated Regional Water Resources Plan (IRWMP) development team for the area.

1.5 ROLES OF THE STATE AND FEDERAL AGENCIES IN CALIFORNIA GROUNDWATER MANAGEMENT

This section describes the roles that state and federal agencies have in California groundwater management. Although the groundwater management plans are the local responsibility, State and federal agencies still have goals related to groundwater management that are focused on maintaining a reliable groundwater supply.

1.5.1 Department of Water Resources

DWR’s role in groundwater management involves programs that directly benefit local groundwater management efforts. DWR’s programs include assisting local agencies to assess basin characteristics and identify opportunities to develop additional water supply, monitoring groundwater levels and quality, and providing standards for well construction and destruction.

1.5.2 State Water Resources Control Board and Regional Water Quality Control Board

The goals of the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) are to ensure water quality in the State and to enforce water quality objectives and implement plans to protect beneficial uses of the State’s waters. The SWRCB and RWQCB are involved in developing basin plans to identify beneficial uses of marine water, groundwater, and surface waters. The Los Angeles RWQCB has jurisdiction of the Santa Rosa Basin.

The Clean Water Act (§303) requires states to develop water quality standards for all waters and to submit them to the United States Environmental Protection Agency for approval. CWC §13241 specifies that each RWQCB establish water quality objectives for their region. These water quality objectives are defined as "the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." (RWQCB, 1994). These water quality objectives are intended to protect the public health, and maintain or enhance water quality in relation to existing and potential beneficial uses of the water.

The surface water and groundwater quality objectives prepared by Los Angeles RWQCB for the Santa Rosa Basin are published in the Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (RWQCB, 1994); these are commonly referred to as the Basin Plan objectives.

1.5.3 United States Geological Survey

The United States Geological Survey (USGS) has an active role in California groundwater basin studies and maintains an extensive database consisting of groundwater level and groundwater quality monitoring data. The USGS also maintains an extensive surface water flow data.

1.6 AUTHORITY TO PREPARE AND IMPLEMENT THE SRGMP

The authority for the District to prepare the SRGMP is outlined in the Groundwater Management Act, CWC §10750, originally enacted as Assembly Bill (AB) 3030 in 1992 to encourage voluntary groundwater management at the local level and provide local public agencies increased management authority over their groundwater resources. AB 3030 applies to all groundwater basins identified by the California Department of Water Resources.

In September 2002, new legislation, Senate Bill 1938 (SB 1938) expanded AB 3030 by requiring groundwater management plans to include certain specific components in order to be eligible for grant funding for various types of groundwater related projects.

The District selected the SRGMP as one of the tools to effectively protect and manage the Santa Rosa Basin. Protecting and effectively managing the Basin is consistent with the Camrosa Water District Urban Water Management Plan (District, 2011b), Integrated Facilities Master Plan (District, 2011a), as well as the CWC.

On December 14, 2011, the District Board set a Public Hearing date of January 11, 2012, to accept public comments, and at the conclusion of the Public Hearing make a decision to adopt a Resolution of Intention to prepare a Groundwater Management Plan Update. On January 11, 2012 the District Board of Directors adopted the Resolution of Intention to prepare a Groundwater Management Plan Update (included in **Appendix A**). The GMP is a required element of the policy.

Recently, there has been an emphasis by the State for agencies to develop integrated regional solutions for water management solutions (SB 1672), and coordinate the conjunctive management of surface and groundwater to improve regional water supply reliability and water quality.

1.7 SRGMP COMPONENTS

The California Department of Water Resources and the CWC provide a summary of Groundwater Management Plan components. The SRGMP includes required and voluntary components as listed in the CWC §10750 and DWR §10775.2 recommended components. Each of these components is addressed within the SRGMP.

Table 1-1 lists these components and indicates the section(s) in which each is addressed.

Table 1-1
Location of SRGMP Components

Description	Section(s)
A. CWC §10750 et seq., Required Components[1]	
1. Documentation of public involvement statement.	I
2. Basin Management Objectives (BMOs).	4
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping.	2
4. Plan to involve other agencies located within groundwater basin.	5
5. Adoption of monitoring protocols by basin stakeholders.	5
6. Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in CDWR Bulletin 118.	1.1
7. For agencies not overlying groundwater basins, prepare GMP using appropriate geologic and hydrogeologic principles.	Not Applicable
B. CDWR's Recommended Components	
1. Manage with guidance of advisory committee.	Not Applicable
2. Describe area to be managed under GMP.	1.1
3. Create link between BMOs and goals and actions of GMP.	4
4. Describe GMP monitoring program.	2.2, 2.3, 5.2
5. Describe integrated water management planning efforts.	5.5
6. Report on implementation of GMP.	5.6
7. Evaluate GMP periodically.	5.6
C. CWC §10750 et seq., Voluntary Components[2]	
1. Control of saline water intrusion.	5.3
2. Identification and management of wellhead protection areas and recharge areas.	5.3
3. Regulation of the migration of contaminated groundwater.	Not Applicable
4. Administration of well abandonment and well destruction program.	5.3
5. Mitigation of conditions of overdraft.	Not Applicable
6. Replenishment of groundwater extracted by water producers.	Not Applicable
7. Monitoring of groundwater levels and storage.	5.3
8. Facilitating conjunctive use operations.	5
9. Identification of well construction policies.	5.3
10. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.	5.7
11. Development of relationships with state and federal regulatory agencies.	5.1
12. Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination.	5.1, 5.5

1. CWC §10750 *et seq.* (seven required components). Amendments to the CWC §10750 *et seq.* require GMPs to include several components to be eligible for the award of funds administered by DWR for the construction of groundwater projects or groundwater quality projects. These amendments to the CWC were included in Senate Bill 1938, effective January 1, 2003.

2. CWC §10750 *et seq.* (12 voluntary components). CWC §10750 *et seq.* includes 12 specific technical issues that could be addressed in GMPs to manage the basin optimally and protect against adverse conditions

Addressing each of these components in the SRGMP demonstrates that the local groundwater basin management authority (the District) has a plan to protect the groundwater resource in a sustainable method for the benefit of current and future interests in the Basin.

Section 2
Water Resources Setting

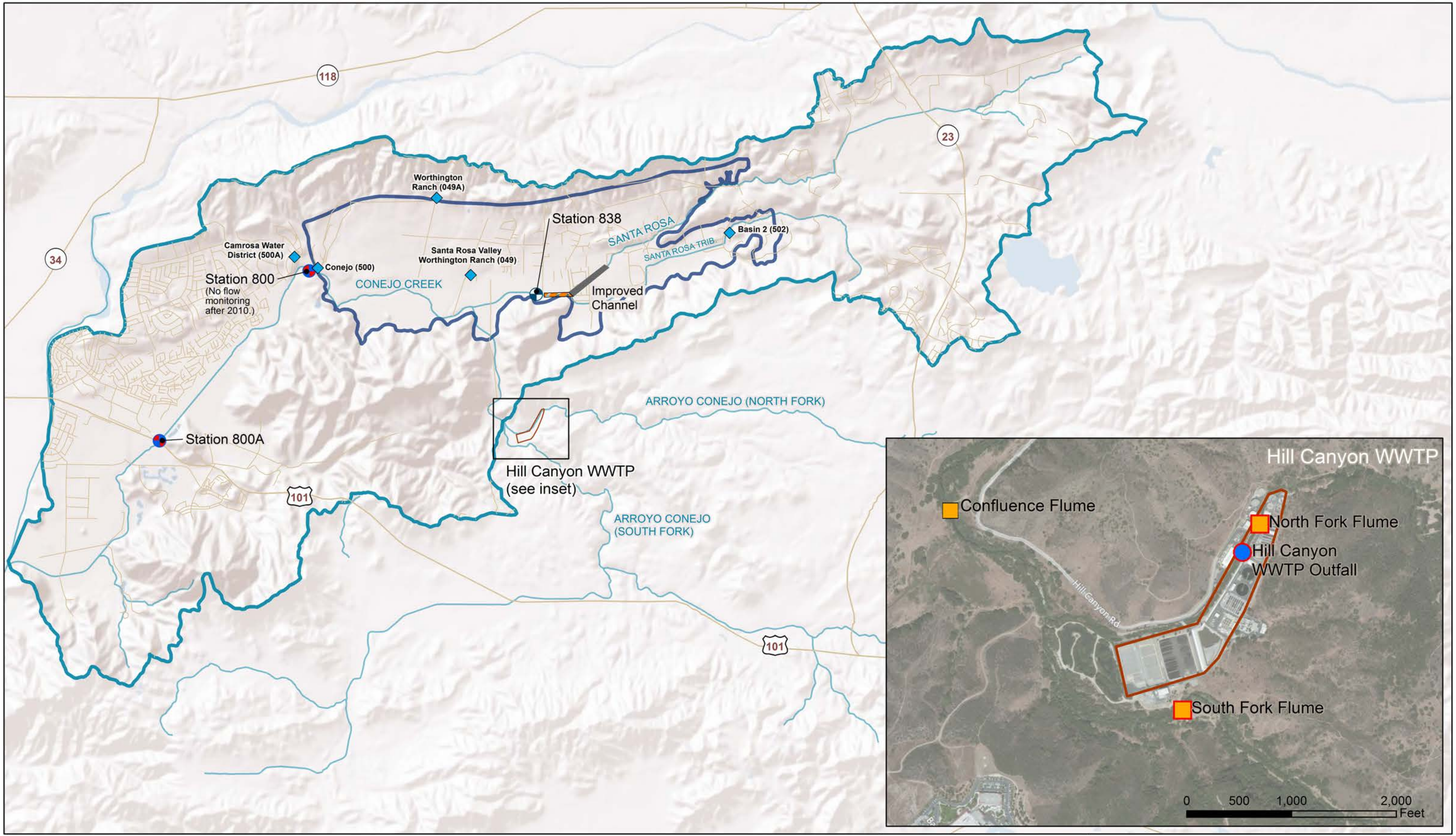
This section describes the water resource setting including the current understanding of the surface and subsurface features of the Santa Rosa Groundwater Basin. This section also includes a description of the groundwater and surface water features in the Basin. Information for this section was obtained from ongoing monitoring efforts and results of previous studies, and represents the best available information. The charts and figures included in this section illustrate the type of information and period of record for understanding the groundwater conditions within the Basin. Instances where the data record appears incomplete, inconsistent, or missing altogether are also noted.

2.1 ENVIRONMENTAL SETTING

The climate of the Basin is classified as Mediterranean. On average, more than 90 percent of the annual rainfall occurs during the six-month period extending from November through April, typical of the Southern California coastal area. Based on precipitation stations maintained by Ventura County Flood Control District, the Santa Rosa Valley surface drainage area receives an average of almost 15 inches of rainfall per year, varying from less than six inches in the driest years to more than 30 inches in the wettest years (District, 2010). **Figure 2-1** shows the watershed and Santa Rosa Groundwater Basin, as well as major surface water and precipitation monitoring stations.

The average temperature fluctuates between an average low of about 44 degrees (January) and an average high of about 75 degrees (August). **Table 2-1**, based on the period of record May 1998 through January 2010 for the Oxnard California WFSO 045672 station, lists the monthly average climatic data for the District service area.

The evapotranspiration (ET) averages for the service area are also contained in **Table 2-1**. These monthly averages are based on historical data obtained from California Irrigation Management Information System (CIMIS) Station 156 – Camarillo, California for the period October 2001 through January 2010.



Key to Features

- Santa Rosa Valley Groundwater Basin
- Watershed Boundary
- ◆ Weather Station
- ▨ Rip Rap Channel
- ▬ Improved Channel
- Stream Flow Gages
- ☐ Hill Canyon WWTP
- — Streams
- ● ● 🟧 Surface Water Quality Locations
- 🟧 Temporary Flume (Surface Water Measurements Taken June - September)
- ● Outfall

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Santa Rosa Valley Surface Water and Precipitation Gaging Station Map

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Figure 2-1

Table 2-1
Santa Rosa Basin Climate Averages

Month	Standard Monthly Average ETo[1] (inches/year)	Monthly Average Maximum Temperature (°F)	Monthly Average Minimum Temperature (°F)	Monthly Average Total Precipitation (inches)
January	1.83	66.8	45.6	2.91
February	2.20	65.9	45.7	3.76
March	3.42	66.9	47.0	1.75
April	4.49	67.6	48.1	1.24
May	5.25	70.0	52.8	0.44
June	5.67	72.5	56.4	0.03
July	5.86	75.8	59.5	0.00
August	5.61	76.0	59.2	0.00
September	4.49	74.8	57.7	0.10
October	3.42	73.7	53.7	0.63
November	2.36	70.3	48.8	1.19
December	1.83	66.4	44.8	1.60
Annual Total/Average	**46.43**	**70.6**	**51.6**	**13.65**

1. ETo is the evapotranspiration from a standardized grass surface
2. Source: District, 2011b Urban Water Management Plan, Table 2.

2.1.1 Precipitation

Precipitation is often a key element of a water budget and therefore characterization of trends in precipitation is of great importance in evaluating long-term hydrologic relationships. Precipitation and related runoff is a major source of groundwater recharge. Cumulative departures from the mean are used to identify long-term trends in both precipitation and stream flow. Cumulative departures of the annual precipitation from the long-term mean are accumulated through the period of record and plotted against time. The resulting plot illustrates dry periods and wet periods, as well as the severity and frequency of each. This plot can also be used to determine if there is a temporal correlation between groundwater and precipitation. The cumulative departure plot of precipitation for Worthington Ranch (Ventura County Watershed Protection District station 049) was used to identify wet and dry periods (**Figure 2-2**). The wet and dry climatic periods were determined using the rising and falling limbs of the cumulative departure curve, respectively.

Four alternating climate cycles that resulted in four wet and five dry periods between 1929 and 2012 were identified on the basis of the cumulative departure curve for precipitation measured at Worthington **Table 2-2**. The climate cycles were separated into wet-year and dry-year periods as follows:

Table 2-2
Santa Rosa Basin Climate Cycles

Cycle	Dry Period	Wet Period
1	1929–1934	1934–1944
2	1944–1964	1964–1969
3	1969–1977	1977–1986
4	1986–1991	1991–2006

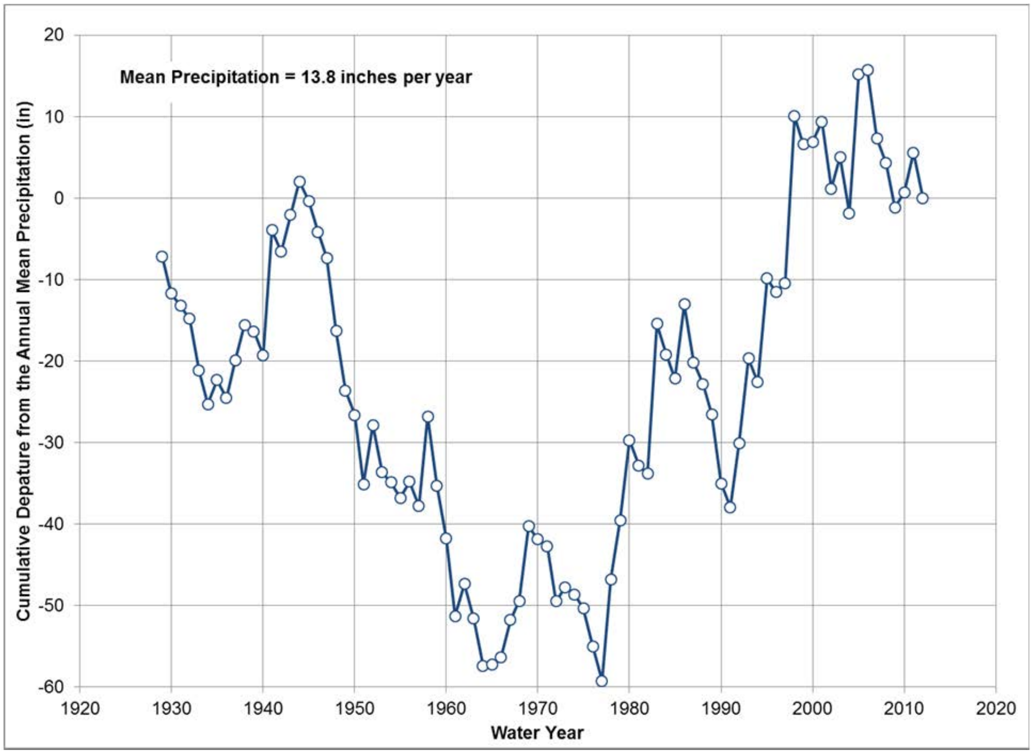


Figure 2-2
Precipitiation Cumulative Departure From the Mean – Station 049 Worthington Ranch

2.1.2 Land Use

Land use is important for groundwater management because it affects the quality of local surface water and groundwater as well as the ability to recharge groundwater. The land use within the contributing drainage area to the Santa Rosa Groundwater Basin is illustrated on **Figure 2-3** and listed on **Table 2-3**. The majority of the land within the Santa Rosa Valley and the contributing drainage area to the Santa Rosa Groundwater Basin is unincorporated and planning efforts are coordinated by the County of Ventura. Local cities within the contributing drainage area conduct their own planning activities.

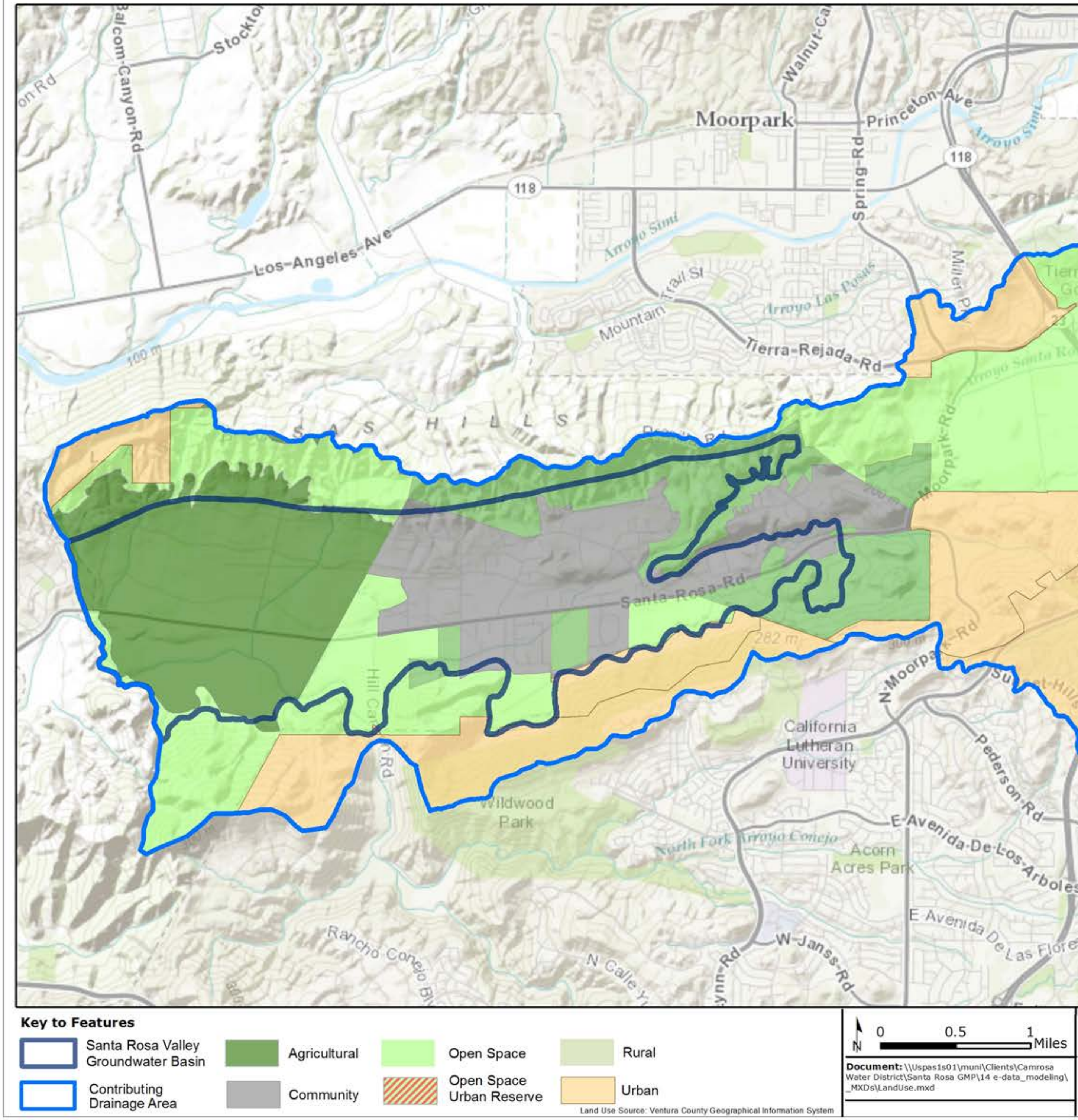
Prior to the 1960's, the Santa Rosa Valley was dedicated to agriculture, primarily citrus crops. By the late 1980's, residential development had risen to 40 percent of the basin area (Boyle, 1987). By 2011, residential lots, ranging in size from two to 40 acres, accounted for 30 percent of the basin area (District, 2011). The Santa Rosa Valley has an annual population growth rate of 0.75 percent. Agricultural use currently accounts for approximately 13 percent of the land within the contributing drainage area. Crop types consist of orchards, berries/nursery, and row crops. Approximately 37 percent of agricultural zoned acreage is irrigated, 26 percent is non-irrigated, and 37 percent is planned to be converted to municipal and industrial use (District, 2011). The remaining land use consists of rural space, open space, and a small fraction of urban development. The entire basin is dependent on permitted septic systems for wastewater disposal. A significant portion of the contributing drainage area does not have a land use classification.

The Tierra Rejada Valley is located on the eastern boarder of the Santa Rosa Valley. The Tierra Rejada Valley is primarily open space and agriculture, with sparse rural-residential developments (District, 2011). A golf course is located in the northeastern portion of the watershed. This area also relies on septic systems for wastewater disposal.

Table 2-3
Land Use Distribution in the Santa Rosa Groundwater Basin Contributing Drainage Area

Land Use Type[1]	Area (acres)	Percent of Total Areal
Agricultural	1,650	13%
Urban	1,150	9%
Open Space	3,808	31%
Rural	1,335	11%
Open Space Urban Reserve	7	<1%
Existing Community	1,429	12%
Non-Classified	2,895	24%
Total Area (acres)	**12,274**	**100**

1. County of Ventura, 2010



Land Use Source: Ventura County Geographical Information System

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Santa Rosa Groundwater Basin Contributing Drainage Area Land Use

MWH

Figure 2-3

2.2 SURFACE WATER CONDITIONS

The primary surface water bodies in the Santa Rosa Valley are the Arroyo Conejo, Conejo Creek, and Arroyo Santa Rosa (**Figure 2-1**). Arroyo Conejo enters the basin from the south and is the primary drainage of Thousand Oaks, draining through the Conejo Hills into Hill Canyon and then into the Santa Rosa Valley. At the mouth of Hill Canyon, the creek joins Arroyo Santa Rosa and becomes Conejo Creek which turns west and drains into the Pleasant Valley Basin and eventually Calleguas Creek. Arroyo Santa Rosa trends east-west, bisecting the Santa Rosa Valley, draining the Tierra Rejada Basin before joining Arroyo Conejo. The drainage area compromises 64 square miles (Boyle, 1987).

2.2.1 Arroyo Santa Rosa

Arroyo Santa Rosa bisects the Santa Rosa Valley and is an ephemeral creek. In 2006 a stream gage was established about one mile upstream of where the Arroyo Santa Rosa discharges into Conejo Creek (**Figure 2-1**). Stream flow measurement at Station 838 on Arroyo Santa Rosa began in 2006. Station 838 was installed for the purpose of recording peak flows during high precipitation events. The data provided by the stream gage is not reliable for typical flows and therefore was not used.

From Santa Rosa Road to Honey Hill Road (approximately 3,000 feet), Arroyo Santa Rosa is composed of a rectangular reinforced concrete channel and a trapezoidal rip rap channel. Downstream of Honey Hill Road to Blanchard Road (approximately 2,750 feet) the channel is still an improved trapezoidal channel, however, this segment is not concrete lined.

2.2.2 Arroyo Conejo

Arroyo Conejo enters the basin from the south where it becomes Conejo Creek draining through the Conejo Hills into Hill Canyon and the into the Santa Rosa Valley. There are two forks of the Arroyo Conejo, a north fork and a south fork. These creeks have no USGS gaging stations, although the Hill Canyon WWTP records flow information on both forks during the summer months. As shown in **Figure 2-1**, the Hill Canyon WWTP discharges effluent into the north fork of Arroyo Conejo. Immediately downstream of the Hill Canyon WWTP, the south fork of Arroyo Conejo merges with the north fork.

The largest contribution to flow to Conejo Creek is the effluent flow from the Hill Canyon WWTP and it is also the most consistent over the recorded period. The Hill Canyon WWTP effluent began discharging into the creek in 1961, although the data presented in **Table 2-4** are all that are available from the facility.

2.2.3 Conejo Creek

At the mouth of Hill Canyon is the confluence of Arroyo Conejo and Arroyo Santa Rosa known as Conejo Creek. From the confluence it turns west and drains into the Pleasant Valley Basin and eventually Calleguas Creek. Discharge in Conejo Creek is predominantly from Arroyo Conejo. Since the addition of the Hill Canyon WWTP effluent in 1961, Conejo Creek was a perennial stream with continuous flow at the County's gauging station (Station 800). In 1968 this gaging station was established by the Ventura County Watershed Protection District and has recorded year-round flows since October 1972. From 1972 through 2010 this gaging station was located just outside of the groundwater basin near the District headquarters on Santa Rosa Road. In 2011 the gage was renamed as Station 800A and was relocated to Ridge View Street south of Highway 101. **Table 2-4** lists the Station 800 flow data from 2003 to 2010. **Table 2-4** also lists the percentage of creek flow that consists of WWTP effluent.

Data presented in **Table 2-4** suggest that the composition of flow in Conejo Creek varies depending on precipitation. Effluent from Hill Canyon WWTP makes up between 23 percent to 71 percent of the total annual flow of Conejo Creek on an annual basis. Using only dry months (June through September where the long-term precipitation averages 0.10 inches or less), Hill Canyon WWTP effluent contributes an average of 79 percent of the total flow in Conejo Creek. For the majority of the year, Hill Canyon WWTP effluent is the predominant contributor to the flow in Conejo Creek.

Table 2-4
Summary of Average Annual Flow at Conejo Creek and Hill Canyon WWTP Effluent

	Annual Discharge			**Dry Month Discharge[3]**		
Year	**HC WWTP Effluent[1] (MGD)**	**Conejo Creek[2] (MGD)**	**Percent HC WWTP Effluent**	**HC WWTP Effluent[1] (MGD)**	**Conejo Creek[2] (MGD)**	**Percent HC WWTP Effluent**
1997	9.4	20.4	46	9.2	11.1	82
1998	10.2	44.4	23	9.8	16.3	60
1999	9.8	14.7	66	9.8	10.9	90
2000	10.3	16.1	64	10.2	10.8	94
2001	11.1	25.1	44	10.8	12.3	88
2002	10.6	14.9	71	10.3	11.4	90
2003	11.2	19.3	58	10.8	12.9	84
2004	11.1	21.5	52	10.7	13.5	80
2005	12.0	41.4	29	10.9	16.9	64
2006	10.6	20.8	51	10.4	15.0	70
2007	10.3	15.2	68	10.3	13.4	77
2008	10.6	22.5	47	10.2	13.9	74
2009	10.0	16.3	61	9.8	10.4	94
Average	**10.6**	**22.6**	**47**	**10.2**	**13.0**	**79**

1. Conejo Creek discharge measurement at Station 800
2. Hill Canyon WWTP (HC WWTP) discharge measurement at HC WWTP Effluent Outfall
3. Dry months are defined as the period from April through December.

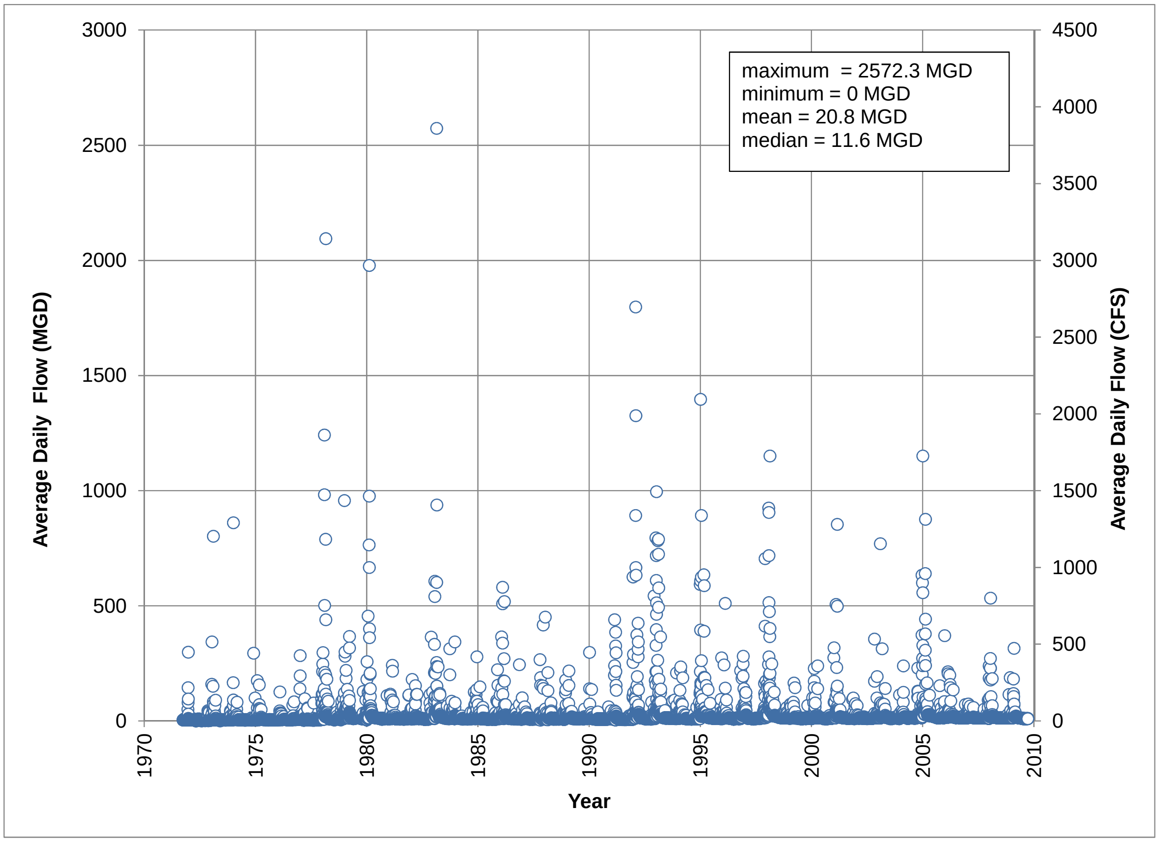


Figure 2-4
Conejo Creek (1971-2010) Hydrograph at Station 800

Figure 2-4 illustrates the average daily flow at Station 800 on Conejo Creek from 1971 to 2009, a different time period than **Table 2-4**. The variability in discharge rate can be attributed to precipitation events which dramatically increase flow in the creek.

Figure 2-5 illustrates the average monthly flow in Conejo Creek, from 1971 to 2010. The wet months of January, February, and March have a significantly higher flow than the summer months.

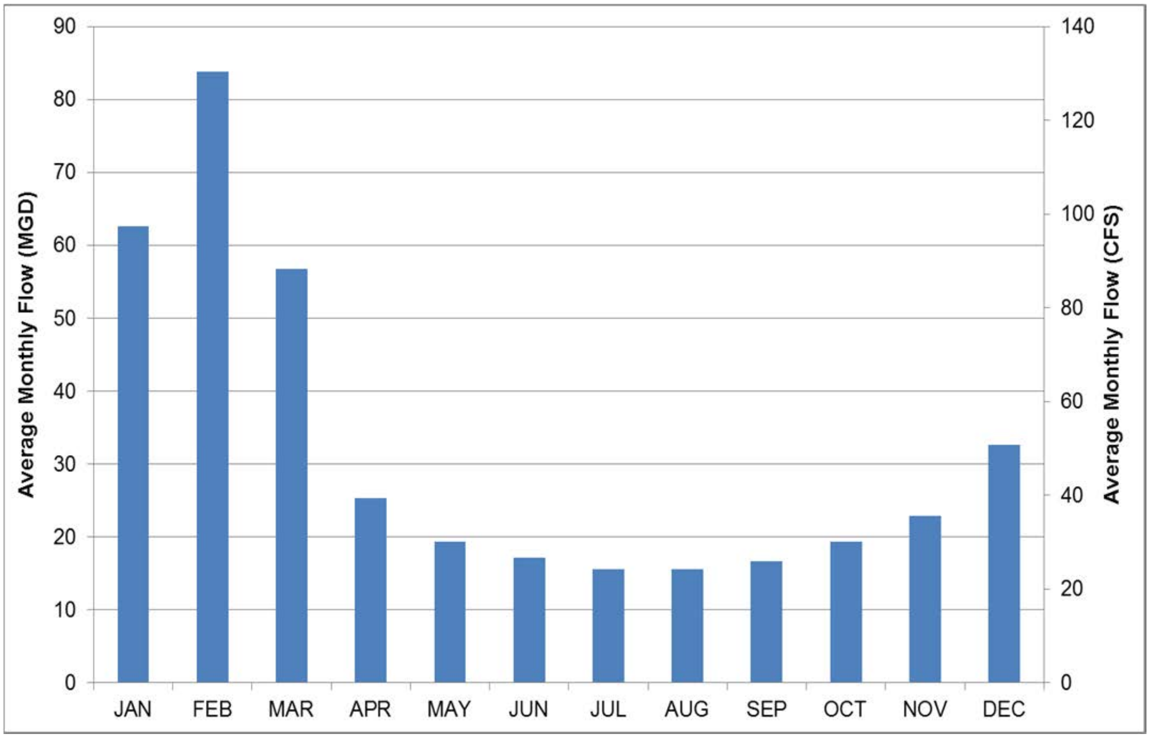


Figure 2-5
Average Monthly Flow in Conejo Creek (1971-2010) at Station 800

2.2.4 Surface Water Quality

Water quality data within the Santa Rosa Basin has been collected and reported for the period from 1990 to the present by the District. Water quality samples are collected from approximately 45 locations within the basin including groundwater wells, creeks, Hill Canyon WWTP effluent, recycled water system, drinking water system, and reservoirs. Monthly samples are collected from the following locations: Hill Canyon WWTP Effluent Outfall, Station 800A, Arroyo Conejo North Fork (North Fork Flume), Arroyo Conejo South Fork (South Fork Flume), and Conejo Creek (Station 800) (as shown on **Table 2-5**). Samples are analyzed for chloride, fluoride, hardness, nitrate, nitrite, pH, phosphate, sulfate, TDS, and turbidity. Additional sampling and analysis for other constituents is conducted periodically, approximately every one to three years. This section provides a summary of the surface water quality results and brief descriptions of trends for constituents in relation to regulatory objectives.

Figure 2-1 presents the flow and water quality measurement locations within the basin. Water quality data for Arroyo Santa Rosa is not available.

Surface water quality from monitoring locations throughout the basin (**Figure 2-1**) has been tabulated on **Table 2-5**; the table also presents the inland surface water quality objectives of the Los Angeles RWQCB within the Arroyo Santa Rosa Hydrologic Unit. These are published in the Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (RWQCB, 1994) and commonly referred to as Basin Plan objectives.

The Clean Water Act (§303) requires states to develop water quality standards for all waters and to submit them to the United States Environmental Protection Agency for approval. CWC §13241 specifies that each RWQCB establish water quality objectives for their region. These water quality objectives are defined as "the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." (RWQCB, 1994). These Basin Plan objectives are intended to protect the public health, and maintain or enhance water quality in relation to existing and potential beneficial uses of the water.

Table 2-5 also lists a comparison of surface water quality data with applicable California drinking water quality standards, both primary and secondary (aesthetic) maximum contaminant levels (MCLs). Primary MCLs are derived from health-based criteria which include technologic and economic considerations. Primary MCLs are legally enforceable standards that apply to public water systems designed to protect the public health by limiting the levels of contaminants in drinking water. Secondary MCLs are designed to regulate contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. In California, public water systems are required to comply with both primary and secondary MCLs as per §116555 of the California Safe Drinking Water Act.

Water quality sampling results from Hill Canyon WWTP Effluent Outfall, Station 800A, Arroyo Conejo North Fork (North Fork Flume), Arroyo Conejo South Fork (South Fork Flume), and Conejo Creek (Station 800) (as shown on **Figure 2-1**) indicate that one or more of the regulatory limits are exceeded for the following constituents:

- Chloride
- Nitrate
- Sulfate
- Total Dissolved Solids

Table 2-5
Surface Water Quality Summary from 1990 to 2010[1]

Constituent	Primary MCL	Secondary MCL	RWQCB Basin Plan Objectives[2]	Units	Arroyo Conejo (North Fork)				Arroyo Conejo (South Fork)				Hill Canyon WWTP Effluent Outfall				Conejo Creek (Station 800)				Diversion Flume (Station 800A)			
					Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave
Chloride	--	250	150	mg/L	213	357	22	219	206	259	54	173	75	188	52	136	217	350	37	154	83	227	39	155
Fluoride	2	--	1.4-2.4[3]	mg/L	31	0.8	0.049	0.37	23	0.74	0.25	0.35	28	1.00	0.07	0.53	29	0.75	0.19	0.47	30	0.8	0.07	0.48
Hardness (as CaCo3)	--	--	--	mg/L	228	899	120	665	215	860	200	665	86	475	150	211	229	600	200	389	93	612	171	371
Nitrate (as NO3)	45	--	45	mg/L	216	28	0.6	8	205	36	0.6	8	75	63	8.2	39	216	102	7	31	82	50	0.3	29
Sulfate	--	250	250	mg/L	211	1040	46.6	311	200	922	68	308	74	173	36	122	216	306	78	200	81	312	42	199
Total Dissolved Solids	--	500	850	mg/L	213	1,660	22	1221	206	1,584	54	1,116	75	820	52	572	217	1,372	37	799	83	1,222	39	790

1. Number of samples per location and constituent vary. Averages are calculated using the total number of samples, as provided by the count.
2. Values provided from the Los Angeles Regional Water Quality Control Board (RWQCB) Basin Plan, dated June 13, 1994, for inland surface waters of the “Calleguas Creek Watershed Above Potrero Road”.
3. MCL for fluoride by annual average of maximum daily air temperature.

MCL = Maximum Contaminant Level
mg/L = Milligrams per Liter
-- = (Not Applicable)

Chloride: The surface water Basin Plan objective for chloride is 150 milligrams per liter (mg/L). As shown in **Table 2-5**, chloride concentrations range from 22 to 357 mg/L. Increased concentration of chloride may be attributed to high chloride levels in Conejo creek, cyclical increases of chloride in imported water, natural sources in geologic formations, and agricultural activities (District, 2011).

Nitrate: The surface water Basin Plan objective for nitrate (as NO_3) is 45 mg/L. As shown in **Table 2-5**, nitrate (as NO_3) concentrations range from 0.6 to 102 mg/L. Concentrations of nitrate have historically exceeded RWQCB Basin Plan objectives. The District currently blends groundwater with State Water Project (SWP) water to adjust high levels of nitrate.

Sulfate: The surface water Basin Plan objective for sulfate is 250 mg/L. As shown in **Table 2-5**, sulfate concentrations range from 36 to 1,040 mg/L.

Total Dissolved Solids (TDS): The surface water Basin Plan objective for TDS is 850 mg/L. As shown in **Table 2-5**, TDS concentrations range from 22 to 1,660 mg/L. Concentration of TDS has remained consistently high since the mid-1980's (Boyle, 1996).

2.3 GROUNDWATER CONDITIONS

This subsection provides a description of general groundwater conditions including the groundwater basin, the geology/hydrogeology, groundwater elevation, and groundwater quality within the SRGMP area.

2.3.1 Groundwater Basin

The Santa Rosa Groundwater Basin underlies Santa Rosa Valley in southern Ventura County. The valley is bounded on the north by the Las Posas Hills and Simi Fault, on the south by the Conejo Volcanic rocks, on the east by the Mountcliff Ridge, and the west by the Pleasant Valley Summit. Ground surface elevations range from about 200 feet in the west to about 400 feet above sea level in the east. The Conejo Hills reach elevations of over 1,000 feet above mean sea level (about 700-800 feet higher than the valley floor). The western boundary of the basin consists of a low, north-trending ridge of volcanic rocks. The narrow Arroyo Santa Rosa Valley separates the Santa Rosa Basin from the Tierra Rejada Basin to the east (District, 1997). The groundwater basin is illustrated on **Figure 2-1**.

2.3.2 Geology and Hydrogeology

The Santa Rosa Basin is located in the tectonically active Transverse Ranges physiographic province. The surrounding mountains are composed of a variety of consolidated marine and terrestrial sedimentary and volcanic rocks of Late Cretaceous through Quaternary age. The basin is filled with a mixture of consolidated and unconsolidated marine and terrestrial coastal deposits of Tertiary and Quaternary age. These basin-fill sediments and consolidated rocks form a complex set of aquifer systems that have been the primary source of water supplies since the early 1900s.

Agriculture has been the main user of groundwater, and in recent years public supply and industry have become significant users of groundwater.

Hydrostratigraphy

According to Hanson et al. (USGS, 2003), lithology in the Santa Rosa Basin and surrounding area can be grouped into two general categories:

- Upper Cretaceous and Tertiary consolidated bedrock and
- Quaternary unconsolidated deposits

The local surficial geology is shown on **Figure 2-6**.

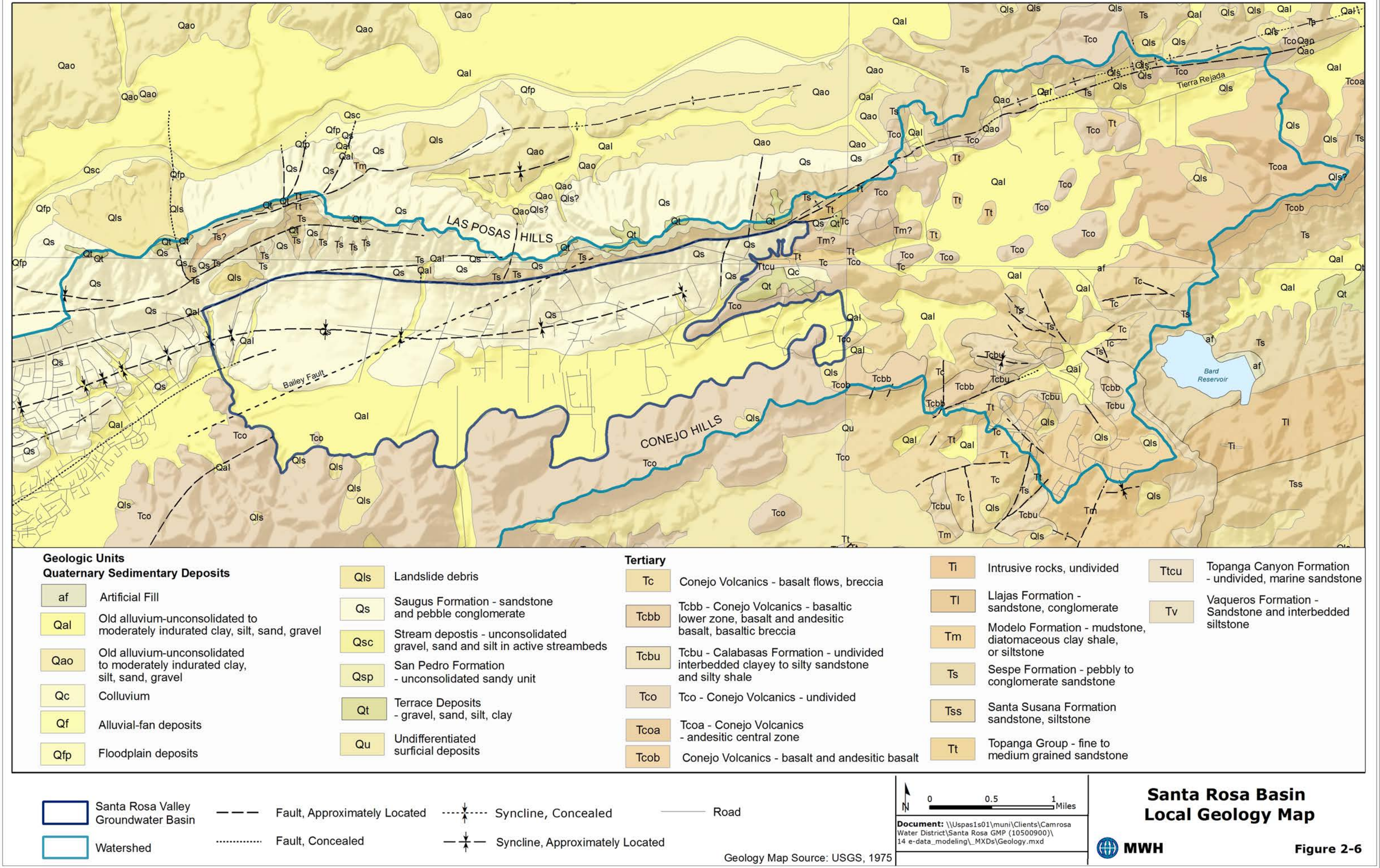
The upper Cretaceous and Tertiary consolidated rocks include sedimentary, volcanic, igneous, and metamorphic rocks. These rocks are virtually non-water bearing and form the base of the basin.

Volcanic rocks and related intrusive rocks of Miocene age underlie parts of Santa Rosa Basin that have been developed for water supply where alluvial deposits are absent. The Conejo Volcanics comprise more than 1,000 feet of basalt breccias and lava flows of Miocene age (Boyle, 1987).

The Santa Margarita Formation in the Santa Rosa Valley subbasin is grouped with the unconsolidated sediments of the lower system. Layers within the Santa Rosa Valley can be 300 to 100 feet thick (Boyle, 1987). During the Pleistocene epoch, major changes in sea level resulted in cycles of erosion and deposition. The sequence of deposits above the erosional unconformities typically starts with a basal conglomerate that is laterally extensive, relatively more permeable than the underlying deposits, and a potential major source of water to wells perforated in these deposits. These coarse-grained layers of fluvial and beach deposits are interbedded with extensive fine-grained layers.

The Quaternary unconsolidated deposits consist of the Santa Barbara Formation, the San Pedro Formation, and the Saugus Formation, all of the Pleistocene epoch, and unconsolidated alluvial and fluvial deposits of the Pleistocene to Holocene epoch. Hanson et al. (USGS, 2003) grouped the unconsolidated deposits together into the upper-aquifer system and the lower-aquifer system.

The Santa Barbara Formation overlies consolidated Tertiary rocks and consists of marine sandstone, siltstone, mudstone, and shale. The formation is of low permeability and generally contains water of poor quality (USGS, 2003). This formation consists of an estimated 20 to 30 feet of blue-gray sandy silt; it only occurs at the extreme western end of the basin and appears to pinch out to the east (Boyle, 1987).



Geology Map Source: USGS, 1975

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Santa Rosa Basin Local Geology Map

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Figure 2-6

The lower portion of the San Pedro Formation consists of marine sand and gravel beds. The upper part of San Pedro Formation consists of lenticular layers of sand, gravel, silt, and clay of marine and continental origin (USGS, 2003). The silt, sand, and gravel fluvial deposits within the upper part of the San Pedro Formation are mapped to as the Saugus Formation. The sand and gravel layers range from 10 to 105 feet thick and are separated by silt and clay layers that generally are 10 to 20 feet thick (Boyle, 1997). The Santa Barbara and San Pedro Formations are absent east of the Santa Rosa Valley. In the eastern part of the basin, recent alluvial and terrace deposits were deposited unconformably on the marine shale and sandstone beds of the Santa Margarita Formation (Late Miocene) or rest unconformably on the Conejo Volcanics (Middle Miocene).

The Late Pleistocene and Holocene deposits are unnamed, consist of relatively flat-lying unconsolidated alluvial deposits. The alluvium deposits include gravels, sands, and silts deposited within and adjacent to the channels of Santa Rosa, and Conejo Creeks. These deposits are generally less than 100 feet thick (Boyle, 1987), and are regionally grouped into the upper system of water-bearing deposits. These deposits were deposited unconformably on the older unconsolidated deposits. The basal deposits of the Holocene epoch consist of gravel and sand, which are overlain by fine-grained deposits. These basal deposits are relatively more permeable than underlying deposits, and are potential major sources of water to wells completed in the saturated parts of these deposits.

Aquifer Systems

Hansen et al. (USGS, 2003) divided the water-bearing deposits in the Santa Clara-Calleguas Basin into six aquifers. In the Santa Rosa Basin, however, five aquifers are identified. The unconsolidated deposits of the late Pleistocene and Holocene epochs are grouped into the regional upper-aquifer system, which includes the Shallow, Oxnard, and Mugu Aquifers. The lower-aquifer system is composed of complexly faulted and folded unconsolidated deposits of the Pliocene and Pleistocene epochs and includes the Upper and Lower Hueneme Aquifers. This representation is regional, but consistent with Bailey (1969, and Boyle, 1987) for the Santa Rosa Basin. East of the Bailey Fault, the shallow aquifer, Santa Margarita, and Conejo Volcanics are the primary water bearing units (Boyle, 1987).

The Shallow Aquifer extends from land surface to a depth of up to 600 feet (Boyle, 1987). The Shallow Aquifer consists of fine-to-medium sand with interbedded clay layers. Clay layers separate the Shallow Aquifer from the underlying Santa Margarita Aquifer.

East of the Bailey Fault, underlying the Shallow Aquifer is the Santa Margarita Aquifer. The thickness of this aquifer is 700 feet in the center of the basin and pinches out against the Conejo Volcanics to the south (Boyle, 1987).

Structure and Groundwater Subbasins

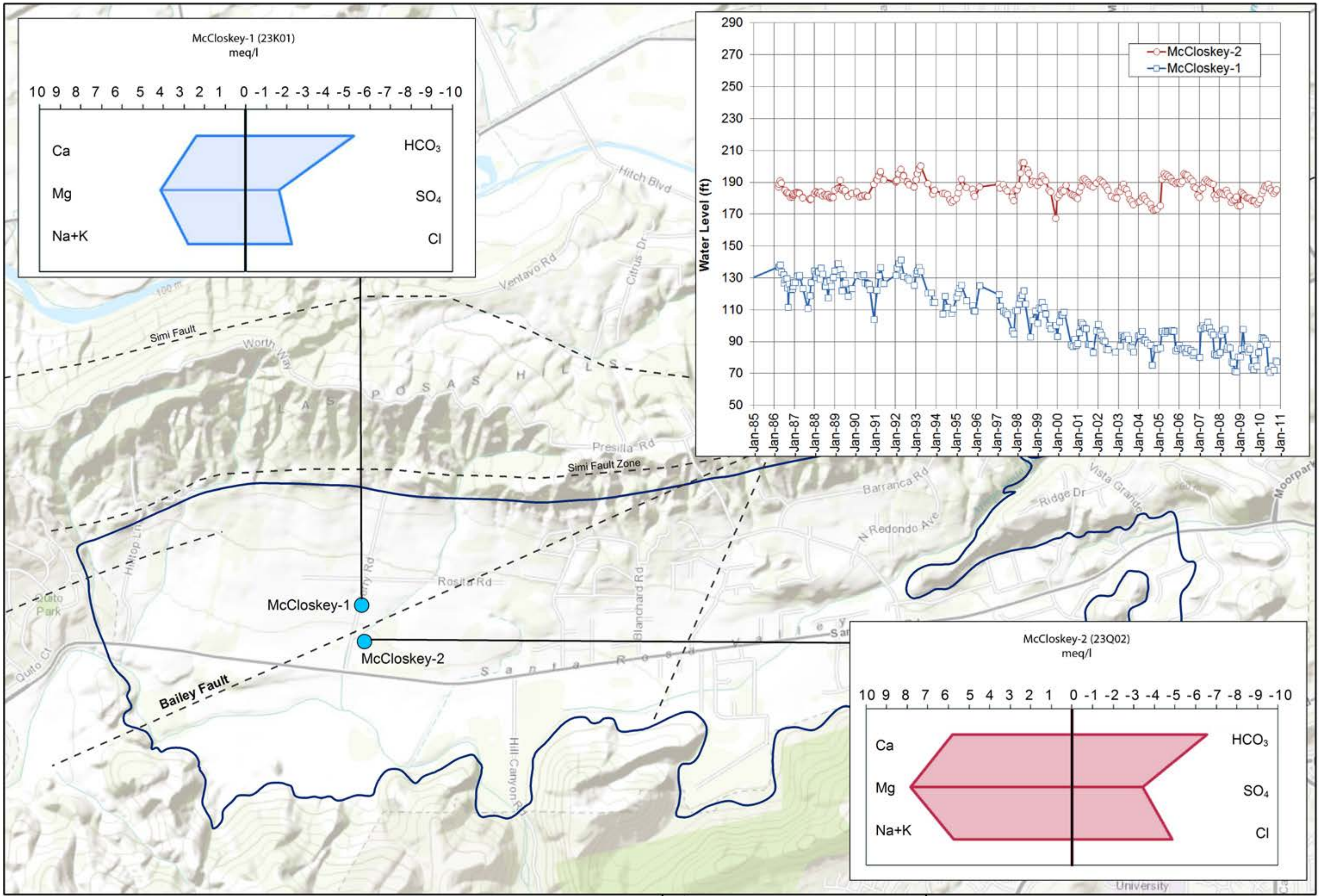
The dominant structural feature of the Santa Rosa Groundwater Basin is the Santa Rosa Syncline, which is a roughly east-west trending downward folding that extends from the east end of the Tierra Rejada Valley dipping westward into Pleasant Valley. Two northeast-southwest trending faults cut the Santa Rosa Groundwater Basin into three subbasins. The western fault is termed Bailey Fault and the eastern fault is unnamed. The western subbasin (west of the Bailey fault) is managed by the FCGMA. The SRGMP study focuses on the eastern two subbasins. There is little evidence of hydraulic subdivision of the two eastern subbasins; they are considered the same basin in this document. The westernmost subbasin divided by the Bailey Fault from the others, shows hydraulic separation from the eastern two thirds of the basin and is discussed below.

Bailey Fault

Boyle Engineering (1997) reported water level differences of 60 to 80 feet across the fault. McCloskey Well-1 (screened 350-800 feet bgs) and McCloskey Well-2 (no screen data is available) are located on west and east side of the Bailey Fault separated by a distance of 900 feet. **Figure 2-7** shows the location of the two wells, hydrographs, and water quality diagrams for each. Water levels at McCloskey Well-2 were generally around 180 feet mean sea level (msl) with low magnitude of fluctuation from March 1986 to July 2010. The average water elevation at McCloskey Well-1 was 108 feet msl and the water level fluctuated from a low of 66 feet msl on May 4, 1964 to a high of 142 feet msl on April 1, 1992.

Water quality data are illustrated with water quality or Stiff diagrams on **Figure 2-7**. A Stiff diagram is a graphical representation of chemical analyses developed by H.A. Stiff (Stiff, 1951). Stiff diagrams are created by plotting the equivalent concentration of the cations left of the center axis and anions on the right. The points are connected to form the figure. These diagrams are useful for quickly identifying water from different sources. A sample taken from McCloskey Well-1(23K01) on May 25, 2000 has a magnesium-sodium-bicarbonate (Mg-Na-HCO3) character, a TDS concentration of 560 mg/L and a nitrate concentration of 10 mg/L. A sample from McCloskey Well-2(23Q02) was taken on May 25, 2000 and analyzed to have magnesium-calcium-bicarbonate (Mg-Ca-HCO3) character, a TDS concentration of 1170 mg/L, and a nitrate concentration of 292 mg/L.

The water level and water quality differences (i.e. Stiff diagram differences) suggest that the Bailey fault is a groundwater flow barrier.



Key to Features

● Well

▭ Santa Rosa Valley Groundwater Basin

N

0 0.25 0.5 Miles

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Bailey Fault as a Barrier to Groundwater Flow

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Figure 2-7

2.3.3 Groundwater Production

The District has been the major producer of groundwater within the Santa Rosa Basin. Major pumping wells are SRMWC-3, SRMWC-8, SRMWC-9, SRMWC-10, Penney, Conejo-1, Conejo-2, Conejo-3, and Conejo-4. Annual total production provided by the District is summarized on **Figure 2-8.** Groundwater production had been reduced sharply from the late 1950s and early 1960s until 1991, when pumping began to increase until 2008. Annual total production over the last 50 years is approximately 3,040 acre-feet/year. **Figure 2-9** indicates production well location and **Table 2-6** lists all the wells in the Santa Rosa Basin along with summary information for each well.

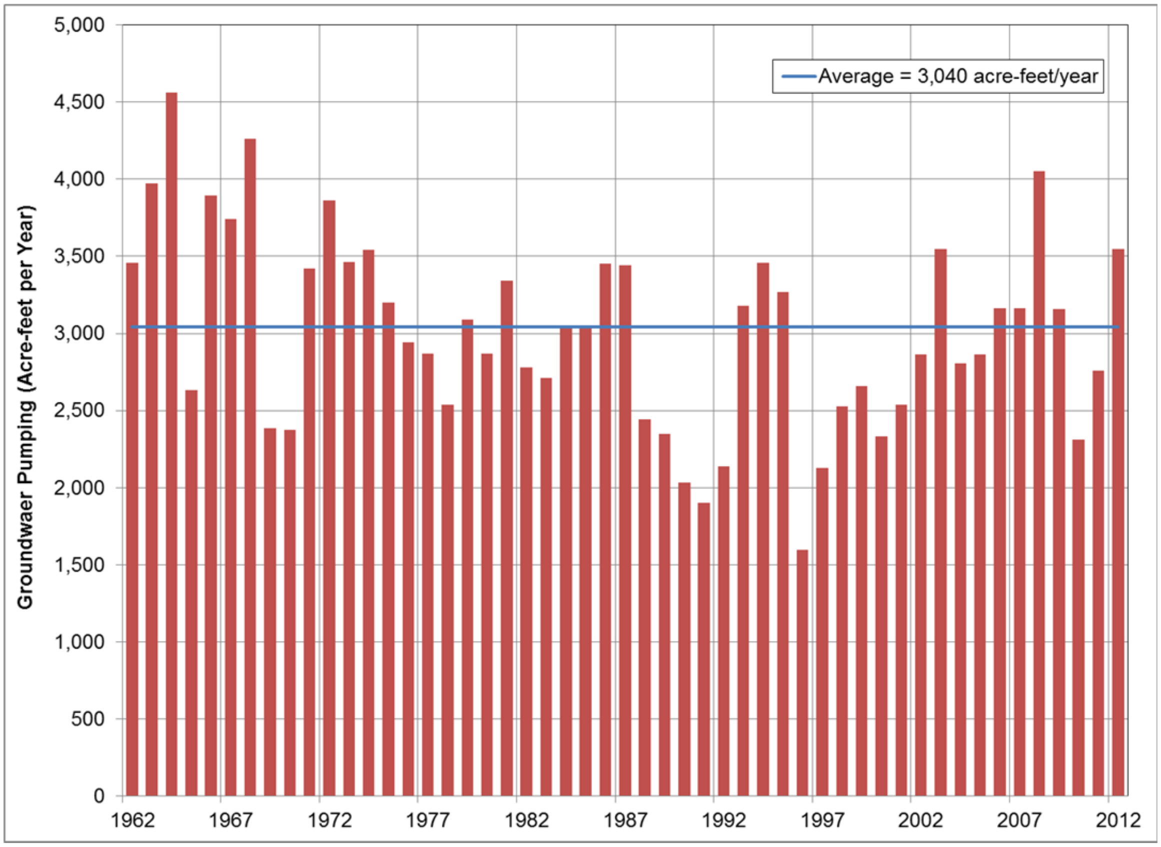
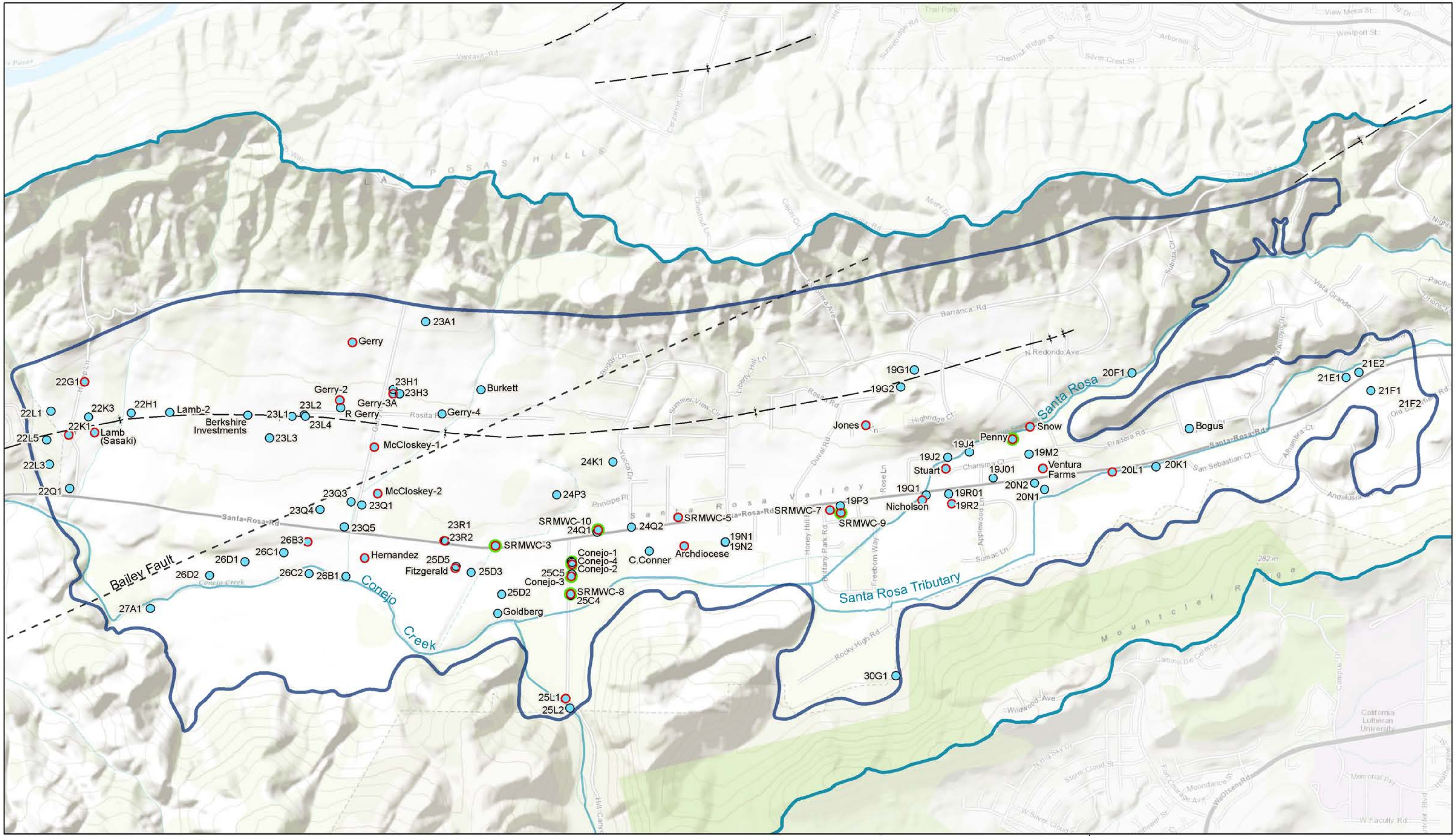


Figure 2-8
Known Santa Rosa Basin 50-Year Groundwater Pumping Summary (no data for 1984 and 1985, assumed mean value)

Groundwater remains an important water supply for the area and the Santa Rosa Basin groundwater represents roughly 12 percent of the total supply for the District, or about 16 percent of the total potable supply (District, 2011a). **Table 2-7** lists the projected pumping in the Santa Rosa Basin through 2035 and the percent of the total water supply the Santa Rosa groundwater comprises (District, 2011a). The planned pumping amounts are approximately 16 percent higher than the 50-year pumping average.



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Santa Rosa Basin Well Map

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Figure 2-9

Table 2-6
Santa Rosa Basin Summary of Well Information

State Well No.	Local Well or Map Name	Well Elevation (ft MSL)	Lithology Record (Y/N)	Water Level Period	Status (if known)
02N/19W-19G01	19G1				
02N/19W-19G02	19G2				
02N/19W-19J01	19J1	301	Y	1989	
02N/19W-19J02	19J2				
02N/19W-19J03	Stuart	315	N	1986-2003	
02N/19W-19J04	19J4		Y	1951	
02N/19W-19L01	Jones	347	N	1972-88	Destroyed
02N/19W-19N01	19N1	237.9	N	None	
02N/19W-19N02	19N2	240	Y	None	In-use
02N/19W-19M02	19M2				
02N/19W-19P01	SRMWC-7	276.6	N	1986-89	
02N/19W-19P02	SRMWC-9	280	Y	1986-Present	In-use
02N/19W-19P03	19P3				
02N/19W-19Q01	19Q1	265	Y	None	
02N/19W-19Q02	Nicholson	290	N	1986-2010	
02N/19W-19R01	19R1	295.26	N	None	
02N/19W-19R02	19R2	291.4	Y	1972-1986	
02N/19W-20F01	20F1				
02N/19W-20K01	20K1	318.3	Y	None	
02N/19W-20K02	Bogus		N	None	
02N/19W-20L01	20L1	302.5	Y	1972-Present	Inactive
02N/19W-20M01	Snow	320.6	Y	1986-94	Destroyed
02N/19W-20M03	Ventura Farms	322	Y	1986-2000	In-use
02N/19W-20M04	Penny	325	Y	1986-2010	Inactive
02N/19W-20N01	20N1	305.55	N	None	
02N/19W-20N02	20N2	316.22	Y	None	In-use
02N/19W-21E01	21E1	420	Y	None	
02N/19W-21E02	21E2	438	Y	None	
02N/19W-21F01	21F1		Y	None	
02N/19W-30G01	30G1				
02N/20W-22G01	22G1			1969-2008	
02N/20W-22H01	22H1				
02N/20W-22J01	Lamb-2		Y	None	In-use
02N/20W-22K01	22K1				
02N/20W-22K02	Lamb (Sasaki)	282	Y	1986-93	In-use
02N/20W-22K03	22K3				
02N/20W-22L01	22L1				
02N/20W-22L03	22L3				
02N/20W-22Q01	22Q1				
02N/20W-23A01	23A1				
02N/20W-23G01	Gerry	378	Y	1986-93, 2012	
02N/20W-23G02	Gerry-2	310	Y	1987-2010	Abandoned
02N/20W-23G03	R Gerry		Y	None	In-use
02N/20W-23H01	23H1				
02N/20W-23H02	Gerry-3A	320	Y	1986-93	In-use
02N/20W-23H03	23H3				
02N/20W-23J01	Gerry-4		Y	None	In-use
02N/20W-23K01	McCloskey-1	274	Y	1955-Present	In-use
02N/20W-23L02	23L2				
02N/20W-23L03	23L3		Y	None	In-use
02N/20W-23L04	23L4				
02N/20W-22L05	22L5				
02N/20W-23L01	23L1				
02N/20W-23M01	Berkshire Investments		Y	None	In-use
02N/20W-23Q01	23Q1	230	Y	None	
02N/20W-23Q02	McCloskey-2	235	Y	1986-2010	In-use
02N/20W-23Q03	23Q3	226.3	Y	None	
02N/20W-23Q04	23Q4		Y	None	
02N/20W-23Q05	23Q5		Y	None	
02N/20W-23R01	23R1	234.6	Y	1928-Present	In-use
02N/20W-23R02	23R2				
02N/20W-24E01	Burkett	330	Y	None	In-use
02N/20W-24K01	24K1	300	Y	None	
02N/20W-24P03	24P3		Y	None	
02N/20W-24Q01	24Q1	225.97	Y	None	
02N/20W-24Q02	24Q2	225.5	Y	None	
02N/20W-24Q03	SRMWC-10	235	Y	1986-95	In-use
02N/20W-24R02	Archdiocese	240	Y	1986-2002	
02N/20W-24R03	SRMWC-5	245	Y	1986-96	Destroyed
02N/20W-25B01	C.Conner	800	Y	None	In-use
02N/20W-25C01	Conejo-1	235	Y	None	In-use
02N/20W-25C02	Conejo-2	226	Y	1986-Present	In-use
02N/20W-25C03	25C3	227.16	Y	None	
02N/20W-25C04	25C4	228	Y	1986-93	
02N/20W-25C05	Conejo-3	220	Y	1993-2010	In-use
02N/20W-25C07	Conejo-4				
02N/20W-25C06	SRMWC-8	260	Y	1986-2008	In-use
02N/20W-25D01	SRMWC-3	235	Y	1986-2010	In-use
02N/20W-25D02	25D2		Y	None	
02N/20W-25D03	25D3	222.87	Y	None	
02N/20W-25D04	Fitzgerald	219.1	Y	1986-95	In-use
02N/20W-25D05	25D5	234	Y	None	In-use
02N/20W-25D06	Goldberg	230	Y	None	In-use
02N/20W-25L01	25L1	235.2	Y	1972-2004	
02N/20W-25L02	25L2	234.91	Y	None	
02N/20W-26B01	26B1	204.7	Y	None	
02N/20W-26B02	Hernandez	200	Y	1986-2000	In-use
02N/20W-26B03	26B3	218	Y	1972-Present	
02N/20W-26C01	26C1				
02N/20W-26C02	26C2	201.63	Y	None	
02N/20W-26D01	26D1		Y	None	
02N/20W-26D02	26D2				
02N/20W-27A01	27A1		Y	None	

Table 2-7
Projected Santa Rosa Basin Groundwater Pumping

	2015	2020	2025	2030	2035
Projected Groundwater Pumping[1] (acre-feet/year)	3,530	3,530	3,530	3,530	4,650
Percent of Total District Water Supply[1]	13	13	12	12	11

1. Camrosa Water District Urban Water Management Plan (District, 2011b).

For purposes of groundwater management, if the District acts as a replenishment agency, pursuant to Part 4 (commencing with Section 60220) of Division 18, may fix and collect fees and assessments for groundwater management. These fees must be equitable annual fees and assessments for groundwater management based on the amount of groundwater extracted from the basin for costs incurred for groundwater management. These costs might include the acquisition of replenishment water, administrative and operating costs, and costs of construction of capital facilities necessary to implement the groundwater management plan. This practice is not currently employed by the District.

2.3.4 Groundwater Monitoring, Levels, and Movement

This section describes the current conceptual understanding of groundwater levels, trends, and recharge and discharge of groundwater flow in the Santa Rosa Basin. Historically, the District monitored water level data at 19 production wells. Among these wells, Chamberlain 5, SRMWC-5, Snow, and Ventura Farms have been abandoned, destroyed, or no longer produce water. The Ventura County Watershed Protection District has maintained a record of water level measurements at eight wells in the Basin. The water level monitoring information is summarized in **Table 2-6**. In total, 11 continuous water level measurement records up to 2010 or later have been maintained. The District has also recorded its production at 11 production wells: Penny, SRMWC-3, SRMWC-8, SRMWC-9, SRMWC-10, Conejo-1, Conejo-2, Conejo-3 and Conejo-4. Water levels and groundwater production are reported on a monthly basis. Non-District groundwater pumping is not reported. (When no local well name is available, the last four characters of the state well number are used, e.g., 2N19W20L1 = 20L1.)

Groundwater levels experienced a steady decline at an average of approximately five feet per year from the early 1950's to the early 1960's. This water level decline was due to groundwater pumping in combination with lower than average recharge. Coincident with the commencement of discharges from the Hill Canyon WWTP effluent into the Arroyo Conejo Creek by the City of Thousand Oaks since 1964, water levels in the Basin have been rising rapidly (Boyle, 1987). While water levels in the central portion of the Basin rose at an average rate of 10 feet per year from 1964 to 1972, water levels rose in the eastern portion of the basin at a rate of 5 feet per year from 1964 to 1980 (Boyle, 1987). Through the early 1980s water levels remained flat with a decreasing trend in groundwater pumping and then in the mid-1980s to early 1990s water levels began to decline during a period of lower than average precipitation. In the late 1990s groundwater levels experienced a steady increase of up to 10 feet per year due a period of higher than average precipitation.

Based on existing water level data, three typical hydrographs have been identified. These hydrographs are representative of the eastern, central and western (east of the Bailey Fault) portions of the Basin. The magnitude of water level fluctuation reduces from east to west. **Figure 2-10 Figure 2-11**, and **Figure 2-12** are hydrographs for wells 20L1, SRMWC-9, and 26B3, respectively. These wells represent the eastern, central, and western portions of the Basin respectively; their locations are shown on **Figure 2-9**.

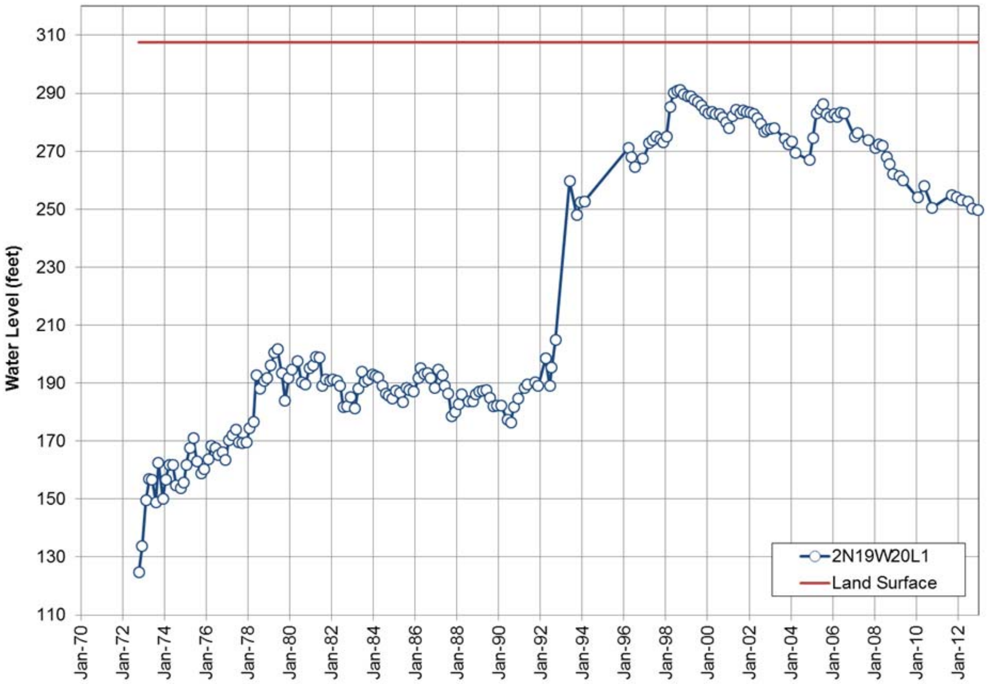


Figure 2-10
Eastern Santa Rosa Basin Long Term Hydrograph for Well 20L1

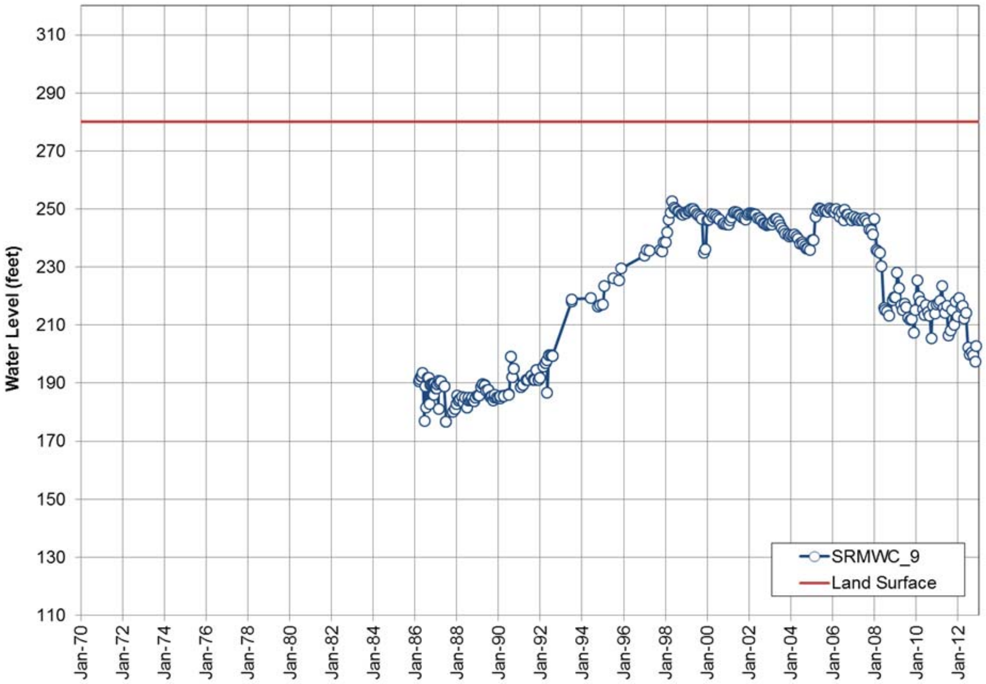


Figure 2-11
Central Santa Rosa Basin Long Term Hydrograph for SRMWC-9

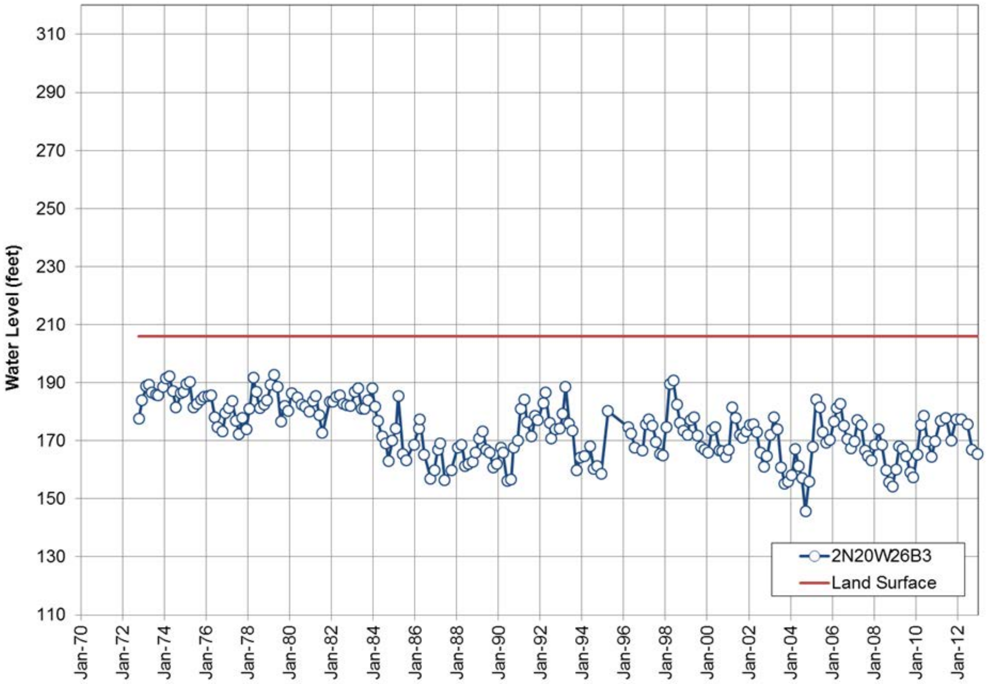


Figure 2-12
Western Santa Rosa Basin Long-Term Hydrograph for 26B3

Approximately to 110 feet of water level rise was observed in Well 20L1 from August 1990 to August 1998. Over this same period, the water level rose approximately 50 feet in Well SRMWC-9. A water level rise of 25 feet was observed in Well 26B3. The water level changes during this period correlate to the reduction in groundwater pumping and wet weather conditions.

Figure 2-13 shows the hydrograph for Well 20L1 with annual precipitation and a five-year moving average of annual precipitation. There is a strong correlation between precipitation and water levels in the eastern portion of the basin. Western wells, e.g., Well 26B3 exhibit much less variably.

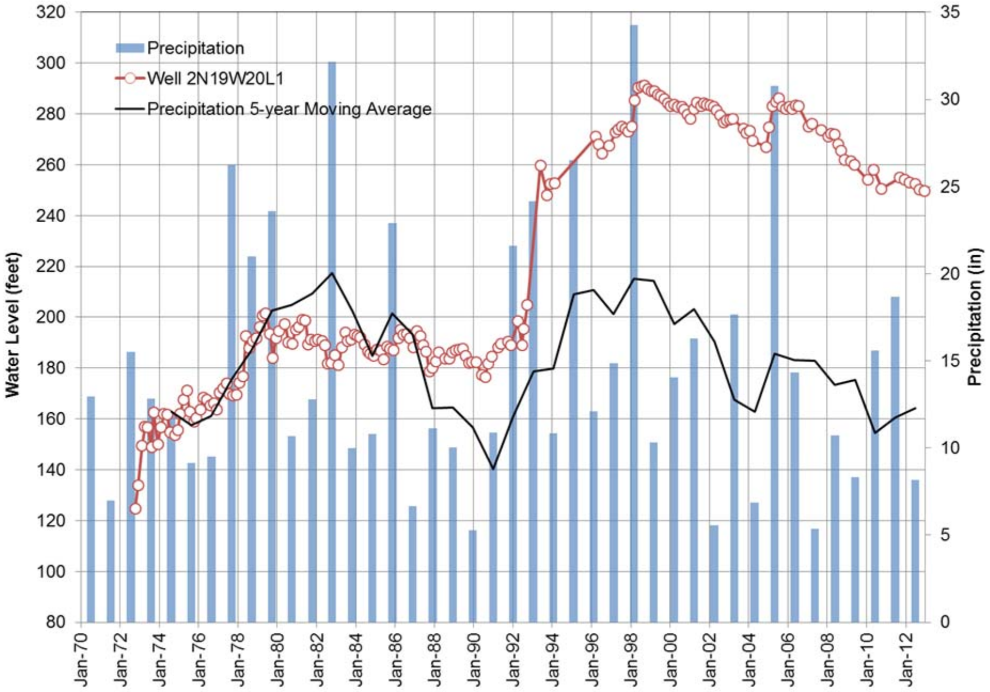
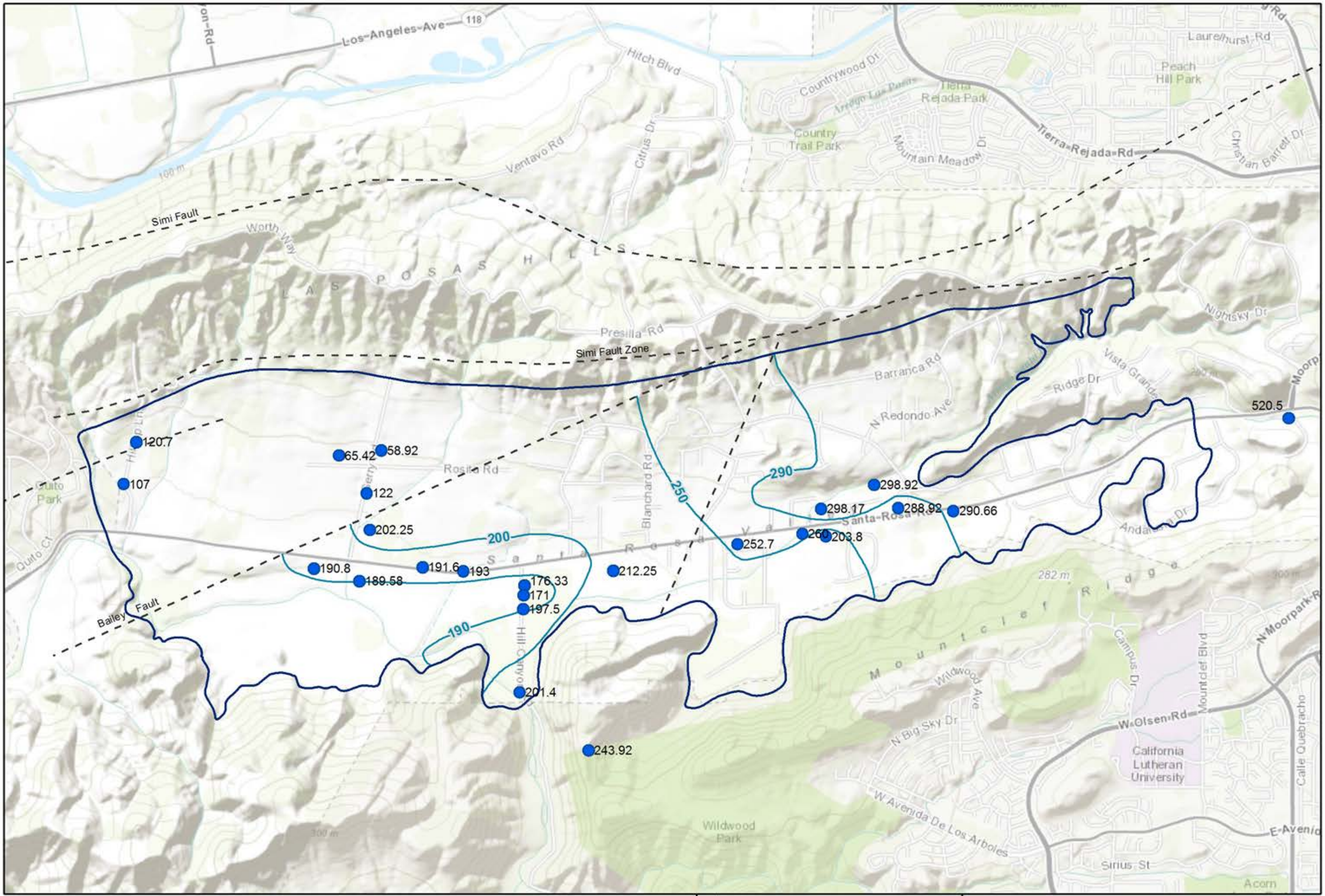


Figure 2-13
Annual Precipitation and Hydrograph for Well 20L1

Figure 2-14 and **Figure 2-15** represent high water (2006) and lower water (1990) conditions for the Santa Rosa Groundwater Basin. These contour maps illustrate the lines of equal hydraulic, or piezometric, head in the aquifer. Groundwater flow is from east to west, regardless of the high or low condition. These figures also indicate the primary recharge sources in the Santa Rosa Basin are from the east and north. Hydrographs for all wells within the data where data is available are in **Appendix B**.



Key to Features

● Well

Wet Year Contours of Equal Groundwater Elevation (10 foot intervals)

▭ Santa Rosa Valley Groundwater Basin

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High Water Groundwater Elevations (2006)

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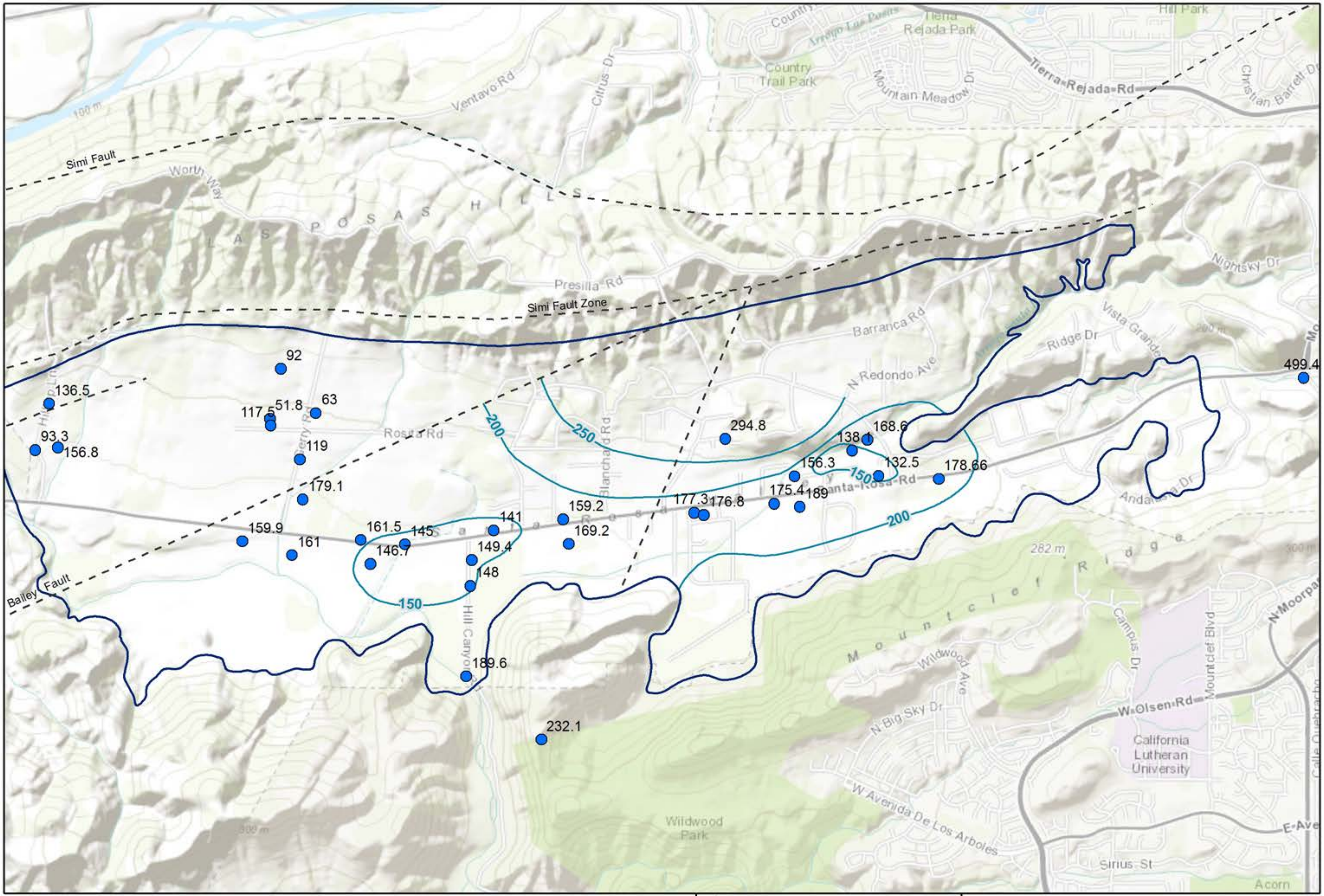
Figure 2-14



Key to Features

● Well

Dry Year Contours of Equal Groundwater Elevation (50 foot intervals)

▭ Santa Rosa Valley Groundwater Basin

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Low Water Groundwater Elevations (1990)

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Figure 2-15

2.3.5 California Statewide Groundwater Elevation Monitoring

In 2009 the California State Legislature amended the Water Code with SBx7-6. This Bill mandates a groundwater level monitoring to track trends in groundwater elevation in the Bulletin 118 defined groundwater basins. With local monitoring and State reporting, collaboration is required between local monitoring agencies and DWR. In accordance with this amendment to the Water Code, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program. The purpose of CASGEM is to establish a program of regular and systematic monitoring of groundwater elevations and to track seasonal and long-term trends in groundwater elevations statewide (DWR, 2012). Local agencies conduct the monitoring and DWR's role is to coordinate the statewide CASGEM program for statewide reporting. The law anticipates that the monitoring of groundwater elevations required by the enacted legislation will be done by local entities. The law required local entities to notify DWR in writing by January 1, 2011 if the local agency or party seeks to assume groundwater monitoring functions in accordance with the law (DWR, 2012).

One of the major benefits of the CASGEM system is that groundwater levels are coordinated statewide and made available for public access. The Santa Rosa Basin has four wells in the CASGEM system. Dr. Timothy Ross, the Southern Region contact for DWR and CASGEM, ensures that the groundwater level for all CASGEM wells in Ventura County are being collected and submitted by the Ventura County Watershed Protection District. As long as there exists a reporting entity in charge of the groundwater basin, overlapping agencies become eligible for all state loans and grants that require CASGEM compliance. Because the Ventura County Watershed Protection District is reporting groundwater level data, the District (Camrosa Water District) has attributed to it all the benefits of compliance. In a document written to the Ventura County Board of Supervisors on December 14, 2010, the Ventura County Watershed Protection District documented the plan and background for assuming monitoring duties for the entire county. The following is an excerpt from that document:

"*The District (Ventura County Watershed Protection District) is the only entity in the County with the jurisdiction to monitor groundwater elevation levels in all the groundwater basins within the County. The District has decades of experience in groundwater level monitoring throughout the County and currently measures almost 200 wells every six weeks. The District has a database of groundwater level data dating back to the early 1970's and beyond. All other groundwater entities within the County have been contacted, are willing to provide data, and have no objection to the District becoming the Umbrella Monitoring Entity for Ventura County. By volunteering to be the Monitoring Entity for all groundwater basins within Ventura County, the District continues to be a regional provider of services to all County residents with up to date groundwater resource data and information, while providing an additional benefit to many local agencies to avoid risking their eligibility to apply for future state loans and grants.*" (Ventura County Watershed Protection District, 2010)

The District need take no action to comply with Water Code/SBx7-6.

2.3.6 Groundwater Quality

Water quality in the Santa Rosa Groundwater Basin has been studied by several authors, including Perliter and Ingalsbe Consulting Engineers for the Camrosa County Water District in 1977 and in 1980, the U.S. ·Bureau of Reclamation in 1978, and Boyle Engineering in 1987 and 1997. Historically, a common conclusion drawn from these investigations is that total TDS and Nitrate (nitrate-nitrogen) concentrations have been rising since the mid-1950's. The rise in TDS concentrations reflect a basin wide trend, while high nitrate values appeared more localized.

Historically, nitrate concentrations occasionally exceed State standards for certain wells within the basin. Speculation attributes these localized occurrences of elevated concentrations of nitrate to percolation of residues of nitrogen-based fertilizers, wells with inadequate sanitary seals, excessive application of fertilizers, effluent from septic tanks, and effluent from the Thousand Oaks Hill Canyon Treatment Plant. TDS concentrations have remained fairly consistent since the mid-1980's. TDS concentrations have ranged between 600 and 1,500 mg/L.

For this GMP, groundwater quality data within the Santa Rosa Basin has been collected and reported for the period from 1990 to the present. Monthly samples are collected from the following wells Conejo-2, Conejo-3, Conejo-4, Penny, SRMWC-10, SRMWC-3, SRMWC-8, and SRMWC-9 and analyzed for chloride, fluoride, hardness, nitrate, nitrite, pH, phosphate, sulfate, TDS, and turbidity. Weekly samples are collected from Conejo-2, Conejo-3, Conejo-4 and analyzed for nitrate. Additional sampling and analysis for other constituents is conducted periodically, approximately every one to three years. This section provides a summary of the groundwater quality results and brief descriptions of trends for constituents in relation to regulatory objectives.

Concentrations of various minerals in groundwater have increased since 1987 (Boyle, 1996). The primary influences over groundwater quality within the basin are agricultural operations, residential use with septic systems, and Hill Canyon WWTP effluent.

Table 2-8 presents a basin-wide water quality summary for the period of 1997 to 2011 provided by the District. **Table 2-8** also lists applicable groundwater quality objectives for groundwater within the Arroyo Santa Rosa Hydrologic Unit. These are published in the Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (RWQCB, 1994) and commonly referred to as Basin Plan objectives. The Basin Plan objectives are intended to protect the public health, and maintain or enhance water quality in relation to existing and potential beneficial uses of the water. **Table 2-8** also lists California drinking water quality standards (both primary and secondary MCLs for comparison purposes).

Table 2-8 indicates that chloride, nitrate, sulfate, and TDS exceed Basin Plan objectives. Water quality results from Conejo-2, Conejo-3, Conejo-4, Penny, SRMWC-10, SRMWC-3, SRMWC-8 and SRMWC-9 were analyzed in further detail for these constituents of concern. **Table 2-9** summarizes data for these wells and constituents. These constituents of concern are discussed in further detail below.

Table 2-8
Santa Rosa Groundwater Basin Groundwater Quality Summary from 1997 to 2011[1]

Constituent	Primary MCL	Secondary MCL	RWQCB Groundwater Basin Plan Objectives[2]	Units	Results		Exceeds Primary or Secondary MCL	Maximum Exceeds RWQCB Groundwater Basin Plan Objective
General Mineral					Maximum	Minimum		
Calcium	--	--	--	mg/L	102	72	--	--
Chloride	--	250	150	mg/L	249	100	Yes	Yes
Fluoride	2	--	1.0	mg/L	0.94	0.18	No	No
Hardness (as CaCo3)	--	--	--	mg/L	802	360	--	--
Magnesium	--	--	--	mg/L	92	58	--	--
Nitrate (as NO3)	45	--	45	mg/L	179	6.7	Yes	Yes
Potassium	--	--	--	mg/L	2	1	--	--
Sodium	--	--	--	mg/L	108	89	--	--
Sodium Percent	--	--	60	%			--	No
Sulfate	250	250	300	mg/L	489	104	Yes	Yes
Alkalinity (total)	--	--	--	mg/L	360	230	--	--
General Physical								
Total Dissolved Solids	500	500	900	mg/L	1492	670	Yes	Yes
Inorganics								
Aluminum	1	0.2	1	mg/L	ND	ND	No	No
Antimony	0.006	--	0.006	mg/L	ND	ND	No	No
Arsenic	0.01	--	0.05	mg/L	0.006	0.003	No	No
Barium	2	--	1	mg/L	0.021	0.005	No	No
Beryllium	0.004	--	0.004	mg/L	ND	ND	No	No
Boron	--	--	1	mg/L	0.300	ND	--	No
Cadmium	0.005	--	0.005	mg/L	ND	ND	No	No
Chromium	0.05	--	0.05	mg/L	0.0150	0.002	No	No
Copper	--	1	--	mg/L	0.01	ND	No	--
Iron	--	0.3	0.3	mg/L	ND	ND	No	No
Lead	0.015	--	--	mg/L	0.0054	ND	No	--
Manganese	--	0.05	0.05	mg/L	ND	ND	No	No
Mercury	0.002	--	0.002	mg/L	ND	ND	No	No
Nickel	0.1	--	0.1	mg/L	0.005	ND	No	No
Perchlorate	--	--	--	mg/L	ND	ND	--	--
Selenium	0.05	--	0.05	mg/L	0.005	0.003	No	No
Silver	--	0.1	--	mg/L	ND	ND	No	--
Thallium	0.002	--	0.002	mg/L	ND	ND	No	No
Vanadium	--	--	--	mg/L	0.061	0.059	--	--
Zinc	--	5.0	--	mg/L	ND	ND	No	--

1. Table was provided by Camrosa Water District and amended using recent data provided by Camrosa Water District.
2. Values provided from the Los Angeles Regional Water Quality Control Board (RWQCB) Basin Plan, dated June 13, 1994, for the Arroyo Santa Rosa basin.

mg/L = Milligrams per Liter

-- = (Not Applicable)

Table 2-9
Santa Rosa Groundwater Basin Well Water Quality Summary from 1990 to 2010[1]

Constituent	Primary MCL	Secondary MCL	RWQCB Basin Plan Objectives[2]	Units	Conejo-2				Conejo-3				Conejo-4				Penny			
					Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave
Chloride	--	250	150	mg/L	181	189	97	145	190	241	112	144	165	195	88	137	153	249	47	107
Nitrate (as NO3)	45	--	45	mg/L	194	179	5	104	201	140	4.6	78	169	152	6.8	103	155	43	0.88	15
Sulfate	--	250	300	mg/L	181	280	52	186	190	347	120	193	165	263	68	174	153	200	7.2	99
TDS	--	500	900	mg/L	180	1,490	308	973	188	1,350	724	962	161	1,308	412	955	153	834	348	643

Constituent	Primary MCL	Secondary MCL	RWQCB Basin Plan Objectives[2]	Units	SRMWC-10				SRMWC-3				SRMWC-9				SRMWC-8			
					Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave	Count	Max	Min	Ave
Chloride	--	250	150	mg/L	68	173	99	129	94	195	109	148	18	139	65	98	209	180	40	148
Nitrate (as NO3)	45	--	45	mg/L	84	137	80	109	93	112	27	57	26	175	81	101	221	91	7	35
Sulfate	--	250	300	mg/L	68	262	118	171	94	262	120	195	18	145	100	116	209	489	24	195
TDS	--	500	900	mg/L	66	1,492	682	941	94	1,156	746	950	17	828	558	739	207	1118	528	874

1. Number of samples per location and constituent vary. Averages are calculated using the total number of samples, as provided by the count.
2. Values provided from the Los Angeles Regional Water Quality Control Board (RWQCB) Basin Plan, dated June 13, 1994, for the Arroyo Santa Rosa basin.

MCL = Maximum Contaminant Level
mg/L = Milligrams per Liter
-- = (Not Applicable)
No = Number of samples collected from 1990 to 2010

Chloride, nitrate, sulfate, and TDS were further analyzed for trends in space and time. **Figure 2-16**, **Figure 2-17**, **Figure 2-18**, and **Figure 2-19** display data for these constituents for Penny Well, Conejo 3, and SRMWC 3 from the period of 1990 to 2010. These wells represent the eastern, central, and western portions of the Basin, respectively. Water quality in the eastern portion of the Basin, represented by Penny Well, is typically of lower concentration for all four constituents. Chloride, sulfate, and TDS are shown to increase over time for Conejo 3. Nitrate increases over time for Conejo 3 from 1990 to 2002, then decreases from 2002-2010. The four constituents are discussed in further detail below.

Chloride: The secondary MCL for Chloride is 250 mg/L and the Basin Plan objective is 150 mg/L. As shown in **Figure 2-16** and illustrated on **Figure 2-16**, chloride concentrations range from 98 to 249 mg/L. Note that Chloride concentrations are lower in the eastern portion of the Basin.

Nitrate: As shown in **Figure 2-17** and illustrated on **Figure 2-17**, nitrate (as NO_3) concentrations range from 15 to 179 mg/L. Concentrations of nitrate have historically exceeded Basin Plan objectives. The District blends groundwater from the Conejo wells with State Water Project (SWP) water to adjust high levels of nitrate. Nitrate concentrations are higher in the central and western portions of the Basin. It should be noted that nitrate levels have decreased since 2002.

Sulfate: The secondary MCL for sulfate is 45 mg/L and the Basin Plan objective is 300 mg/L. As shown in **Figure 2-18** and illustrated on **Figure 2-18**, sulfate concentrations range from 99 to 489 mg/L. Sulfate is typically less than the Basin Plan objective.

Total Dissolved Solids (TDS): The secondary MCL for TDS is 500 mg/L and the Basin Plan objective is 900 mg/L. As shown in **Figure 2-19** and illustrated on **Figure 2-19**, TDS concentrations range from 572 to 1,492 mg/L. TDS concentrations are higher in the central and western portions of the basin.

Pesticides: Agricultural operations within the basin have led to a single detectable concentrations of ethylene dibromide (EDB), dibromochloropropoane (DBCP), and other pesticides. The EPA Primary MCLs for EDB and DBCP are 0.00005 mg/L and 0.0002 mg/L, respectively. A 1999 investigation of Penny Well's water quality showed a significant decrease in pesticide concentration (IMFP, 2011).

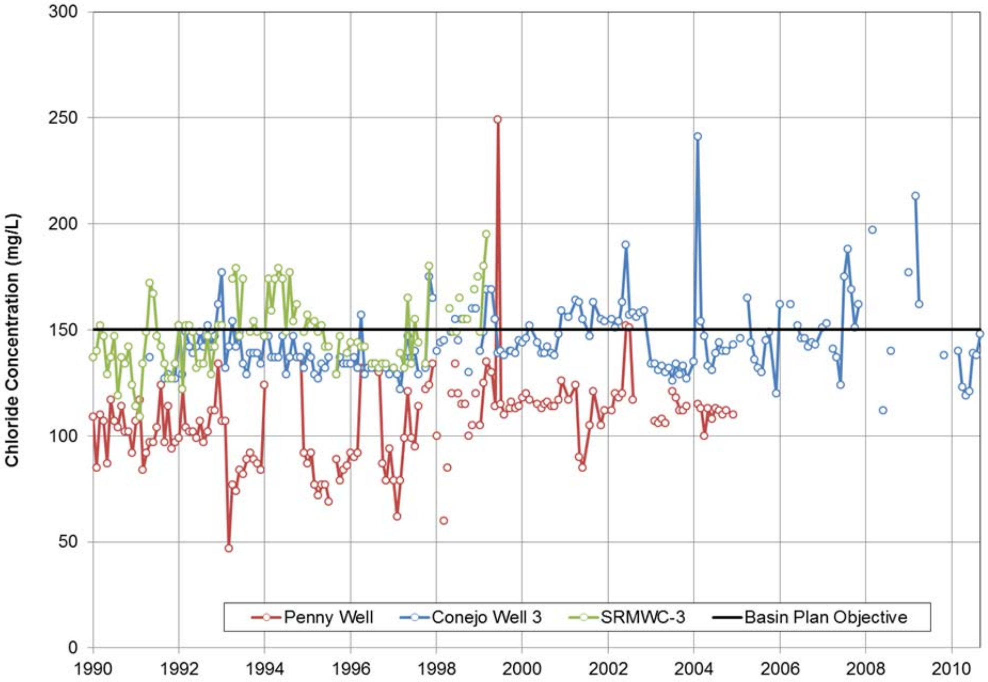


Figure 2-16
1990 to 2010 Chloride Concentration at Penny Well, Conejo 3, and SRMWC-3

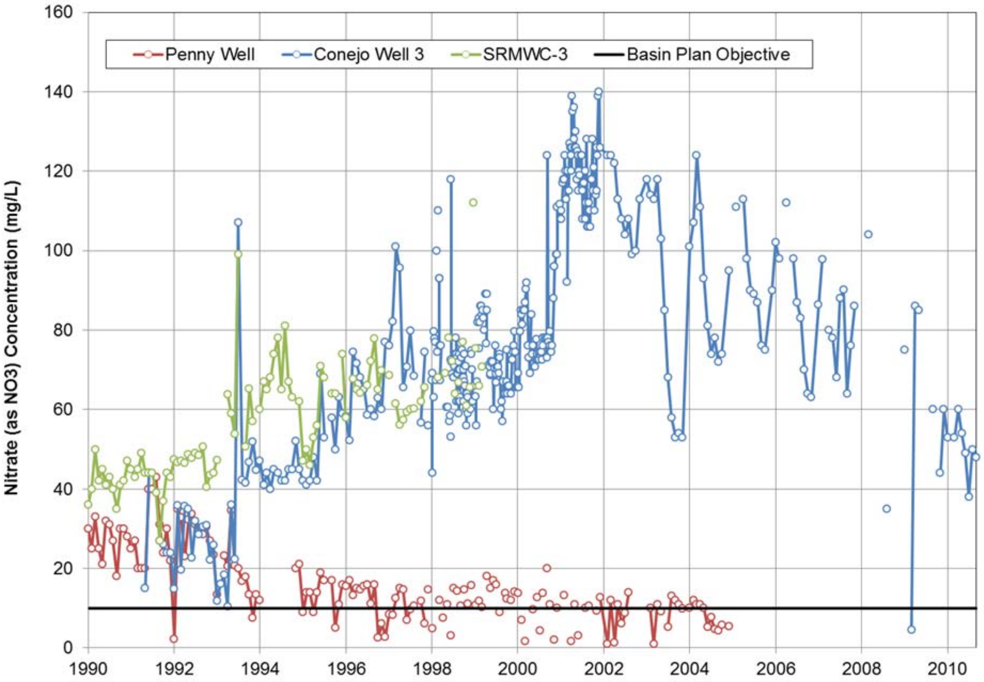


Figure 2-17
1990 to 2010 Nitrate (as NO_3) Concentration
at Penny Well, Conejo 3, and SRMWC-3

Figure 2-18
1990 to 2010 Sulfate Concentration
at Penny Well, Conejo 3, and SRMWC-3

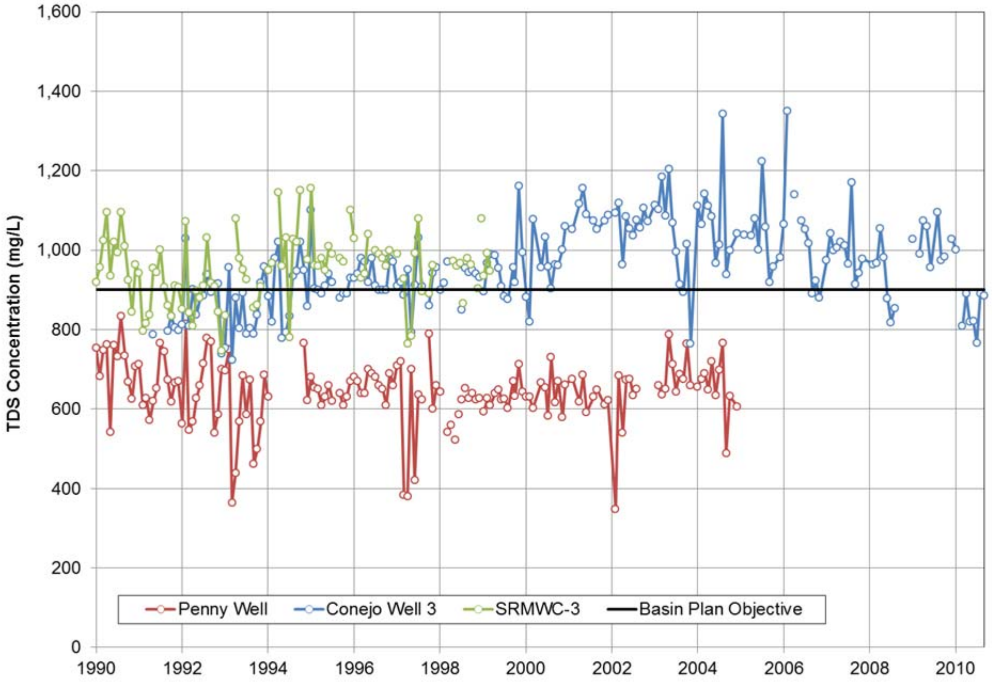


Figure 2-19
1990 to 2010 TDS Concentration
at Penny Well, Conejo 3, and SRMWC-3

2.4 SURFACE WATER AND GROUNDWATER INTERACTION

To evaluate the interaction between surface water and groundwater, Conejo Creek discharges at various locations were compared. Staff at Hill Canyon WWTP place temporary flumes in the locations shown in **Figure 2-1** to measure flow rates in the Arroyo Conejo from June through September every year, although data was only available for the period from 2003 to 2009. A summary of these data is listed in **Table 2-10**. The data provided by Hill Canyon WWTP is useful to evaluate the contribution of each source that comprises the flow in Arroyo Conejo, and eventually Conejo Creek. The measured discharge at the Confluence Flume represents the surface flow measured prior to entrance in to the Santa Rosa Basin.

The Confluence Flume and Station 800 represent the entrance and exit of the reach of the creek, respectively, that traverses the groundwater basin, as shown on **Figure 2-1**. By subtracting the creek discharge at Station 800 from the creek discharge at the Confluence Flume, the net losses to groundwater within the Santa Rosa Basin can be estimated. On average, the value of this calculation is positive, suggesting the groundwater basin is recharged by Conejo Creek. The negative value in 2004 suggests the opposite scenario: flow from groundwater to Conejo Creek. These data indicate that the groundwater basin typically has a net recharge from the creek, but when water levels are high, as in 2003 through 2008, there is little storage capacity in the groundwater basin and groundwater can discharge to Conejo Creek. In 2004 there was a net gain by the Creek.

Table 2-10
Estimated Conejo Creek Losses (June-September) 2003-2009

Year	Confluence Flume Discharge (acre-feet)	Average Station 800 Discharge (acre-feet)	Conejo Creek Losses to Groundwater (acre-feet)
2003	5,406	4,782	624
2004	4,479	5,040	(561)
2005	6,414	6,325	89
2006	6,114	5,604	510
2007	5,545	5,012	533
2008	5,391	5,187	204
2009	5,089	3,907	1,182
Average	**5,491**	**5,122**	**369**

The evaluation of gains or losses from Conejo Creek indicates that for the period evaluated the average four-month loss rate to groundwater is about 370 acre-feet, or about 1,100 acre-feet per year. This is consistent with previous work. Boyle (1997) estimated Conejo Creek losses of about 1,480 to acre-feet per year and Boyle (1987) estimated 1,370 acre-feet per year from 1973 to 1983.

2.5 WATER BUDGET

Table 2-11 provides a summary of the water budget components which are further described in this section. The water budget was prepared to evaluate recharge and discharge of the groundwater system and to develop a groundwater model. The water budget could be considered the average condition for the Basin and individual years will vary. Documentation of the groundwater model can be found in **Appendix C**. Estimates found in this section represent the best available information at the time the SRGMP was published. It is important to note that water budget analyses are intended to provide baseline estimates for flows into and out of the system; the values are not known with high certainty, but are used to offer guidance and reasonable limits to the groundwater modeling effort.

Table 2-11
Estimated Water Budget Components

Component	Annual Volume (AF/yr)
Inflow into Basin (Recharge)	
Precipitation (Valley Floor)	450
Precipitation (Watershed)	360
Subsurface Inflow (from Tierra Rejada Basin)	240
River Leakage (Conejo Creek)	1,030
River Leakage (Arroyo Santa Rosa)	600
Agricultural Return	200
Residential Wastewater Return (Indoor)	715
Residential Wastewater Return (Outdoor)	765
Residential Wastewater Return (Public and Others)	30
Total Inflows	**4,390**
Outflow from Basin (Discharge)	
Pumping	3,320
Evapotranspiration / Consumptive Use	775
Outflow to Adjacent Subbasin (Bailey Fault)	290
Total Outflows	**4,390**

2.5.1 Recharge

Precipitation

A study completed by Blaney (California Department of Public Works, 1934) suggested that annual fractions of rainfall penetration range from 0.01 to 0.17 for dry years and from 0.06 to 0.34 for wet years. The available data shows that water year 1987 to 1988 is a dry year with 11.12 inches of precipitation, 1997 to 1998 is a wet year with 34.25 inches and 1999 to 2000 a normal year with 14.05 inches. For this study, a recharge coefficient of 0.09 for dry year, 0.34 for wet year and 0.2 for normal year was used. This results in an estimate of about 450 acre-feet per year, this is consistent with other work.

Subsurface Inflow

Schaaf (1998) estimated a subsurface inflow of 225 acre-feet/year. Boyle (1997) reported a similar estimate of 301 acre-feet/year. Based on these values and the model results, a value of 240 acre-feet per year was used for this water budget.

River Leakage

Boyle (1997) estimated a total river leakage of 1,113 acre-feet/year from the Hill Canyon WWTP effluent to the Gage Station 800. Boyle (1997) reported an estimate of 1,370 acre-feet/year. Using the latest data for a much shorter period and the groundwater model, MWH estimated a value of 1,030 acre-feet/year for Conejo Creek and 600 acre-feet//year for Arroyo Santa Rosa.

Agricultural Return

Using data from the District efficiency report (District, 2009), the estimated maximum, minimum and average agricultural return is 462, 154 and 407 acre-feet/year, respectively. Based on these values and model calibration, a value of 200 acre-feet/year is estimated.

Residential Returns

According to the District IFMP (District, 2011) the population in Santa Rosa Valley area in 2005 was 6,580. For indoor use, assuming no sewer connection and a consumption rate of 100 gallons/person/day and 97 percent return rate, a total of 715 acre-feet/year is estimated.

The District IFMP (District, 2011) also reported that the total potable residential sale in 2005 was 6,750 acre-feet/year. Subtracting personal daily consumption, a total of 3,630 acre-feet/year was used for landscaping. Assuming 79 percent of efficiency in 2005 (District, 2009), the estimated landscaping return is approximately 765 acre-feet/year.

Within a total of 1,660 acres of open space and parks area, 155 acres were in Santa Rosa Valley in 2005. Total water sale for public and others was 1,320 acre-feet. Thus public and others water use in Santa Rosa Valley was 122 acre-feet. Assuming 25 percent return of this water, the estimated return is 30 acre-feet/year.

2.5.2 Discharge

Stream Outflow

During years with high precipitation when groundwater elevations are high, discharge occurs from the groundwater basin to Conejo Creek. This event occurs rarely and is not considered an average condition.

Pumping

Groundwater production had been reduced sharply from 1959 until 1991, when pumping began to increase up to 2008. On average, annual total production was approximately 3,190 acre-feet/year. For this study considering the time period ranging from 1984 to 2012, the annual output is 2,874 acre-feet/year.

Evapotranspiration / Consumptive Use

Evapotranspiration and consumptive use values were estimated based on the IFMP Plan (District, 2011), and the District efficiency report (District, 2009). This value is estimated to be 1,380 acre-feet/year.

Outflow to Adjacent Subbasin

Boyle (1997) reported water level differences of 60 to 80 feet across the fault. In addition to a large difference in water level, MWH has analyzed water quality using Stiff diagrams showing that there is a clear difference in water quality across the Bailey Fault. Although the calibrated groundwater model indicated that there is flow out of the Basin across the majority of the fault, there is likely flow in the southwest corner, where the historical Conejo Creek channel has likely cut across the fault. The estimation of 290 acre-feet/year (Boyle, 1997) is used in this study as a reasonable flow out of the Basin.

Comments on the draft report were received regarding flow across the Bailey Fault, these comments are listed in **Appendix D**. As such, further discussion on the issue is provided. The Bailey Fault was simulated as a no flow boundary with exception to the portion of the fault immediately adjacent to the Conejo Creek. This portion of the fault is assumed to have been cut or eroded by the historical Conejo Creek. In this area adjacent to the creek, the calibrated groundwater model assumes discharge from the eastern portion of the Santa Rosa Basin to the western portion (FCGMA) of the basin west of the Bailey Fault. Additional work could be completed to decrease the uncertainty of this value, although it is not within the scope of this project. This work could include the construction of monitoring wells on each side of the fault, pumping testing, and the development of new cross-sections with the new lithologic data.

2.6 DATA GAPS

This section summarizes data gaps that were observed in preparing the water resources setting summary.

Surface Water:

- No stream flow data in North and South forks Arroyo Conejo in the winter. These data would assist in characterizing gains or losses for Conejo Creek.
- Gage station 828 (Arroyo Santa Rosa) has some data, but it is variable and the quality is suspect. Arroyo Santa Rosa flow data would assist in accurately characterizing the surface water system.
- Flow for 2010 to present was excluded on Conejo Creek because Station 800 moved to 800A. Because the distance from Hill Canyon to 800A is twice the distance from Hill Canyon to 800 it was not possible to correlate the data. Maintaining data collection at the original location of Station 800 is very important for characterizing groundwater and surface water relationships.

Groundwater:

- There is little water level or water quality data west of the Conejo Well field. These data would assist in understanding the groundwater flow relative to Conejo Creek and assist in characterizing groundwater quality.

Section 3
Basin Yield

The concept of a safe yield is based on a balance between groundwater development for economic demands and environmental needs and providing adequate resources for the future. This section defines terms used in basin yield management, summarizes previous estimates, summarizes the current basin yield estimate, and provides recommendations for developing an operational yield for the Santa Rosa Basin.

3.1 SAFE YIELD

Safe yield has been defined by technicians and the courts since the early 1900's. Within the California legal system, the issue of safe yield has been defined by decisions typically pertaining to basin overdraft. Overdraft is a condition that occurs when the extraction from a groundwater basin exceeds the safe yield and groundwater levels decline. The legal cases that have defined safe yield are usually brought to the court to resolve water rights issues in a groundwater basin where the current extraction rate, or yield, cannot be maintained and overdraft is occurring. Within California, safe yield is a method to clarify an availability and allocation of supply. There have been numerous cases within the state of California to refine the definition of safe yield, although *Los Angeles v. San Fernando (1975 14 Cal. 2d 199, 278)* provides a succinct and often referenced definition:

> "By definition, the safe yield of the ground water reservoir of the Upper Los Angeles River area is the maximum average annual pumping draft which can be continually withdrawn for useful purposes under a given set of conditions without causing an undesired result."

The safe yield is an average amount which may vary based on variable water budget conditions, such as precipitation in a given year, but the yield is the average annual extraction. The set of conditions that effect the estimation of safe yield include the base period for assessing the values of the hydrologic components of safe yield and the geographic distribution of extraction from the basin. Other conditions could include the concept of using basin management techniques to optimize yield. The undesirable results vary by location; these results are typically gradual lowering of the groundwater levels resulting eventually in depletion of the supply, land subsidence, and/or impacts to water quality.

3.2 PREVIOUS ESTIMATES

The previous yield analyses and estimates conducted within the Santa Rosa Groundwater Basin included portions of the basin that are both east and west of the Bailey Fault.

Safe yield estimates have been completed for the Santa Rosa Basin since 1953. Bulletin 12 prepared by the California State Water Resources Board (CSWRB, 1953) estimated a yield of 3,100 acre-feet on average years. The data used to prepare these estimates was from 1951, prior to wastewater discharge into Conejo Creek.

In 1969, the District retained Thomas Bailey, a professional geologist, to report on the geology and groundwater supplies of the District. The Bailey report included a statement of safe yield for the entire Basin. Bailey indicated that effluent discharge from the Hill Canyon facility increased the safe yield of the Basin to approximately 3,600 acre-feet per year, but decreased the expected long-term water quality as a result of the facility.

Prior to 1964, water levels in the Santa Rosa Basin had been rapidly declining under an average annual extraction of approximately 3,500 acre-feet. This extraction rate was believed to be over drafting the Basin by about 600 acre-feet per year (Boyle, 1987). With the discharge of treated wastewater to Arroyo Conejo in 1964 from the Hill Canyon WWTP, water levels within the Basin began to recover. Recovery of overdraft conditions was established by 1970 and water levels have remained relatively stable. The 1987 Boyle study found the annual yield of the Basin to be approximately 4,200 acre-feet per year.

In 1997, Boyle prepared an updated groundwater management plan and again evaluated the yield of the Basin. This study concluded that western portion of the Basin (west of the Bailey fault) had a yield of 1,380 acre-feet per year, the middle portion of the Basin has a yield of 2,335 acre-feet per year (lower area between the Bailey Fault and unnamed fault just west of SRMWC-7), and the upper portion of the Basin had a yield of 385 acre-feet per year for a total of 4,100 acre-feet per year.

3.3 ESTIMATE OF BASIN YIELD

Maimone (2004) articulates that the idea that there exists a single, correct number representing sustainable safe yield must be abandoned. There is no single value but a working definition, coupled with an adaptive management approach, based on the following considerations: understanding the local, sub-regional, and regional effects, a comprehensive conceptual water budget, temporal aspects of yield (including droughts and floods), stakeholders input to understand tradeoffs and develop consensus, and determination of the interdisciplinary nature of the impacts of groundwater utilization. What is provided herein is a range of estimates that should be revised based on adaptive management of the basin and updated understanding of the above considerations.

Methods of determining safe yield are generally based on mass conservation considerations expressed in the hydrologic balance equation. The Hill Method and the Zero Water Level Change Method were used to evaluate the yield on the Basin and are further described below. The Hill Method defines safe yield as annual pumping amount when average annual water level change equals zero. The Zero Water Level Change Method defines safe yield as the average amount of pumping over a period of time, provided that the groundwater storage elevation is the same at the beginning and end of this long period of pumping.

As previously noted, previous yield analyses and estimates conducted included portions of the Basin that are east and west of the Bailey Fault. This study only considers the yield within the Santa Rosa Basin east of the Bailey Fault.

3.3.1 Hill Method

The Hill Method is a plot of pumping versus water-level change, this relationship allows for identification of the pumping amount associated with zero water level change (Sophocleous, 1998). The Hill Method does not consider all potential undesirable effects of pumping, only the prevention of overdraft. The evaluation was completed on a monthly time scale at two different wells within the Basin over two different time periods. This method has several assumptions and simplifications. It assumes the Basin is a single aquifer, one well represents the entire aquifer, the well configuration (location and magnitude) does not and will not change, and the climatic conditions during the evaluation period are representative. It also assumes that there were no undesirable effects during the periods used.

Figure 3-1 illustrates the Hill Method applied to the Nicholson Well for the periods of 1987 to 1990 and 1994 to 2009. Monthly groundwater pumping is represented on the x-axis and change in groundwater level is presented on the y-axis. A linear trend line is used to determine at what monthly pumping rate there is zero change in head. When these data are plotted there is a weak relationship. The coefficient of determination for these two plots relationships is 0.10 and 0.14 for 1987 to 1990 and 1994 to 2009 periods, respectively. The coefficient of determination, or R^2, is used to describe how well a regression line fits a set of data, the closer to 1.0 the better the fit. Using the equation for the trend line the monthly acre-feet for the basin at zero change in water level is 215 acre-feet and 210 acre-feet for 1987 to 1990 and 1994 to 2009 periods, respectively. This is equivalent to 2,580 for the period of 1987 to 1990 and 2,520 acre-feet per year for the period of 1994 to 2009.

Figure 3-2 illustrates the Hill Method applied to the SRMWC-5 well for the periods of 1986 to 1994 and 1990 to 1995. Again, monthly groundwater pumping is represented on the x-axis and change in groundwater level is presented on the y-axis and a linear trend line is used to determine at the pumping rate there is zero change in head. A relationship is apparent, but not a strong one. The coefficient of determination for these two plots relationships is 0.19 and 0.14 for 1986 to 1994 and 1990 to 1995 periods, respectively. Using the equation for the trend line the monthly acre-feet for the basin at zero change in water level is 167 acre-feet and 229 acre-feet for 1986 to 1994 and 1990 to 1995 periods, respectively. This is equivalent to 1,980 for the period of 1987 to 1990 and 2,760 acre-feet per year for the period of 1990 to 1995. These results present a larger range than the Nicholson Well; the 1990 to 1995 period is 37 percent larger than the 1986 to 1994 period.

The results of the Hill Method safe yield estimates are summarized in **Table 3-1**. The estimates range from 1,980 to 2,760 acre-feet per year. The average of the estimates is 2,460 acre-feet per year.

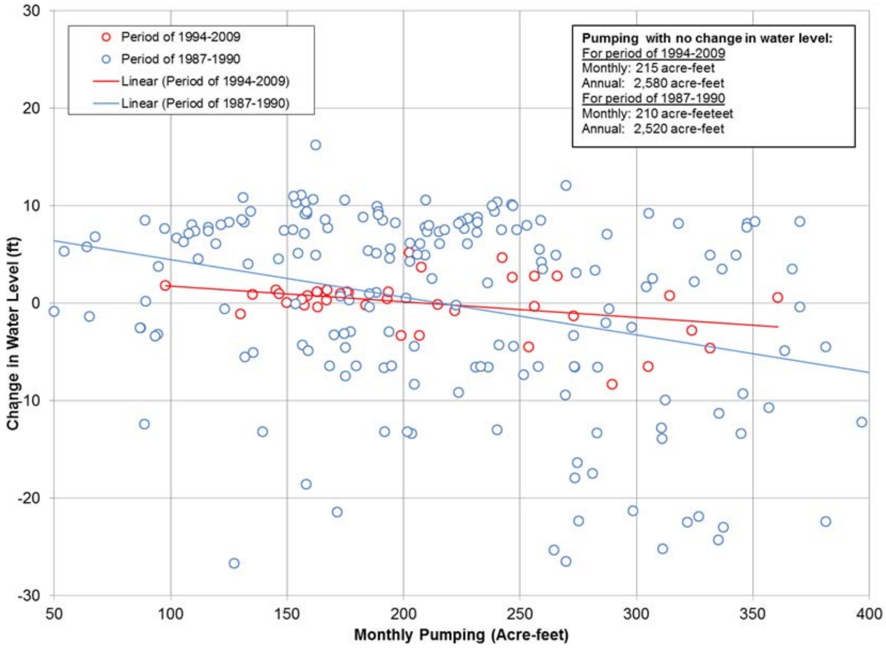


Figure 3-1
Monthly Change in Head at Nicholson Well and Total Santa Rosa Basin Pumping

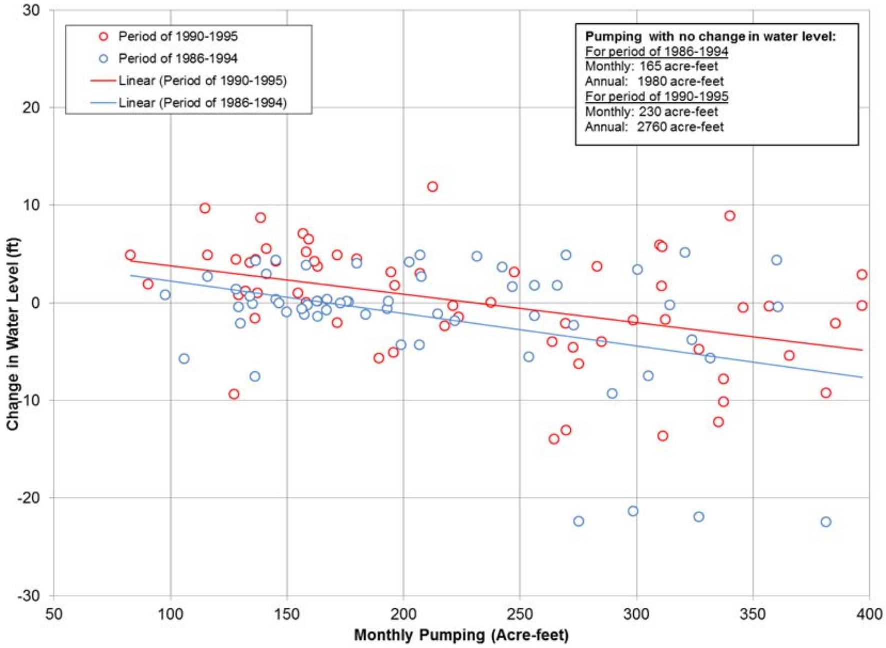


Figure 3-2
Monthly Change in Head at SRMWC-5 Well and Total Santa Rosa Basin Pumping

Table 3-1
Hill Method Results Summary

Well	Period	Calculated Monthly Yield (acre-feet/mo)	Estimated Annual Yield (acre-feet/yr)
Nicholson	1987-1991	215	2,580
Nicholson	1994-2009	210	2,520
SRMWC-5	1986-1994	167	1,980
SRMWC-5	1990-1995	229	2,760
Average			**2,460**

3.3.2 Zero Water Level Change Method

The Zero Water Level Change Method defines safe yield as the average amount of pumping over a period of time, provided the groundwater storage elevation is the same at the beginning and end of this long period of pumping. The groundwater storage is determined by the water level elevation in a well. When the elevation at the well is at the same water level the assumption is made that the storage is the same, hence the zero water level change method. This method also has its assumptions and simplifications. It assumes the basin is a single aquifer, one well represents the entire aquifer, the well configuration (location and magnitude) does not and will not change, and the climatic conditions during the evaluation period are representative. It also assumes that there were no undesirable effects during the periods used.

Listed in **Table 3-2** are the selected periods from representative wells used for the yield estimate. Listed next to each well is the starting and ending period when the net groundwater storage change was zero, as represented by the same water level. These periods are shown as hydrographs on **Figure 3-3** and **Figure 3-4.** To determine the yield estimate for each of these periods the total groundwater production for the period is divided by the length of the period. The four periods ranged from 55 to 184 months and spanned both wet and dry climatic periods.

Table 3-2
Zero Water Level Change Yield Estimate Summary

Well	Period Starting Month	Water Level (ft)	Period Ending Month	Water Level (ft)	Total Period Production (acre-feet)	Average Annual Production (acre-feet)
Nicholson	Feb-87	189.6	Sep-91	189.7	11,366	2,480
Nicholson	Apr-94	228.2	Aug-09	228.1	39,766	2,590
SRMWC-5	Aug-86	169.5	Sep-94	168.6	21,603	2,670
SRMWC-5	Nov-90	179.2	Dec-95	179.3	14,209	2,790
Average	**-**	**-**	**-**	**-**	**21,736**	**2,630**

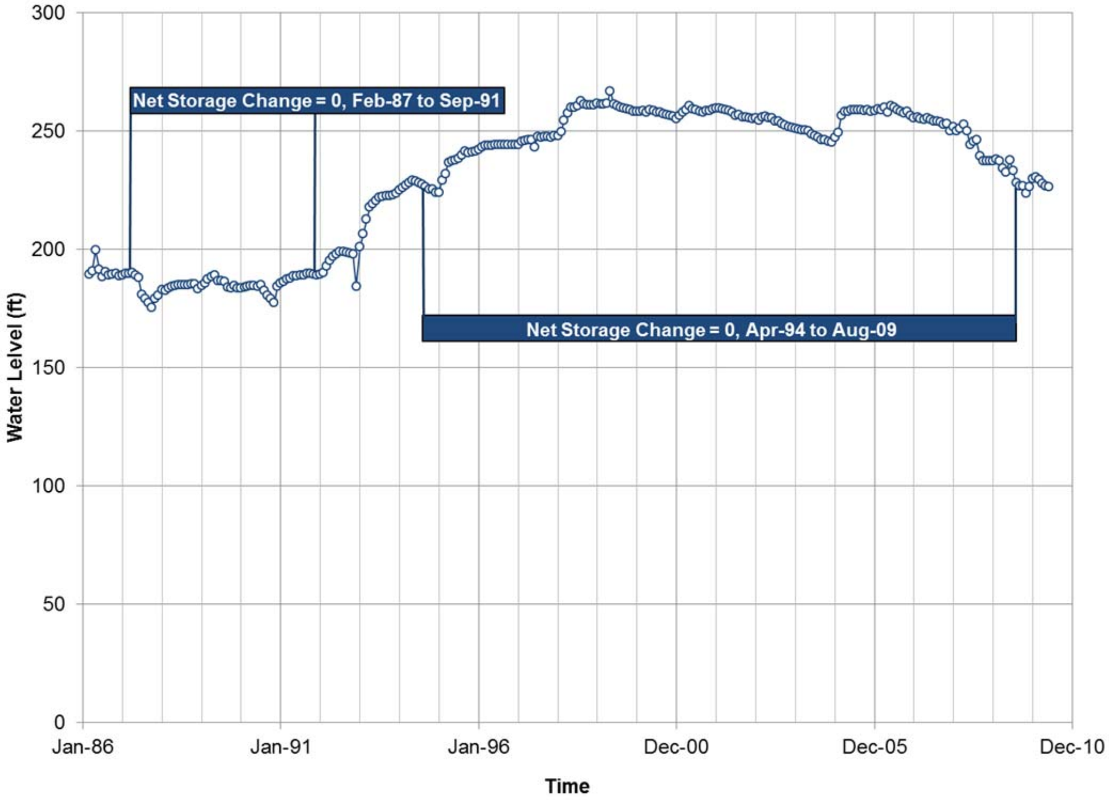


Figure 3-3
Hydrograph and Basin Change in Storage at Nicholson Well

The results of the Zero Water Level Change Method safe yield estimates are summarized in

Table 3-2. The estimates range from 2,480 to 2,790 acre-feet per year. The average of the estimates is 2,630 acre-feet per year.

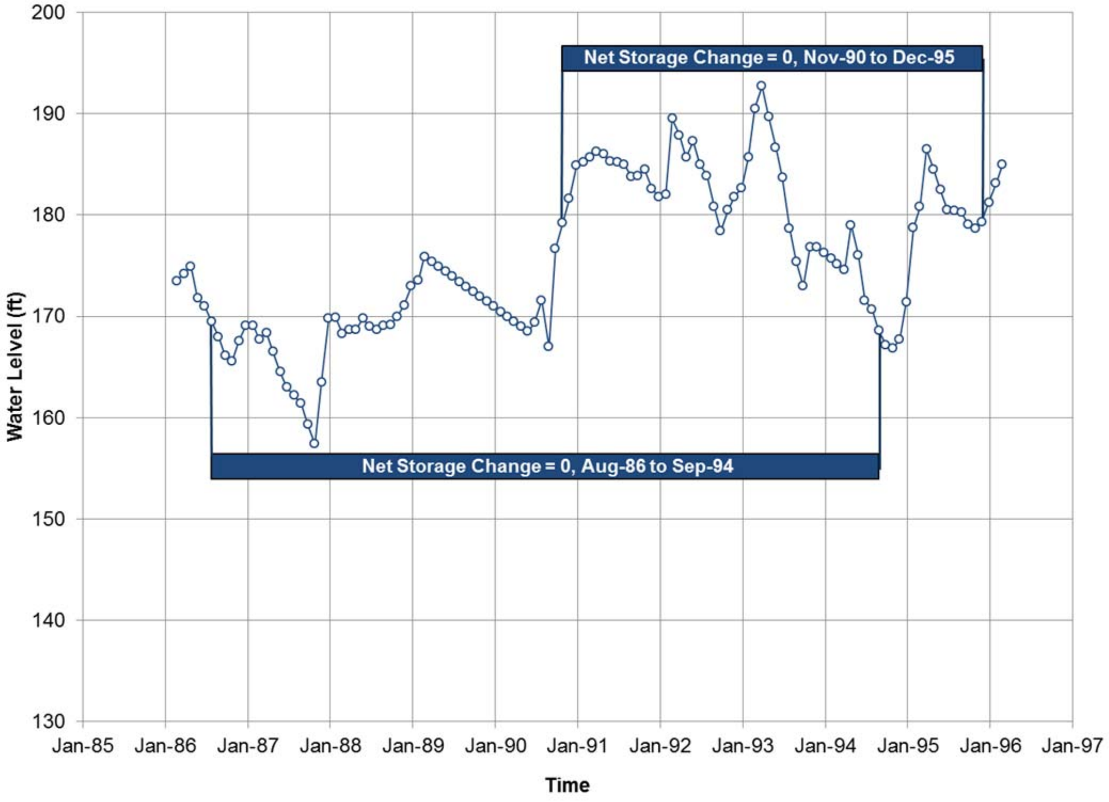


Figure 3-4
Hydrograph and Basin Change in Storage at Well SRMWC-5

Table 3-3
Zero Water-Level Change Yield Estimate Summary

Well	Period	Total Period Production (acre-feet)	Average Production per Month (acre-feet)	Estimated Annual Yield (acre-feet)
Nicholson	Feb-87 to Sep-91	11,366	207	2,480
Nicholson	Apr-94 to Aug-09	39,766	216	2,590
SRMWC-5	Aug-86 to Sep-94	21,603	222	2,670
SRMWC-5	Nov-90 to Dec-95	14,209	233	2,790
Average		**21,736**	**220**	**2,630**

3.3.3 Numerical Groundwater Model

A groundwater model was prepared and calibrated for the Santa Rosa Groundwater Basin to assist in the development of the GMP and evaluate future projects. The model was also used to evaluate the effects of long-term pumping and estimate basin yield.

The model code used for this effort was MODFLOW 2000 (Harbaugh et al., 2000). The model is simulated as a single-layer system. A uniform cell dimension of 100 feet is used for the model. There are a total of 10,469 active cells. The two sets of grid lines are orientated east-west and north-south. Complete model documentation is provided in **Appendix C**.

During development and calibration of the groundwater model, a number of unique characteristics of the groundwater system became apparent. The most significant characteristics related to basin yield are summarized below.

- A pumping rate of approximately 3,320 acre-feet per year was sustainable for long-term pumping (east of the Bailey Fault) without overdraft.
- The model is very sensitive to the elevation of the Conejo Creek surface (stage) and ability of the river bottom to allow groundwater flow (conductance). The groundwater relationship with Conejo Creek is significant. The groundwater system has a net discharge of approximately 775 acre-feet per year to the creek, meaning water level elevations were higher in the groundwater basin than in the creek.
- Water level observation and water quality data have shown that the Bailey Fault is a groundwater flow barrier, at least in the central part. It is unclear to what extent the other part of the fault acts as a groundwater barrier.

3.3.4 Basin Yield Estimate Summary

As previously discussed, the values estimated herein and summarized below represent a best estimate for a long-term average annual pumping rate. These are all estimates, each with limitations as there is no perfect solutions. All Basin yield estimates were completed for the portion of the Basin that is east of the Bailey Fault. There is no single, correct number representing sustainable safe yield, but a value that can be used with an adaptive management approach that changes based on performance of the basin and several other considerations. Listed in **Table 3-4** is a summary of the estimated yield for the basin and the method used to obtain the estimate.

Table 3-4
Basin Yield Estimate Summary[1]

Method	Basin Yield Estimate (acre-feet/yr)
Hill	1,980 - 2760
Zero Water Level Change	2,480 - 2790
Numerical Model	3,320

1. These estimates represent the yield for the Santa Rosa Basin east of the Bailey Fault. Boyle (1997) estimated the yield for portion of the Basin west of the Bailey Fault at 1,380 acre-feet per year and the portion east of the Bailey Fault at 2,720 acre-feet per year.

Based on the various estimates, the basin yield is approximately 2,800 acre-feet per year. For clarification, the values listed **Table 3-3** are related to the historical pumping rates. The pumping that has occurred during the yield evaluation periods has established a new equilibrium in the Basin. The consistent yield estimates reflect this equilibrium that has been established with relatively consistent recharge and discharge. What is not known is if greater groundwater production yield could occur without undesirable results. This can only be determined with monitoring and adaptive management. Monitoring would include any sensitive habitat, subsidence, and groundwater levels. Adaptive management would entail making modifications to operations based on analysis of the monitoring data.

3.4 PROJECT PUMPING AND APPROXIMATE SAFE YIELD

Table 3-5 summarizes estimated Basin yield, actual recent pumping and planned basin pumping by the District. Care must be taken to not over draft the basin, the basin water levels should be monitored for water regularly to prevent overdraft. As previously stated, there is significant uncertainty with the estimated yield; pumping greater than the estimated yield may be feasible. Monitoring and adaptive management are recommended to determine if pumping above the estimated yield causes undesirable results.

Table 3-5
Basin Yield, Recent Actual Pumping and Projected Pumping[1]

Year	Estimated Basin Yield (acre-feet/yr)	Actual/Projected District Pumping[1] (acre-feet/yr)	Balance (acre-feet/yr)
2010	2,800	2,310	490
2011	2,800	2,760	40
2012	2,800	3,250	(450)
2013	2,800	3,250[2]	(450)
2014	2,800	3,250[2]	(450)
2015	2,800	3,530	(730)
2020	2,800	3,530	(730)
2025	2,800	3,530	(730)
2030	2,800	3,530	(730)
2035	2,800	4,650	(1,850)

1. Camrosa Water District Urban Water Management Plan (District, 2011b).
2. No published projected pumping, value assumed based on 2012 pumping.

Adaptive management focuses on monitoring, learning and adapting operations to create and maintain sustainable systems. A common problem in resource management involves the linear processes of decision making, by which the best action depends on the state of the managed system. Different management decisions at a given time can influence the state of the system from that time forward. A key issue is how best to choose management actions, recognizing that the most appropriate management strategy is obscured by limited understanding. This can only be done by closely monitoring the system and making operational adjustments based on what is observed.

3.5 OPERATIONAL YIELD

The operational yield of a groundwater basin is the optimal amount of annual pumping which can be annually withdrawn for useful purposes under a given set of conditions without causing an undesired result. This is a dynamic quantity that varies with management goals, objectives, and constraints.

Balleau et al (1988) described the transition of groundwater development from storage depletion to induced recharge. Every groundwater development operation, whether from a local river bed or a large regional scale flow system, begins with 100 percent withdrawal from groundwater in storage. The timing of the change from storage depletion to induced recharge from surface water bodies is fundamental to developing protective long-term water use policy. If the change from storage to induced recharge is a short period of time there will be less groundwater storage depletion. If the change takes a long period of time, the storage depletion can be great.

When evaluating basin yield for water policy a distinction is necessary between developed and non-developed groundwater basins, with three groundwater basin scenarios possible:

1. *A non-developed system* which has no human interaction and is in equilibrium or steady state in the absence of pumping;
2. *A developed system* with pumping, that is in equilibrium or steady state, with moderate pumping at a fixed depth; and
3. *A depleted system*, in non-equilibrium or unsteady state, with heavy pumping at an ever increasing depth.

In the non-developed system, the average recharge is equal to average discharge, net storage change is zero, with no pumping. In the developed system the captured recharge is the increase in recharge induced by pumping. Similarly, the captured discharge is the decrease in discharge induced by pumping. The “residual discharge” is equal to natural recharge minus captured discharge. Net recharge is equal to the sum of captured recharge plus captured discharge. Net recharge varies with the intensity of pumping; the greater the intensity of pumping, the greater the net recharge, permitting there is a source. Pumping in the developed groundwater system is equal to net recharge, or captured recharge and discharge (Ponce, 2007). The depleted system pumps the captured recharge, captured discharge, as well as water from storage. Pumping in the depleted groundwater system is equal to net recharge plus captured storage. This has the long-term effect of lower water levels and overdraft.

3.5.1 Santa Rosa Basin and Operational Yield

The Santa Rosa Basin is a developed system with pumping that is in near equilibrium or steady state. The long-term operations in the Basin have passed the transition from storage depletion to induced recharge. The system is currently capturing recharge induced by pumping. Similarly, the system is capturing discharge, with the decrease in discharge induced by pumping. **Table 2-10** indicates that during periods of wet conditions there can be a net discharge to the Conejo Creek; therefore, there is still discharge to be captured. Operational yield within the Santa Rosa Basin would mean finding a balance between lower water levels in the western portion of the basin, specifically near Conejo Creek, to ensure there is no discharge to the creek and storage capacity for wet periods.

Section 4
Management Plan Goals and Objectives

This section of the SRGMP provides a description of management plan elements developed for the Basin. Within this section, goals for four supporting basin management objectives (BMOs) are documented.

4.1 GROUNDWATER MANAGEMENT GOAL

The management goal for the Santa Rosa Basin is to optimize the beneficial uses of groundwater, preserve and enhance water quality, understand and operate within the yield of the Basin, and assure preservation of groundwater and environmental resources for future generations.

4.2 BASIN MANAGEMENT OBJECTIVES (BMO)

The California State Water Code §10753.7 (a) (1) states that the required components of a GMP include the following relative to basin management objectives:

> “Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin.”

This portion of the Water Code implies that BMOs and actions taken to achieve these objectives need to have sufficient specificity in numerical objectives so as to be measurable in implementation through monitoring and management programs. At the same time, the BMOs are intended to be flexible so as to be adaptive to increase knowledge of how the groundwater basin behaves over time as better monitoring data is collected. To meet these co-equal objectives, general BMO statements have been prepared and are accompanied by specific and measurable methods for implementing. Additional specificity is provided with the actions listed under each component category in Section 5.

Based on these guidelines, four (4) BMOs have been developed from the Basin management goal and Camrosa Water District Strategic Plan (District, 2008) and are listed below:

1) Protect and enhance groundwater quality
2) Sustain a safe, reliable local groundwater supply
3) Improve understanding of groundwater elevations, Basin yield and hydrogeology
4) Maintain public awareness and confidence, and honor the public trust

4.2.1 BMO No.1 - Protect and Enhance Groundwater Quality

BMO No. 1 is intended to protect and enhance the groundwater quality in the basin by locating and reducing groundwater contamination, protecting recharge areas, and improving recharge water quality.

Background

As documented in Section 2, groundwater quality within the Basin varies by location. In general, the average reported concentrations of TDS and nitrates are well above the Basin Plan objectives in the western portion of the Basin. Water quality is a significant problem in the Basin.

Recharge of groundwater occurs primarily from percolation of irrigation water, infiltration along creeks and drainages, percolation of precipitation, and subsurface inflow. Protection of natural recharge is an important element of protecting and enhancing groundwater quality.

Methods/Approach

In order to meet this BMO, The District will work toward accomplishing multiple activities including:

- The District will collect and analyze additional monitoring data to better understand the sources and relative volumes of constituents in groundwater. These data include groundwater water level, surface flow data, as well as groundwater and surface water quality data. The analysis will be the basis of developing source control strategies.
    - Collecting groundwater water level and quality data will indicate recharge sources and the recharge source impact on basin water quality.
    - Collecting surface water flow data and quality will assist in the impact of surface water on the groundwater quality.
- Groundwater remediation techniques may be implemented where contamination is identified.

- Investigate the feasibility of implementing conjunctive use and groundwater desalination in the Basin. Implementation priority will be given to feasible projects that improve groundwater quality in addition to water supply reliability.

Desired Outcome

As described in District's Strategic Plan (District, 2008): maintaining affordable, independent supplies with a uniform quality is the District's ultimate goal. The District will work toward protecting and enhancing groundwater quality for the benefit of basin groundwater uses. This BMO will be met when groundwater quality constituent concentrations in the Basin are brought to concentrations lower than those defined by their respective Basin Plan objectives.

4.2.2 BMO No.2 - Sustain a Safe, Reliable Local Groundwater Supply

The intent of BMO No.2 is to sustain a safe and reliable local groundwater supply for existing and future groundwater uses by adaptive management of groundwater production.

Background

Groundwater supply was approximately 18 percent of the total water supplied to customers in 2010 and 38 percent of the total potable water supplied in 2010. As described in the District Urban Water Management Plan, having multiple water sources gives the District considerable flexibility and improved reliability. Local groundwater helps maintain that reliability at the lowest cost. Reduced dependence on imported water is part of the District's Strategic Plan (District, 2008). The costs of imported water is a substantial expenditure incurred by the District (District, 2008). Minimizing the use of imported water and purchased power will provide independence in providing service to the District's customers.

Moving in the future, groundwater is planned to remain an important water supply, representing roughly 25 percent of the total supply used within the District 2015 through 2035.

Methods/Approach

In order to meet this BMO, the District can operate under their current conditions, which have not created overdraft or undesirable hydraulic conditions. Alternatively, the District could manage groundwater storage more aggressively to 1) induce additional recharge from Conejo Creek, 2) reduce or eliminate discharge of groundwater to Conejo Creek, and 3) allow for additional storage of groundwater during wet periods. The management of storage, or development of an operational yield program, must be conducted in a controlled and calculated manner as not to present undo risk to users by land subsidence, dewatering of existing wells, degrading groundwater quality, and adding cost to pumping groundwater from lower elevations. Increases in pumping for supply could also be offset by artificial recharge of the Basin.

Desired Outcome

Developing an operational yield program and or conjunctive use program would increase the reliability of the groundwater supply for future uses. The program would include incremental increases in groundwater pumping with monitoring for undesirable impacts, such as harm to vegetation, low water levels, and subsidence.

4.2.3 BMO No.3 - Improve Understanding of Groundwater Elevations, Basin Yield and Hydrogeology

The intent of this BMO is to improve the general understanding of the Basin specifically related to groundwater elevations, yield and hydrogeology.

Background

Understanding the groundwater system will improve the planning and management of the groundwater basin. This SRGMP has documented the current basin understanding by reporting on previously-collected data related to well construction, groundwater elevation and quality, surface water quantity and quality, and borehole lithology.

Methods/Approach

In order to meet this objective, some additional monitoring and reporting is to be implemented through the adoption of this SRGMP. Similar to BMO No.1, the data collected would include: groundwater water level, surface flow data, as well as groundwater and surface water quality data. The analysis will be the basis of developing source control strategies.

- Collecting groundwater water level and quality data.
- Collecting daily surface water flow data and quality data.

These data are to be reviewed annually and formally reported biennially. The review and analysis would consist of the preparation of wet year water budgets and dry year water budgets. Daily surface water and groundwater data will allow for more accurate estimates of groundwater and surface water interaction.

Desired Outcome

This BMO will be met when the District has analyzed groundwater elevation fluctuations, responses to pumping, and has quantified hydrogeologic connections between groundwater and surface water and the potential for increasing storage capacity.

4.2.4 BMO No.4 – Maintain Public Awareness and Confidence and Honor the Public Trust

The intent of this BMO is to improve the awareness of stakeholders, ensure the stakeholders are heard in the management process, and instill confidence in the public that the District is maintaining the Basin for future beneficial uses.

Background

The management actions taken by the District in implementing the SRGMP will impact a range of individuals and agencies that have a stake in the successful management of the Basin; which include well owners, state and federal water resource agencies. To address the needs of all the stakeholders, this SRGMP pursues several means of achieving broader involvement in the management of the Basin. These means include: (1) involving members of the public; 2) involving other agencies within and adjacent to the basin; (3) developing relationships with state and federal water agencies; and, (4) pursuing a variety of partnerships to achieve the BMOs.

Methods/Approach

The approach to this BMO is to develop effective public outreach tools and media to educate the District's stakeholders about water resources. This includes incorporation of the public into the process and regular reporting of groundwater conditions to the public.

Desired Outcome

As described in the District's Strategic Plan, the objective of this BMO is to clearly communicate the challenges faced by Camrosa related to water reliability and water quality with the public.

Section 5
Plan Components

This section of the SRGMP provides a description of management plan elements developed for the Basin. Section 4 presented the management goal and the four objectives to reach the goal. This section documents the five component categories established with specific measurable management actions to be implemented by the District.

Table 1-1 lists a variety of components that are required, recommended and voluntary per CWC §10750, and DWR Bulletin 118 (DWR, 2003). For the purpose of the SRGMP, the individual components listed on **Table 1-1** have been grouped into five broad component categories as listed below:

1) Coordination and stakeholder involvement

2) Monitoring program

3) Groundwater resource protection

4) Groundwater sustainability

5) Planning integration

Each of the five component categories listed above are presented in detail in the following sections. For each component category, a set of management actions is developed to implement the BMOs. The following sections provide a listing of management actions within each component category.

5.1 COORDINATION AND STAKEHOLDER INVOLVEMENT

The management actions taken by the District in implementing the SRGMP has the potential to impact numerous stakeholders in the successful management of the basin. Stakeholders include: agricultural, or agricultural-residential private well owners, residential customers, residential well owners, land owners with septic systems, and local municipalities. To address the needs of all the stakeholders, this SRGMP pursues several means of achieving broader involvement in the management of the basin. These consist of: (1) involving members of the public; 2) involving other agencies within and adjacent to the Basin; (3) developing relationships with state and federal water agencies; and, (4) pursuing a variety of partnerships to achieve the BMOs. Each of these is discussed further below.

5.1.1 Involving the Public

Keeping the public informed of groundwater conditions and management is important to maintain the public trust.

Actions:

- Conduct annual public groundwater management update meetings for stakeholders. At these meetings the District will present a summary of current water quality monitoring, water level monitoring, groundwater pumping, projected groundwater pumping, current project status, planned project status, and current issues and concerns.
- Develop an outreach program for agricultural pumpers to educate basin water users on irrigation efficiency options.

5.1.2 Involving Other Agencies Within and Adjacent to the Santa Rosa Basin

Working relationships between the District and local, state, and federal regulatory agencies are important in developing and implementing various groundwater management strategies and actions detailed in this SRGMP. This District will work toward further establishing points of contact with those responsible for resource management within these agencies.

Actions:

- Establish a point of contact within local, state, and federal regulatory agencies that have responsibility for resource management within Santa Rosa Basin. Publish this list in future updates to the SRGMP. Maintain relationships with these contacts to assist in the completion of other action items.
- Coordinate with FCGMA regarding the data transmitted to DWR for CASGEM reporting.
- Monitor and review new development proposals and projects within the watershed to ensure that these proposals incorporate appropriate measures to protect water quality and water quantity within the Santa Rosa drainage area.
- Collaboration with the Ventura County Water & Environmental Resources Division, Groundwater Section, for the permitting of wells in accordance with the objectives of the SRGMP.
- Provide copies of the adopted SRGMP and subsequent bi-annual state of the basin assessments to representatives from the City of Thousand Oaks, Moorpark, FCGMA, Camarillo, and other interested parties.

5.2 MONITORING PROGRAM

At the heart of a groundwater management plan is a monitoring program. Data collected under this program allows the District to better assess the current condition of the Basin and document future management actions water level responses. The program includes monitoring groundwater elevations and stream flows, groundwater and surface water quality, assessing the potential for land surface subsidence resulting from groundwater pumping, and developing a better understanding of the interaction between surface water and groundwater. The monitoring related actions are described below.

5.2.1 Groundwater Elevation Monitoring

The accurate and continuous measurement of water levels in existing wells is an important data collection activity that provides information about changing groundwater conditions.

Actions:

- Continue water level monitoring at a monthly frequency.
- Identify an additional monitoring well west of SRMWC-3. This well will be used to monitor water levels relative to Conejo Creek surface elevation.
- Complete a well survey to determine if there is a need for well abandonment or location for possible new monitoring wells in areas lacking groundwater data.

A well survey is an inventory of wells within the basin. A well survey is important because it will indicate any wells that provide an conduit for aquifer contamination, assist in determining non-District pumping, potential locations for groundwater monitoring. It is in the best interest of the District that a survey is completed. The County of Ventura is not responsible for well surveys. The well survey will record the following:

- Photo
- Diameter
- Water level
- Location (coordinates)
- Total depth (if feasible)
- Video survey (if feasible)
- If a pump is present
- Potential pumping rate (pump size)
- Level of surface protection (potential for aquifer contamination)

5.2.2 Groundwater Production Monitoring

The accurate and continuous measurement of groundwater production is also an important data collection activity that provides information about changing groundwater conditions.

Actions:

- Continue to track groundwater production on a monthly basis at all production wells within the Basin.
- Prepare estimates of non-District groundwater pumping and return flows based on water service connection data and crop information. This would entail reviewing water service connections, land use, and checking land use water demands with the amount of water served. For example, if there is no connection to an acre of alfalfa, alfalfa requires 5 feet per acre of water to grow, then it can be assumed that there must be 5 acre-feet of water pumped on site. This information can be cross-checked with well survey data.
- Complete a well survey to determine if there are additional unknown groundwater production wells.

5.2.3 Groundwater Quality Monitoring

Groundwater quality data within the Basin has been collected and reported for the period from 1990 to the present by the District. Monthly samples are collected from wells Conejo-2, Conejo-3, Conejo-4, Penny, SRMWC-10, SRMWC-3, SRMWC-8, and SRMWC-9 and analyzed for chloride, fluoride, hardness, nitrate, nitrite, pH, phosphate, sulfate, TDS, and turbidity. Weekly samples are collected from Conejo-2, Conejo-3, Conejo-4 and analyzed for nitrate.

Several constituents, specifically chloride, nitrate, sulfate, and TDS exceed Basin Plan objectives. Water quality at production wells requires high-cost imported water for blending.

Agricultural operations within the area have led to detectable concentrations of ethylene dibromide (EDB), dibromochloropropoane (DBCP), and other pesticides. A 1999 investigation of Penny Well’s water quality showed a significant decrease in pesticide concentration (District, 2011).

Actions:

- Continue to complete required water quality analyses on each water supply well.
- Annually evaluate groundwater at key wells for pesticides and herbicides. These key wells must be established. The wells should vary in location and depth within the Basin.
- The District will prepare a Salt and Nutrient Management Plan consistent with the DWR Bulletin 160. It is the intent of this plan to identify salt and nutrient sources in the basin and develop management protocols on a basin-wide basis for the attainment of water quality objectives and protection of beneficial uses.

5.2.4 Surface Water Flow Monitoring

Surface water monitoring is an integral part of determining the amount of water recharged to the groundwater basin.

Actions:

- Coordinate with Hill Canyon WWTP staff to document Arroyo Conejo flow data.
- Install permanent gaging station at Confluence Flume location. These data would help define surface water entering the Basin. This location is currently monitored four months per year by Hill Canyon WWTP staff.
- Re-install Station 800 near the District offices on Conejo Creek. This station would help define the surface water exiting the basin and help define surface water-groundwater interaction.

5.2.5 Surface Water Quality Monitoring

Monthly samples are collected from the following locations: Hill Canyon WWTP Effluent Outfall, Station 800A, Arroyo Conejo North Fork (North Fork Flume), Arroyo Conejo South Fork (South Fork Flume), and Conejo Creek (Station 800) (as shown on **Figure 2-1**). Samples are analyzed for chloride, fluoride, hardness, nitrate, nitrite, pH, phosphate, sulfate, TDS, and turbidity.

Actions:

- Continue monthly water quality sampling and analysis.
- Annually evaluate surface water for pesticides and herbicides. Ideally this would be conducted on surface water prior to entering the Basin, e.g., Confluence Flume, and leaving the Basin, e.g., Station 800.

5.2.6 Land Surface Elevation Monitoring

Land surface elevation monitoring is conducted to track inelastic land subsidence. Inelastic land subsidence is the permanent compaction of the subsurface. Activities that have the most potential to cause inelastic land subsidence are withdrawals of groundwater or petroleum from the subsurface. Adverse impacts related to inelastic land subsidence include permanent loss in aquifer storage and damage to foundations, roads, bridges, and/or other infrastructure. Inelastic land subsidence has not been historically reported or documented within the Santa Rosa Basin. Because of the lack of a large thickness of compressible clay, the Basin does not appear to be at high risk of inelastic subsidence. Nevertheless action will be taken to document the presence or absence of subsidence.

Actions:

- Establish a surveyed benchmark that can be used to evaluate subsidence trends over time. One benchmark should be located near the Conejo Wellfield.
- Conduct an annual subsidence monitoring at the identified benchmark and report in the biennial report (described in Section 5.2.8).

5.2.7 Protocols for the Collection of Groundwater and Surface Water Data

In order for the District to ensure quality data is being used to make management decisions Standard Operation Procedures (SOPs) for the collection of future data are provided in **Appendix E** and **Appendix F**. These SOPs will be reviewed periodically and modified to reflect new data collection techniques and procedures as necessary. To improve the comparability, reliability and accuracy of groundwater data, the District will take the following actions:

Actions:

- Determine monitoring network adequacy and periodically review and expand as appropriate to meet the needs of the SRGMP on a 5-year frequency or on a special project need basis.
- Establish protocols for methods and frequency of collection, and storing of data. These protocols will be documented in **Appendix E** and **Appendix F** and may be updated in the bi-annual state of the basin assessments.

5.2.8 Groundwater Reporting

The District, basin stakeholders, and the public will benefit from preparing a biennial State of the Basin Report on the conditions of the Santa Rosa Basin. This SRGMP prepared by the District is not intended to be a static document. As conditions change, such as population, land uses, water quality, surface water flows, it may be warranted to revisit the District's goals and BMOs to ensure that the overall goal of sustaining its groundwater resources to meet current and future demands for the District is being satisfied. As conditions and usage change in the future, it will be necessary to update and revise or expand this SRGMP.

Actions:

- The District will report on implementation progress in a biennial State of the Basin Report that summarizes the groundwater conditions in the Santa Rosa Basin. This report will include the following information:
    - Activities and progress made in implementing the SRGMP
    - Groundwater conditions and monitoring results and trends of groundwater levels and quality
    - Information on the improved characterization of the Santa Rosa Valley through continued data collection and analysis
    - A discussion, supported by monitoring results, of whether management actions are meeting BMOs
    - Any plan component changes, including modification of BMOs during the period covered by the report
    - Declaration of additional management actions
    - The state of the basin report will be completed within two years after SRGMP adoption, and every two years thereafter. It will report on conditions and activities completed through the preceding year. The District will provide

summaries to interested stakeholders, and made available on the District website for stakeholder access.

5.2.9 Surface Water Groundwater Interaction Monitoring

The interaction between groundwater and surface water has not been extensively evaluated within the basin. The primary occurrence of surface water and groundwater interaction exists at along Conejo Creek. This occurs as a result of losses from the Creek to the Basin and underflow from the basin to the Creek. The potential losses of groundwater supplies to the Creek necessitates the need for active monitoring of this interaction.

Actions:

- Regularly summarize groundwater and Conejo Creek water quality in the biennial report.
- Actions as described in Sections 5.2.1 and 5.2.4 are fundamental to evaluating the interaction of surface water and groundwater:
    - Identify an additional monitoring well west of SRMWC-3. This well will be used to monitor water levels relative to Conejo Creek surface elevation.
    - Coordinate with Hill Canyon WWTP staff to document Arroyo Conejo flow data.
    - Install permanent gaging station at Confluence Flume location. These data would help define surface water entering the Basin. This location is currently monitored four months per year by Hill Canyon WWTP staff.
    - Re-install Station 800 near the District offices on Conejo Creek. This station would help define the surface water exiting the basin and help define surface water-groundwater interaction.

5.3 GROUNDWATER PROTECTION

Groundwater protection is one of the most critical components of ensuring a sustainable groundwater resource. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, and protection of recharge areas. Prevention also includes measures to prevent contamination from human activities as well as contamination from natural substances such as saline water bodies from entering the potable portion of the groundwater system.

5.3.1 Well Policies

The County of Ventura administers well construction policies through a well permitting program for the entire County. The Ventura County Water and Environmental Resources Division, Groundwater Section, oversees the administration of Ventura County Ordinance No. 4184. This purpose of this ordinance is to “provide for the construction, maintenance, operation, use, repair, modification, and destruction of wells in such a manner that the groundwater of the County will not be contaminated or polluted, and that water obtained from wells will be suitable for beneficial use and will not jeopardize the health, safety or welfare of the people of this (Ventura) County."

5.3.2 Well Abandonment Policies

Ventura County Water and Environmental Resources Division, Groundwater Section, oversees the administration of these policies. There are no planned actions addressing well abandonment policies.

5.3.3 Well Destruction Policies

Ventura County Water and Environmental Resources Division, Groundwater Section, oversees the administration of these policies. There are no planned actions addressing well destruction policies.

5.3.4 Protection of Recharge Areas

Protection of the recharge area will maintain and or improve water quality within the groundwater basin. The contributing drainage area and its associated land use, illustrated on **Figure 2-3,** as well as the contributing drainage area to the Arroyo Conejo, all have a direct impact on the water quality of the Basin. Protecting these recharge and runoff area protects the water quality of the Basin.

Actions:

- Coordinate with City of Thousand Oaks on a source water protection program. For the Hill Canyon WWTP. This source water protection program will assist in the protection groundwater quality within the Santa Rosa Basin.
- Coordinate with County of Ventura to ensure planned land density requirements are maintained to protect groundwater quality. This will limit the density of septic systems and protect water quality.
- Develop outreach an program for agricultural stakeholders to educate them on pesticides and herbicides use, handling disposal, and the relationship to groundwater quality.

5.3.5 Wellhead Protection Measures

A drinking water source assessment is the first step in the development of a complete drinking water source protection program. The assessment includes: A delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply; an inventory of possible contaminating activities (PCAs) that might lead to the release of microbiological or chemical contaminants within the delineated area; and a determination of the PCAs to which the drinking water source is most vulnerable. Identification of wellhead protection is the objective of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by the California Department of Public Health (DHS). As a first step to a complete source protection program, DHS requires water systems to conduct a preliminary assessment. The District has completed source assessment for current Basin production wells.

Another aspect of wellhead protection is the proper destruction of abandoned wells and or adequate well head protection to prevent contamination from the ground surface.

Actions:

- The District will continue to complete drinking water source assessments for any new production wells.
- The District conduct an inventory and survey of active and inactive wells in the Basin to identify potential abandoned wells, and develop an approach for possible grant funding to provide incentives to properly destroy abandoned wells.
- The District prepare and distribute a “Guide for Well Owners” that includes consumer information about the SRGMP, the County’s well construction, abandonment and destruction requirements, well head protection information, and recommendations for ensuring that wells are properly maintained and protected.

There remains the potential for localized contamination of groundwater by industrial point sources such as diesel fuel tanks, street runoff and agricultural runoff .

While the District does not have authority or the responsibility for the oversight or remediation of contamination, it will coordinate with responsible parties and regulatory agencies to keep Basin stakeholders informed on the status of potential contamination in the Santa Rosa Valley.

5.4 GROUNDWATER SUSTAINABILITY

To ensure a long-term sustainable supply of groundwater reduce dependence on imported water, the District must consider ways to increase or maintain groundwater recharge, improve groundwater quality, increase recycled (or non-potable) water use, and increase conservation.

5.4.1 Hill Canyon WWTP

Recharge from Conejo Creek is a primary portion of the groundwater recharge to the Basin. Approximately 50 percent of the annual flow in Conejo Creek is discharge from Hill Canyon WWTP.

The agreement regarding the District’s primary access to Hill Canyon WWTP discharge in Conejo Creek was executed in 1994. This 25-year contract will expire in 2019. The District is currently in the process of renegotiating the agreement to retain rights to Hill Canyon WWTP water. This agreement is important to the sustainability of groundwater as a water supply in the Basin.

Actions:

- Complete negotiations and extend the agreement with City of Thousand Oaks for primary access to Hill Canyon WWTP discharge in Conejo Creek.

5.4.2 Brackish Groundwater Desalination Component

As described in the Section 2, the groundwater quality fails to meet drinking water standards and several Basin Objective standards. If groundwater pumping is increased the quality of the water requires that the groundwater be blended with imported water at a significant price. Due to the Conejo Wellfield location, introducing greater quantities of imported water to the produced groundwater is not currently feasible (District, 2011a). An alternative to imported water that would increase reliability and decrease reliance on outside sources, is to treat a portion of the groundwater to meet drinking water standards. A proposed desalination facility considered by the District would divert up to 1 MGD from the total groundwater pumped prior to it being blended, treat that stream to the appropriate quality, and blend with untreated groundwater for potable distribution (District, 2011a).

Actions:

- The District will report on the technical, economical, and environmental feasiblity of Santa Rosa Basin desalination within the biennial report within two years from the release of this report.

5.5 PLANNING INTEGRATION

Planning integration involves making decisions with regional consideration of viewpoints, and considering multiple viewpoints from inside and outside the Basin regarding how groundwater should be managed. Such integration also promotes resource enhancements and reliability, operational efficiency, cost savings, and possibly environmental benefits.

As the District continues to seek out alternative supplies to imported water, and as awareness of the cost and dependence on others grows, it has become increasingly beneficial for the District to cooperate with neighboring districts and agencies to find practical, regional solutions to regional problems. Several interagency efforts are already in place, such as the Hill Canyon WWTP agreement that provides the District with non-potable surface water from Conejo Creek, and District plans to pursue cooperative projects that take a regional perspective in addressing water supply problems, the removal of salts from the watershed, and maintain the overall health and sustainability of regional resources (District, 2011).

5.5.1 Integrated Regional Water Management Plan

The Watersheds Coalition of Ventura County (WCVC) was formed in April 2006 as the water resource management group required by the passage of Propositions 50 and 84, and is managed by County of Ventura staff. The WCVC is a collaborative entity with interests in improving water quality, water supply reliability, water recycling, water conservation, flood control, recreation and access, wetlands enhancement and creation, and environmental and habitat protection (Ventura County, 2013). The WCVC, and its three watershed committees, are engaged in a variety of local planning efforts designed to address the objectives developed by the watershed committees; the District is a member of the Calleguas Creek committee.

The District developed the IRWMP in coordination with the Cities of Thousand Oaks, Camarillo, and Simi Valley; Calleguas Municipal Water District, Ventura County Water Works Districts 1 and 19, Ventura County Resource Conservation District; and Santa Monica Mountains Recreation and Conservation Agency. The broader Watershed Plan seeks to reduce reliance on imported water and over drafted, confined groundwater aquifers by reclaiming poor quality, unconfined groundwater supplies and otherwise expanding water recycling projects. The District adopted the IWRMP for the Calleguas Creek Watershed.

The IRWMP provides an umbrella under which the Urban Water Management Plan (UWMP) was developed. The facilities envisioned in the plan reduce reliance on imported water supplies while improving water quality through the managed transport of salts out of the watershed. The goals and objectives of the IRWMP are reflected in the projections and projects incorporated in this UWMP.

5.5.2 Urban Water Management Plan (UWMP)

The District prepared a 2010 UWMP, which was then adopted by the Board of Directors on June 8, 2011. The purpose of the plan was to update information in the previous plan, extend the water supply planning horizon to 2030, provide comprehensive assessment of the District's water resource needs for a 20-year planning period, develop a plan to meet the 20 percent water conservation requirements in 2015 and 2020, and document present and future water sources and demands. The UWMP was coordinated with a number of agencies to ensure that data and issues were accurate. The results of the UWMP were incorporated in the District's Integrated Facilities Master Plan (IFMP). Copies of the Draft 2010 Urban Water Management Plan were circulated and coordinated with the following agencies: Calleguas Municipal Water District, City of Camarillo, City of Thousand Oaks, California State University - Channel Islands, County of Ventura, and Pleasant Valley County Water District.

5.5.3 Integrated Facilities Master Plan (IFMP)

In September 2011, the District published the District's IFMP. The purpose of this plan was to evaluate the District's ability to meet its demand through 2035 and properly plan for the capital requirements to do so. The evaluation conducted within the document was based on the current population projections, land development trends, and water and wastewater demand forecasts. The resulting recommendations were developed to serve as the guide for capital improvements to meet 2035 potable and non-potable water service demands and sanitary service demands. Several of these capital improvements are groundwater-related projects.

Firm projects include the construction of additional wells. Other projects identified that require further study include: a Santa Rosa Desalination Facility, denitrification of the Conejo Creek Wellfield, and groundwater recharge in the Santa Rosa Basin with non-potable water (District, 2011b).

5.6 IMPLEMENTATION

Many of these actions involve coordination by the District with other local, and or state agencies and most of these will begin within 6 months, following adoption of this SRGMP. A few activities involve assessing trends in basin monitoring data for the purpose of determining the adequacy of the monitoring network. These assessments will be made as new monitoring data become available for review by the District, and results will be documented in an annual Biennial State of the Basin assessment.

5.6.1 Biennial GMP Implementation Report

The District will report on progress made implementing the SRGMP in a Biennial State of the Basin assessment, which will summarize groundwater conditions in the Santa Rosa Basin and document groundwater management activities from the previous two years. This report will include:

- Summary of hydrologic conditions and monitoring results, including a discussion of historical trends.
- Changes in well status – constructed destroyed etc.
- Summary of management actions during the period covered by the report.
- A discussion, supported by monitoring results, of whether management actions are achieving progress in meeting BMOs.
- Summary of status of BMO component category implementation.

The State of the Basin assessment will be completed by April 1st every other year and will report on conditions and activities completed through December 31st of the preceding two years.

5.6.2 Future Review of the SRGMP and Related Programs

This SRGMP is intended to be a framework for the management efforts in the Santa Rosa Basin area. Many of the identified actions will likely evolve as the District continues to actively manage and learn more about the Basin. Many additional actions will also be identified in the biennial report. The SRGMP is therefore intended to be a living document, and it will be important to evaluate all of the actions and objectives over time to determine how well they are meeting the overall goal of the plan. The District plans to evaluate this entire plan within five years of adoption.

5.6.3 Financing

It is envisioned that implementation of the SRGMP, as well as many other groundwater management-related activities will be funded from a variety of sources including the District, state or federal grant programs, and local, state, and federal partnerships. Some of the items that may qualify for funding include:

Preparation of SRGMP biennial reports.
- Updates of the overall SRGMP
- Update of data sets and recalibration/improvement of existing groundwater model
- Collection of additional subsidence data
- Construction of monitoring wells where critical data gaps exist
- Stream-aquifer interaction studies

Implementation of the SRGMP including:
- Monitoring for groundwater quality or elevations in wells
- Reactivation of surface water gauging

5.6.4 Implementation Summary

This subsection summarizes the plan components, their actions, and which BMO they are associated with. Is ongoing

Table 5-1
Summary of Implementation Actions

Coordination and Stakeholder Involvement	**Timing/ Frequency**	**BMO[A]**
Action		
Conduct annual public groundwater management update meetings for stakeholders. At these meetings the District will present a summary of current water quality monitoring, water level monitoring, groundwater pumping, projected groundwater pumping, current project status, planned project status, and current issues and concerns.	2014 - ongoing	4
Develop an outreach program for agricultural pumpers to educate basin water users on irrigation efficiency options.	2014 - ongoing	1,2,4
Establish a point of contact within local, state, and federal regulatory agencies that have responsibility for resource management within Santa Rosa Basin. Publish this list in future updates to the SRGMP. Maintain relationships with these contacts to assist in the completion of other action items.	2014	4
Coordinate with FCGMA regarding the data transmitted to DWR for CASGEM reporting.	2014 - ongoing	4
Monitor and review new development proposals and projects within the watershed to ensure that these proposals incorporate appropriate measures to protect water quality and water quantity within the Santa Rosa drainage area.	2013 - ongoing	1,2
Collaboration with the Ventura County Water & Environmental Resources Division, Groundwater Section, for the permitting of wells in accordance with the objectives of the SRGMP.	2014 - ongoing	1,2,4
Provide copies of the adopted SRGMP and subsequent bi-annual state of the basin assessments to representatives from the City of Thousand Oaks, Moorpark, FCGMA, Camarillo, and other interested parties.	2013	4
Monitoring Program		
Action		
Continue water level monitoring at a monthly frequency.	2013 - ongoing	3
Identify an additional monitoring well west of SRMWC-3. This well will be used to monitor water levels relative to Conejo Creek surface elevation.	2014	3
Complete a well survey to determine if there is a need for well abandonment or location for possible new monitoring wells in areas lacking groundwater data.	2014 - ongoing	1,3
Continue to track groundwater production on a monthly basis at all production wells within the Basin.	ongoing	2,3
Prepare estimates of non-District groundwater pumping and return flows based on water service connection data and crop information.	2014	2,3
Continue to complete required water quality analyses on each water supply well.	2013 - ongoing	1,2
Annually evaluate groundwater at key wells for pesticides and herbicides. These key wells must be established. The wells should vary in location and depth within the Basin.	Annually	1,2
Prepare a Salt and Nutrient Management Plan consistent with the DWR Bulletin 160. It is the intent of this plan to identify salt and nutrient sources in the basin and develop management protocols on a basin-wide basis for the attainment of water quality objectives and protection of beneficial uses.	2014	1,2,3
Coordinate with Hill Canyon WWTP staff to document Arroyo Conejo flow data.	2014	3
Install permanent gaging station at Confluence Flume location. These data would help define surface water entering the Basin. This location is currently monitored four months per year by Hill Canyon WWTP staff.	2014/2015	3
Re-install Station 800 near the District offices on Conejo Creek. This station would help define the surface water exiting the basin and help define surface water-groundwater interaction.	2014/2015	3
Annually evaluate surface water for pesticides and herbicides. Ideally this would be conducted on surface water prior to entering the Basin, e.g., Confluence Flume, and leaving the Basin, e.g., Station 800.	Annually	1,2
Establish a surveyed benchmark that can be used to evaluate subsidence trends over time. One benchmark should be located near the Conejo Wellfield.	2014	2,3
Conduct an annual subsidence monitoring at the identified benchmark and report in the biennial report	Annually	2,3
Determine monitoring network adequacy and periodically review and expand as appropriate to meet the needs of the SRGMP on a 5-year	Ongoing	3
Establish protocols for methods and frequency of collection, and storing of data. These protocols will be documented in Appendix D and Appendix E and may be updated in the bi-annual state of the basin assessments.	2014 - ongoing	3
Report on implementation progress in a biennial State of the Basin Report that summarizes the groundwater conditions in the Santa Rosa Basin.	Biennially	4
Identify an additional monitoring well west of SRMWC-3. This well will be used to monitor water levels relative to Conejo Creek surface elevation.	2014	3
Groundwater Protection		
Action		
Coordinate with City of Thousand Oaks on a source water protection program. For the Hill Canyon WWTP. This source water protection program will assist in the protection groundwater quality within the Santa Rosa Basin.	2014	1
Coordinate with County of Ventura to ensure planned land density requirements are maintained to protect groundwater quality. This will limit the density of septic systems and protect water quality.	2014	1
Develop outreach an program for agricultural stakeholders to educate them on pesticides and herbicides use, handling disposal, and the relationship to groundwater quality.	2014 - ongoing	1
Conduct an inventory and survey of active and inactive wells in the Basin to identify potential abandoned wells, and develop an approach for possible grant funding to provide incentives to properly destroy abandoned wells.	2014 - ongoing	1
Prepare and distribute a “Guide for Well Owners” that includes consumer information about the SRGMP, the County’s well construction, abandonment and destruction requirements, well head protection information, and recommendations for ensuring that wells are properly maintained and protected.	2014	1
Groundwater Sustainability		
Action		
Complete negotiations and extend the agreement with City of Thousand Oaks for primary access to Hill Canyon WWTP discharge in Conejo Creek.	2013	2
The District will report on the technical, economical, and environmental feasibility of Santa Rosa Basin desalination within the biennial report within two years from the release of this report.	Biennially	2,4
Planning Integration		
Action		
Preparation of Biennial GMP Implementation Report - The State of the Basin assessment will be completed by April 1st every other year and will report on conditions and activities completed through December 31st of the preceding two years.	Biennially	2,4

A. BMO = Best Management Objective, definitions: 1. Protect and enhance groundwater quality, 2. Sustain a safe, reliable local groundwater supply, 3. Improve understanding of goundwater elevations, Basin yield and hydrogeology and, 4. Maintain public awareness and confidence, and honor the public trust

5.7 GROUNDWATER RELATED PROJECTS

As described in 5.5.3, firm projects described in the IFMP included the construction of additional wells. Other projects identified that require further study included a Santa Rosa Desalination Facility, denitrification of the Conejo Creek Wellfield, and groundwater recharge in the Santa Rosa Basin with non-potable water (District, 2011b). Projects were recommended by the District for evaluation in this management plan relative to increased yield. These projects included:

- Recharge Basin East of Conejo Wellfield
    - With non-potable water
    - With recycled water
- Recharge within Arroyo Santa Rosa
- Direct injection wells

Other projects were also considered that improve water quality and may increase yield of the Basin, these included:

- Western Extension of the Conejo Wellfield
- Desalination of Groundwater (and possibly denitrification)
    - At the District office site
    - At Conejo Wellfield

The location of each of these projects is shown on **Figure 5-1**. Listed below is a brief description of each project, summary of any analysis completed, project benefits, and project issues.

5.7.1 Recharge Basin East of Conejo Wellfield

Recharge basins have been considered by the District and were defined in the IFMP. The project would construct recharge ponds east of the Conejo Wellfield on a vacant parcel owned by the City of Thousand Oaks, as shown on **Figure 5-1**.

Recharge water would be delivered to the basin(s) from either the current non-potable distribution system, a new pipeline from Hill Canyon WWTP for recycled water, and or a diversion from Arroyo Santa Rosa for stormwater.

This project was modeled with the numerical groundwater model developed as part of this SRGMP to evaluate the potential additional yield and affects to groundwater from the project. Hydraulic modeling is independent of the type of water recharged. The total recharge area assumed is 3.3 acres. The initial recharge basin area was larger, nearly 10 acres, and had to be reduced due to high groundwater conditions, or mounding. Initial simulations were reduced until high groundwater and discharge to Arroyo Santa Rosa was eliminated. This issue is related to the current depth to groundwater, site hydraulic properties, and the assumed recharge rate. A feasibility analysis that includes field testing should be conducted to validate and or measure these properties.

It was assumed that the facilities would be in operation for 10 months a year, 2 months down time is assumed for cleaning. A recharge rate of one foot per day was assumed based on local soil types. Given these assumptions, a total of 990 acre-feet of either non-potable, recycled, or stormwater water can be recharged annually. If pumping remains constant, this additional recharge increases the Basin outflow to Conejo Creek by the same amount, this can be assumed to be the approximate increased yield. If possible, this additional yield could be captured with new wells.

Issues that require further assessment:

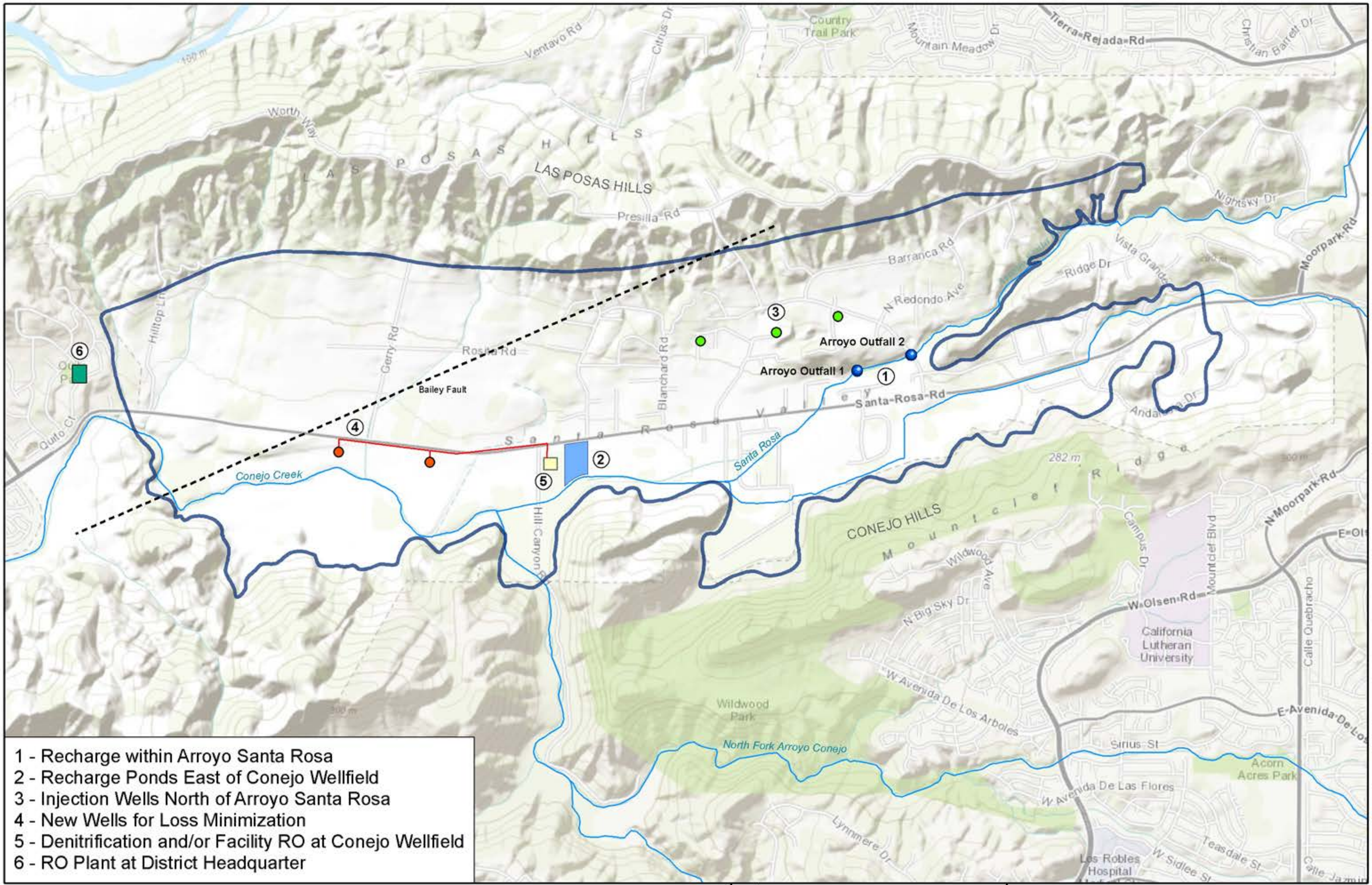
Hydraulic Properties: modeling assumptions related to recharge rate, conductivity, and current depth to water were made and directly affect the model results. A feasibility analysis that includes field testing should be conducted to validate and or measure these properties.

Land Acquisition: The land on which the basins would be constructed must be obtained, further evaluation must be conducted to determine the value of the land and the potential to obtain the required land for recharge operations.

Project Permitting: An issue with a recharge project of this type will be the recharge water quality. Water quality must meet the RWQCB Basin Plan objective for groundwater, regardless of water type (non-potable from Conejo Creek, recycled water from Hill Canyon WWTP, or stormwater) because there is limited assimilative capacity in the Basin for chloride, nitrate, sulfate, or TDS. This may be one of the largest impediments to a potential project. Currently, the non-potable water does not meet the chloride Basin Plan requirement for groundwater, and therefore, could not be recharged alone. A recharge project using only non-potable water is not feasible. Recycled water or stormwater would meet all Basin Plan objectives.

The use of recycled water will require a permit from the RWQCB and the recharge of another supply as dilution, or diluent water. Diluent water is defined as water, other than treated wastewater, that actively or passively is used to dilute treated wastewater in a recharge project. Diluent water requirements (CWC §60320) may be satisfied by using surface water, stormwater, or groundwater. The amount of diluent water required is a function of the water quality of the recycled water and diluent water. The Recycled Water Contribution (RWC) is defined by the following equation in CWC §60320:

$$RWC = \frac{Recycled\ Water\ Volume}{Recycled\ Water\ Volume + Diluent\ Volume}$$



1 - Recharge within Arroyo Santa Rosa
2 - Recharge Ponds East of Conejo Wellfield
3 - Injection Wells North of Arroyo Santa Rosa
4 - New Wells for Loss Minimization
5 - Denitrification and/or Facility RO at Conejo Wellfield
6 - RO Plant at District Headquarter

Key to Features

● Recharge within Arroyo Santa Rosa
● New Wells for Loss Minimization
● Potential Injection Wells
▭ City Boundaries
▭ Santa Rosa Valley Groundwater Basin
▭ Watershed
■ Recharge Ponds East of Conejo Wellfield
— New Pipeline for Loss Minimization
▭ Injection Well Area
■ Denitrification and/or RO Facility at Conejo Wellfield
■ RO Plant at District Headquarter

N
0 0.3 0.6 Miles

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Santa Rosa Basin Potential Groundwater Projects

MWH

Figure 5-1

For example, if 1,000 acre-ft of recycled water is combined with 4,000 acre-ft of diluent water,

$$RWC = \frac{1000}{1000 + 4000} = 0.2 = 20\%.$$

The initial RWC is based on CDPH's review of a project engineering report. The RWC can range from 0.2 for surface spreading (i.e. 20% recycled water), to ≤ 0.5 for subsurface injection (i.e. 50% recycled water), to 1.0 (100% recycled water) for advanced treated water surface recharge or injection. The RWC calculation is typically made on a 60-month rolling average. Increasing the allowable RWC is dependent on the Total Organic Carbon (TOC) in the recycled water (CWC §60320) and would require approval by CDPH and the RWQCB modified in the project permit. Also the maximum allowable TOC as defined under CWC §60320 is,

$$TOC_{\max} = \frac{0.5\,mg/L}{RWC}.$$

For example, for a 20% RWC,

$$TOC_{max} = \frac{0.5\,mg/L}{0.2} = 2.5\,mg/L.$$

So, recycled water with TOC greater than 2.5 mg/L may require reverse osmosis to comply with CWC §60320.

Using recycled water may require the purchase of imported water if stormwater does not provide sufficient diluent water. District non-potable water may be considered diluent water. This will require RWQCB and CDPH approval, but it fits the current definition provided in the draft permit – although, this water does NOT currently meet the basin plan objective. A feasibility analysis must be completed to the determine the amount of non-potable water that could be reached to meet potential permit requirements. With the lack of reliable monitoring data on Arroyo Santa Rosa, it is not known if there is a reliable diluent supply or if imported water must be purchased.

There are no regulatory requirements for the use of stormwater for surface spreading. The RWQCB has determined that it is not feasible to develop numeric limits for stormwater permits. Stormwater quality is protected by NPDES permits (including Municipal Separate Storm Sewer Systems [MS4] permits) issued by the Los Angeles RWQCB. Each regulated MS4 is required to develop and implement a stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges. These individual permits, if issued upstream of the recharge facility, protect stormwater recharge water quality.

A recycled water recharge project would have a net benefit on groundwater quality due the current quality of recycled water and the ambient water quality within the basin.

Capital and Operating Expenses: Capital construction costs were not evaluated for this project and require further study. Annual operation and maintenance will be required for the recharge basins, which typically range from $10 to $30 per acre-foot of recharge volume.

5.7.2 Recharge within on Arroyo Santa Rosa

Recharge within the Arroyo Santa Rosa can be increased if the residence time and wetted area are increased. This project is described in the IFMP and would be constructed near two non-potable system turnouts, above Charisma Court, upstream of Santa Rosa Road and downstream of East Las Posas Road. Although the project could also be completed with recycled water, imported water or stormwater could also be used.

This reach of the Arroyo Santa Rosa has sections of both improved and natural channels. The improved areas generally have riprap bank protection and a natural bottom with medium to heavy vegetation. Recharge within the stream channel can be achieved with the construction of inflatable rubber dams. Inflatable rubber dams are used throughout California to retain water for recharge and or divert water to off channel recharge facilities. A typical rubber dam installation consists of a reinforced concrete foundation constructed across a riverbed with a rubber bladder anchored to the foundation. The bladder is inflated and deflated through connected air piping. Most contemporary rubber dams use air for inflation, but water may be suitable where hydraulic conditions are more demanding.

For project evaluation, two rubber dams were assumed to be constructed within the Arroyo Santa Rosa. It is assumed that the facilities will be in operation during the dry season only, that is, from April to November, with a recharge rate is one foot per day. The channel width was assumed to be 40 feet. Given these assumptions, a total of 435 acre-feet of either non-potable, recycled, or stormwater water can be recharged annually. If pumping remains constant, this additional recharge increases the Basin outflow to Conejo Creek by the same amount. Again, this can be assumed to be the approximate increased yield and this amount could be captured with new wells. .

Issues that require further assessment:

Construction within a stream channel can be a greater effort than the development of recharge basins or wells due to habitat protection measures, potential additional permitting, and flood management considerations.

Hydraulic Properties: modeling assumptions related to recharge rate, conductivity, and current depth to water were made and directly affect the model results. A feasibility analysis that includes field testing should be conducted to validate and or measure these properties. Monitoring data should be collected on the Arroyo Santa Rosa to determine potential for stormwater recharge with the project.

Access: The land on which the rubber dams would be constructed and access to the site for operations requires additional evaluation and was not considered assessment.

Project Permitting: The same water quality requirements and blending requirements listed in Section 5.7.1 also apply for this project. Again, there are no regulatory requirements for the use of stormwater for surface spreading.

Capital construction costs for this project will require further feasibility analysis.

5.7.3 Injection Wells

This project would consist of three injection wells that would directly inject water into the underlying aquifer. This project would create injection facilities that recharge water throughout the year in the eastern portion of the Basin. The injection wells would be constructed to an anticipated depth of 400 feet below ground surface. Each well is assumed to have an injection capacity of 300 gpm, and each would be in operation for 11 months annually.

Recharge water would be delivered to the wells most likely via the imported water system. Typically in California, permitted injection projects require from either fully treated water that meets California drinking water standards or advanced treated recycled water. There are exceptions, but they are rare. Injection of tertiary treated recycled water, stormwater, or non-potable water is not recommended due to substantial permitting requirements and additional well maintenance requirements. Recharge of imported water would have a positive effect on groundwater quality in the Basin.

This project was modeled with the numerical groundwater model developed as part of this SRGMP to evaluate the potential additional yield and affects to groundwater from the project. The initial location of the wells described by District Staff was farther east than those modeled, due to a lack of thickness in the aquifer the wells were moved west to reduce high groundwater conditions, or mounding. Given the model assumptions, a total of 1,000 acre-feet of water can be recharged annually. If Basin pumping remains constant, this additional recharge increases the Basin outflow to Conejo Creek by the same amount. Again, this can be assumed to be the approximate increased yield and this amount could be captured with new wells.

Issues that require further assessment:

Land Acquisition: The land on which the wells would be constructed must be obtained, and right-of-ways must be obtained for any connecting piping. Further evaluation must be conducted to determine the value of the land and the potential to obtain the required land for recharge operations.

Hydraulic Properties: Modeling assumptions related to recharge rate, conductivity, and current depth to water were made and directly affect the model results. A feasibility analysis that includes field testing (and pilot well program) should be conducted to validate and or measure these properties. Monitoring wells may also be required to evaluate the impact of the injection program.

Project Permitting: The same water quality requirements and blending requirements listed in Section 5.7.1 also apply for this project.

The injection wells associated with this project would be classified as Environmental Protection Agency (EPA) Class V wells. To meet EPA requirements for Class V wells, injection well owners and operators are required to submit basic inventory information to the primacy enforcement agency. In California the primacy authority is the RWQCB and oversees all permitting. The RWQCB is more restrictive than the EPA and requires local permitting for a Class V injection well. . The RWQCB issues permits, but also works with DPH which will require monitoring and reporting of the injection well program. The permits are typically in the form of waste discharge permits and have requirements for water quality, monitoring, reporting, and compliance determination.

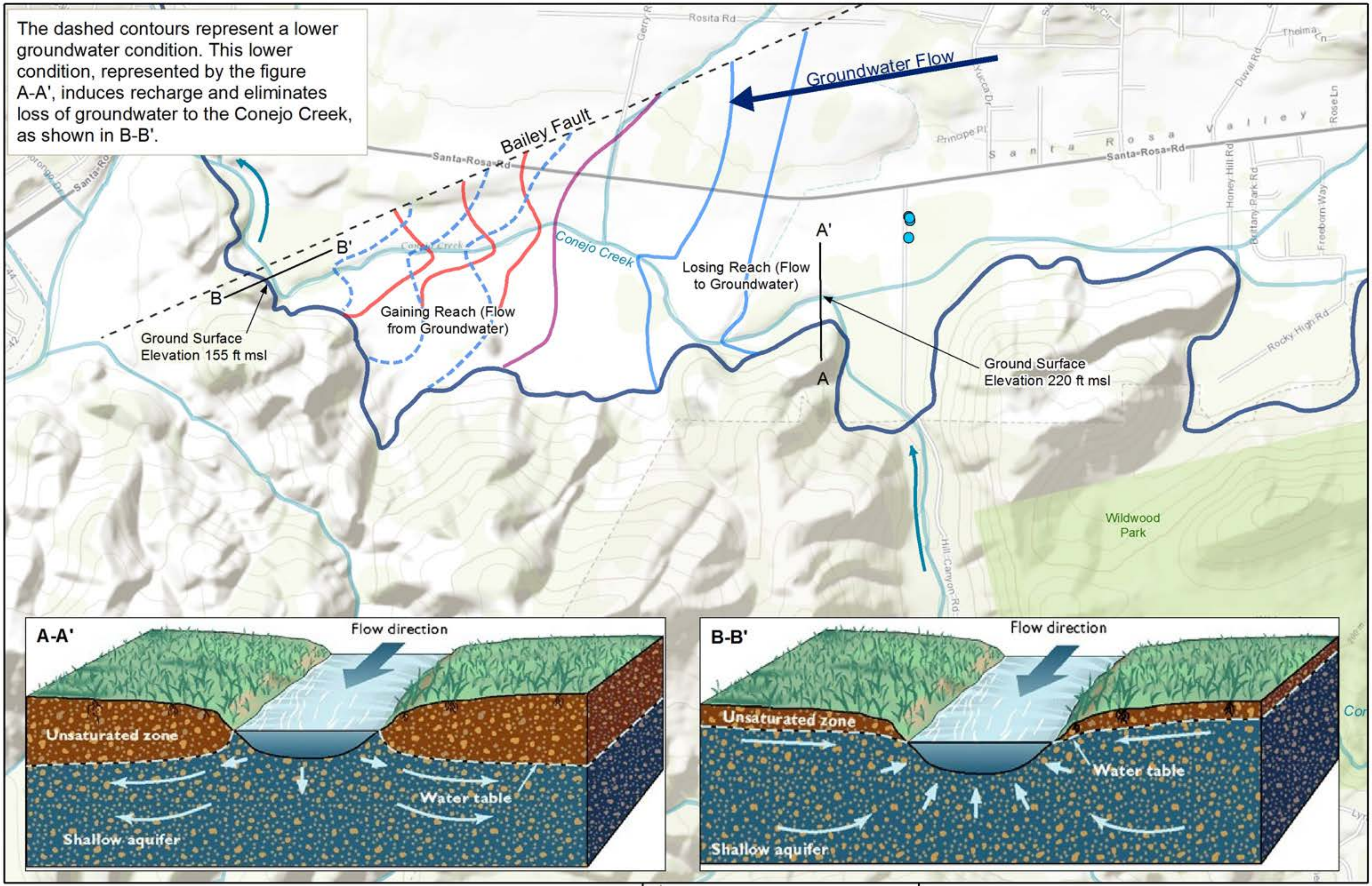
Capital and Operating Expenses: Capital construction costs were not evaluated for this project and require further study.

Cost of Imported Water: The cost to buy imported water could present significant constraints to the project.

5.7.4 Western Extension of the Conejo Wellfield

This project would consist of two additional extraction wells located west of the Conejo Creek Wellfield and parallel to Conejo Creek. The conceptual project would include a pipeline to the Conejo Creek Wellfield for distribution. The purpose of this project draw water levels down to 1) provide storage capacity for wet periods and 2) maintain a lower water level in the Basin than the water level in Conejo Creek whereby recharge from the creek always occurs.

A review of surface water flow and groundwater levels indicate that the groundwater basin typically has a net recharge from the creek, but when water levels are high, as in 2003 through 2008, there is little storage capacity in the groundwater basin and groundwater can discharge to Conejo Creek. Keeping groundwater levels lower will ensure no losses of groundwater to the Creek. This the lowering of groundwater levels is conceptually illustrated on **Figure 5-2**. As summarized in Section 2, over 1,000 acre-feet of groundwater was lost to the Creek in 2004 during a wet period.



The dashed contours represent a lower groundwater condition. This lower condition, represented by the figure A-A', induces recharge and eliminates loss of groundwater to the Conejo Creek, as shown in B-B'.

Key to Features

- ● Conejo Production Wells
- Stream
- - - - Fault

Conceptual Groundwater Contours

- Equilibrium
- Gaining Reach
- Losing Reach
- - - - Lower Water Level

- Santa Rosa Valley Groundwater Basin Boundary
- Surface Water Flow Direction

Stream Cross Section Source: Winter and others, 1999

N

0 0.25 0.5 Miles

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Conceptual Surface Water / Groundwater Relationship

MWH

Figure 5-2

Issues that require further assessment:

Land Acquisition: The land on which the wells would be constructed must be obtained, and right-of-ways must be obtained for any connecting piping. Further evaluation must be conducted to determine the value of the land and the potential to obtain the required land.

Environmental Analysis: An environmental impact analysis must be completed to determine any potential impact to the Conejo Creek based from lowering groundwater levels. This project requires modeling and additional technical evaluation.

Capital and Operating Expenses: Capital construction costs were not evaluated for this project and require further study.

5.7.5 Desalination of Groundwater (and possibly Denitrification)

Desalination and denitrificaiton of Conejo Wellfield water for use in the potable distribution system is a project that is summarized in the IFMP. The construction of a reverse osmosis (RO) desalination facility, would either be located at at the Conejo Wellfield or at Camrosa Headquarters.

If the facility is located at the District site, water produced at the Conejo Wellfield would be treated with a 3 MGD RO treatment plant constructed in the back lot at District Headquarters, 2.3 miles away. The water would be treated to remove salts and the finished water would be blended back potable distribution system.

The proposed treatment facility at Conejo Wellfield would be located between Well Conejo-3 and Well SRMWC-8 and consist of a 1 MGD treatment facility. Feed water piping into the treatment facility would allow water to be taken separately from Wells Conejo-2 and/or 4 or the onsite tank that is filled by the wells. The highest nitrate concentrations would be supplied to the treatment facility and allow the treated product water to be blended back into the poor quality well water. This project would have a significant impact on the reliability of groundwater supply for the District and improve long-term Basin water quality.

The brine waste stream from the treatment plant would be discharged through a brine line that would interconnect with the Calleguas MWD Regional Brine Line. Depending on the location of the facility, 3.0 to 5.3 mile-long pipeline would run along Santa Rosa Road from the treatment plant to Upland Road, and then along Upland Road to connect to the Salt Management Pipeline in Lewis Road. The pipeline along Upland Road would be attached to the Upland Road Bridge to avoid a trenched crossing of Calleguas Creek (District, 2011).

Issues that require further assessment:

Brine Discharge: The Calleguas Regional Salinity Management Pipeline (SMP) is being constructed by the Calleguas Municipal Water District. The pipeline will extend from the city of Simi Valley, at the most easterly point, through the cities of Moorpark, Camarillo, Oxnard, and areas of unincorporated Ventura County. The westerly endpoint of the pipeline is located in Port Hueneme. The alignment of the SMP near the District has not been determined and may impact the cost of using the SMP. Connection fees for the SMP were not evaluated as part of this project.

Capital and Operating Expenses: Capital construction costs were not evaluated for this project and require further study. A financial evaluation should be conducted to determine the size of the treatment facility, the cost of treated water relative to imported costs for blending, and the value of an independent reliable water supply.

Section 6
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Appendix A

Public Notices

Client:

CAMROSA WATER/WC LEGAL

Account # 19833 Ad # 296175

Phone: (805) 987-4797 Ext: 0

Fax:

Address: 7385 SANTA ROSA ROAD
CAMARILLO, CA 93012

Sales Rep.:

Phone: (805) 437-0352

Fax: (805) 437-0065

Email: legals@vcstar.com

Entry date: 12/19/2011 11:23 AM

Class.: 1299 Other Public Notices

Requested By:

DONNIE ALEXANDER

PO #: UMWP

Entered By: 147412

Printed By: 147412

Start Date: 12/21/2011

End Date: 01/04/2012

Nb. of 4

Publications: Ventura County Star
Web

Total Price: $143.00

Paid Amount: $0.00

Page 1 of 1

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that a Public Hearing with the Camrosa Water District Board of Directors will be held:

---Wednesday, January 11, 2012 at 5:00pm---
CAMROSA WATER DISTRICT
7385 Santa Rosa Rd. Camarillo, CA. 93012
(805) 482-4677

The purpose of this Public Hearing is to accept public testimony regarding the preparation of a groundwater management plan for the Santa Rosa Basin.

Tony L. Stafford
Secretary / Interim General Manager
CAMROSA WATER DISTRICT BOARD OF DIRECTORS
Publish: Dec. 21, 2011, Jan. 4, 2012 Ad No.296175

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

December 21, 2011

THIS IS TO CERTIFY THAT THREE COPIES OF THE CAMROSA WATER DISTRICT'S PUBLIC HEARING NOTICE FOR:

- ***Preparation of the Santa Rosa Groundwater Management Plan***

WERE PLACED WITHIN DISTRICT BOUNDARIES FOR CAMROSA CUSTOMERS AND ITS CONSTITUENTS TO VIEW.

THE PUBLIC HEARING NOTICE POSTING LOCATIONS ARE:

SANTA ROSA ELEMENTARY SCHOOL
13282 Santa Rosa Rd. Camarillo, CA. 93012

CAMROSA WATER DISTRICT
7385 Santa Rosa Rd. Camarillo, CA. 93012

CAMROSA WATER RECLAMATION FACILITY
1900 Lewis Rd. Camarillo, CA. 93010

Donnie Alexander
Communications Coordinator

7385 Santa Rosa Road • Camarillo, CA 93012-9284
Phone: (805) 482-4677 • FAX: (805) 987-4797
Website: www.camrosa.com

Certificate of Publication

Ad #296175

In Matter of Publication of:

NOTICE OF PUBLIC HEARING

State of California)
))§
County of Ventura)

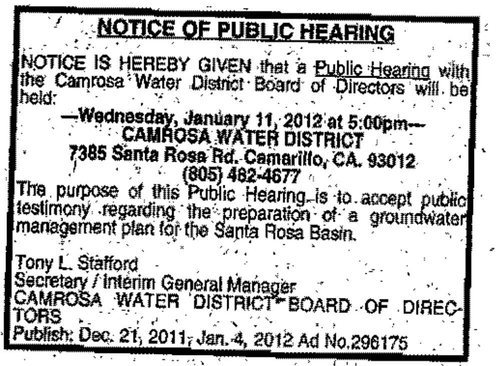
I, **Ossie Knowlton**, hereby certify that the **Ventura County Star Newspaper** has been adjudged a newspaper of general circulation by the Superior Court of California, County of Ventura within the provisions of the Government Code of the State of California, printed and published in the City of Camarillo, County of Ventura, State of California; that I am a clerk of the printer of said paper; that the annexed clipping is a true printed copy and publishing in said newspaper on the following dates to wit:

December 21, 2011, January 4, 2012

I, Ossie Knowlton certify under penalty of perjury, that the foregoing is true and correct.

Dated this January 4, 2012, in Camarillo, California, County of Ventura.

Ossie Knowlton



NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that a Public Hearing with the Camrosa Water District Board of Directors will be held:

—Wednesday, January 11, 2012 at 5:00pm—
CAMROSA WATER DISTRICT
7385 Santa Rosa Rd. Camarillo, CA. 93012
(805) 482-4677

The purpose of this Public Hearing is to accept public testimony regarding the preparation of a groundwater management plan for the Santa Rosa Basin.

Tony L. Stafford
Secretary / Interim General Manager
CAMROSA WATER DISTRICT BOARD OF DIRECTORS
Publish: Dec. 21, 2011, Jan. 4, 2012 Ad No.296175

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

January 5, 2012

Dear Camrosa Customer:

The Camrosa Water District (District) is in the early planning phase of updating its existing groundwater management plan (Plan) for the Santa Rosa Groundwater Basin. The original groundwater management plan was first prepared in 1987 and subsequently updated in 1997 under the authority of the Groundwater Management Act of the California Water Code. Nearly 15-years have passed and a Plan update is needed to assist the District in optimizing the beneficial uses of the groundwater basin, preserve and enhance water quality, and assure preservation of the resource for future generations.

All agricultural interests and private pumpers overlying the groundwater basin have the opportunity to participate and comment in the development of the Plan.

On December 14, 2011, the District Board set a Public Hearing date of January 11, 2012, to accept public comments, and at the conclusion of the Public Hearing make a decision to adopt a Resolution of Intention to prepare a Plan update.

If you have any comments, you may attend the meeting held on January 11, 2012, beginning at 5:00 PM, or submit your comments in writing to:

Camrosa Water District
C/O Mr. Terry Curson
7385 Santa Rosa Road
Camarillo, CA 93012

or email at tcurson@camrosa.com

Sincerely,

Tony Stafford

Tony Stafford,
Interim General Manager

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

Resolution No: 12-01

A Resolution of the Board of Directors of Camrosa Water District

To Draft A Groundwater Management Plan For The Santa Rosa Valley Basin Pursuant To The Groundwater Management Act Of The California Water Code

Whereas, California's Legislatures has declared that groundwater is a valuable natural resource and should be managed to ensure both its safe production and quality; and

Whereas, the Groundwater Management Act, commonly referred to as AB3030 was signed into law on September 26, 1992, and became effective on January 1, 1993, and is incorporated into the California Water Code under Section 10750 et seq., authorizing local agencies whose service area includes a groundwater basin that is not subject to groundwater management pursuant to other provisions of the law or court decisions, to adopt and implement a groundwater management plan; and

Whereas, the Santa Rosa Valley Groundwater Basin lies within Camrosa's boundaries and the greatest portion of this basin, east of what is known as the Bailey Fault, is not subject to groundwater management pursuant to other provisions of the law; and

Whereas, the Camrosa Water District was organized under Division 12, Section 3000 of the State Water Code and is authorized to prepare and adopt groundwater management plans pursuant to the California Water Section 10750 et seq.,; and,

Whereas, agricultural interests and private pumpers overlying the groundwater basin will be given opportunity to participate and comment in the development of the groundwater management plan; and

Whereas, following publication of notice as required by law, the Camrosa Water District held a Public Hearing on January 11, 2012, to receive public comment on the merits of whether or not to adopt a Resolution of Intent to draft a groundwater management plan; and,

Whereas, after considering the public comments and other information presented at the Hearing, Camrosa's Board of Directors determines that it is in the best interest of the District's constituents to draft a groundwater management plan for the Santa Rosa Valley Basin.

Now, Therefore, Be It Resolved by the Camrosa Water District Board of Directors as follows:

1. *Camrosa hereby declares its intention to draft a Groundwater Management Plan, pursuant to the Groundwater Management Act of 1993, for the Santa Rosa Valley Basin, in the portion not subject to groundwater management pursuant to other provisions of the law, and in cooperation with local agricultural and private well owners interest.*

2. *Camrosa hereby declares its intention in developing the Groundwater Management Plan is to assure that adequate water supplies of the highest possible quality are maintained for all current and future users of the Groundwater Basin.*

3. *Camrosa hereby declares its intended objectives as follows:*

    A. *Evaluate historical and projected groundwater pumping and estimated groundwater balance/overdraft; and,*

    B. *Characterize and estimate quantities of flows in and out of the Basin and Sub-basins; and,*

    C. *Evaluate groundwater quality characteristics and water quality improvements and degradation trends; and,*

    D. *Identify points of natural and/or intentional basin recharge.*

Adopted, Signed and Approved this 11th day of January 2012.

Al E. Fox, President
Board of Directors
Camrosa Water District

ATTEST:

Tony Stafford

Tony L. Stafford, Secretary
Board of Directors
Camrosa Water District

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

December 3, 2012

Dear Camrosa Customer:

The Camrosa Water District (District) is preparing an update to the Santa Rosa Basin Groundwater Management Plan. The original groundwater management plan was first prepared in 1987 and subsequently updated in 1997 under the authority of the Groundwater Management Act of the California Water Code. Nearly 15-years have passed and a Plan update is needed to assist the District in optimizing the beneficial uses of the groundwater basin, preserve and enhance water quality, and assure preservation of the resource for future generations.

The District is convening a stakeholder meeting on December 13, 2012 at 4:00 PM to conduct an overview of the Groundwater Management Plan and provide interested stakeholders an opportunity to discuss the Plan's development. The meeting will take place at the following location:

Camrosa Water District
7385 Santa Rosa Road
Camarillo, CA 93012

Additional information may be obtained by contacting Mr. Terry Curson, Project Engineer by email terryc@camrosa.com or by telephone at (805) 482-8063.

Sincerely,

Tony Stafford

Tony Stafford
General Manager

7385 Santa Rosa Road ▪ Camarillo, CA 93012-9284
Phone: (805) 482-4677 ▪ FAX: (805) 987-4797
Website: www.camrosa.com

CAMROSA WATER DISTRICT
BUILDING WATER SELF-RELIANCE

STAKEHOLDER MEETING

NOTICE IS HEREBY GIVEN that a Stakeholder Meeting with the Camrosa Water District Staff will be held:

---Thursday, December 13, 2012 at 4:00pm---

CAMROSA WATER DISTRICT
7385 Santa Rosa Rd. Camarillo, CA. 93012
(805) 482-4677

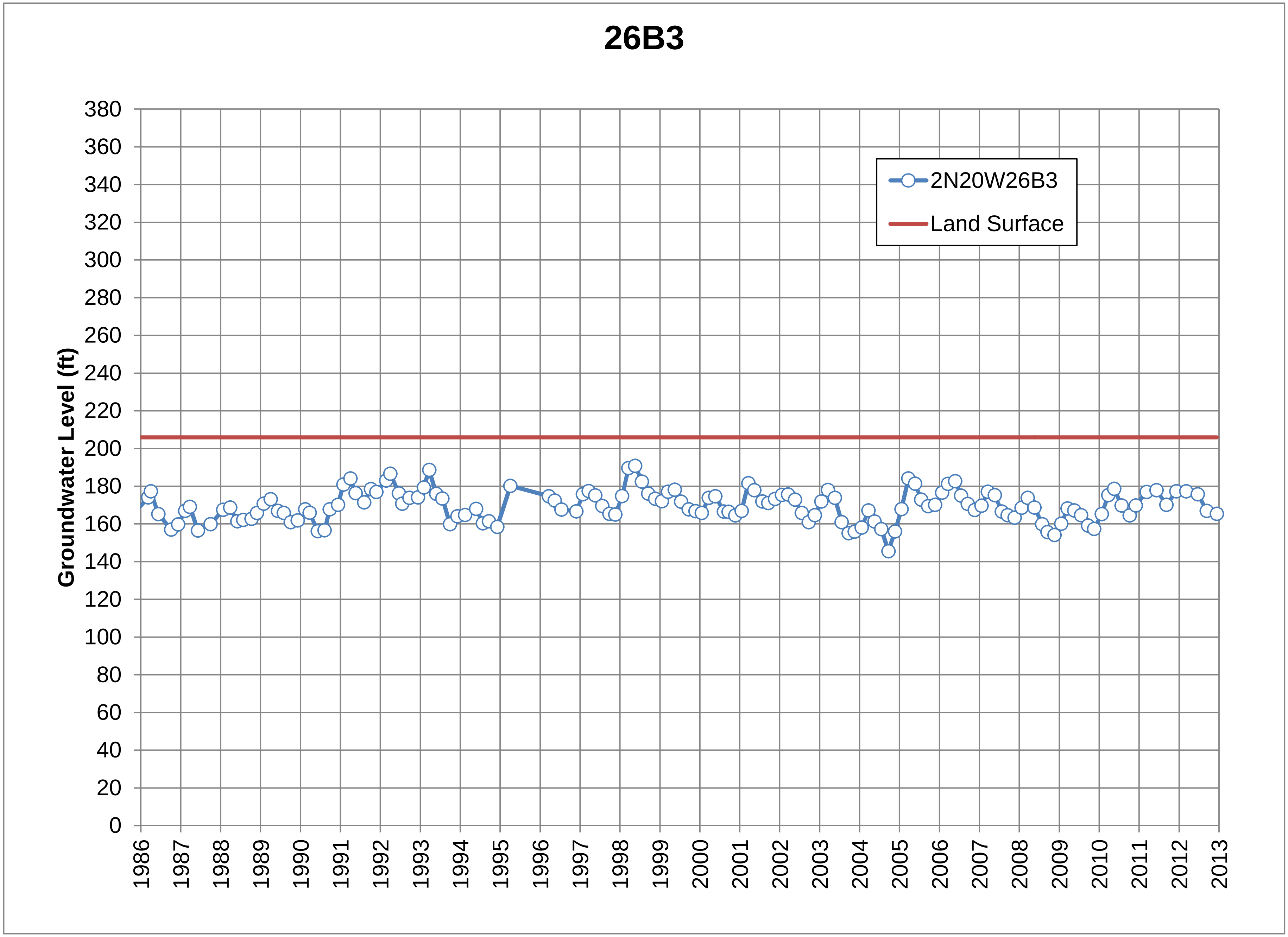
The purpose of the Stakeholder Meeting is to conduct an overview of the preparation of the Santa Rosa Basin Groundwater Management Plan Update and provide interested stakeholders an opportunity for discussion.

Tony Stafford

Tony L. Stafford
Secretary / General Manager

Appendix B

Santa Rosa Basin Hydrographs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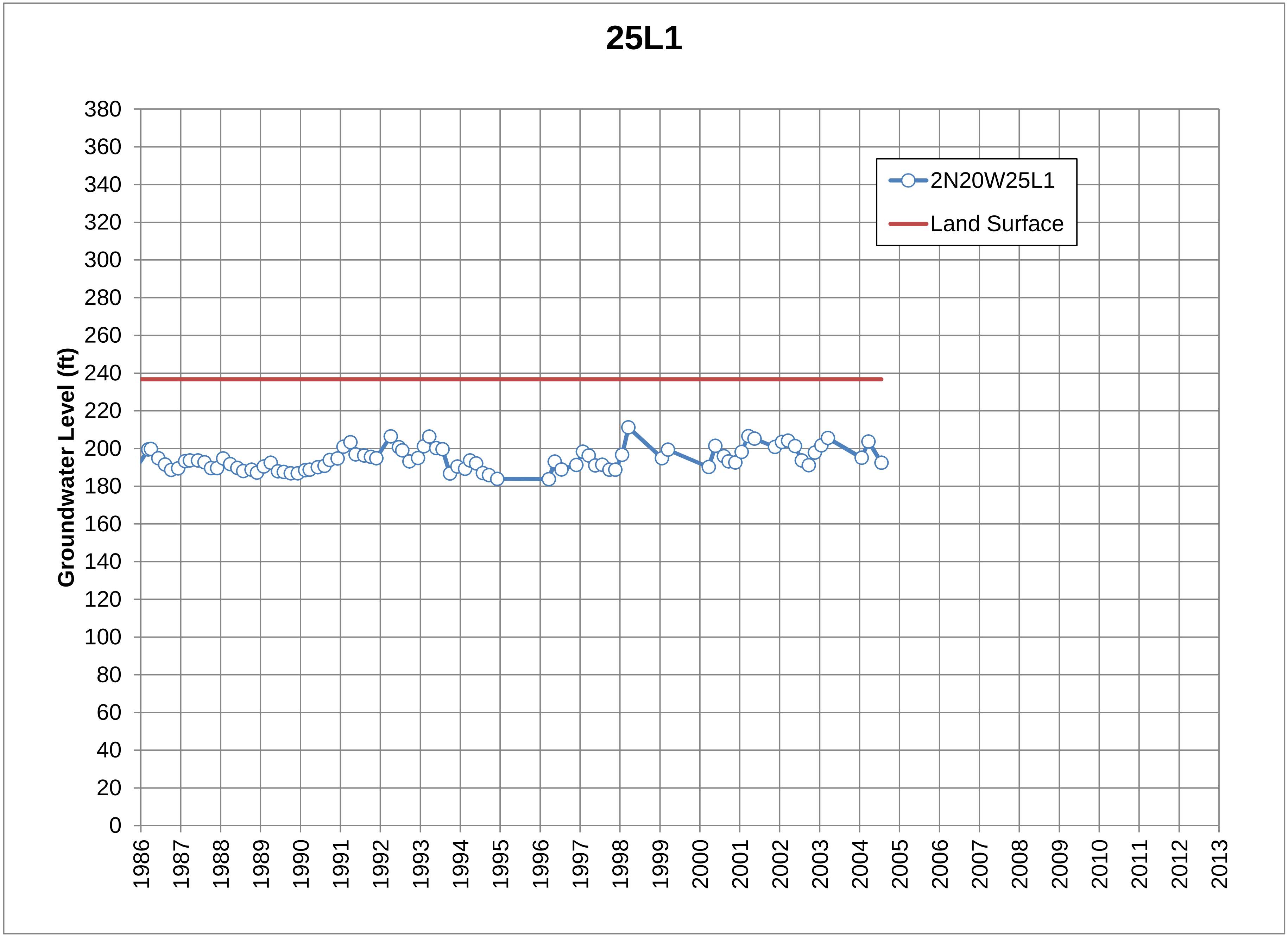
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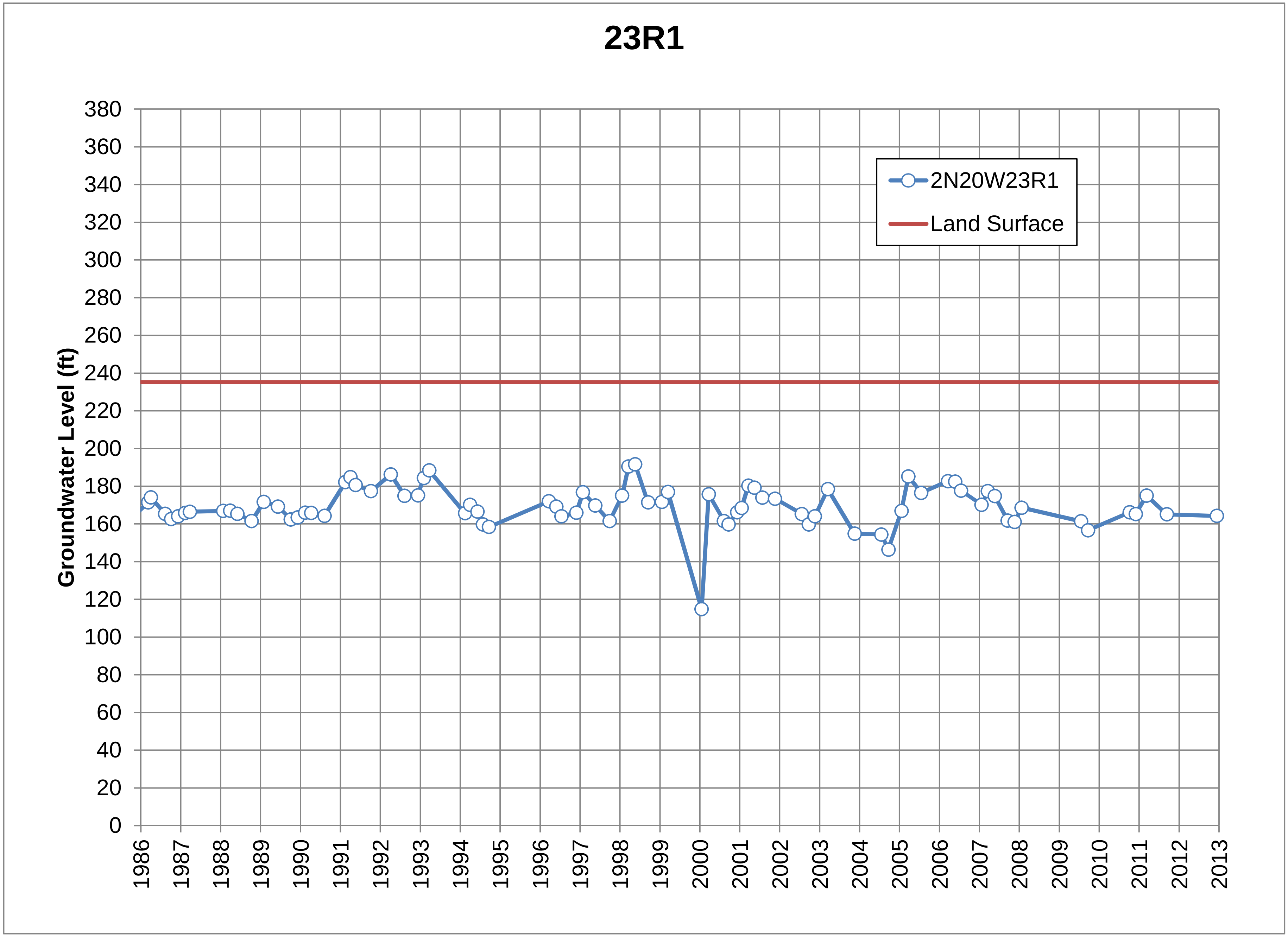

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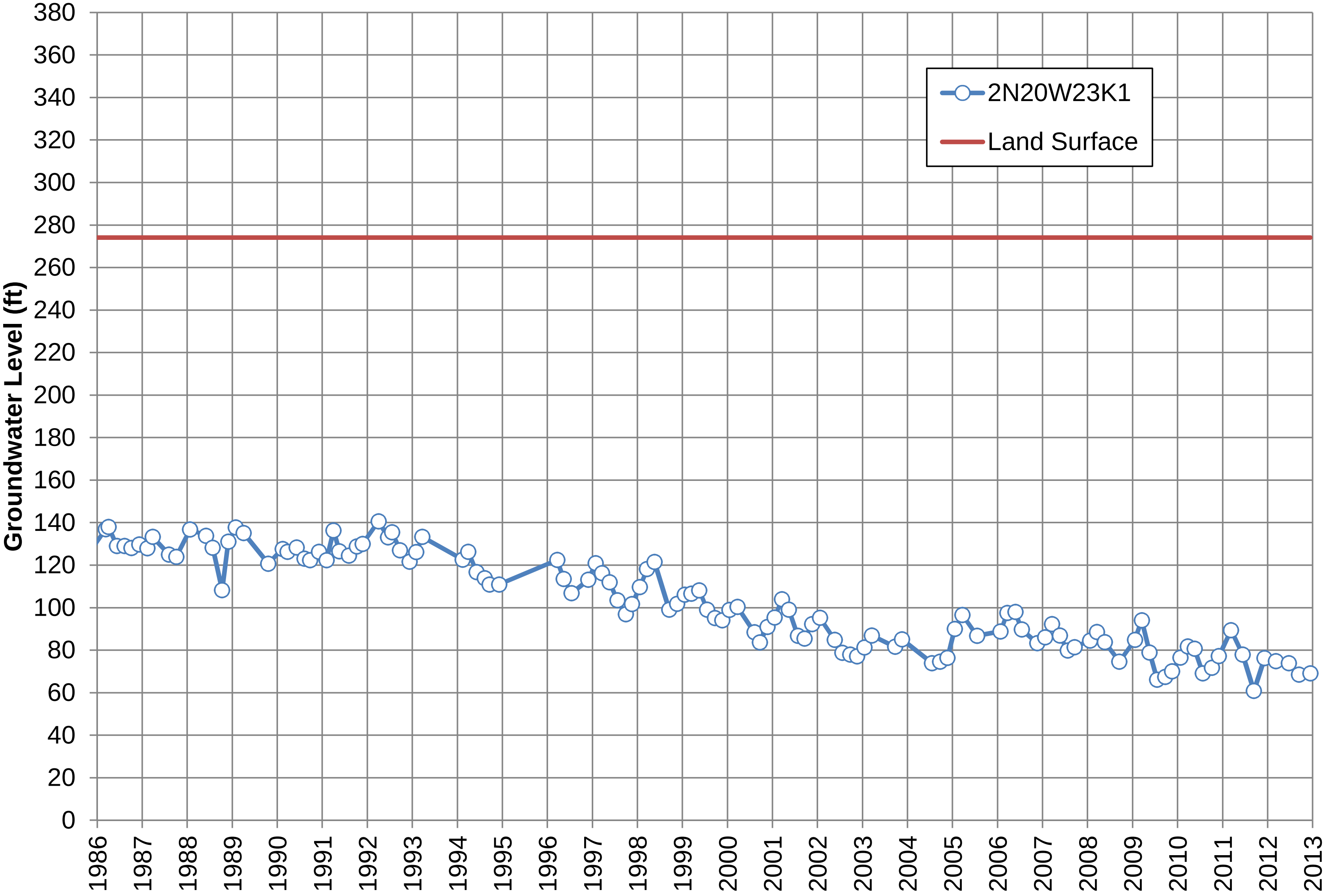
McCloskey-1



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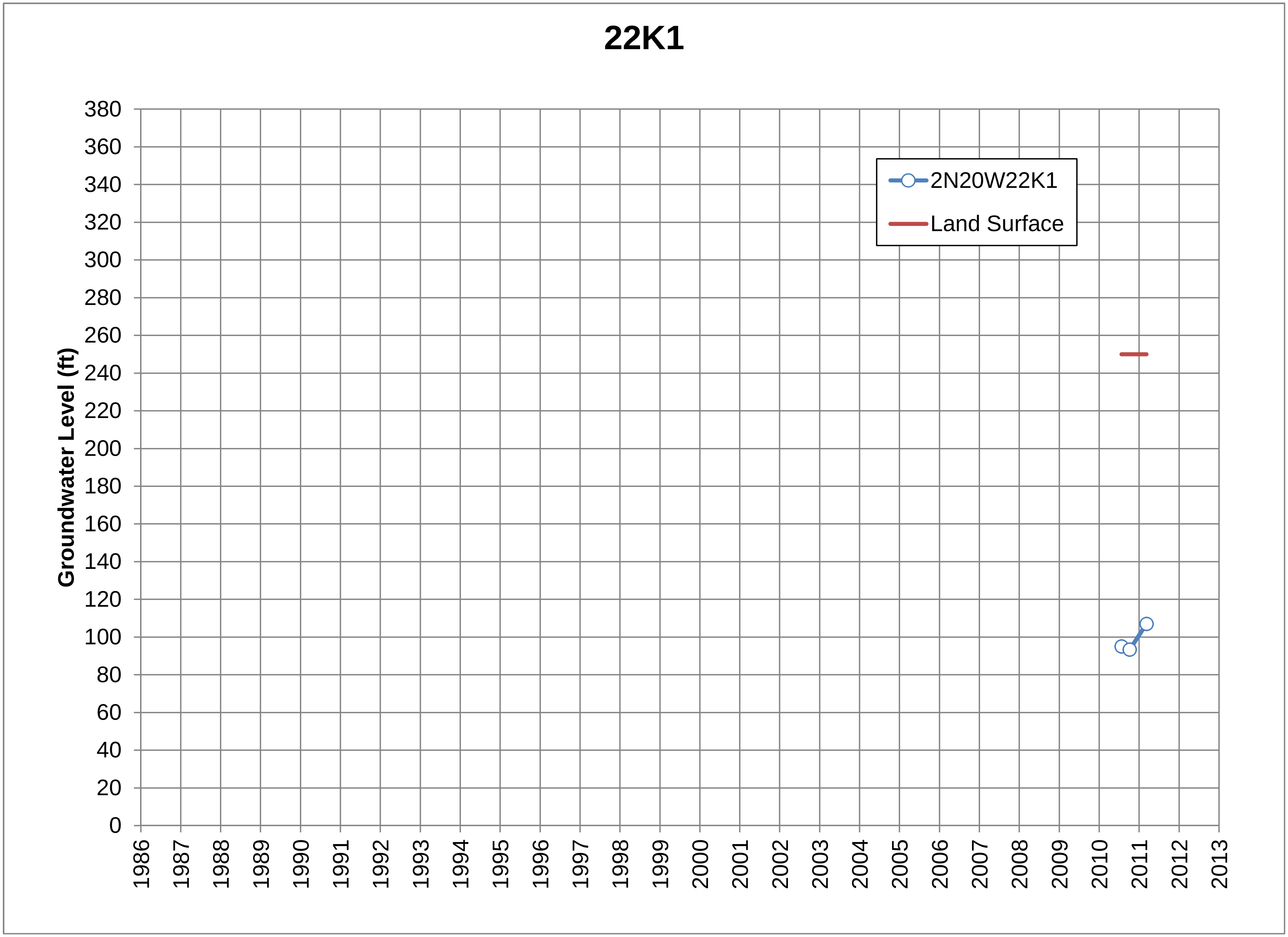
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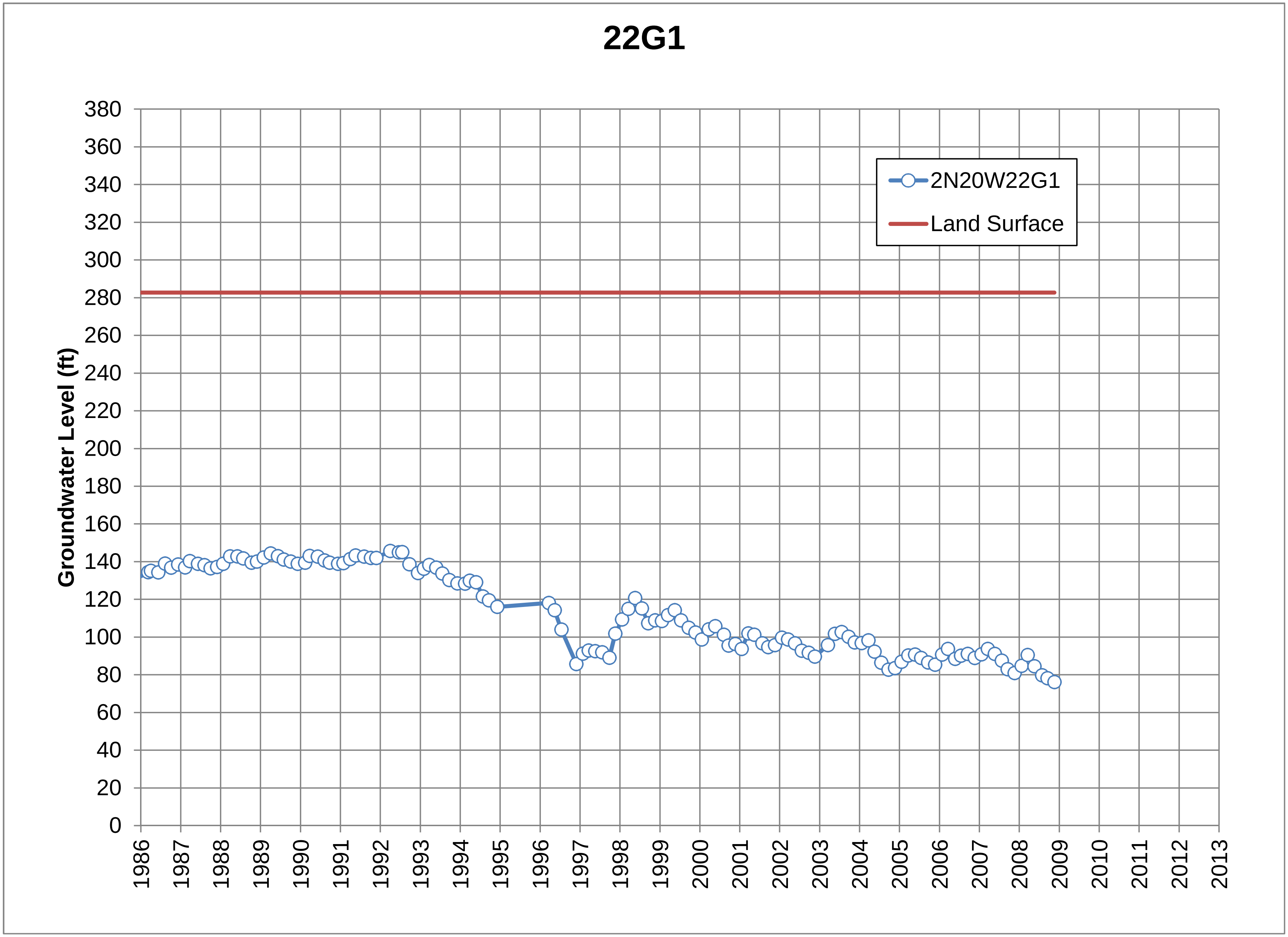
Land Surface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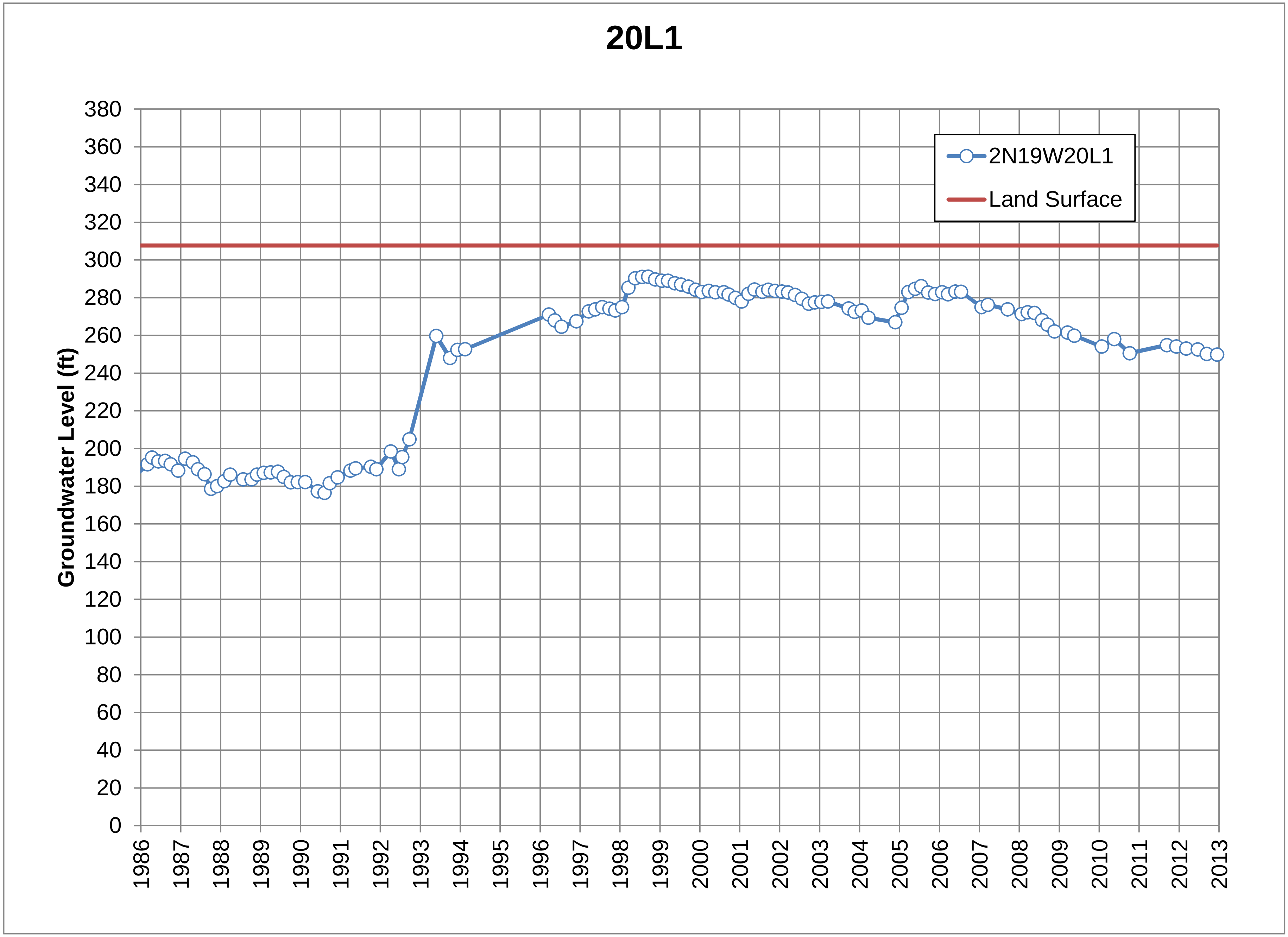
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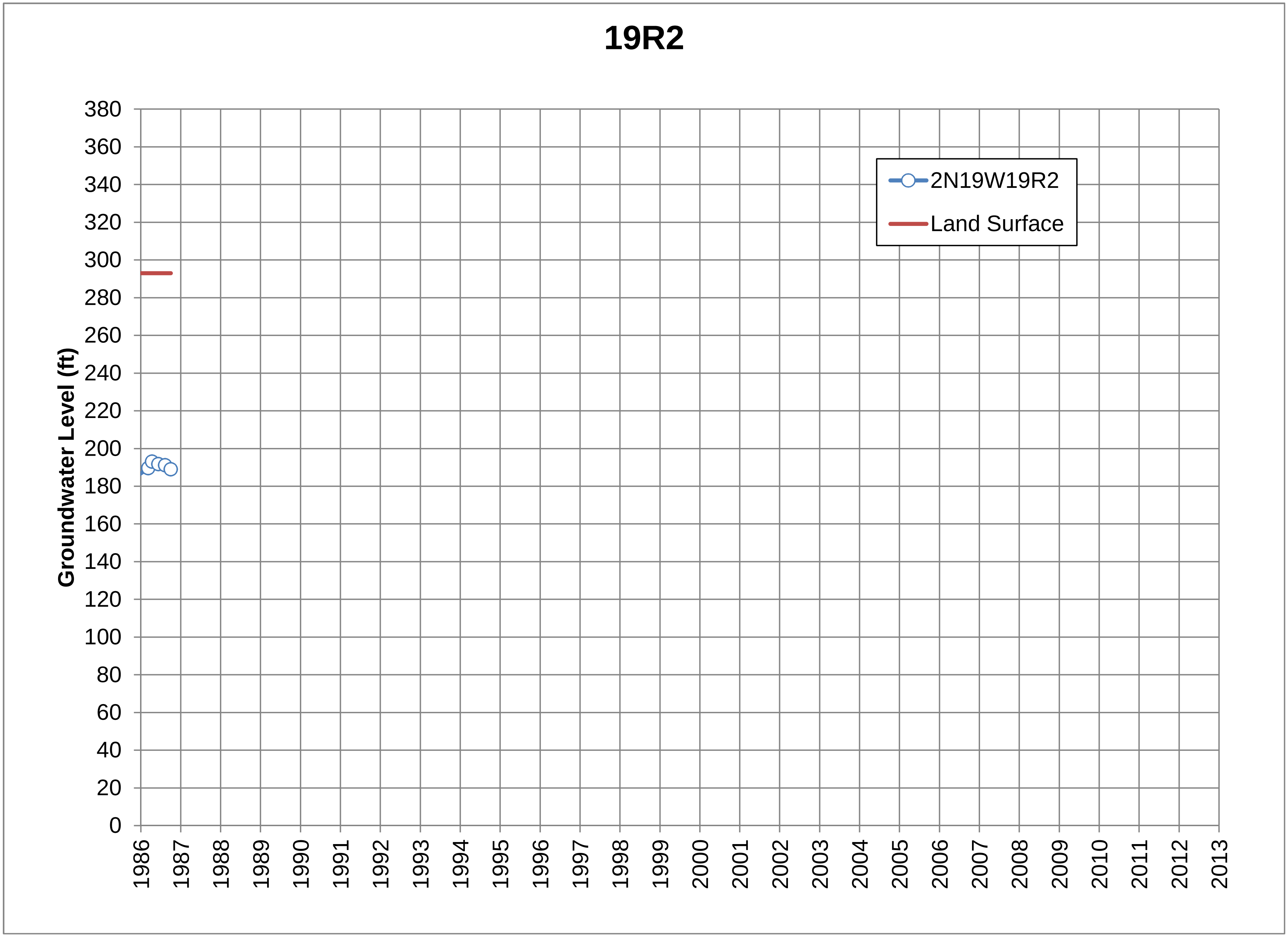
Land Surface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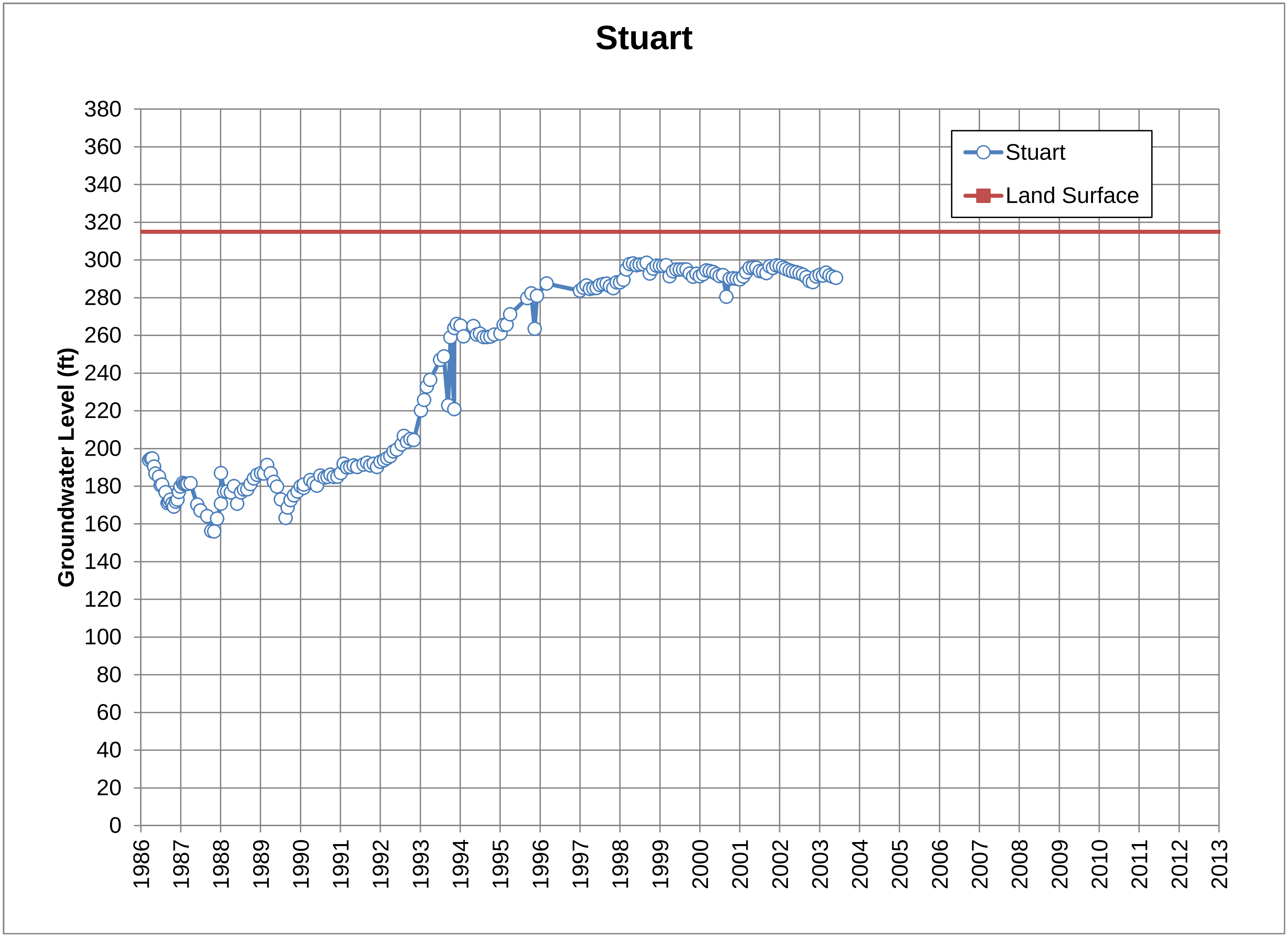
Land Surface



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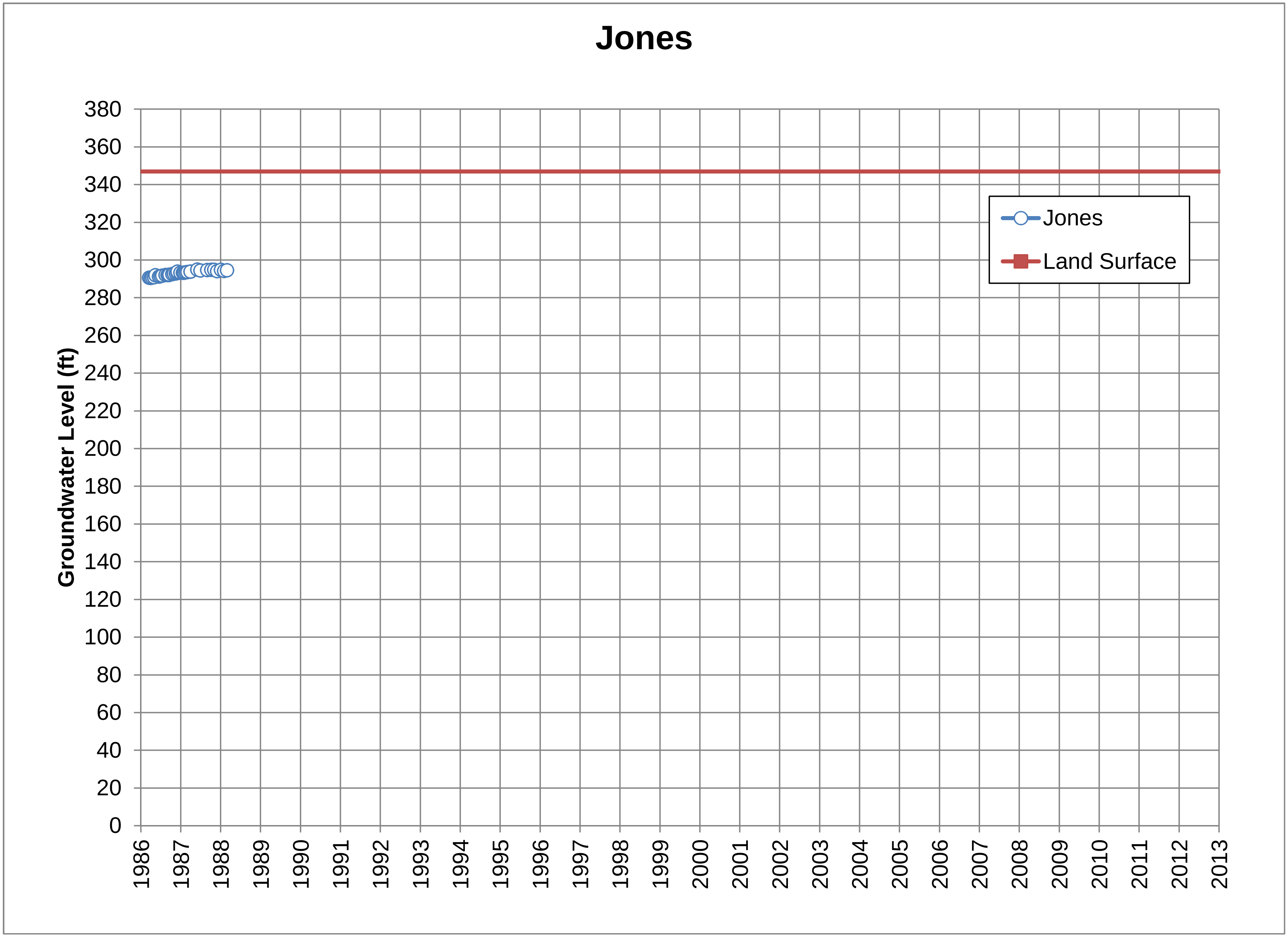
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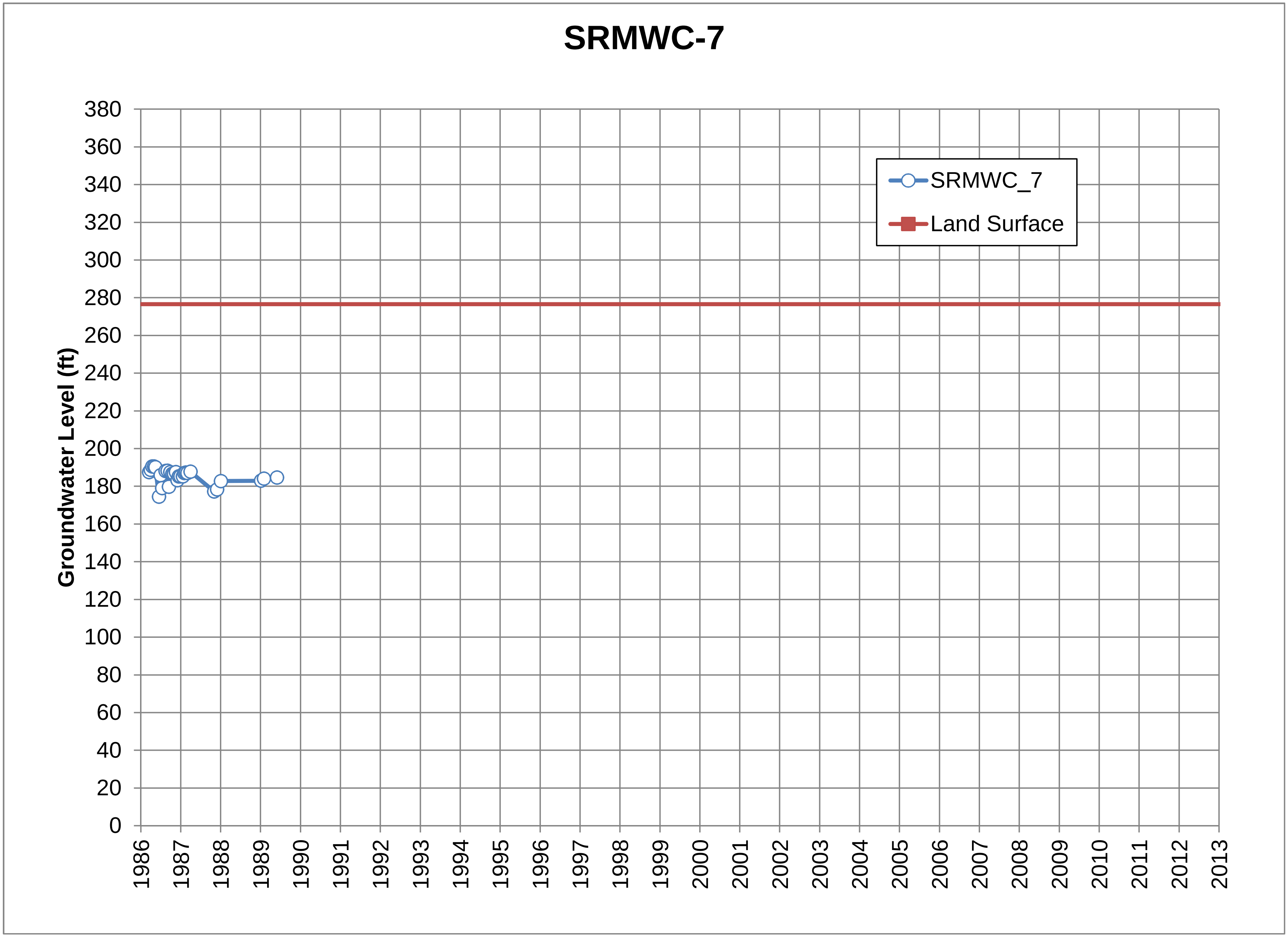
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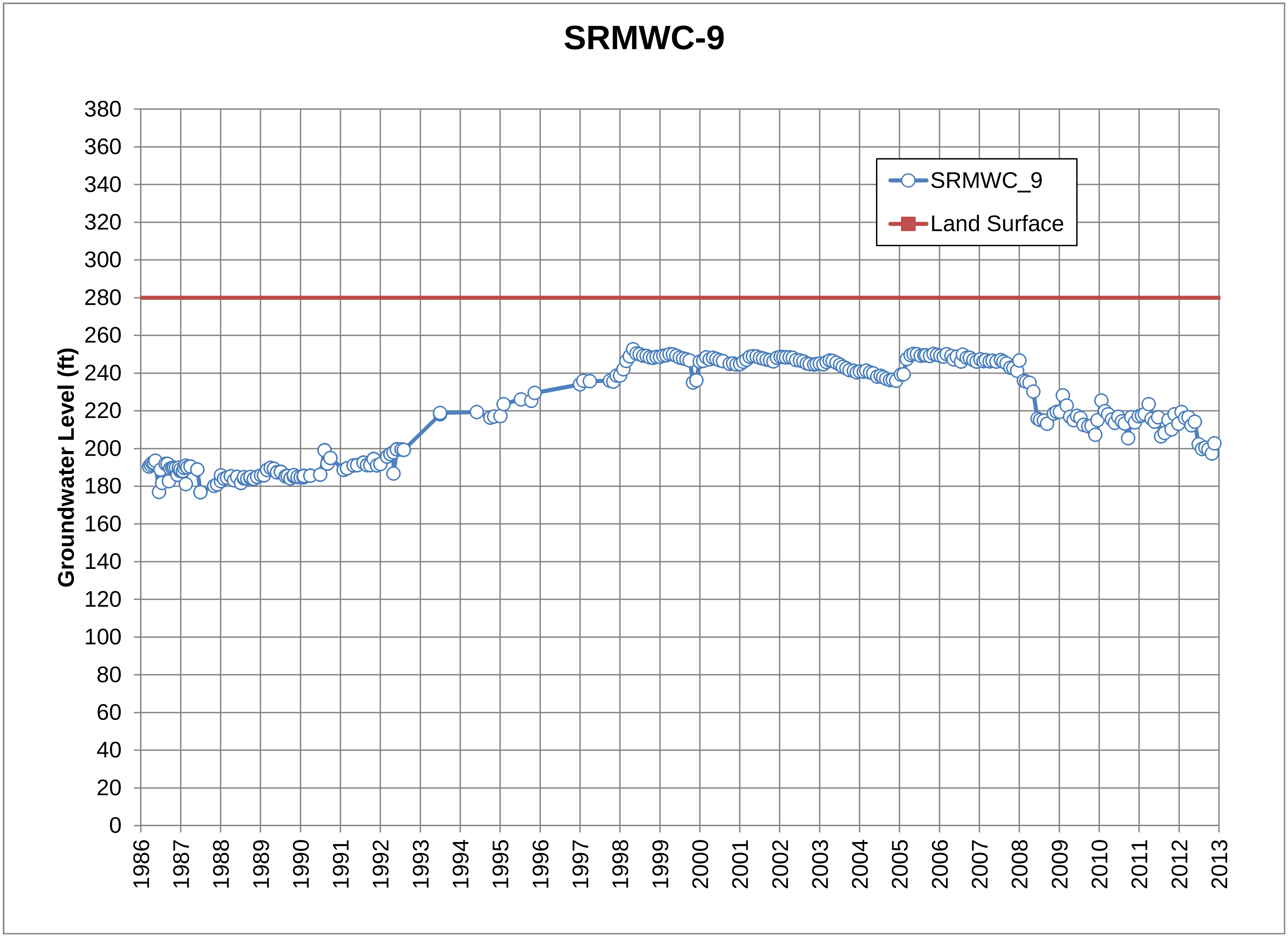
SRMWC-9
SRMWC_9
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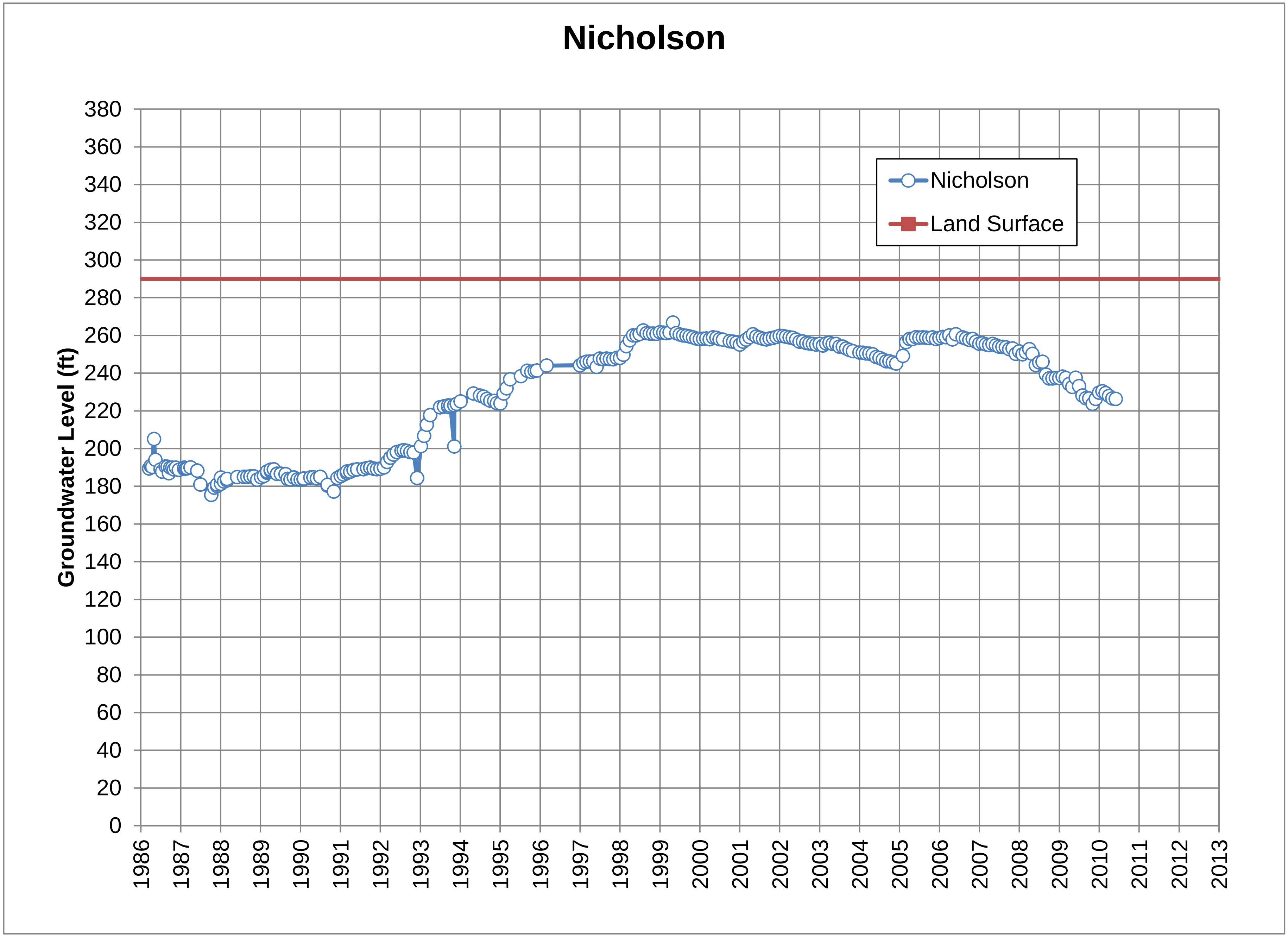
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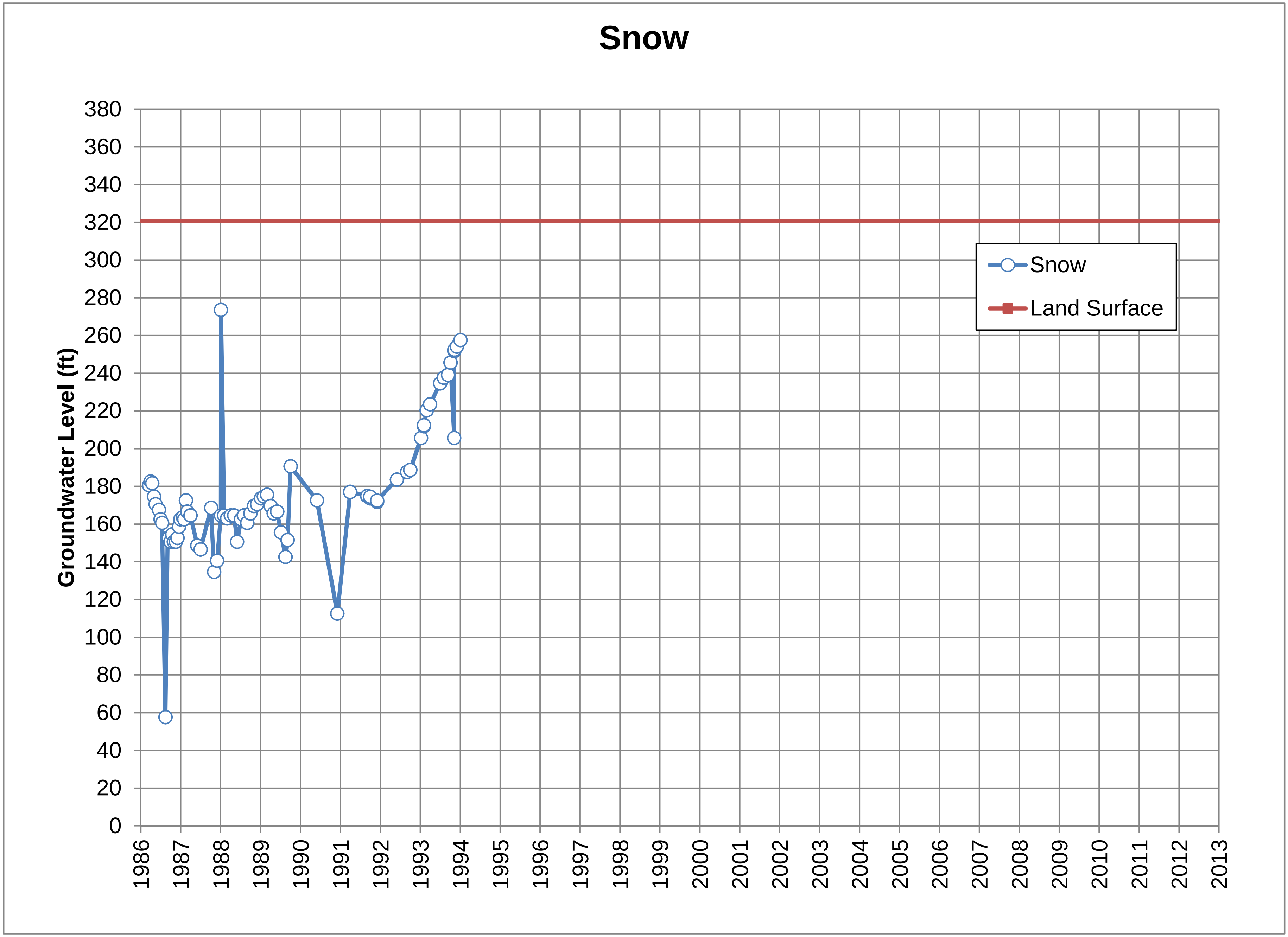
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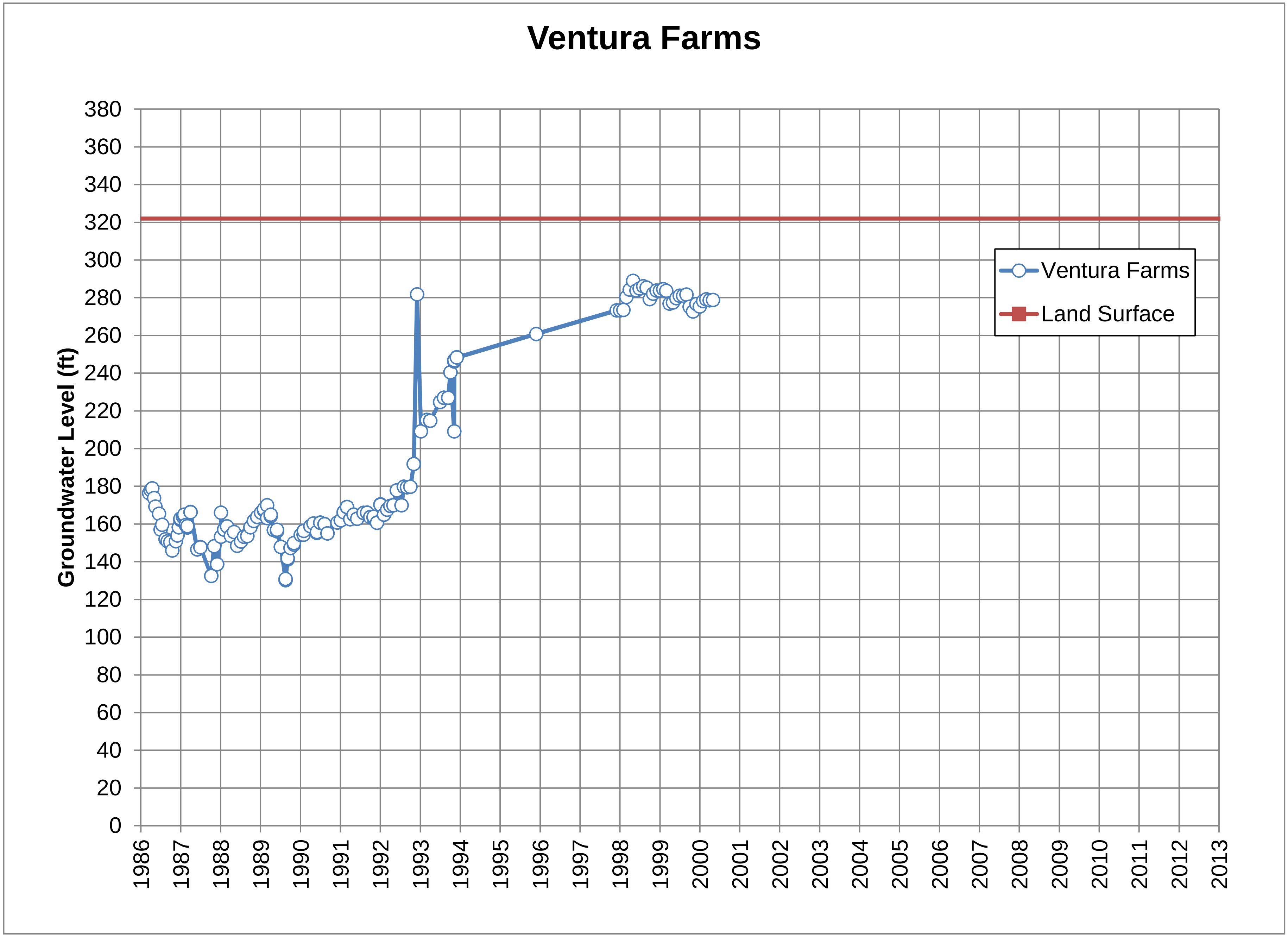

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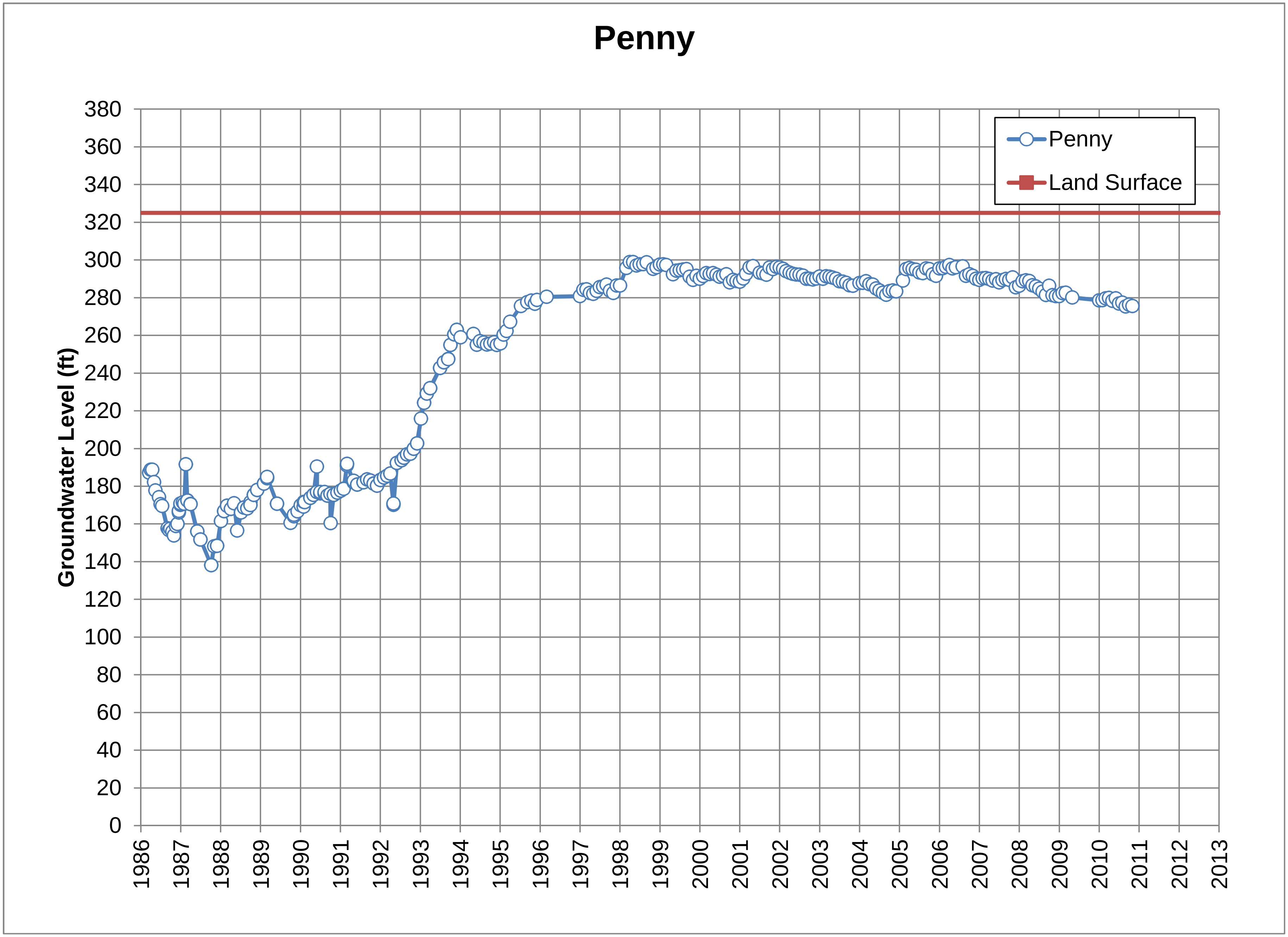
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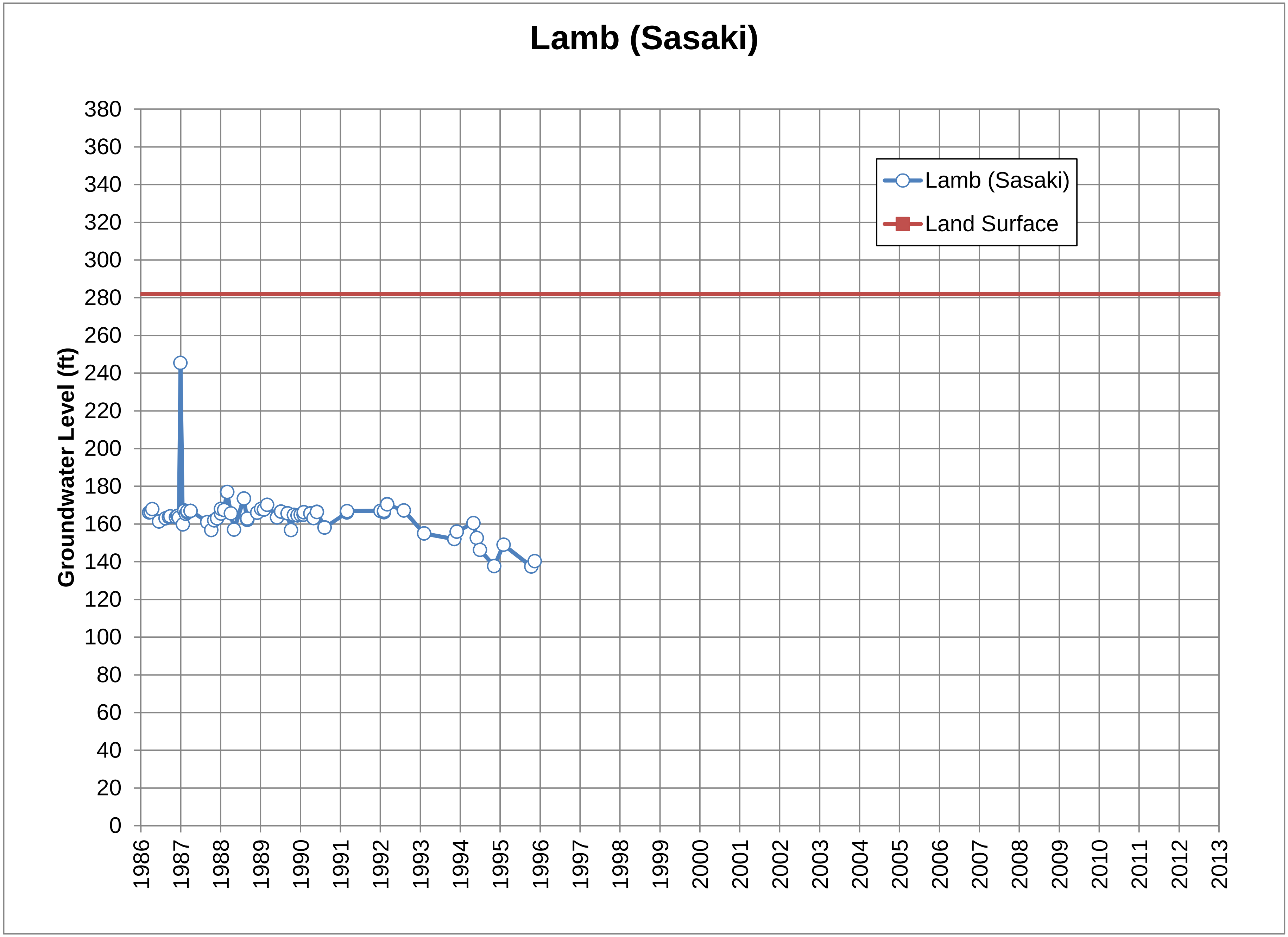
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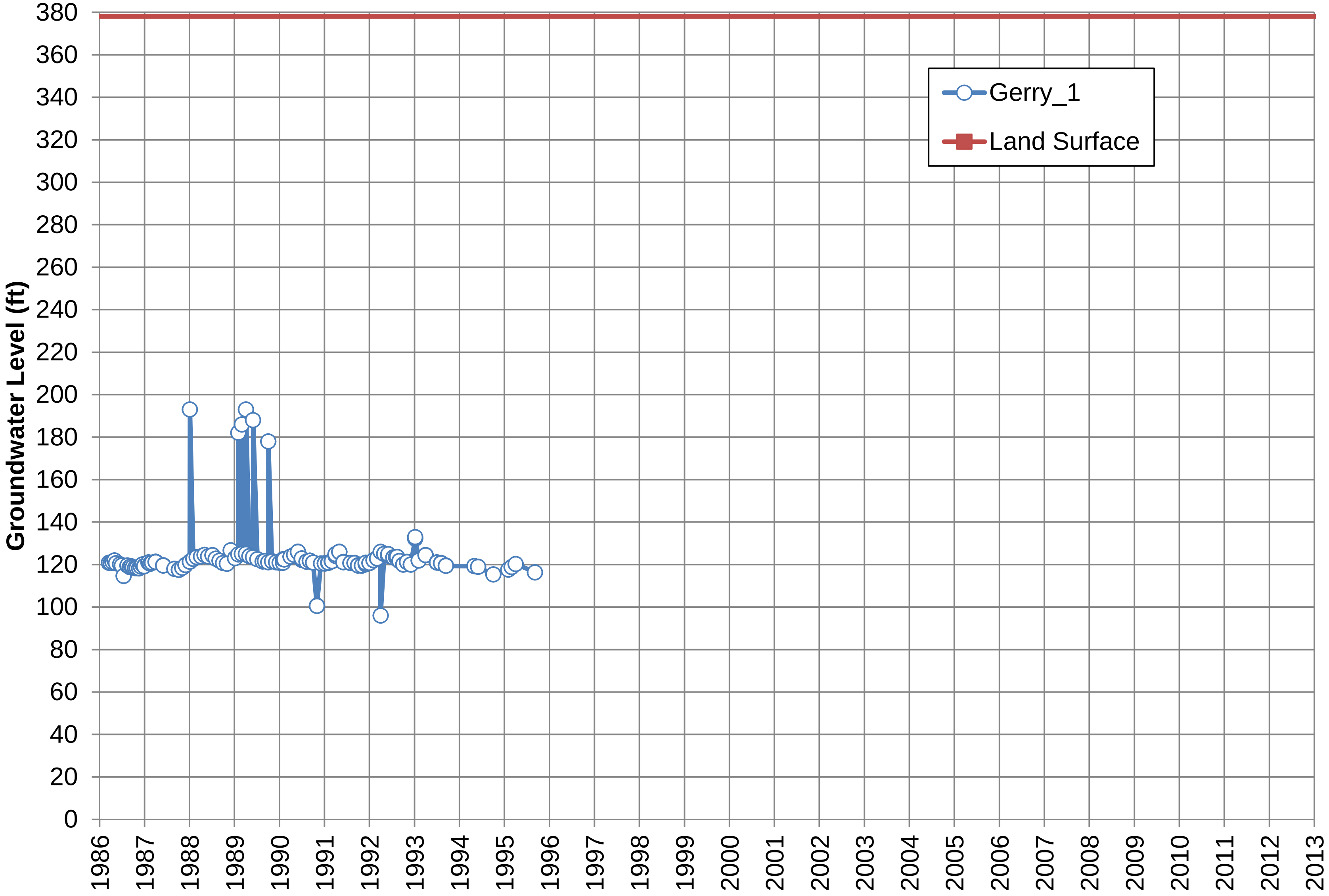
Lamb (Sasaki)
Land Surface

Gerry



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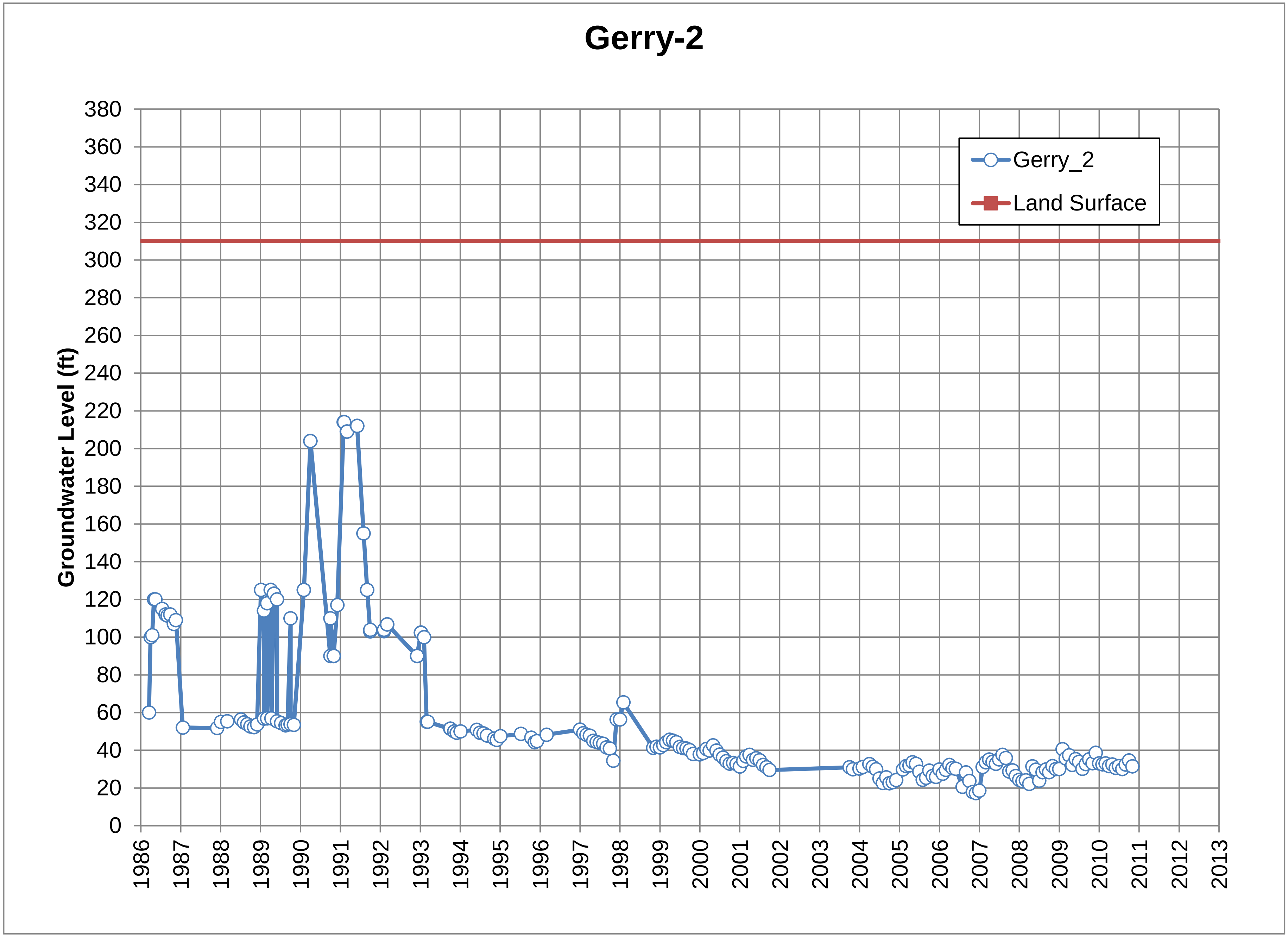
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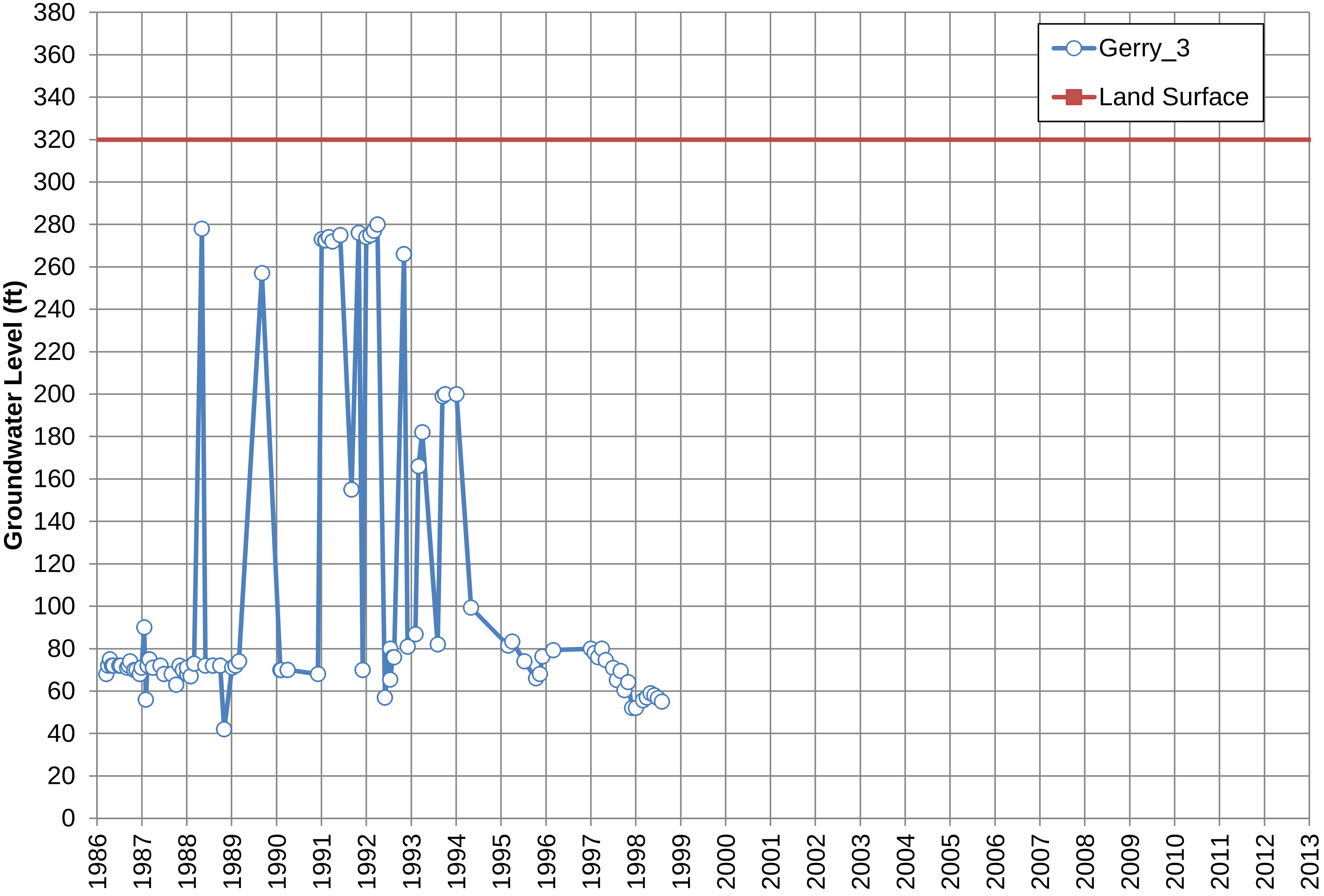
Gerry-3A



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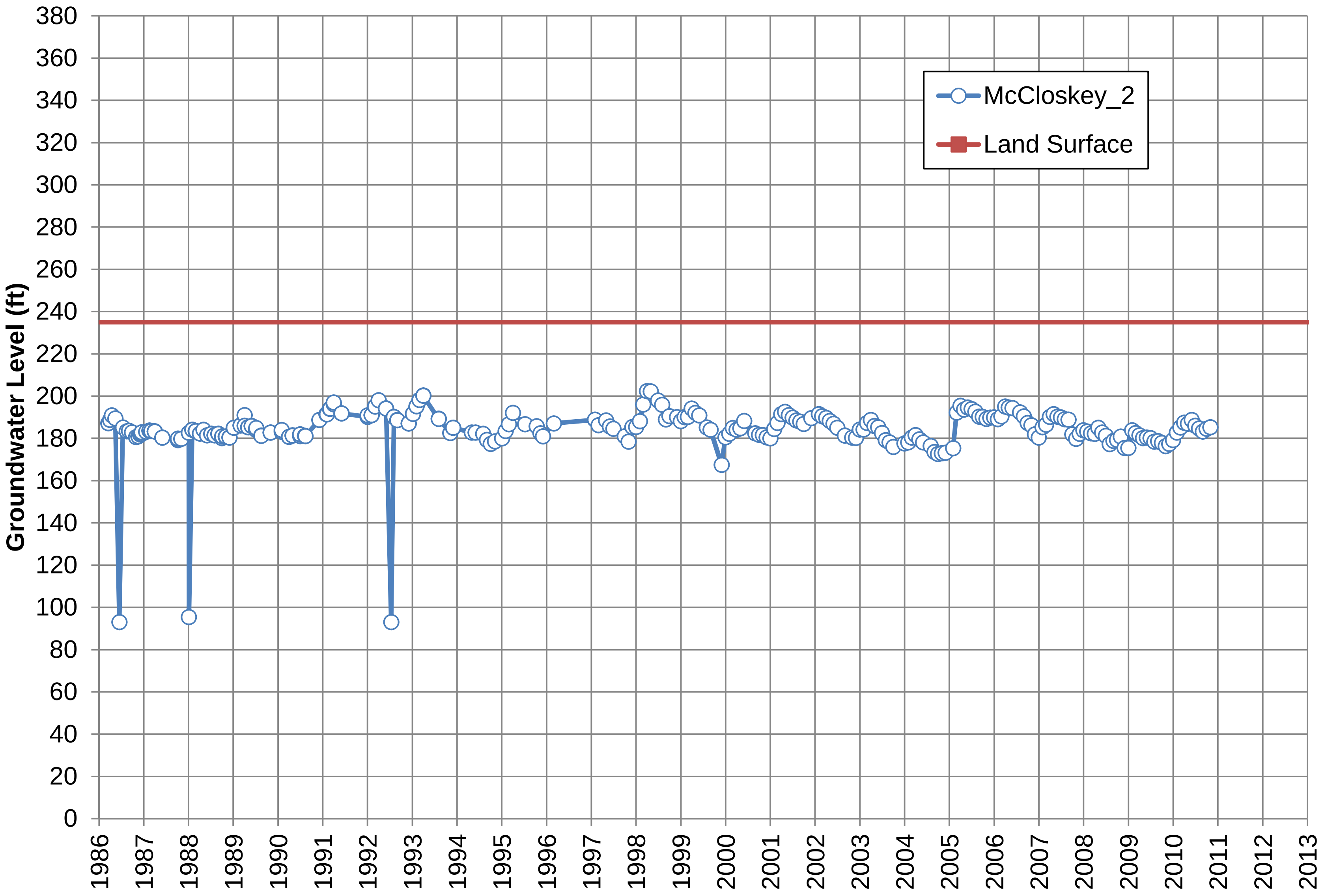
Land Surface

McCloskey-2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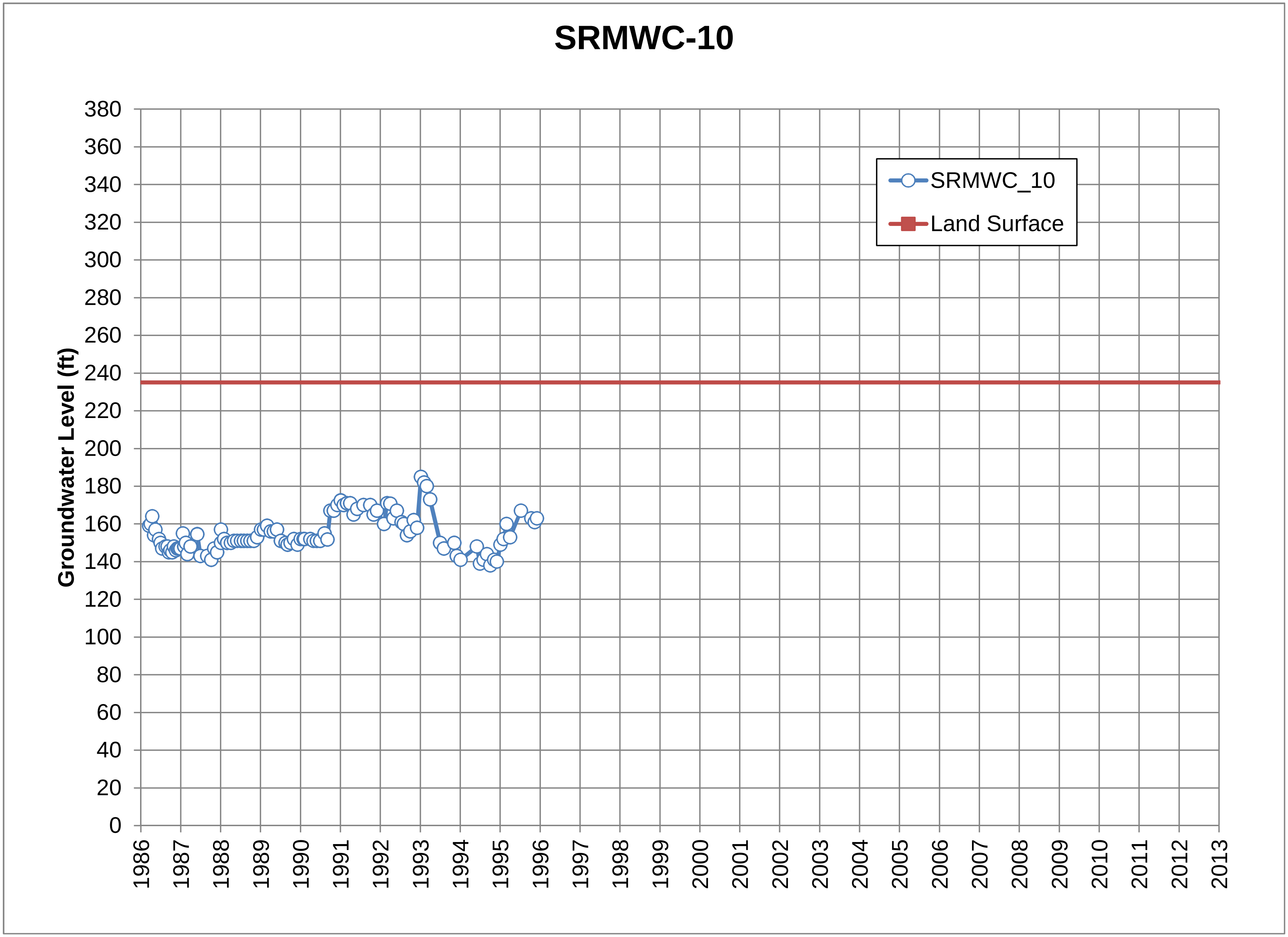
McCloskey_2
Land Surface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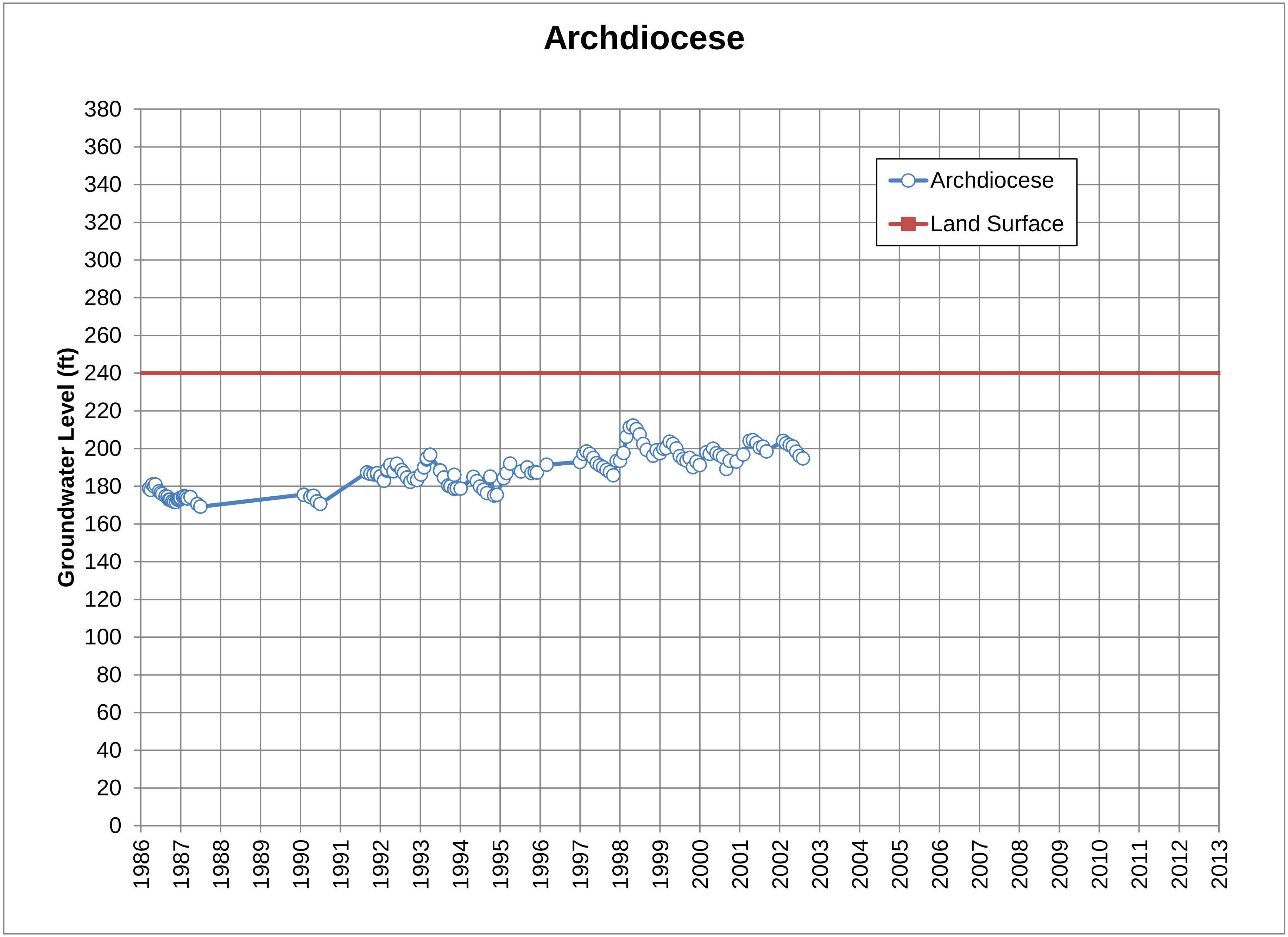
SRMWC_10
Land Surface

Archdiocese
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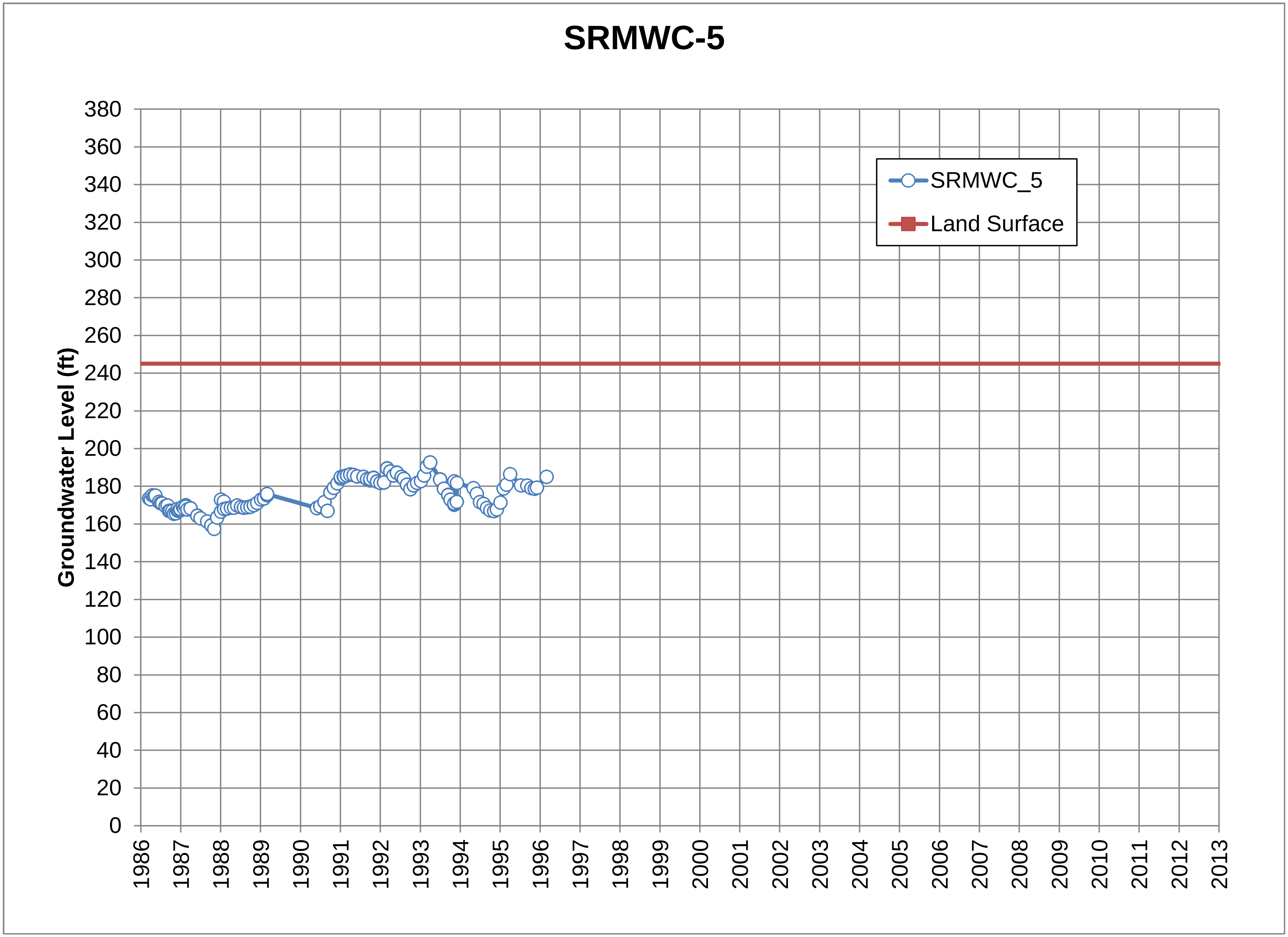
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SRMWC_5
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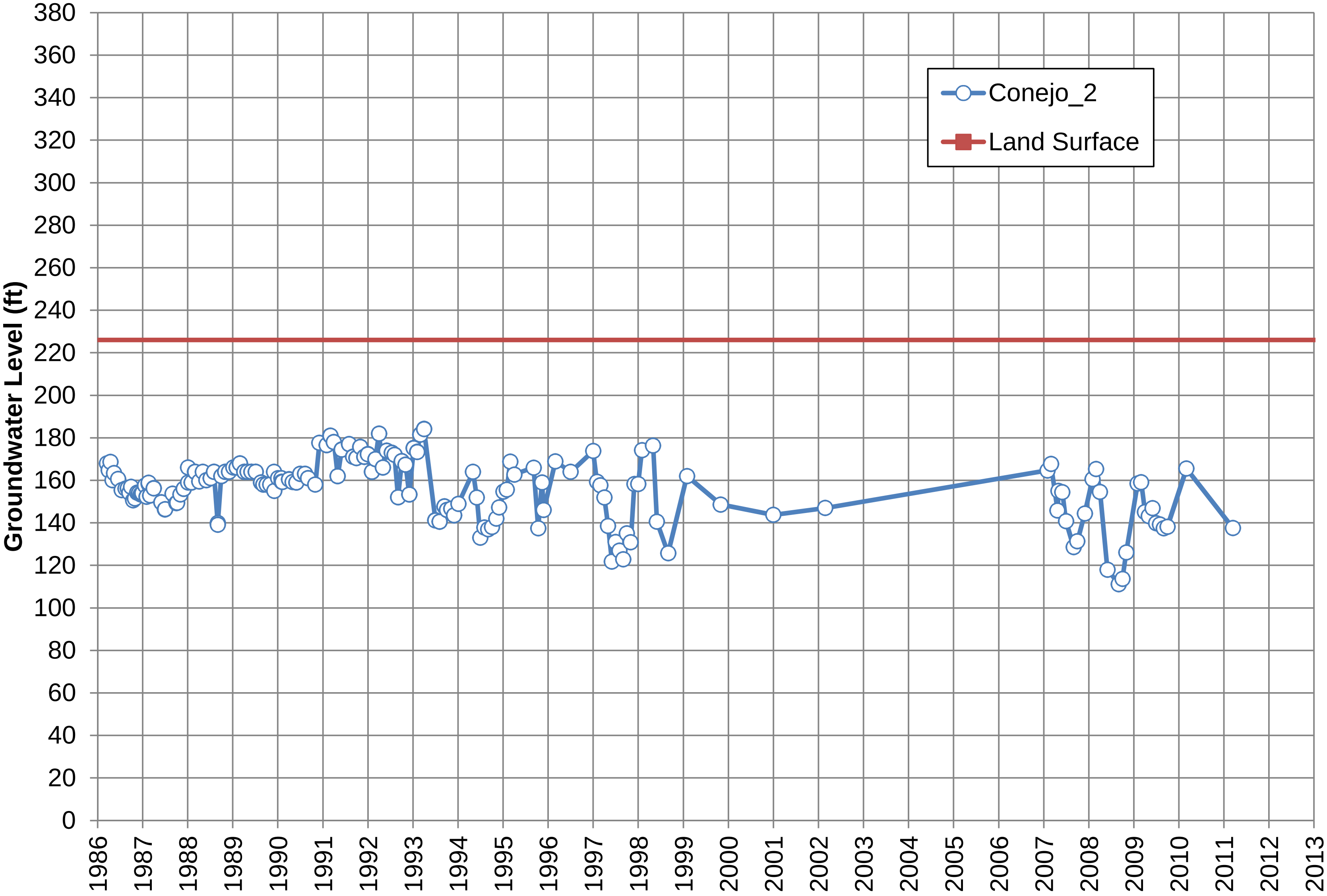
Conejo-2



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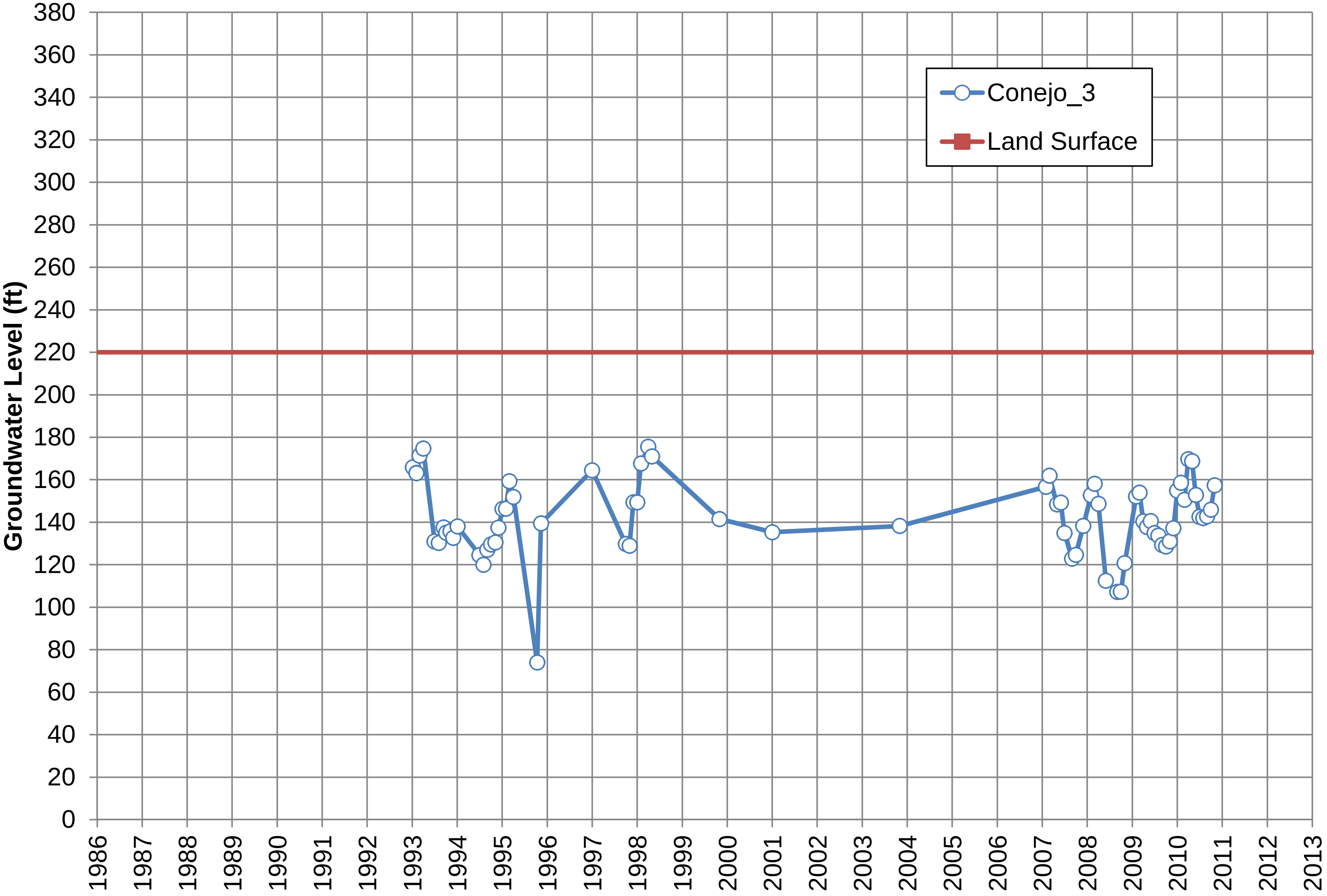
Conejo_2
Land Surface

Conejo-3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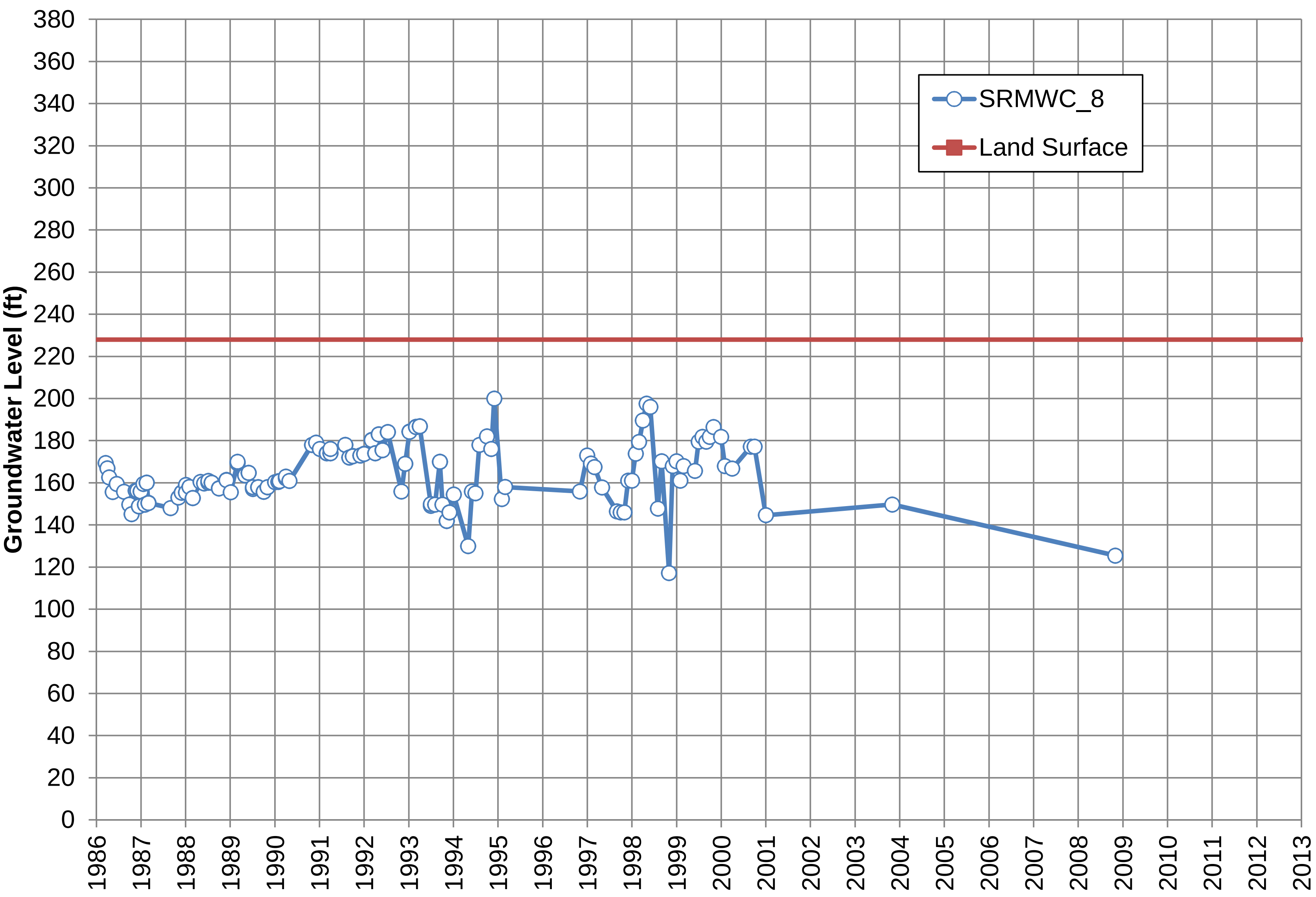
Conejo_3
Land Surface

SRMWC-8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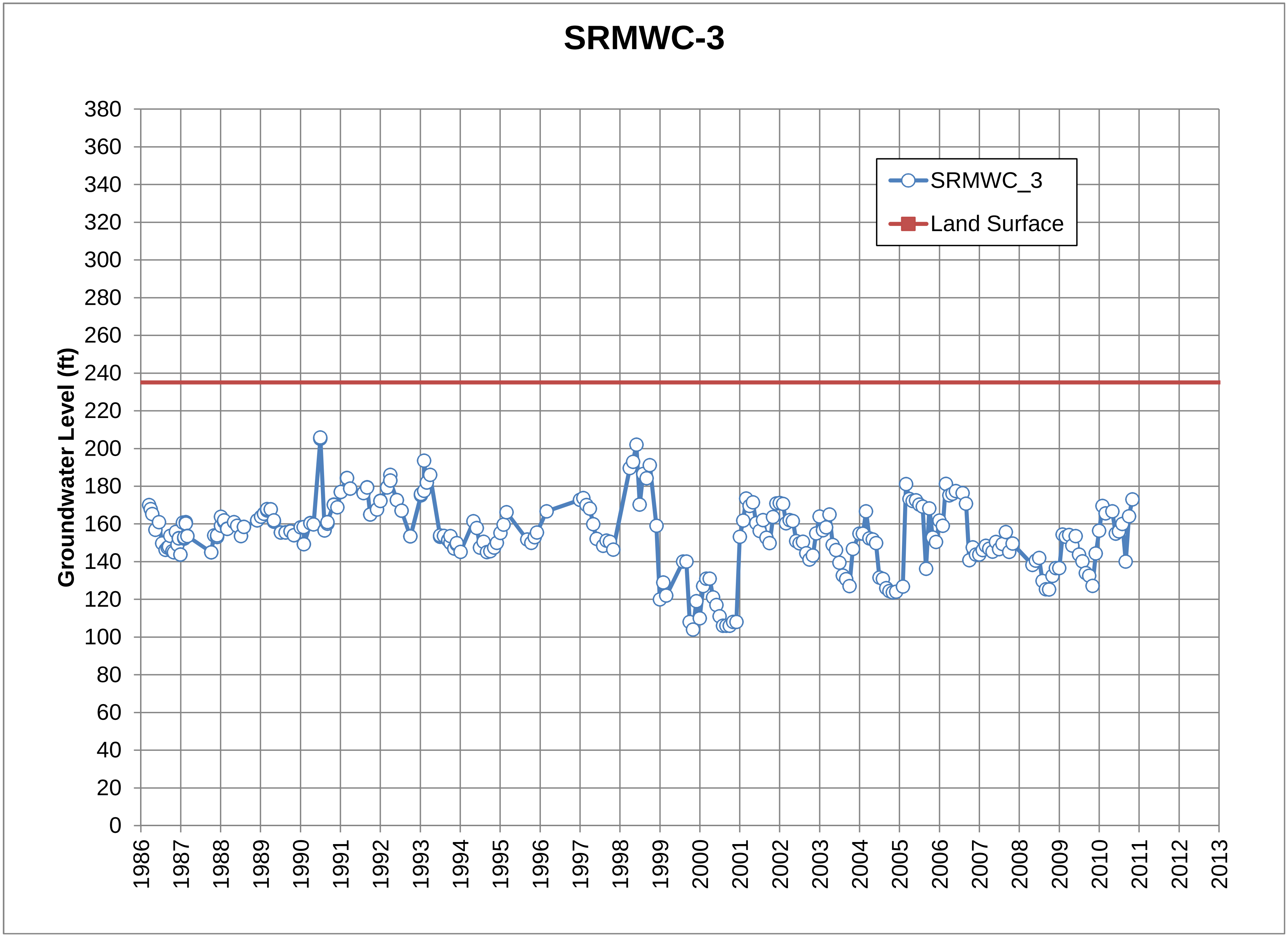
SRMWC_8
Land Surface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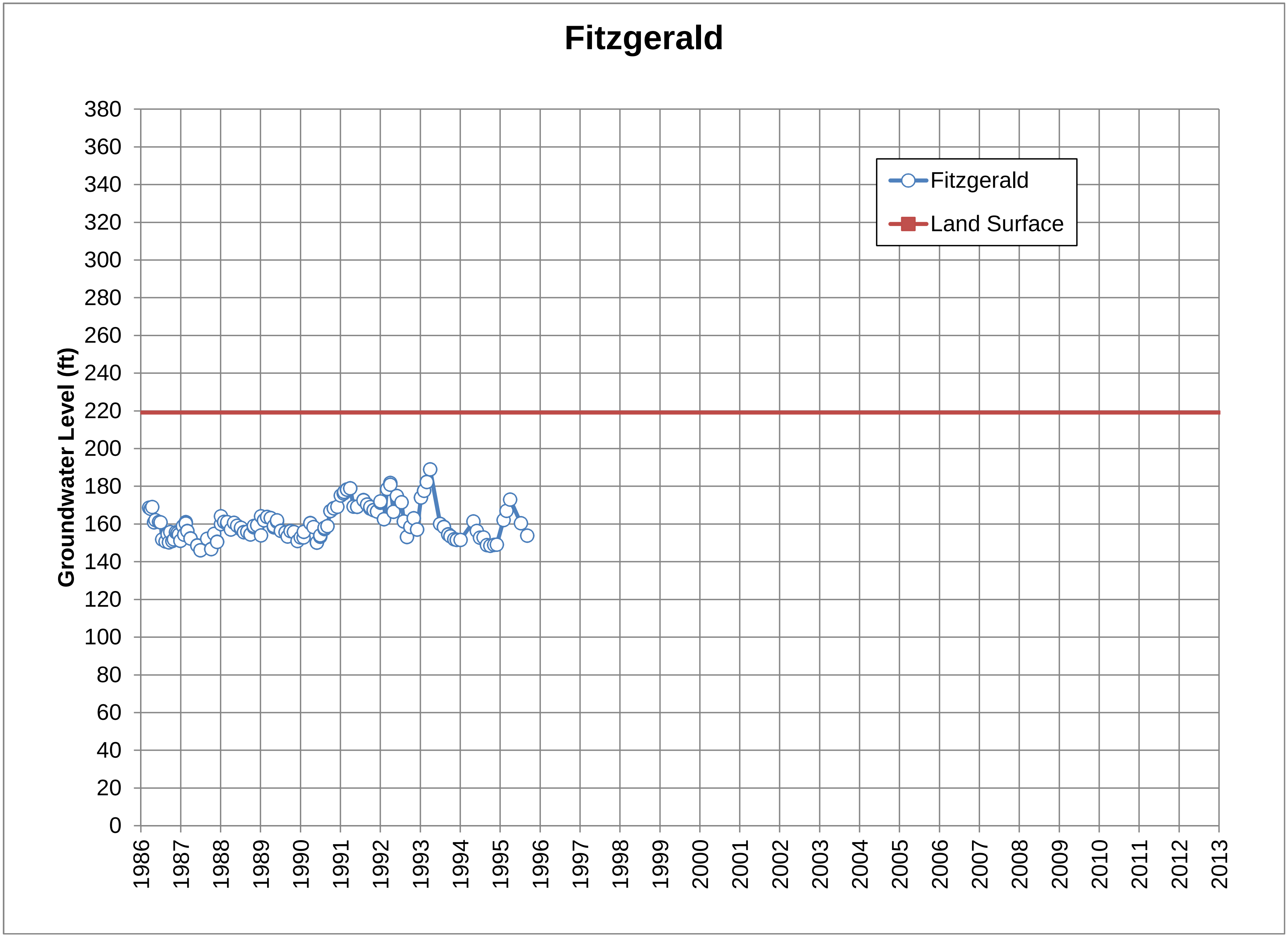
SRMWC_3
Land Surface


Fitzgerald
Groundwater Level (ft)
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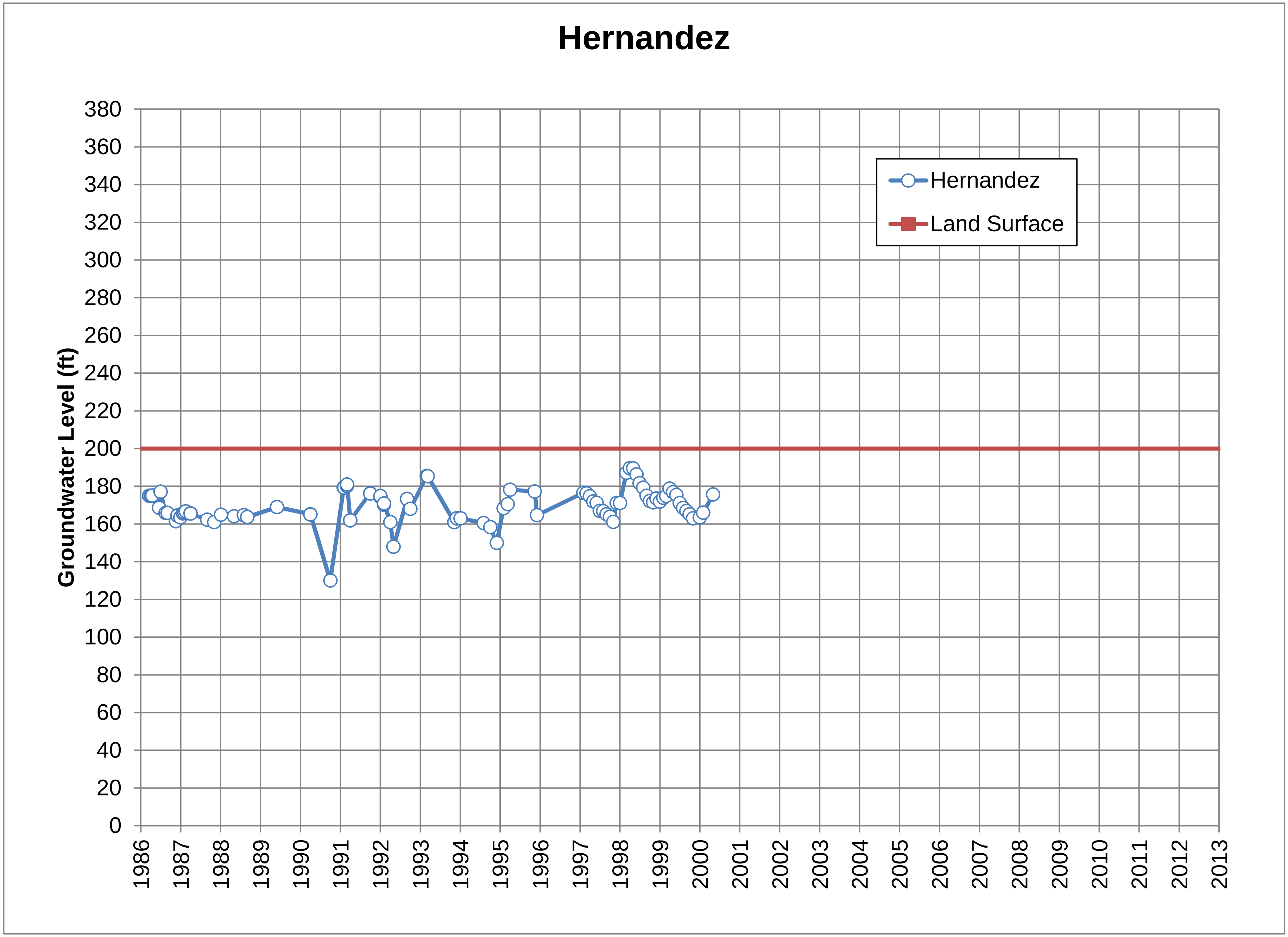
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Land Surface

Appendix C

Groundwater Model Documentation and Evaluation of Recharge Projects

MWH

BUILDING A BETTER WORLD

Technical Memorandum

TO: *Camrosa Water District*

DATE: *March 2013*

FROM: *MWH*

REFERENCE: 10500990

SUBJECT: *Santa Rosa Basin Groundwater Model Documentation*

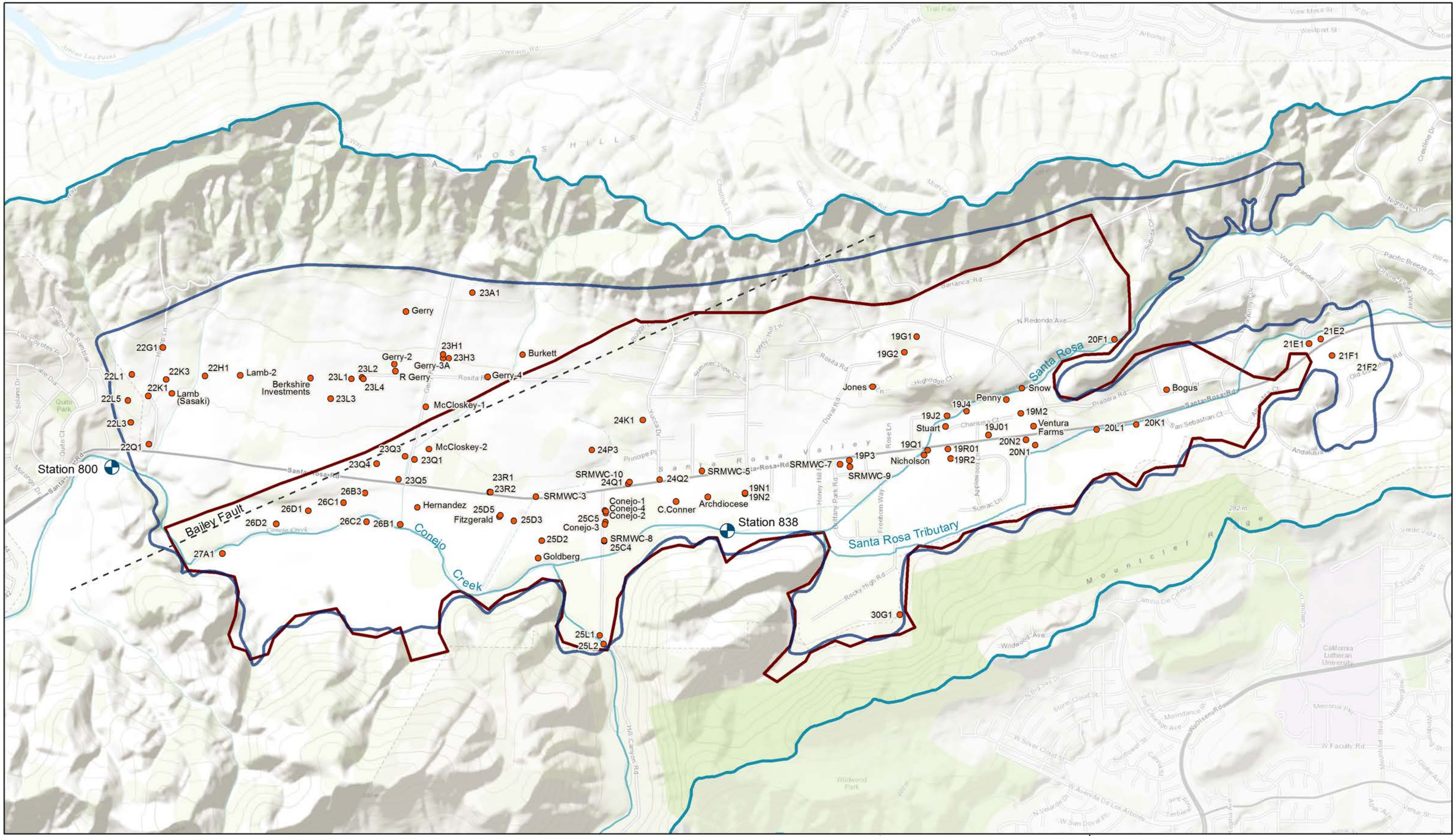
1.0 INTRODUCTION

MWH prepared and calibrated the Santa Rosa Basin (SRB) groundwater model to assist evaluate and develop the updated groundwater basin management plan. This Technical Memorandum (TM) is intended to document the SRB groundwater model development and calibration for future reference.

The SRB model boundaries (or “domain”) are shown in **Figure 1.** The model domain is coincident with the groundwater basin boundaries at the northern, eastern and southern portions of the basin. The western boundary is the Bailey Fault, which acts as a groundwater barrier (Bailey, 1969; Johnson et al., 1987).

The TM is organized as follows:

- Section 1: Introduction
- Section 2: Groundwater Model Attributes
- Section 3: Steady-State Calibration Results
- Section 4: Conclusions and Recommendations
- Section 5: References



Key to Features

Santa Rosa Valley Groundwater Basin

Watershed

● Well

Streams

Model Domain

Stream Flow Gages

Topo Map Source: ESRI

N

0 0.25 0.5 Miles

Document: \\Uspas1s01\muni\Clients\Camrosa Water District\Santa Rosa GMP (10500900)\14 e-data_modeling_MXDs\WellLocationMap.mxd

Date: March 25, 2013

MWH

Study Area

Figure 1

2.0 GROUNDWATER MODEL ATTRIBUTES

The modeling software used for this effort was MODFLOW 2000 (Harbaugh et al., 2000).The MODFLOW code was developed the the U.S. Geological Survey, and was selected because it is a standard in the industry, is public domain software, and is very well documented (Harbaugh, et al, 2000). This section describes the model attributes assigned during the model development and calibration effort. Head dependent flux (River Package) was used to simulate the Conejo Creek.

Boundary Conditions

The northern, southern, and eastern boundaries of the model were assigned no-flow boundaries, which mimic hydrogeologic conditions in the basin. The Bailey Fault was also modeled as a no-flow boundary. A variable, or head dependent flux termed the River Package was used to simulate the Conejo Creek. Recharge package was used to simulate precipitation recharge, leakage from septic tanks and irrigation return flow. The recharge amounts used in the model are based on the groundwater budget described in the updated Groundwater Management Plan.

The SRB study area is delineated by hydraulic boundaries (either bedrock boundaries or a flow barrier). To the north, east and south, the study area is bounded by undulating hills. Minimal groundwater flows across these boundaries. The northeast-southwest trending Bailey Fault acts as a flow barrier.

Model Layering

Interpretation of lithologic logs and evaluation of well construction and water level observation data suggest that the Santa Rosa Groundwater Basin is composed of a single unconfined aquifer. Accordingly, the model utilizes one layer to represent the groundwater system.

MODFLOW is designed to calculate flow and groundwater elevations in a rectangular grid system. The rectangular area within the grid is called a cell. For the SRB groundwater model, a uniform cell dimension of 100 feet by 100 feet was used. There are a total of 10,469 active cells in the groundwater model. The grid is orientated due east-west and north-south direction.

Model Zonation within Layers

Each cell within the MODFLOW grid is assigned hydraulic properties. The hydraulic properties used in the model include horizontal hydraulic conductivity, vertical anisotropy of hydraulic conductivity and specific yield.

The model domain is subdivided into a number of zones of assumed similar parameter values. The model zonation is primarily based on geological and hydrogeologic data consisting of:

- Correlation of data from drilling logs.
- Various reports and publications on wells pump tests, and monitoring reports performed in the Santa Rosa Groundwater Basin study area obtained from Camrosa Water District.

The MODFLOW model is calibrated by a trial and error process whereby aquifer parameters, or zones of aquifer parameters are changed to make the model simulation approximate observed field conditions. The difference between the model-simulated head and field-measured head at a particular location is called a *residual*. The preliminary zone maps were revised by parameter value, spatial extent, and number (added or removed) during the calibration process until the final zonation was achieved following calibration of the steady-state model. **Table 1** lists the zone properties by parameter. **Figure 2** presents the model parameter zonation map.

The calibrated parameter values listed in **Table 1** fall within the range of published hydraulic conductivity and storage coefficients for the types of sediments found in the basin (Freeze and Cherry, 1979). The hydraulic conductivity values range from a high of 50 feet/day (representing sands and gravelly silty sands), to a low of 3 feet/ day (representing low-conductivity clayey silt). The specific yield values range from a high of 0.15 to a low of 0.06. These values fall within the typical range for modeling applications (Anderson and Woessner, 1992), and were estimated during the calibration process.

Table 1
Aquifer Parameter Values Estimated During Calibration

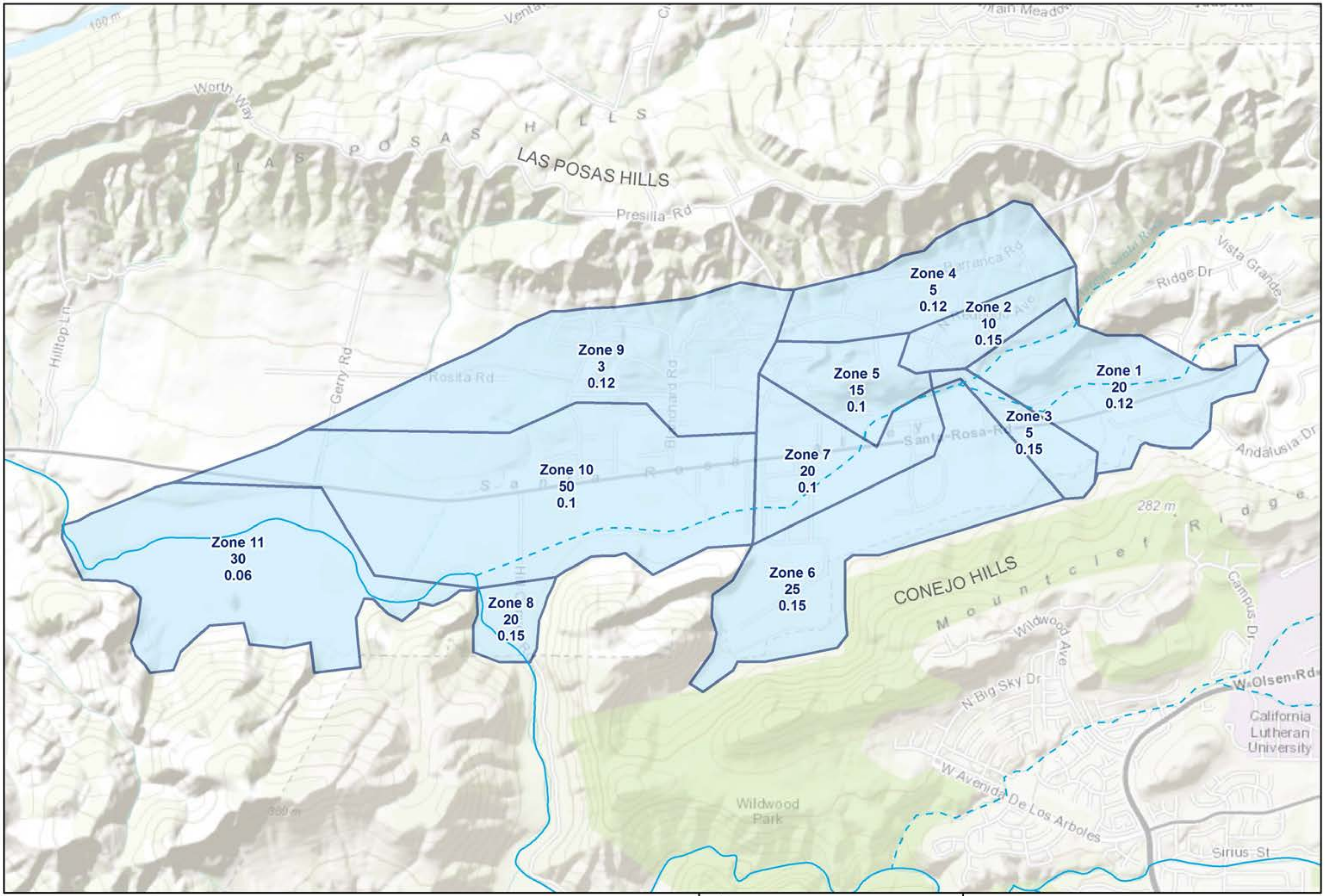
Zone ID	Horizontal K (ft/d)	Specific yield (-)	Vertical Anisotropy of Hydraulic Conductivity (-)
1	20	0.12	10
2	10	0.15	10
3	5	0.15	10
4	5	0.12	10
5	15	0.1	20
6	25	0.15	10
7	20	0.1	20
8	20	0.15	10
9	3	0.12	10
10	50	0.1	10
11	30	0.06	10

3.0 STEADY-STATE CALIBRATION RESULTS

Steady-state calibration was completed for the SRB groundwater model. The term “steady-state” means that boundary conditions such as pumping are unchanged during the simulation period. The calibration process was competed in an iterative or trial-and-error process.

The steady-state model represents the groundwater conditions in the period in mid-1993. In some cases water level information prior to or after the mid-1993 were used for calibration if it is the only available data. Steady-state calibration targets can be categorized in three areas:

- Simulated water levels match field-measured water level data from Camrosa Water District and Ventura County Watershed Protection District;
- The overall or areal groundwater flow pattern matches the general pattern based on field observations; and,
- A realistic water budget is achieved.



Document: \\Uspas1s01\muni\Clients\Camrosa Water District\Santa Rosa GMP\14 e-data_modeling_MXDs\Zonation.mxd

Date: January 29, 2013

Parameter Zonation Map

Figure 2

MWH

A brief description of each calibration target area and how the calibrated model performed relative to the observed, or estimated, data is provided below.

Water Level Data

Wells used for steady-state calibration to calibrate water levels for specific locations are shown on **Figure 1** and listed in **Table 2**. **Table 2** also lists the calibration residual at each calibration well.

Table 2
Calibration Wells and Steady-State Calibration Head Residual

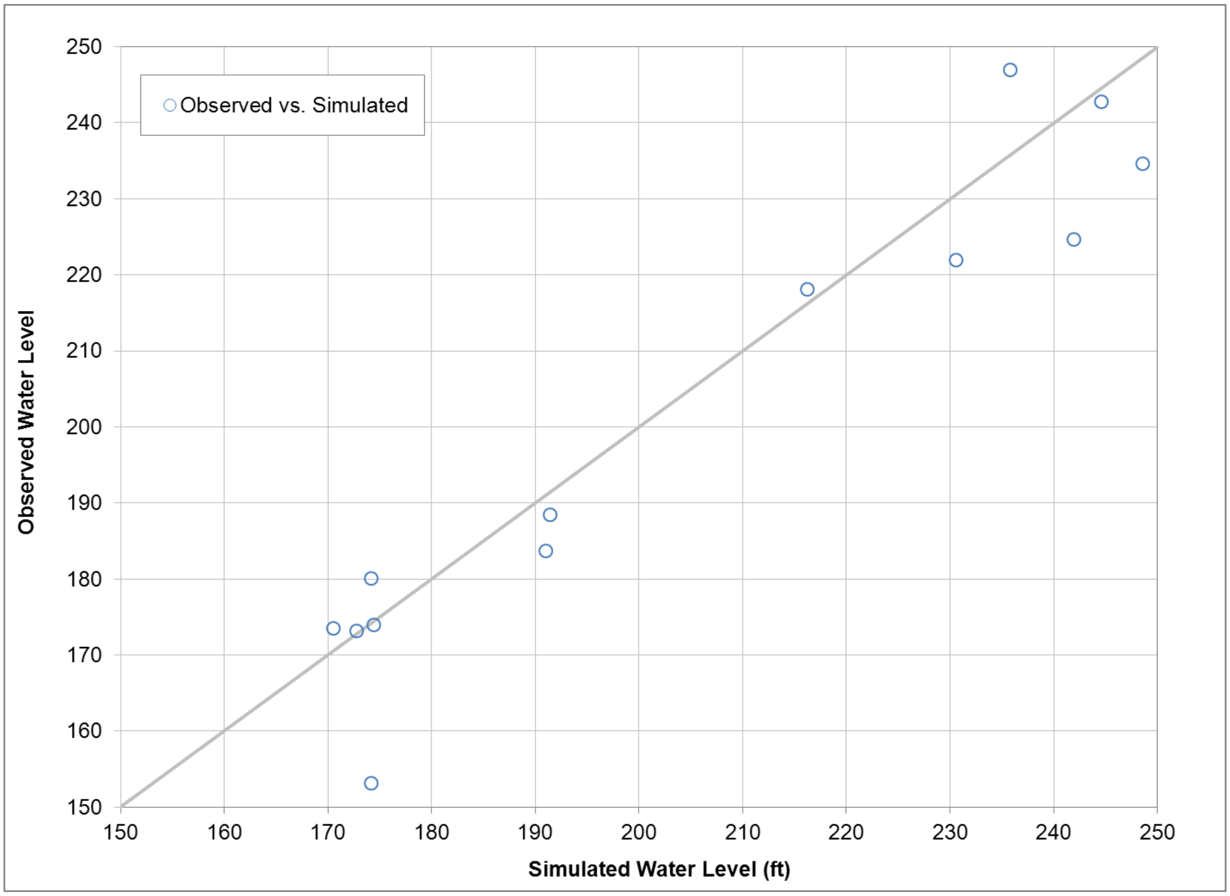
Well Name	State Well No.	X (ft)	Y (ft)	Ground Surface Elevation (ft amsl)	Well Depth (ft)	Observed Water Level (ft amsl)	Simulated Water Level (ft amsl)	Residual (ft)
Ventura Farms	2N19W-20M3	1728155	270312	322	300	224.7	241.9	-17.2
Penny	2N19W-20M4	1727571	270883	325	464	242.8	244.6	-1.8
SRMWC 3	2N20W-25D1	1717522	268804	235	460	153.2	174.2	-21.0
Fitzgerald	2N20W-25D4	1716741	268371	219.1	190	174	174.4	-0.4
SRMWC 8	2N20W-25C4	1718982	267871	260	240	149.1	169.3	-20.2
Conejo 2	2N20W-25C2	1719014	268451	226	399	141.3	165.8	-24.5
Stuart	2N19W-19J3	1726273	270306	315	N/A	247	235.8	11.2
SRMWC 5	2N20W-24R3	1721071	269357	245	287	183.7	191.0	-7.3
26B3	2N20W-26B3	1713872	268885	218	300	173.5	170.5	3.0
Hernandez	2N20W-26B2	1714986	268573	200	392	173.2	172.7	0.5
23R1	2N20W-23R1	1716529	268905	234.6	555	180.1	174.2	5.9
Snow	2N19W-20M1	1727909	271123	320.6	500	234.6	248.6	-14.0
Archdiocese	2N20W-24R2	1721191	268802	240	N/A	188.5	191.4	-2.9
Nicholson	2N19W-19Q2	1725814	269694	290	N/A	221.9	230.5	-8.6
SRMWC 9	2N19W-19P2	1724229	269444	280	393	218.1	216.2	1.9

Table 3 is a statistical residual summary for the steady-state SRB Groundwater model.

- The **mean residual** is the average difference between observed and simulated head in feet. If this value is close to zero, then it indicates that the positive residuals are balanced by the negative residuals. The mean residual for this model is -13.23 feet. The negative value indicates that, overall, the model tends to under predict water levels.
- The **mean absolute error** is the mean error after taking the absolute value of the errors. The mean absolute residual for the model is 15.18 feet, which means that the average simulated head is about ± 15 feet from an observed head. This value indicates the average elevation residual of the calibrated model.
- The **root mean square error** (RMSE) is a measure of precision, or the repeatability of the model results. This statistic is calculated by summing the square of the residuals, dividing by the number of observations, and taking the square root. The lower the RMSE the better the model fit. The SRB model has a RMSE of 22.96 feet.

Figure 3 is a plot of all observed and corresponding model simulated heads for the steady-state calibration. Perfect simulation would result in a straight line where the simulated head would equal the observed head. All of the points are distributed closely around the diagonal line. The points that do deviate from the diagonal line are randomly distributed, indicating no significant trend in residuals with varying elevation.

Figure 3
Comparison of Observed and Simulated Water Levels



Causes of residuals include the following:

- **Groundwater Flow not in a Steady State.** Most of the water level observations started in March 1986. Hydrographs show that water level fluctuated at low level between March 1986 and January 1991, and then increased steadily until mid-1998.
- **Water Level Observed in Pumping Wells.** Most water level measurements were taken from pumping wells and there may be drawdown interference from nearby pumping wells.
- **Known Non-Contemporaneous Data Points**. Water level measurements for the steady-state calibration were taken at different times, separated by months. If these data were all that were available at some locations, then they were used in the calibration but may not be representative of conditions in the mid-1993.
- **Unaccounted for Heterogeneity**. The SRB groundwater model domain covers an area of both valley floor and mountain front. Estimates of aquifer parameters have been made between

known lithologic data points, but there is a significant area between these data points. A particular area of uncertainty is in the mountain front area, because no data exists for this area.

- **Numerical Model Cell Size**. The model necessarily generalizes computed water levels over a 100 by 100 foot area. This generalized or average water level may not be representative of water levels measured in the field at a particular point, particularly in an area of high groundwater gradients.

Table 3
Calibration Statistics for the SRB Groundwater Model

Calibration Statistic	MODFLOW
Mean Error (ft)	-13.23
Absolute Mean Error (ft)	15.18
Root Mean Squared Error (ft)	22.96

Groundwater Flow Pattern

Another method of evaluating the model fit is to review model-wide head results for general flow relationships. In general, the simulated water level matches well to those observations, except in and around the Conejo well field, where as discussed above, water level was measured in pumping wells.

Water Budget

The water budget is an accounting of groundwater recharge (inflow) as it moves into the SRB study area and groundwater discharge and pumping (outflows). The water budget was developed as an approximation of a steady-state condition. There is no true “steady-state”, but the water budget attempts to balance annual average historic inflows and outflows to/from the SRB study area.

Table 4 and **Table 5** summarize the inflow and outflow for the Santa Rosa Basin, respectively. When total inflow is equal to total outflow, there is little change in groundwater storage, indicating that the aquifer system is at or near equilibrium. For steady-state modeling this is an implicit assumption in that there is no change in storage.

Estimated ranges of values by water budget component are summarized in **Table 4**. The purpose of these values was not to conclusively apply fixed numbers to the groundwater model, but to provide guidance and reasonable limits to the groundwater modeling effort. All inflow components of the groundwater model water budget fit within the estimated reasonable range.

Table 4
Steady-State Water Budget Summary of Inflows

Component		Estimated Range (AF/Yr)	Calibration (AF/Yr)
Precipitation	Valley Floor	206-2,397	2,520
	Periphery	130-1,509	
Agricultural Return	Santa Rosa Valley	154-462	
Wastewater Return	Indoor	715	
	Outdoor	765	
	Public and Others	30	
Subsurface	Tierra Rejada	225-301	240
River Leakage	Arroyo Santa Rosa	546	600
	Conejo Creek	1,113	1,030
Total			**4,390**

In the case of Santa Rosa Basin, detailed data on outflow from the groundwater system is not available. For example, private groundwater pumping from most wells is not gauged, and the amount of pumped water from those wells that returns to the aquifer through deep percolation is a further unknown.

Table 5
Steady-State Water Budget Summary of Outflows

Component	Calibration (AF/Yr)
Well Pumping	3,320
Subsurface	290
Evapotranspiration/Consumptive Losses	780
Total	**4,390**

The steady-state total inflow/outflow to the groundwater body in the model area is approximately 4,390 acre-feet per year which is consistent with recharge and discharge estimates based on existing data.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Considerable efforts have been completed to develop an accurate conceptual and numerical model of the Santa Rosa Basin area. In spite of the fact that model-simulated water levels do not exactly match field-measured water levels, the numerical model represents a valuable tool to evaluate a variety of groundwater management alternatives discussed in the groundwater related projects section.

During development and calibration of the SRB groundwater model, a number of unique characteristics of the model became apparent. The most significant of these characteristics is summarized below.

- It was found that converting specific flow to river package for Conejo creek greatly enhanced the stability of the model. The model is very sensitive to the stage elevation and river conductance.
- Water level observation and water quality data have shown that the Bailey fault is a groundwater flow barrier, at least in the central part, but it's not clear if and to what extent the other part of the fault acts as a hydraulic barrier.

As with any groundwater model, uncertainties exist in specific areas. Future efforts to improve the model should focus on:

- Validation of the model based on long-term and systematic groundwater monitoring. The current monitoring program should be updated and expanded based on the preferred water management alternative identified in subsequent tasks. The model should be continuously updated as new information becomes available.
- After continued monitoring, a transient calibration is recommended to improve the reliability of the model results.
- This model represents the area east of the Baily Fault. Continued evaluation of the role of faulting on groundwater flow. The best information on the role of faulting would come from high-volume pump testing adjacent to faults with observations on either side of a fault.
- A gauging station is recommended located on the Conejo Creek at the location where the Creek is out of the Hill Canyon and met the valley floor.
- An elevation profile along the Conejo Creek channel within the model domain would improve model results.
- Further evaluation of the sensitivity of the conductance used in the river package to model simulations.

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Appendix D

Draft Report Comments From Fox Canyon Groundwater Management Agency

FOX CANYON
GROUNDWATER MANAGEMENT AGENCY
A STATE OF CALIFORNIA WATER AGENCY

July 5, 2013

Terry Curson, P.E.
Project Engineer
Camrosa Water District
7385 Santa Rosa Rd.
Camarillo, CA 93012

SUBJECT: DRAFT CAMROSA WATER DISTRICT SANTA ROSA BASIN GROUNDWATER MANAGEMENT PLAN, APRIL 2013

Thank you for the opportunity to review the subject (early version) draft report. Some sections of the draft report have not yet been completed and are identified as such.

Section 2-Water Resources Setting describes the Santa Rosa Basin (SRB) and its structure in general terms. An important structural feature, known as the Bailey Fault, trends north-east south-west across the western (approximately) third of the SRB. Based on water level differences (lower water levels west of the fault) the fault is understood to restrict underflow from the SRB east of the fault, into the SRB basin west of the fault. The SRB aquifers west of the fault are managed by the Fox Canyon Groundwater Management Agency (FCGMA) and the fault at this location serves as the Agency boundary.

The draft report describes estimated groundwater underflow from the eastern part of the SRB across the Bailey Fault into the western part of the SRB to be 502 acre-feet per year (Boyle, 1997). Section 3-Basin Yield describes the Bailey Fault as a groundwater flow barrier in its central portion and goes on to describe that it is unclear the extent that the other parts of the fault act as a barrier. The draft report's Appendix C Groundwater Model Documentation and Evaluation of Recharge Projects describes that the Bailey Fault is modeled as a no-flow boundary.

The groundwater model results in the draft report indicate the SRB yield east of the Bailey Fault is 3,320 acre-feet per year. What does the groundwater model indicate the underflow across the Bailey Fault is into the FCGMA under current conditions? What is the model value of potential underflow reduction under likely groundwater development scenarios? Have geologic cross sections been developed through this area as part of this study, and will they be included in a revised draft report?

Section 4-Management Plan Goals and Objectives and Section 5-Plan Components both describe approaches to better understand groundwater quality and groundwater availability for use (including pump and treat of the water) to remove salts. It appears that controlling sources of salts and nutrients may be a limited part of the work described for existing land uses, with a broader goal to achieve groundwater quality improvements through extracting and treating groundwater. Are additional controls on land use necessary (i.e. septic system density, livestock, etc.) to achieve the basin management objectives? Under the proposed groundwater management plan scenarios, how will basin groundwater quality change over time?

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Websites: *www.fcgma.org* **or** *www.fcgmaonline.org*

Section 5-Plan Components indicates further assessment of the groundwater model is needed in order to validate and measure model assumptions. Is this further assessment a near term goal (within six months) or a longer term goal? Do these further assessments include validating assumptions about the Bailey Fault's ability to restrict groundwater flow?

Via a July 3, 2012 letter, our office provided comment to Camrosa Water District's Draft Program EIR for the Integrated Facilities Master Plan. That comment letter recommended that the Draft Program EIR be revised to describe any loss of recharge to aquifers in the FCGMA. The draft report which is the subject of this letter has provided a more in depth analysis and we recommend that future versions of the draft report address our questions presented in this letter.

Thank you again for the opportunity to review the draft report and provide comment. Please contact me at (805) 650-4083 if you have any questions.

Sincerely,

Rick Viergutz

Rick Viergutz, CEG
Groundwater Manager

cc: Jeff Pratt

Appendix E

Standard Operating Procedures
Well Water Sampling and Field Measurements

STANDARD OPERATING PROCEDURES

WELL WATER SAMPLING AND FIELD MEASUREMENTS

MWH

STANDARD OPERATING PROCEDURES
SOP-5

WELL WATER SAMPLING AND FIELD MEASUREMENTS

TABLE OF CONTENTS

LIST OF ATTACHMENTS

DISCLAIMER

THE FOLLOWING STANDARD OPERATING PROCEDURE PROVIDES A GENERAL GUIDANCE ON PROCEDURES RELATING TO TECHNICAL ISSUES TO BE ADDRESSED INVOLVING SAMPLING OF GROUNDWATER MONITORING WELLS. IT IS NOTED, HOWEVER, THAT EACH PROJECT AND SITE IS UNIQUE AND THAT THESE GUIDELINES ARE NOT A SUBSTITUTE FOR COMMON SENSE AND GOOD MANAGEMENT PRACTICES BASED ON PROFESSIONAL TRAINING AND EXPERIENCE. IN ADDITION, INDIVIDUAL CONTRACT TERMS MAY AFFECT THE IMPLEMENTATION OF THESE STANDARD OPERATING PROCEDURES.

1.0 INTRODUCTION

This guideline is a general reference for the proper equipment and techniques for groundwater sampling. The purpose of these procedures is to enable the user to collect representative and defensible groundwater samples and to facilitate planning of the field sampling effort. These techniques should be followed whenever applicable, although site-specific conditions or project-specific plans may require adjustments in methodology.

To be valid, a groundwater sample must be representative of the particular zone of the water being sampled. The physical, chemical, and bacteriological integrity of the sample must be maintained from time of collection to time of analysis in order to minimize changes in water quality parameters. Acceptable equipment for withdrawing samples from completed wells includes bailers and various types of pumps. The following are primary considerations in obtaining a representative sample of the groundwater:

- Avoid collecting stagnant (standing) water in the well.
- Avoid physically or chemically altering the water by improper sampling techniques, sample handling, or transport.
- Document that proper sampling procedures have been followed.

This guideline describes suggested well evacuation (or purging) methods, sample collection and handling, field measurement, decontamination, and documentation procedures. Examples of sampling and chain-of-custody (COC) forms are attached.

2.0 DEFINITIONS

Annular Space	The space between casing or well screen and the wall of the drilled hole, or between drill pipe and casing, or between two separate strings of casing. Also called annulus.
Aquifer	A geologic formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.
Bailer	A long narrow tubular device with an open top and a check valve at the bottom that is used to remove water from a well during purging or sampling. Bailers are available in many widths and lengths, and may be made of Teflon, polyvinyl chloride (PVC), polyethylene (PE), or stainless steel. Disposable bailers are widely used, and are available in Teflon and PE.
Bladder Pump	A pump consisting of flexible bladder (usually made of Teflon) contained within a rigid cylindrical body (commonly made of PVC or stainless steel). The lower end of the bladder is connected through a check valve to the intake port, while the upper end is connected to a sampling line that leads to the ground surface. A second line, the gas line, leads from the ground surface to the annular space between the bladder and the outer body of the pump. After filling, under hydrostatic pressure, application of gas pressure causes the bladder to collapse, closing the check valve and forcing the sample to ground surface through the sample line. Gas pressure is often provided by a compressed air tank, and commercial models generally include a control box that automatically switches the gas pressure off and on at appropriate intervals.
Centrifugal Pump	A pump that moves a liquid by accelerating it radially outward in an impeller to a surrounding spiral-shaped casing.
Chain of Custody	Method for documenting the history and possession of a sample from the time of its collection through its analysis and data reporting to its final disposition.
Check Valve	Ball and spring valves on core barrels, bailers, and sampling devices that are used to allow water to flow in one direction only.

Conductivity (electrical)	A measure of the quantity of electricity transferred across a unit area, per unit potential gradient, per unit time. It is the reciprocal of resistivity.
Datum	An arbitrary surface (or plane) used in the measurement of heads (i.e., National Geodetic Vertical Datum, commonly referred to as mean sea level).
Direct-Push Technology	A method of soil boring installation involving pushing a sampling device into the ground and retrieving it for soil description and collection (Geoprobe® is a common trademark name). Groundwater samples can be collected from the borehole by inserting a screen point into the hole and removing groundwater via peristaltic pump or small-diameter bailer. Similar to Hydropunch® (see below).
Decontamination	A variety of processes used to clean equipment that contacted formation material or groundwater that is known to be or suspected of being contaminated.
Downgradient	In the direction of decreasing potentiometric head.
Drawdown	The lowering of the water level or potentiometric surface in a well and aquifer due to the discharge of water from the well.
Electric Submersible Pump	A pump that consists of a rotor contained within a chamber and driven by an electric motor. The entire device is lowered into the well with the electrical cable and discharge tubing attached. A portable power source and control box remain at the surface. Electrical submersible pumps used for groundwater purging are constructed of inert materials such as stainless steel, and are well sealed to prevent sample contamination by lubricants.
Filter Pack	Sand or gravel that is generally uniform, clean, and well rounded that is placed in the annulus between the borehole wall and the well screen to prevent formation material from entering through the well screen and to stabilize the adjacent formation.
Headspace	The empty volume in a sample container between the water level and the cap.

HydroPunch®	An in situ groundwater sampling system in which a hollow steel rod is driven into the saturated zone that allows for the collection of a groundwater sample.
In Situ	In the natural or original position; in place.
Monitoring Well	A well that is constructed by one of a variety of techniques for the purpose of extracting groundwater for physical, chemical, or biological testing, or for measuring water levels or potentiometric surface.
Packer	A transient or dedicated device placed in a well or borehole that isolates or seals a portion of the well, well annulus, or borehole at a specific level.
Peristaltic Pump	A low-volume suction pump. The compression of a flexible tube by a rotor results in the development of suction.
pH	A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. (Original designation for potential of hydrogen.)
Piezometer	An instrument used to measure water level or potentiometric head at a point in the subsurface; a non-pumping well, generally of small diameter, that is used to measure the elevation of the water table or potentiometric surface.
Preservative	An additive (usually an acid or a base) used to protect a sample against decay or spoilage, or to extend the holding time for a sample.
Static Water Level	The elevation of the top of a column of water in a monitoring well or piezometer that is not influenced by pumping or conditions related to well installation, hydrologic testing, or nearby pumping.
Turbidity	Cloudiness in water due to suspended and colloidal organic and inorganic material.
Upgradient	In the direction of increasing potentiometric head.

3.0 RESPONSIBILITIES

The **Project Manager** selects site-specific water sampling methods, locations for monitoring well installations, monitoring wells to be sampled and analytes to be analyzed (with input from the Field Team Leader and Project Geologist), and is responsible for project quality control and field audits.

The **Field Team Leader** implements the water sampling program; supervises the Project Geologist/Hydrogeologist and Sampling Technician; ensures that proper chain-of-custody procedures are observed and that samples are sampled, transported, packaged, and shipped in a correct and timely manner.

The **Project Geologist/Hydrogeologist** ensures proper collection, documentation, and storage of groundwater samples prior to shipment to the laboratory, and assists in packaging and shipment of samples.

The **Field Sampling Technician** assists the Project Geologist/Hydrogeologist in the completion of tasks and is responsible for the proper use, decontamination, and maintenance of groundwater sampling equipment.

4.0 WATER SAMPLING GUIDELINES

4.1 EQUIPMENT

There are many methods available for well purging (evacuation) and sampling. A variety of issues must be considered when choosing purging and sample collection equipment. These issues include the following:

- Depth and diameter of the well
- Recharge capacity of the well
- Analytical parameters that will be tested
- Governing regulatory requirements

Few sampling devices are suitable for the complete range of groundwater analytical parameters. For example, a bailer is acceptable for collecting major ion and trace metal samples (if turbidity is not a factor), but analytical results may be incorrect if used for the collection of samples that are analyzed for volatile organics, dissolved gases, or even pH. Generally, the best pumps are positive displacement pumps, such as bladder and helical rotor pumps, which minimize the aeration of the groundwater as it is sampled, and therefore yield the most representative groundwater samples. Although it is possible to use different equipment to purge the well and to sample the well, this is not recommended because of the increased decontamination requirements and possibilities for cross contamination. It is recommended that a flow rate as close to the actual groundwater flow rate should be employed to avoid further development, well damage, or the disturbance of accumulated corrosion or reaction products in the well (Puls and Barcelona, 1989).

Positive displacement pumps, such as bladder pumps, are generally recommended for both well evacuation and sample collection. Disposable bailers are also commonly used for well development and evacuation, as well as sample collection in certain cases. Other types of sample collection such as gas lift pumps should be avoided, especially when analyzing for sensitive parameters, because of the geochemical changes that can occur due to the aeration of the water within the well. Also, the use of certain sample devices (e.g., bailers or high-rate centrifugal pumps) may entrain suspended materials, such as fine clays and colloids, which are not representative of mobile chemical constituents in the formation of interest (Puls and Barcelona, 1989).

Specific instructions for the use of several of the sampling devices are discussed in the next sections. All purging and sampling equipment should be decontaminated before beginning work and between wells, in accordance with Section 4.5.

4.1.1 Bailers

Bailers represent the simplest and least expensive method of collecting the sample from a well. However, they may not be suitable for all analyses. Bailers are available as permanent (re-usable or dedicated) and disposable. Permanent bailers are usually constructed of Teflon or stainless steel. Disposable bailers are usually constructed of polyethylene or Teflon.

The advantages to using permanent bailers are:

- Inexpensive
- Easy to use and maintain

The disadvantages to using permanent bailers are:

- Disturb sediment while sampling
- Require decontamination and risk of cross-contamination
- Require disposal of contaminated purge water
- Possibility of splashing (health and safety issue)

The advantages of using disposable bailers are:

- No need for decontamination between.
- Inexpensive
- Easy to use

The disadvantages to using disposable bailers are:

- Disturb sediment while sampling
- Require disposal of contaminated purge water
- Possibility of splashing (health and safety issue)

Disposable bailers are preferred. Since there is no cross- contamination between samples, there is no need for time-consuming decontamination.

Bailers can be lowered and raised using stainless steel wire or polypropylene cord. Polypropylene cord is recommended since it is inexpensive, light, and strong, however it should be discarded after one use to prevent cross-contamination. At no time should the bailer or the line touch the ground during the sampling process. This can be done by coiling the line around one's hands while pulling the bailer out of the well. For deep wells, the line may be coiled into a bucket or on a clean plastic sheet.

During bailing, the purge water is poured out of the top of the bailer into a 5-gallon bucket, 55-gallon drum, or equivalent. Most groundwater sampling protocols require that the amount of water purged be recorded; thus, a 5-gallon bucket with 1-gallon markings is recommended. During sampling, the water can be poured out of the top of the bailer. This should not be done for volatile analyses. Water can also be removed from the bottom of the bailer using a small tube or sampling device that comes with most disposable bailers. This device essentially pushes the ball out of the valve, allowing water to slowly flow out of the bottom of the bailer. This is the recommended method for VOC sampling.

4.1.2 Peristaltic Pumps

Peristaltic and centrifugal pumps are widely used for purging wells with water levels close to the surface (less than 30 feet). They are light, reasonably portable, and easily adaptable to ground level monitoring of field parameters by attaching a flow-through cell. These pumps require minimal downhole equipment. The tubing can easily be cleaned in the field; however, more often dedicated tubing is left in each well, or tubing is replaced after each well. The following procedures should be considered when using these pumps:

- Unless dedicated tubing is used, the interior and exterior of all intake tubing used with the peristaltic/centrifugal pump should be thoroughly washed with a detergent wash, flushed with tap water, and then double rinsed with distilled water prior to use.
- Peristaltic pumps typically run on batteries. However, if a gas-powered generator is used, it should be downwind of the well.
- The intake of the tubing should be lowered to the midpoint of the well screen. Alternatives to this procedure may be necessary if the drawdown from the purging operations causes the water level to fall and begin to pump air. Because of accumulated sediment at the well bottom, the intake should be at least 1 foot above the bottom of the well.
- If parameters are to be monitored continuously, it is recommended that an in-line "flow-through" cell with a multi-parameter water quality meter be used. Connect

the discharge tubing from the pump to the “in” port of the flow-through cell and begin evacuating the well (make sure to have the “out” port connected to a bucket or some sort of water containment). Continuously monitor the parameters (typically pH, oxidation reduction potential (ORP or redox), dissolved oxygen (DO), turbidity, temperature, and specific conductivity) and measure the volume of groundwater being pumped.

- After purging is complete (stabilization of parameters), disconnect the discharge tubing from the flow through cell prior to sampling. Do not collect water that has flowed through the flow-through cell.

The advantages of using peristaltic pumps are:

- Typically less purge water to collect and dispose (if low-flow sampling)
- Relatively easy to use
- Very little disturbance of sediment; easy to achieve low turbidity samples
- Low health and safety risk (low splash possibility)

The disadvantages to using peristaltic pumps are:

- Possibly expensive, depending on tubing and pump used.
- Sampling time can be 1 hour or more per well.
- Limited depth applicability; can pump only from depths less than 32 feet.
- Vacuum or negative pressure can potentially alter the geochemistry (VOCs, pH, alkalinity).

4.1.3 Submersible Pumps

Submersible pumps take in water and push the sample up a tube to the surface. The power sources for these pumps may be compressed gas or electricity. The operation principles vary, and the displacement of the sample can be by an inflatable bladder, sliding piston, gas bubble, or impeller. Bladder or helical rotor pumps are recommended for sampling for sensitive parameters. Bladder pumps are available for .05-inch diameter wells and larger, and these pumps can lift water up to several hundred feet. For large sampling projects, dedicated tubing is recommended, as tubing for bladder pumps is typically very expensive ($10 per foot), thus making disposable tubing not efficient. The entire pump assembly (and tubing, if applicable) should be decontaminated before purging and between wells, as described in Section 4.5.

The advantages of using submersible pumps are:

- Less purge water to collect and dispose (if low-flow sampling).
- Very little disturbance of sediment; easy to achieve low turbidity samples.
- Adjustable to very low flow rates.
- Can be used to sample wells 300 or more feet deep.
- Dedicated systems can lower costs over time.
- Low health and safety risk (low splash possibility).
- Some types (e.g., bladder pumps) can be easily disassembled for decontamination.

The disadvantages of submersible pumps are:

- Need power source or gas source, which can be hard to transport to remote well locations.
- High start-up costs; Many models of these pumps are expensive, as is the tubing.
- Sediment in water may cause clogging of the valves or eroding the impellers with some of these pumps.
- Decontamination of internal components of some types is difficult and time consuming.

4.1.4 Other Pumps

Gas-Lift Pumps

A pressure displacement system consists of a chamber equipped with a gas inlet line, a water discharge line, and two check valves. When the chamber is lowered into the casing, water floods it from the bottom through the check valve. Once full, a gas (e.g., nitrogen or air) is forced into the top of the chamber in sufficient amounts to displace the water in the discharge tube. The check valve in the bottom prevents water from being forced back into the casing, and the upper check valve prevents water from flowing back into the chamber when the gas pressure is released. This cycle can be repeated as necessary until purging is complete. The potential for increased gas diffusion into the water (and thus loss of volatiles) makes this system unsuitable for sampling volatile organic or most pH critical parameters. This method is not recommended for groundwater sampling, but may be useful for development or evacuation of a well.

Direct-Push Technology Groundwater Sampling

Direct Push Technology provides in situ groundwater samples by using a specially designed sample tool to provide a hydraulic connection with the water table. When used with a mobile laboratory, DPT groundwater sampling can be useful for such applications as relatively rapid delineation of groundwater plumes. It is also ideal for screening for contaminants. Both groundwater and floating layer hydrocarbons may be sampled using this method.

The DPT method utilizes a sampler containing a stainless steel screen point, which is attached to the DPT rods and is inserted into the DPT borehole. When the screen is at the desired depth, the sampler is pulled back, exposing the screen to the formation. Groundwater can then be sampled used a peristaltic pump or a small diameter bailer.

This method may be used to sample groundwater up to approximately 60 feet of soft sediments. In coarse sand, gravel, consolidated rock, or at depths greater than 60 feet, a pilot hole must be drilled prior to using this method.

The advantages of using DPT groundwater sampling techniques are:

- Low cost (relative to installing monitoring wells)
- Able to collect a relatively undisturbed in situ groundwater sample
- The relative speed with which a sample can be collected when compared to drilling, installing, developing, purging, and sampling a monitoring well

The disadvantages of using DPT groundwater sampling techniques are:

- Accurate water levels can not be obtained
- Sampling cannot be repeated if problems occur with the samples after they are collected
- Does not allow for long-term groundwater monitoring

4.2 WELL PURGING METHODS

Well development procedures are covered in SOP-03, “Groundwater Monitoring Well Development.”

4.2.1 Calculation of Casing Volume

To ensure that an adequate volume of water has been removed from the well prior to sampling, it is first necessary to determine the volume of standing water in the well and the volume of water in the filter pack below the well seal. The volume can be easily calculated by the following method (calculations should be entered in the field logbook):

1. Obtain all available information on well construction (e.g., location, casing, screen, depth).
2. Determine well or casing diameter.
3. Measure and record static water level using an electronic water level meter (depth below top of casing reference point).
4. Use a pre-determined total depth of the well to calculate the water column. Measuring total depth prior to sampling will disturb sediment that has accumulated at the bottom of the well, which will affect sample results.
5. Calculate the volume of water in the casing using the following formula:

$$V = 7.481 (\pi r^2 h)$$

where:

V = Casing volume (gal)
r = Well radius (ft)
h = Linear feet of water in well = total well depth (ft) - static water depth (ft)

Alternatively, the casing volume can be calculated by multiplying the linear feet of water in the well by the volume per linear feet taken from Attachment 1 or other similar tables. Always be sure that the units in your calculation are consistent. In the equation above, 7.481 is the conversion factor from cubic feet to gallons.

4.2.2 Calculation of Annulus Volume

Some groundwater sampling protocols require the purging of casing and annulus volumes prior to sampling. In these cases the volume of water contained in the annular space between the casing and the borehole wall is calculated by the following formula:

$$Va = (Cb - Cc) \text{ x } (h) \text{ x } (0.30)$$

where:

Va	=	Volume of water in annulus (gal)
Cb	=	Borehole capacity (gal/ft)
Cc	=	Casing capacity (gal/ft)
h	=	Amount of standing water in the well or total linear height of the sand pack, whichever is less (ft)
0.30	=	Average porosity of typical sand pack

The values for Cb and Cc can be calculated by the formula πr^2. The annulus volume is added to the casing volume prior to multiplying by the number of volumes to be purged.

4.2.3 Purging Requirements

The composition of the water within the well casing and in close proximity to the well is probably not representative of the overall groundwater quality in the target aquifer. This is because important environmental conditions such as the ORP may differ drastically near the well from the conditions in the surrounding water-bearing materials. For this reason it is necessary to either purge the well until it is thoroughly flushed of standing water and contains fresh water from the aquifer, or sample from discrete intervals in the screened interval at low flow rates in order to collect undisturbed aquifer water (Puls and Barcelona, 1996).

Full Well Purging

When full purging is required, the recommended amount of purging before sampling depends on many factors, including the characteristics of the well, the hydrogeological nature of the aquifer, the type of sampling equipment being used, the parameters that are to be analyzed, and the regulatory requirements of the project. The number of casing volumes that should be removed prior to sample collection has been a matter of debate in the groundwater community for some time. However, it is recommended that where possible, between three and five casing volumes should be purged prior to sampling.

Low-Flow Sampling

Many groundwater scientists and regulatory departments have accepted and prioritized the use of low-flow purging and sampling of groundwater. Low-flow purging is defined as pumping rates between 0.1 and 0.5 liters per minute (L/min). Also, rather than relying on the removal of a specific volume of water prior to sample collection, physical parameters, such as pH, DO, ORP, turbidity, specific conductivity, and temperature, are collected at certain intervals (usually every 2 to 5 minutes). In order to minimize contact with the atmosphere, these parameters are typically measured using a multi-parameter meter inside a closed “flow-through” cell attached to the discharge side of a pump system. Once the parameters have stabilized, the groundwater is considered representative of the aquifer and is ready for sample collection. Determining *when* the parameters have stabilized, however, may differ between regulatory agencies. Per the U.S. Environmental Protection Agency (EPA) document *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures* (Puls and Barcelona, 1996), the parameters are considered stabilized when three consecutive measurements are within the following constraints:

• Temperature	± 10 %
• Conductivity	± 3 %
• pH	± 0.1
• DO	±10 %
• ORP	±10 mV
• Turbidity	±10 % or <10 nephelometric turbidity units (NTUs)

During purging, water levels should be monitored to ensure that drawdown does not exceed 0.1 m (0.3 ft). If the water level drop exceeds this, the flow rate should be decreased until the water level stabilizes. If water levels in low yield wells do not stabilize at flow rates near 0.1 L/min, the well should be purged to dryness once and then sampled (EPA, 1986). Samples should be collected when the well has recovered to 80 percent of its original capacity or at 24 hours from being purged to dryness, whichever comes first. At no time should the well be pumped to dryness if the recharge rate causes the formation water to vigorously cascade down the sides of the screen and cause an accelerated loss of volatiles. In this case, samples should be collected at a rate slow enough to maintain the water level at or above the top of the screen to prevent cascading.

4.2.3 Purge Water Handling and Disposal

Because of the potential for spreading environmental contamination, planning for purge water disposal is a necessary part of well monitoring. Alternatives range from releasing it on the ground (<u>not</u> back down the well) to full containment, treatment, and disposal. If the well is believed to be contaminated, the best practice is to contain the purge water and store it in drums labeled "purge water" or in aboveground portable storage tanks (i.e., Baker Tanks) until the water samples have been analyzed. Include the date that the waste was generated on the container. Once the contaminants are identified, appropriate treatment or disposal requirements can be determined.

4.3 FIELD MEASUREMENTS

A variety of field measurements are commonly made during the sampling of groundwater including water level, pH, conductivity, turbidity, temperature, DO, and ORP. The accuracy, precision, and usefulness of these measurements are dependent on the proper use and care of the field instruments. Valid and useful data can only be collected if consistent practices (in accordance with recommended manufacturer's instructions) are followed. The instruments should be handled carefully at the well site and during transportation to the field and between sampling sites.

4.3.1 Water Level

Water levels can be measured by several techniques, but the most common method is using an electronic water level meter. The proper sequence is as follows:

1. Check operation of measurement equipment aboveground. Prior to opening the well, don personal protective equipment as required.

2. Record the following information on a sampling form or in the field notebook if a form is not available:

   - Well number
   - Top of casing elevation
   - Surface elevation, if available.

3. After opening the well, observe any pressure in the well. Allow 10-30 seconds for the water levels to equilibrate and stabilize. Repeat measurement after 30 seconds to assure the water level has stabilized.

4. Measure and record static water level and total depth (only if necessary) to the nearest 0.01 foot (0.3 cm) from the surveyed reference mark on the top edge of the inner well casing. If no reference mark is present, record in the log book where the measurement was taken (e.g., from the north side of the inner casing).

5. Record the time and day of the measurement.

Electric Water Level Indicators

These devices consist of a spool of small-diameter cable or tape and a weighted probe attached to the end. When the probe comes in contact with the water, an electrical circuit is closed and a meter, light, and/or buzzer attached to the spool will signal the contact. For accurate readings, the probe should be lowered slowly into the well.

Oil/Water Interface Probes

If oil or free product is encountered in the well, an oil/water interface probe can be used to measure the thickness of the product on top of the water. Most models exhibit two distinct electronic sounds for oil (usually a solid beep) and water (an intermittent beep). The most accurate method for measuring the oil/water interface is to first measure the top of the free product, then go through the product until the probe registers water, and then slowly raise the probe until a solid beep is encountered. This prevents a false thickness of product being measured, since product may stick to the probe causing the probe to read product when it really is in water.

4.3.2 MULTI-PARAMETER PROBES

Typically, groundwater parameters such as pH, temperature, and dissolved oxygen are measured in a flow-through cell using a probe that measures several parameters at once. Certain sampling techniques may preclude the use of these probes, and individual probes may need to be used instead.

Instruments should be calibrated at the beginning of every day, and if readings become suspect. Most instruments claim to hold their calibration longer than a day; if so, their calibration can be checked every morning. If the values do not match the expected numbers, the instrument should be calibrated again. The manufacturer's directions for calibration, maintenance, and use should be read and closely followed. Any problems with the functioning of the meter should be noted in the field log and reported to the office equipment manager.

4.4 SAMPLE COLLECTION METHODS

4.4.1 Sample Containers

A complete set of sample containers should be prepared by the laboratory prior to going into the field. The laboratory should provide the proper containers with the required preservatives. The laboratory's QA manual should provide a complete description of the procedures used to clean and prepare the containers. The containers should be labeled in the field with the date, well designation, project name, collectors' name, time of collection, and parameters to be analyzed. The sample containers should be kept in a cooler (at 4 degrees centigrade) until they are needed (i.e., not left in the sun during purging). One cooler should be used to store the unfilled bottles and another to store the samples.

The sample bottles should be filled in order of the volatility of the analytes so that the containers for volatile organics will be filled first, and samples that are not pH-sensitive or subject to loss through volatilization will be collected last. A preferred collection order (EPA, 1986) is as follows:

- Volatile organics (VOCs)

- Total petroleum hydrocarbons
- Total organic halogens
- Total organic carbon
- Extractable organics (e.g., BNAs, pesticides, herbicides)
- Total metals
- Dissolved metals
- Phenols
- Cyanide
- Sulfate and chloride
- Nitrate and ammonia
- Radionuclides

Field measurements, such as temperature, pH, and specific conductance, should be measured and recorded in the field before and after sample collection to check on the stability of the water samples over time.

4.4.2 Field Filtration for Dissolved Metals

Filtering groundwater samples has been a subject of considerable debate in recent years. In many cases, samples passing a 0.45-micron filter were used to provide an indication of dissolved metals concentrations in groundwater. Puls and Barcelona (1989) report that the use of a 0.45-micron filter was not useful, appropriate, or reproducible in providing information on metals mobility in groundwater systems, nor was it appropriate for determination of truly "dissolved" constituents in groundwater. A dual sampling approach is recommended to collect both filtered and unfiltered samples.

Any filtration for estimates of dissolved species loads should be performed in the field with no air contact and immediate preservation and storage. In-line pressure filtration is best with as small a filter pore size as practically possible (e.g., 0.45, 0.10 micron). Disposable, in-line filters are recommended for convenience and avoiding cross-contamination. The filters should be pre-rinsed with distilled water; work by Jay (1985) showed that virtually all filters require pre-washing to avoid sample contamination.

In the absence of filters, low-flow sampling techniques can reduce turbidity to values less than 10 NTUs.

4.4.3 Sampling from Non-Monitoring Wells and Springs/Seeps

Municipal/Residential Wells

Residential water supply wells should be sampled in a similar manner to monitoring wells, although allowances must be made for the type of pumping equipment already installed in the well. In most cases, this will involve sampling directly from the tap on each well and before the water has gone through any chlorination or treatment system. The sampling point should be a cold-water tap located as close to the pump as practical. Domestic supply samples should not be taken from taps delivering chlorinated, aerated, softened, or filtered water. Faucet aerators should be removed if possible before sampling. Outdoor spigots are generally preferable, since they are usually provide untreated water and are less of an intrusion into the residence. Field parameters (temperature, DO, ORP, etc.) can be measured in a flow-through cell connected via hose to an outside spigot. The water sample can be collected after parameters stabilize. For sampling, the flow rate should be set to low flow sampling rates (or approximately 0.1 L/min). If field parameter measurement is not possible, the water tap should be turned on and run for at least 30 minutes unless the water tap is directly adjacent to the well head, and then the water should be allowed to run for no less than 10 minutes before the samples are collected to flush stagnant water from the system. All sample containers should be filled with water directly from the tap and the samples processed as described for monitoring well samples. Components of the plumbing system should be noted to assist in data interpretation.

Spring and Seep Sampling

Samples from springs or seeps should be collected directly into the sample bottles without using any special sampling equipment. The sample will be collected as close as possible to where the spring emanates from the soil or rock. The sampler should always stand downstream of the spring or seep to avoid disturbing sediment or clouding the water.

4.5 DECONTAMINATION

Decontamination procedures will vary from project to project based on the regulations and project-specific Field Sampling Plan (FSP). Generally, decontamination procedure for non-dedicated groundwater sampling equipment (bailers, pumps, water-level probes) consists of the following steps:

1. Scrub and wash with laboratory-grade detergent (such as Alconox™) and tap water.
2. Triple rinse with deionized water.

If equipment is highly contaminated, it may be rinsed with reagent-grade isopropanol alcohol or methanol and allowed to air dry prior to Step 2 above. A hot water pressure washer can also be used for decontaminating sampling equipment. However, dedicated or disposable equipment is preferable since it eliminates any possible cross-contamination pathway that incomplete decontamination may cause. As with other procedures documented in this SOP, decontamination procedures may be determined by the client or regulatory agency involved in the project.

4.6 RECORDS AND DOCUMENTATION

4.6.1 Sample Designation

Sample names vary from project to project, and further instructions are typically described in the project Quality Assurance Project Plan (QAPP) or FSP. Typically, the site name or an abbreviation or acronym of the site name is included along with the well identification. For example, a sample from Hill Air Force Base Operable Unit 1 could be designated HAFB-OU1-2, with the final 2 designating the monitoring well number. Blind duplicate samples should be labeled with the number of a non-existent well, and should not include a sample time on the label. Equipment and trip blanks, collected when non-dedicated equipment is used, may also be labeled with a fictitious well name in a similar manner to the blind duplicate samples.

4.6.2 Sample Label

Sample containers should be labeled using waterproof ink before a sample is obtained. A sample label should be affixed to all sample containers. This label identifies the sample by documenting the sample type, sampler(s) initials, sample location, time, date, analyses requested, and preservation method. A unique sample designation as discussed above is assigned to each sample collected. This sample ID is also noted on the sample label.

4.6.3 Field Notebooks and Sampling Forms

A field notebook should be prepared prior to beginning sampling activities and should be maintained throughout the sample round. The notebook should contain pertinent information about the monitoring wells, such as depth of casing and water levels. During sampling, all the activities should be recorded on a groundwater sampling log (see Attachment 2) and/or in the field notebook. All forms used during sampling should be referenced in the field notebook. A brief description of weather conditions should also be noted as weather can sometimes affect samples. Any deviation from the sampling procedure described in the project work plan or SOP should be outlined in detail and justified in the field notebook. Specialized sampling forms can also be used to record the field measurements and other conditions observed.

4.6.4 Chain-of-Custody

The COC form (see Attachment 3) should be used to record the number of samples collected and the corresponding laboratory analyses. Information included on this form consists of time and date sampled, sample number, type of sample, sampler's name, preservatives used, and any special instructions. The project QAPP will detail the procedure for completing the COC form. A separate COC form may be completed for each cooler, or copies of the completed COC may be placed in every cooler. A copy of the COC form should be retained by the sampler prior to shipment (forms with multiple carbon copies are recommended). The original COC form should accompany the sample to the laboratory and provide a paper trail to track the sample. When transferring the possession of samples, the individuals relinquishing and receiving the samples should sign, date, and note the time on the COC form. Frequent communication with the laboratory after shipment is recommended to assure proper handling and adherence to holding times.

4.7 SAMPLE HANDLING AND SHIPPING

4.7.1 Sample Handling

The samples will be kept cool during collection and shipment with regular ice contained in a plastic bag. Frozen “blue ice” is not recommended. The samples should be stored in a durable, appropriately sized ice chest. The samples should be placed upright on a 1- to 3-inch layer of packing materials, such as vermiculite or bubble packaging, and kept separated, with the intervening voids filled with the packing material more than halfway to the top of the bottles or containers. The ice should be placed above and about the tops of the containers. The COC record should be sealed in a Ziplock plastic bag and affixed to the inside of the top lid of the cooler. The remaining space should be filled with packing material. The cooler should be secured by completely wrapping with strapping tape around both ends and around the lid. If there is a drain on the cooler, it should be taped shut. Chain-of-custody seals should be affixed across the seal between the lid and body of the cooler.

4.7.2 Shipping Instructions

All samples should be shipped overnight delivery through a reliable commercial carrier, such as FedEx. If shipment requires more than a 24-hour period, sample holding times can be exceeded, or the samples may get warm, compromising the integrity of the sample analysis. The sampler should call the laboratory to alert them when the samples will arrive on the following day.

5.0 REFERENCES

Jay, P.C., 1985. *Anion Contamination of Environmental Water Samples Introduced by Filter Media*. Analytical Chemistry 57(3): 780-782.

Nielson, D.M., 1991. *Practical Handbook of Groundwater Monitoring*, Lewis Publishers, Inc., Chelsea, MI.

Puls, R.W. and M.S. Barcelona, 1989. *Ground Water Sampling for Metals Analyses,* Superfund Ground Water Issue, EPA/540/4-89/001, March.

Puls, R.W. and M.S. Barcelona, 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*, U.S. Environmental Protection Agency document EPA/540/S-95/504, April.

U.S. Environmental Protection Agency, 1986. *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document*, OSWER-9950.1, September.

ATTACHMENT 1

MONITORING WELL DEVELOPMENT/SAMPLING FORM

MONITORING WELL DEVELOPMENT/SAMPLING FORM

MWH
MONTGOMERY WATSON HARZA

MONITORING WELL SAMPLIN

PROJECT:

Well ID:
Date:
Sample ID:
Time:
Analyses:
QA/QC - **Dup ID:**
Rinsate ID:

Screened Interval (ft):
Pump Depth (ft):
Flow Rate (gpm)
Purging Device:
Sampling Device:
Water Level Instrument:
Water Quality Meter(s):

Well Diameter (in)
Static Water Level (ft):
Standing Water (ft):
One Well Volume (gal):
OVA Reading at TOC:
OVA Reading in BZ:
Samplers Signature:

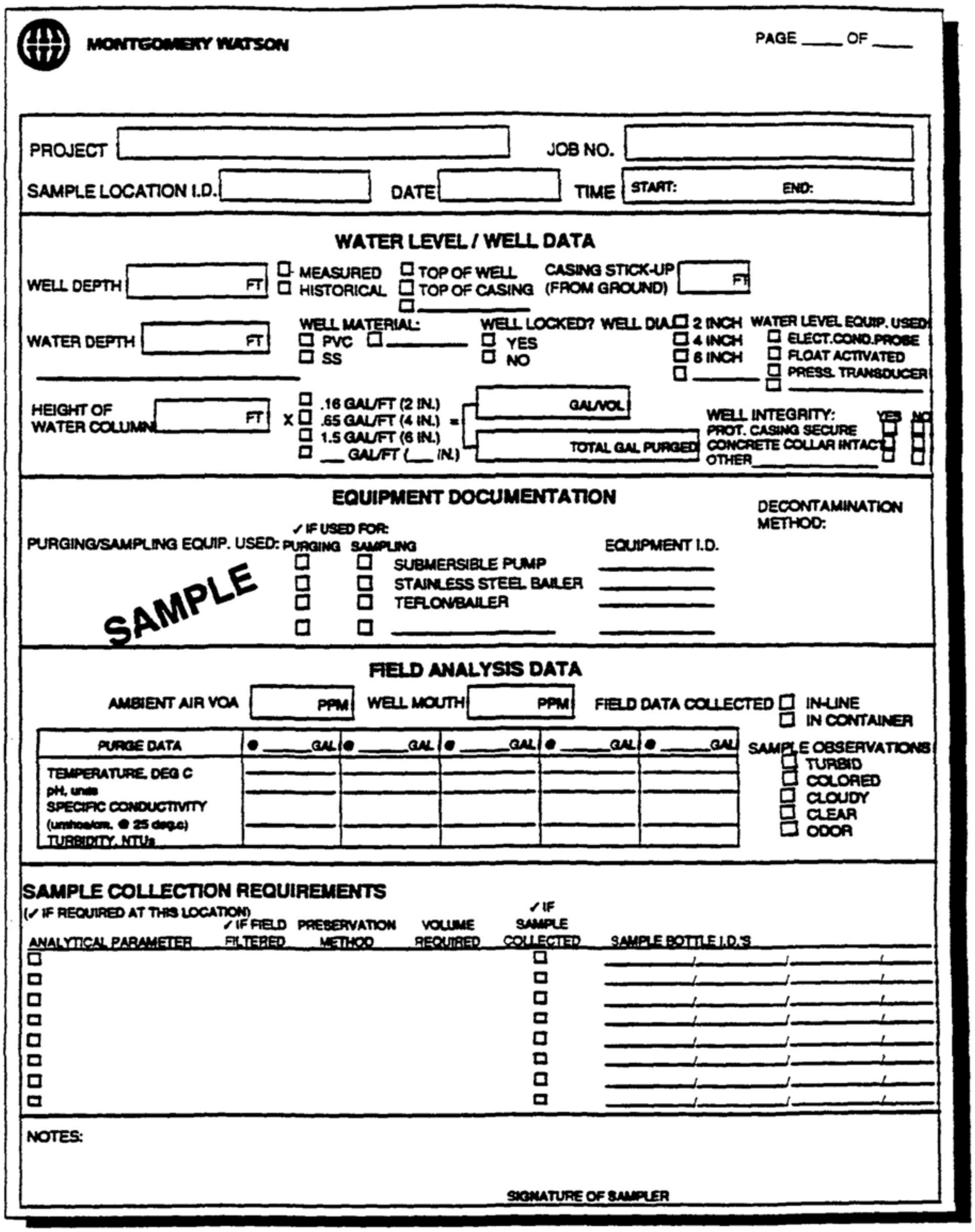
Time	Volume Purged (gal)	Flow Rate (gpm)	Water Level (feet - TOC)	SC (µS/cm)	pH	Temp	DO (mg/L)	Turbidity (NTU)	Other
			± 0.1 ft	5%	± 0.1	± 1°C	10%	< 10 NTU	
Final Field Parameter Measurements									

Comments:

ATTACHMENT 2

GROUNDWATER FIELD SAMPLING DATE RECORD

GROUNDWATER FIELD SAMPLING RECORD



MONTGOMERY WATSON

PAGE ____ OF ____

PROJECT ☐ JOB NO. ☐

SAMPLE LOCATION I.D. ☐ DATE ☐ TIME START: END:

WATER LEVEL / WELL DATA

WELL DEPTH ____ FT ☐ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☐ TOP OF CASING ☐ ________ CASING STICK-UP (FROM GROUND) ____ FT

WATER DEPTH ____ FT

WELL MATERIAL: ☐ PVC ☐ SS ☐ ________

WELL LOCKED? ☐ YES ☐ NO

WELL DIA. ☐ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ________

WATER LEVEL EQUIP. USED: ☐ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ________

____

HEIGHT OF WATER COLUMN ____ FT X ☐ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = ____ GAL/VOL ____ TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☐	☐
CONCRETE COLLAR INTACT	☐	☐
OTHER ________	☐	☐

EQUIPMENT DOCUMENTATION

DECONTAMINATION METHOD:

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	SUBMERSIBLE PUMP	________
☐	☐	STAINLESS STEEL BAILER	________
☐	☐	TEFLON/BAILER	________
☐	☐	________	________

SAMPLE

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☐ IN CONTAINER

PURGE DATA	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					
TURBIDITY, NTUs					

SAMPLE OBSERVATIONS:
- ☐ TURBID
- ☐ COLORED
- ☐ CLOUDY
- ☐ CLEAR
- ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	____/____/____/____
☐				☐	____/____/____/____
☐				☐	____/____/____/____
☐				☐	____/____/____/____
☐				☐	____/____/____/____
☐				☐	____/____/____/____
☐				☐	____/____/____/____
☐				☐	____/____/____/____

NOTES:

SIGNATURE OF SAMPLER

ATTACHMENT 3

CHAIN-OF-CUSTODY RECORD

CHAIN OF CUSTODY RECORD

MONTGOMERY WATSON HARZA

CHAIN OF CUSTODY RECORD

MWH CONTACT PERSON:

FED EX #: ____________ COOLER #: ____________ COC ID: ____________ LOGCODE: LAB:

SAMPLER(S) PRINTED NAME AND SIGNATURE

PROJECT NAME:

CLIENT ID

PROJECT NUMBER:

						ERPIMS CODES							ANALYSIS REQUEST											
SAMPLE ID	LOC ID	SBD	SED	DATE	TIME	SA	SN	SM	MC	BC	CT	PR												REMARKS

Comments/Instructions:

Note:

Signature:	Print Name:	Company Name/Title:	Date:	
RELINQUISHED BY:		Montgomery Watson Harza		
RECEIVED BY:				
RELINQUISHED BY:				
RECEIVED BY:				

For Lab Use Only: Sample Condition Upon Receipt:

Legend

SBD: Sample Beginning Depth

SED: Sample Ending Depth

Sample Type Code (SA): From ERPIMS Handbook

Sample Number (SN): From ERPIMS Handbook

Sampling Method Code (SM): From ERPIMS Handbook

Sampling Matrix Code (MC): From ERPIMS Handbook

Bottle Count (BC): 1,2,3, etc.

Container Type (CT): S = Sleeve, A= Amber Glass, G = Clear Glass, P = Plastic, E = Encore sample

Preservative (PR): NA = None, A = HNO3, B = H2SO4, C = HCl, D = NaOH

ORIGINAL: Send with sample (sign only in blue or black ink)

COPIES: Retained by Sampler, Sent to Office

ATTACHMENT 4

VOLUME OF SCHEDULE 40 PVC PIPE

VOLUME OF PVC PIPE

Schedule	**Diameter (inches)**	**OD (inches)**	**ID (inches)**	**Volume/LF (gallon)**
40	1.25	1.660	1.380	0.08
40	2	2.375	2.067	0.17
40	3	3.500	3.068	0.38
40	4	4.500	4.026	0.66
40	6	6.625	6.065	1.50
40	8	8.625	7.981	2.60
40	12	12.750	11.938	5.82
80	2	2.375	1.939	0.15
80	4	4.500	3.826	0.60

Appendix F

Standard Operating Procedures
Surface Water Sampling

STANDARD OPERATING PROCEDURES

SURFACE WATER SAMPLING

MWH

STANDARD OPERATING PROCEDURES

SURFACE WATER SAMPLING

TABLE OF CONTENTS

LIST OF FIGURES

DISCLAIMER

THE FOLLOWING STANDARD OPERATING PROCEDURE PROVIDES A GENERAL GUIDANCE RELATING TO TECHNICAL ISSUES TO BE ADDRESSED INVOLVING SURFACE WATER SAMPLING FOR ENVIRONMENTAL INVESTIGATIONS. IT IS NOTED, HOWEVER, THAT EACH PROJECT AND SITE IS UNIQUE AND THAT THESE GUIDELINES ARE NOT A SUBSTITUTE FOR COMMON SENSE AND GOOD MANAGEMENT PRACTICES BASED ON PROFESSIONAL TRAINING AND EXPERIENCE. .

1.0 INTRODUCTION

This Standard Operating Procedure describes methods and equipment commonly used for collecting environmental samples of surface water and aquatic sediment for either on-site examination or chemical testing, or for laboratory analysis.

The information presented in this guideline is generally applicable to all environmental sampling of surface waters, except where the analyte(s) may interact with the sampling equipment. The collection of concentrated sludges or hazardous waste samples from disposal or process lagoons often requires methods, precautions, and equipment different from those described herein.

Specific sampling problems may require the adaptation of existing equipment or design of new equipment. Such innovations should be described in the sampling plan (or addendum to the sampling plan if the remedial investigation is ongoing) and brought to the attention of the project manager.

2.0 DEFINITIONS

Environmental Sample	Low constituent-concentration sample typically collected off site and not requiring Department of Transportation (DOT) hazardous waste labeling or Contract Laboratory Program (CLP) handling as a high hazard sample.
Hazardous Waste Sample	Medium to high constituent-concentration sample (e.g., source material, sludge, leachate) requiring DOT labeling and CLP handling as a high hazard sample.

3.0 RESPONSIBILITIES

The **Field Team Leader** has overall responsibility for the correct implementation of surface water and sediment sampling activities, including review of the sampling plan with, and any necessary training of, the sampling technician(s). The actual collection, packaging, documentation (sample label and log sheet, chain-of-custody record, etc.) and initial custody of samples will be the responsibility of the sampling technician(s).

4.0 PROCEDURES

4.1 BACKGROUND

Collecting a representative sample from surface water is often difficult because of water movement, stratification, or the intermittent nature of these media. To collect representative samples, sampling bias must be standardized relative to site selection; sampling frequency; sample collection; sampling devices; and sample handling, preservation, and identification.

Representativeness is a qualitative description of the degree to which an individual sample accurately reflects population characteristics or parameter variations at a sampling point. It is therefore an important quality not only for assessment and quantification of environmental threats posed by the site, but also for providing information for engineering design and construction. Proper sample location selection and sample collection methods are important to ensure that a truly representative sample has been taken. Regardless of scrutiny and quality control applied during laboratory analyses, reported data are no better than the confidence that can be placed in the representativeness of the samples.

4.2 DEFINING THE SAMPLING PROGRAM

Factors that must be considered in developing a sampling program for surface water, including study objectives, are accessibility; site topography; flow, mixing, and other physical characteristics of the water body; point and diffuse sources of contamination; and personnel and equipment available to conduct the study. For waterborne constituents, dispersion depends on the vertical and lateral mixing within the body of water. The professional developing the sampling plan must therefore know not only the mixing characteristics of streams and lakes, but also must understand the role of fluvial-sediment transport, deposition, and chemical sorption.

4.2.1 Sampling Program Objectives

The objective of surface water sampling is to determine the surface water quality entering, leaving, or remaining within the site. The scope of the sampling program must consider the sources and potential pathways for transport of contamination to or in a surface water body. Sources may include point sources (leaky tanks, outfalls, etc.) or nonpoint sources (e.g., spills).

The following are major pathways for surface water contamination (not including airborne deposition):

- Overland runoff
- Leachate influx to the water body
- Direct waste disposal (solid or liquid) into the water body
- Groundwater influx

The relative importance of these pathways, and therefore the design of the sampling program, is controlled by the physiographic and hydrologic features of the site, the drainage basin(s) that encompass the site, and the history of site activities.

Physiographic and hydrologic features to be considered include the following:

- Slopes and runoff direction
- Areas of temporary flooding or pooling
- Tidal effects
- Artificial surface-runoff controls such as berms or drainage ditches (and when they were constructed relative to site operation)
- Locations of springs, seeps, marshes, etc.

In addition, the obvious considerations such as the location of man-made discharge points to the nearest stream (intermittent or flowing), pond, lake, estuary, etc., should not be overlooked.

The distribution of particulates within a sample is an important consideration. Many organic compounds are only slightly water-soluble and tend to be adsorbed by particulate matter. Nitrogen, phosphorus, and heavy metals may also be transported by particulates. Samples must be collected with a representative amount of suspended material; transfer from the sampling device should include transferring a proportionate amount of the suspended material.

The first steps in selecting sampling locations, therefore, are to 1) review site history, 2) define the hydrologic boundaries and features of the site, and 3) identify the sources, pathways and potential distribution of contamination. Based on these considerations, the numbers, types, and general locations of required samples upgradient (for background measurement) on site and downgradient can be identified.

4.2.2 Location of Sampling Stations

Accessibility is the primary factor affecting sampling costs. The desirability and utility of a sample for analysis and description of site conditions must be balanced against the costs of collection as controlled by accessibility. Bridges or piers are the first choice for locating a sampling station on a stream because bridges provide ready access and permit the sampling technician to sample any point across the stream. A boat or pontoon (with an associated increase in cost) may be needed to sample locations on lakes and reservoirs, as well as those locations on larger rivers. Frequently, however, a boat will take longer to cross a water body and will hinder manipulation of the sampling equipment. Wading for samples is not recommended unless it is known that contaminant levels are low enough that skin contact will not produce adverse health effects. This provides a built-in margin of safety in the event that wading boots or other protective equipment should fail to function properly. If it is necessary to wade into the water body to obtain a sample, the sampler should be careful to minimize disturbance of bottom sediments and must enter the water body downstream of the sampling location. If necessary, the sampling technician should wait for the sediments to settle before taking a sample.

Sampling in marshes or tidal areas may require the use of an all-terrain-vehicle. The same precautions mentioned above with regard to sediment disturbance will apply.

Under ideal and uniform contaminant dispersion conditions in a flowing stream, the same concentrations of each would occur at all points along the cross section. This situation is most likely downstream of areas of high turbulence. Careful site selection is needed to ensure, as closely as possible, that samples are taken where uniform flow or deposition and good mixing conditions exist.

The availability of streamflow and sediment discharge records can be an important consideration in choosing sampling sites in streams. Streamflow data in association with contaminant concentration data are essential for estimating the total contaminant loads carried by the stream. If a gauging station is not conveniently located on a selected stream, the project hydrologist should explore the possibility of obtaining streamflow data by direct or indirect methods.

4.2.3 Frequency of Sampling

The sampling frequency and the objectives of the sampling event will be defined by the work plan. For single-event site- or area-characterization sampling, both bottom material and overlying water samples should be collected at the specified sampling stations. If valid data are available on the distribution of the contaminant between the solid and aqueous phases, it may be appropriate to sample only one phase, although this is not often recommended. If samples are collected primarily for monitoring purposes, consisting of repetitive, continuing measurements to define variations and trends at a given location, water samples should be collected at a pre-established and constant interval as specified in the work plan (often monthly or quarterly) and during droughts and floods. Samples of bottom material should be collected from fresh deposits at least yearly, and preferably during both spring and fall seasons.

The variability in available water-quality data should be evaluated before deciding on the number and collection frequency of samples required to maintain an effective monitoring program.

4.3 SURFACE WATER SAMPLE COLLECTION

4.3.1 Streams, Rivers, Outfalls, and Drainage Features (Ditches, Culverts)

Methods for sampling streams, rivers, outfalls, and drainage features at a single point vary from the simplest of hand-sampling procedures to the more sophisticated multipoint sampling techniques known as the equal-width-increment (EWI) method or the equal-discharge-increment (EDI) methods (defined below).

Samples from different depths or cross-sectional locations in the water course taken during the same sampling episode should be composited. However, samples collected along the length of the watercourse or collected at different times may reflect differing inputs or dilutions and therefore should not be composited. Generally, the number and type of samples to be taken depend upon the width of the river, depth, discharge, and the suspended sediment the river transports. The greater number of individual points that are sampled, the more likely that the composite sample truly will represent the overall characteristics of the water.

In small streams less than about 20 feet wide, a sampling site can generally be found where the water is well mixed. In such cases, a single grab sample taken at mid-depth in the center of the channel is adequate to represent the entire cross section.

For larger streams, at least one vertical composite should be taken with one sample each from just below the surface, at mid-depth, and just above the bottom. Measurements of dissolved oxygen (DO), pH, temperature, conductivity, etc., shall be made on each aliquot of the vertical composite and on the composite itself. For rivers, several vertical composites should be collected.

4.3.2 Lakes, Ponds, and Reservoirs

Lakes, ponds, and reservoirs have a much greater tendency to stratify than rivers and streams do. The relative lack of mixing requires that a high number of samples be obtained to adequately represent the overall characteristics of the water body.

The number of water sampling sites on a lake, pond, or impoundment will vary with the size and shape of the basin. In ponds and small lakes, a single vertical composite at the deepest point may be sufficient. Similarly, measurements of DO, pH, temperature, etc., are to be conducted on each aliquot of the vertical composite. In naturally formed ponds, the deepest point may have to be determined empirically; in impoundments, the deepest point is usually near the dam.

In lakes and larger reservoirs, several vertical composites should be composited to form a single sample. These verticals are often taken along a transect or grid. In some cases, it may be of interest to form separate composites of epilimnetic and hypolimnetic zones. In a stratified lake, the epilimnion is the upper, warmer, and less dense layer of lake water (above the thermocline) that is exposed to the atmosphere. The hypolimnion is the lower, "confined" layer that is only mixed with the epilimnion and vented to the atmosphere during seasonal "overturn" (when density stratification disappears). These two zones thus may have very different concentrations of contaminants if input is only to one zone, if the contaminants are volatile (and therefore vented from the epiliminion but not the hypolimnion), or if the epilimnion only is involved in short-term flushing (i.e., inflow from or outflow to shallow streams). Normally, however, a composite consists of several verticals with samples collected at various depths.

In lakes with irregular shape and with bays and coves that are protected from the wind, separate composite samples may be needed to adequately represent water quality since it is likely that only poor mixing will occur between these areas. Similarly, additional samples should be taken where discharges, tributaries, land-use characteristics, and other such factors are suspected of influencing water quality.

Most lake measurements should be made in-situ using sensors and automatic readout or recording devices. Single and multiparameter instruments are available for measuring temperature, depth, pH, oxidation-reduction potential, specific conductance, dissolved oxygen, some cations and anions, and light penetration.

4.3.3 Estuaries

Estuarine areas are by definition zones where inland fresh waters (both surface and ground) mix with oceanic saline waters. Estuaries are generally categorized into three types, depending on freshwater inflow and mixing properties. Knowledge of the estuary type is necessary to determine sampling locations. Following are the three types of estuaries:

- Mixed estuary—characterized by the absence of a vertical halocline (gradual or no marked increase in salinity in the water column) and a gradual increase in salinity seaward. Typically this type of estuary is shallow and is found in major freshwater sheetflow areas. Since they are well mixed, the sampling locations are not critical in this type of estuary.

- Salt wedge estuary—characterized by a sharp increase in salinity with depth and stratified freshwater flow along the surface. In these estuaries, the vertical mixing forces cannot override the density differential between fresh and saline waters. In effect, a salt wedge tapering inland moves horizontally, back and forth, with the tidal phase. If contamination is being introduced into the estuary from upstream, water sampling from the salt wedge may miss it entirely.

- Oceanic estuary—characterized by salinity approaching full-strength oceanic waters. Seasonally, freshwater inflow is small, with the preponderance of the fresh-saline water mixing occurring near, or at, the shoreline.

Sampling in estuarine areas is normally based upon the tidal phases, with samples collected on successive slack tides (i.e., when the tide turns). Estuarine sampling programs should include vertical salinity measurements at 1- to 5-foot increments coupled with vertical DO and temperature profiles.

4.3.4 Sampling Equipment and Techniques

The selection of sampling equipment depends on the site conditions and sample type required. In addition, the chemical compatibility of the sampling equipment with the constituents of concern must be addressed prior to initiating the sampling program. The following are the most frequently used samplers:

- Open-mouth bottle sampler (dip sampler)
- Weighted bottle sampler
- Hand pump
- Thief samplers
- Depth-Integrating sampler

The open-mouth bottle sampler (dip sampler) and the weighted bottle sampler are used most often.

The criteria for selecting a sampler include the following:

- Disposable and/or easily decontaminated

- Inexpensive (if the item is to be disposed of)

- Ease of operation, particularly if personnel protection required is above Level D

- Nonreactive/noncontaminating—Teflon®-coated, glass, stainless steel, or PVC sample chambers are preferred (in that order)

Each sample (grab or each aliquot collected for compositing) should be measured for the following:

- Specific conductance
- Temperature
- pH (optional)
- DO (optional)

These items should be measured for as soon as the sample is recovered. These analyses will provide information on water mixing/stratification and potential contamination.

Open-Mouth Bottle Sampling (Dip Sampling)

Water is often sampled by filling a container, either attached to a pole or held directly, from just beneath the surface of the water (a dip or grab sample [Figure 1]). Constituents measured in grab samples are only indicative of conditions near the surface of the water and may not truly represent the total concentration distributed throughout the water column and in the cross section. Therefore, dip samples should be augmented whenever possible with samples that represent both dissolved and suspended constituents and both vertical and horizontal distributions.

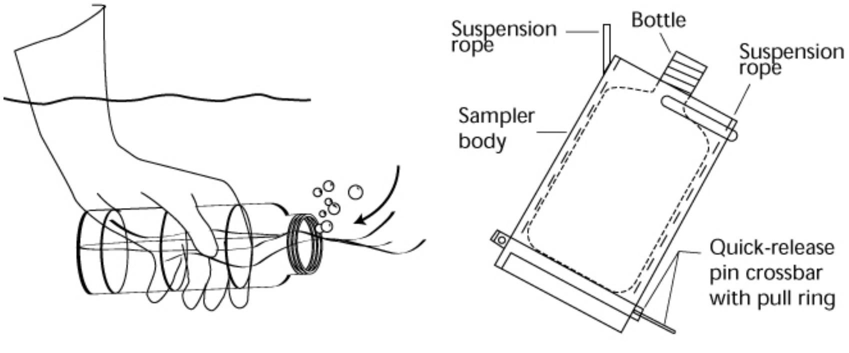
Sample bottles containing preservatives should never be used to directly collect surface water samples.

Weighted Bottle Sampling

A grab sample can also be taken using a weighted holder that allows a sample to be lowered to any desired depth, opened for filling, closed, and returned to the surface. This allows discrete sampling with depth. Several of these samples can be combined to provide a vertical composite. Alternatively, an open bottle can be lowered to the bottom and then raised to the surface at a uniform rate. In this manner the sample will be collected throughout the depth interval and will be filled just before it reaches the surface. Using either method, the resulting sample will roughly approach what is known as a depth-integrated sample.

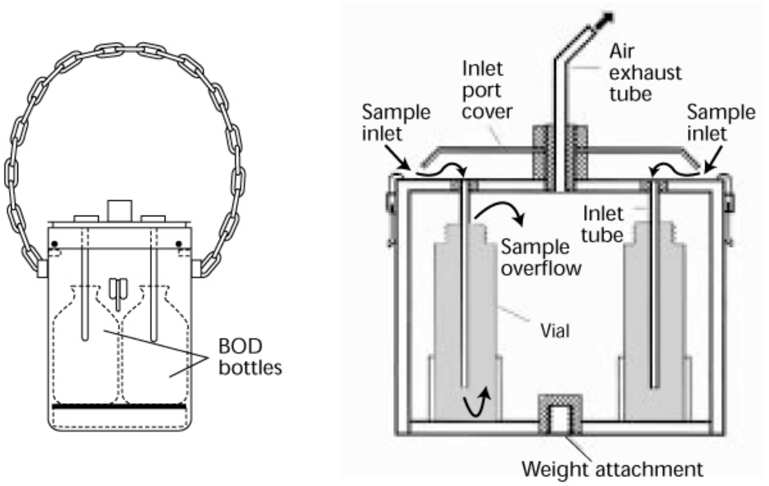
A closed, weighted bottle sampler consists of a stoppered glass or plastic bottle, a weight and/or holding device, and lines to open the stopper and lower or raise the bottle (Figure 1). The procedure for sampling is:

1. Gently lower the sampler to the desired depth so as not to remove the stopper prematurely (watch for bubbles).
2. Pull out the stopper with a sharp jerk of the sampler line.
3. Allow the bottle to fill completely, as evidenced by the cessation of air bubbles.
4. Raise the sampler and cap the bottle
5. Decontaminate the outside of the bottle. The bottle can be used as the sample container (as long as original bottle is an approved container).



A. Hand-held open-mouth bottle sampler

B. US WBH-96 weighted bottle sampler



C. BOD sampler

D. VOC sampler

Not to scale

Figure 1 Examples of Open Mouth Samplers

(Source: USGS, 1997-1999)

Hand Pumps

Hand pumps may operate by peristaltic, bellows, diaphragm, or siphon action. Hand pumps that operate by bellow, diaphragm, or siphon action should not be used to collect samples that will be analyzed for volatile organics because the slight vacuum applied may cause loss of these contaminants. To avoid contamination of the pump, a liquid trap consisting of a vacuum flask or other vessel to collect the sample should be inserted between the sample inlet hose and the pump.

Tubing used for the inlet hose should be nonreactive (preferably Teflon®). The tubing and liquid trap must be thoroughly decontaminated between uses (or disposed of after one use).

When sampling, the tubing is weighted and lowered to the desired depth. The sample is then obtained by operation of the pump, and subsequently transferred from the trap to the sample container.

Thief Samplers

Thief samplers are used to collect “point” samples from a specific depth. Examples of thief samplers include Kemmerer and Van Dorn samplers, and double check-valve bailers (Figure 2). The Kemmerer sampler is a brass cylinder with rubber stoppers that leave the ends open while being lowered in a vertical position to allow free passage of water through the cylinder. The Van Dorn sampler is plastic and is lowered in a horizontal position. In both the Kemmerer and Van Dorn samplers, a "messenger" is sent down the line when the sampler is at the designated depth, to cause the stoppers to close the cylinder, which is then raised. A double check-valve bailer is similar to a Kemmerer sampler in that it allows free passage of water through the cylinder until the desired sampling depth is reached. However, the check valves automatically close when the bailer is retrieved. Water is removed through a valve to fill sample bottles.

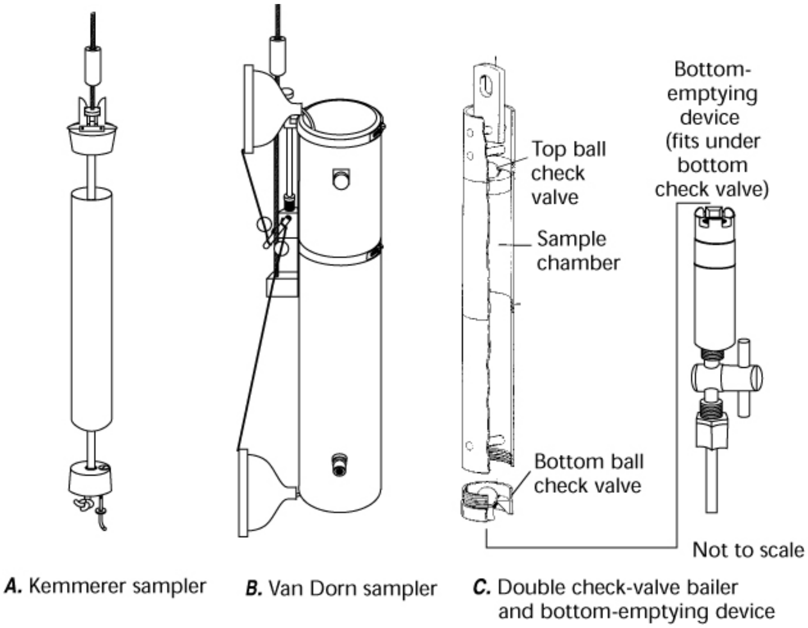


Figure 2 Examples of Thief Samplers

(Source: USGS, 1997-1999)

Depth-Integrated Sampling

Depth integration is used to collect a water and suspended material sample, in direct proportion to relative velocity at each increment of depth. This means that the volume of water and suspended material must enter the sample bottle at a rate proportional to the velocity of the flow passing the intake of the sampler. If a depth-integrating sampler is lowered from the surface to the bed and back at the same rate, and presuming that the sampler is not overfilled during the course of the sampling operation, each increment of flow in that vertical is sampled proportionately to the velocity. The minimum stream velocity must be greater than 1.5 feet per second (ft/s) for a depth-integrated sampler with a rigid bottle, or greater than 3.0 ft/s for a depth-integrated sampler with a bag (USGS, 1998).

One method of collecting depth-integrated samples is the EWI technique. Samples are taken at several equally spaced verticals across the stream, with the transit rate of the sampler (that is, the velocity at which the sampler is passed through the water column) the same in all verticals. The samples collected in each vertical are then composited into a single sample representative of the entire flow in the cross section. Because the volume collected in each vertical sample will be directly in proportion to depth and velocity at the vertical location, the composite sample of the water-sediment mixture flowing in the cross section will be discharge-weighted.

In the EDI technique, the positions of sampling verticals across the stream are based on incremental discharges rather than width (i.e., deeper or higher velocity areas of the stream cross section are sampled at a closer spacing). This method provides the most accurate measure of total discharge of the contaminant for streams that are not well mixed; however, it requires knowledge of the cross-sectional stream flow distribution.

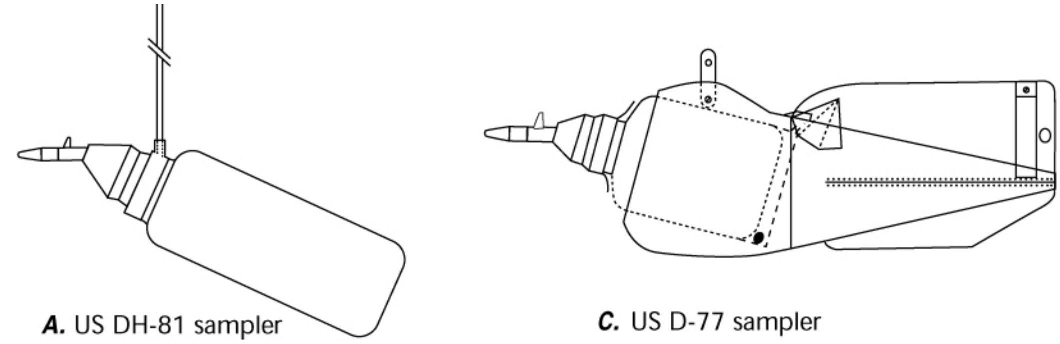
The EDI method has these advantages: variable transit rates may be used because samples can be composited in proportion to known stream flow distribution, fewer verticals need to be sampled, and cross-section discharge information is obtained. The primary disadvantage of the method is that the streamflow distribution in the cross section must be known or measured each time before sampling.

The EWI method has these advantages: discharge measurements are not needed, the technique is learned easily, and the technique is applicable where cross-sectional stream flow distribution varies because of shifting beds or other causes. The main disadvantages are that the procedure is time consuming for large streams and does not provide quantitative information on cross-sectional discharge because this parameter does not need to be measured for the EWI method. Furthermore, the EWI method requires sampling at equally spaced verticals and use of identical transit rates within each vertical.

Because these multi-point sampling techniques can become very time consuming and expensive, an alternate method often used involves sampling at the quarter points or other equal intervals across the width of the stream. Composites of individual samples collected at the quarter points can be fairly representative, providing the stream cross section is properly located.

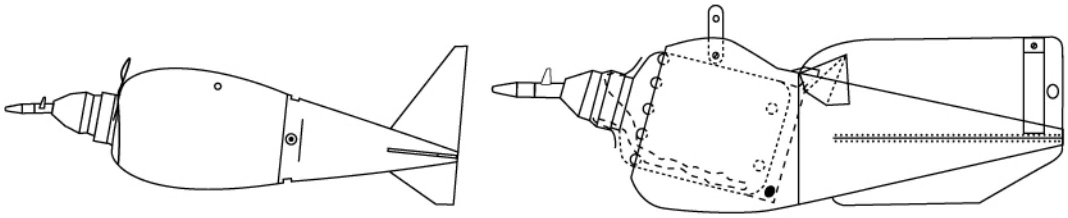
Several depth-integrating samplers specifically designed and suitable for collecting representative samples are available and include the US DH-81, US DH-95, US DH-77 samplers (Figure 3). US DH-81 or US DH-95 samplers can be used where flowing water can be waded or where a bridge is accessible. The US DH-77 (or the D-77 Bag, or Frame-Bag sampler) is a cable-and-reel sampler for use when flowing water cannot be waded.

Because of the number and diversity of analyses that may be performed on collected surface water or water-sediment mixtures, a sample splitter will often be required. A churn splitter is a practical means for splitting composited samples into representative subsamples.



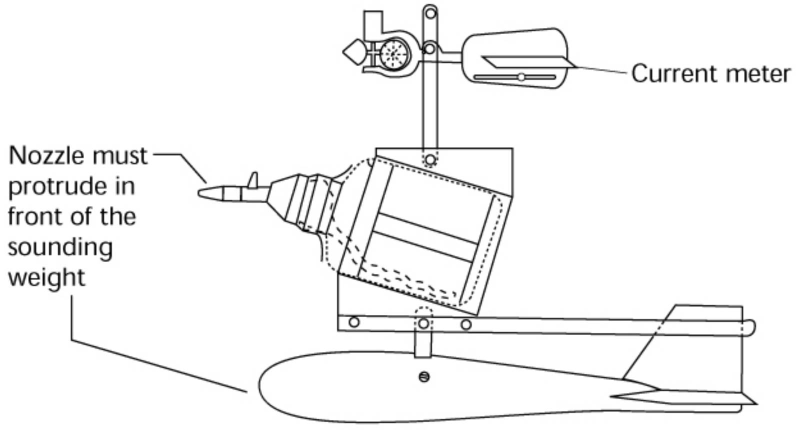
A. US DH-81 sampler

C. US D-77 sampler



B. US D 95 sampler

D. D-77 bag sampler
(current meter not attached)



E. Frame-bag sampler with sounding weight
(current meter attached)

Not to scale

Figure 3 Depth-Integrating Samplers

(Source: USGS, 1997-1999)

5.0 REFERENCES

Feltz, H.R., 1980. *Significance of Bottom Material Data in Evaluating Water Quality in Contaminants and Sediments*. Ann Arbor, Michigan, Ann Arbor Science Publishers, Inc., Vol. 1, pp. 271-287.

Kittrell, F.W., 1969. *A Practical Guide to Water Quality Studies of Streams*. U.S. Federal Water Pollution Control Administration, Washington, D.C., 135 pp.

U.S. Environmental Protection Agency, 1980. *Standard Operating Procedures and Quality Assurance Manual*. Water Surveillance Branch, USEPA Surveillance and Analytical Division, Athens, Georgia.

U.S. Geological Survey, 1997-1999. *National Field Manual for the Collection of Water-Quality Data*. U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chaps. A1-A9, 2 v., variously paged. (Chapters were published from 1997-1999; updates and revisions are ongoing and can be viewed at http://water.usgs.gov/owq/FieldManual/mastererrata.html).

Appendix G

Summary of Santa Rosa Basin Pumping East of Baily Fault

Table F-1
Summary of Santa Rosa Basin Pumping East of Baily Fault
(all units in acre-feet)

Local ID	SRMWC No.9	Snow	Ventura Farms	Penny	SRMWC No.10	Conejo 2	Conejo 1	Conejo 3	SRMWC No.8	SRMWC No.3	Conejo 4	Total	Notes
State ID	**021919P2**	**021920M1**	**021920M3**	**021920M4**	**022024Q3**	**022025C1**	**022025C2**	**022025C5**	**022025C6**	**022025D1**	**022025C07**		
1955												3,967	No well records exist. Totalized values digitized from Figure 2.11 of Final Draft Report on Santa Rosa Groundwater Basin Management Plan by Boyle, 1987
1956												4,078	
1957												3,508	
1958												2,933	
1959												5,204	
1960												4,610	
1961												5,235	
1962												3,459	
1963												3,973	
1964												4,561	
1965												2,633	
1966												3,894	
1967												3,741	
1968												4,261	
1969												2,388	
1970												2,376	
1971												3,422	
1972												3,860	No well records exist. Totalized values digitized from Table 2-1 in Final Draft Report on Santa Rosa Groundwater Basin Management Plan by Boyle, 1987
1973												3,460	
1974												3,540	
1975												3,200	
1976												2,940	
1977												2,870	
1978												2,540	
1979												3,090	
1980												2,870	
1981												3,340	
1982												2,780	
1983												2,710	
1984												ND	No data exists
1985												ND	No data exists
1986	85.8	349.3	154.1	124.8		1,465.3	794.1		232.6	244.8		3,451	Well Extraction Data in: Santa Rosa Basin Groundwater Management Plan, Boyle Engineering Corporation, April 24, 1997 Note the 1996 Record from January to July
1987	60.3	364.5	216.2	183.1		1,458.3	727.2		236.7	193.0		3,439	
1988	65.8	50.2	296.2	34.4		1,326.9	219.2		249.5	200.7		2,443	
1989		181.2	386.1	126.0		1,218.3			239.1	198.0		2,349	
1990			513.3			966.4	147.0		218.9	190.0		2,036	
1991			451.7			601.0	323.6	98.3	168.9	256.3		1,900	
1992	22.7		349.7			802.9	396.3	145.8	141.1	278.1		2,137	
1993	61.6		278.2		80.0	853.7	388.4	1,048.3	350.1	116.8		3,177	
1994	86.8		466.6		69.0	803.4	293.2	1,361.4	308.0	69.0		3,457	
1995	124.9		380.6		139.5	867.7	22.3	1,371.5	286.3	73.5		3,266	
1996	72.2		186.4		129.1	38.2	-	903.4	210.3	55.8		1,595	
1997						165.4		270.9			626.4	1,063	*Record from July to December
1998						576.5		991.8			958.4	2,527	
1999						705.5		1,356.2			599.2	2,661	
2000						784.6		1,268.6			280.4	2,334	
2001						354.1		905.4	**421.5***		855.9	2,115	*Four (4) months of record
2002					**2.4***	574.7		944.9	1,342.9		-	2,863	*One (1) month of record
2003					595.0	440.7		749.6	1,250.4		510.5	3,546	
2004					276.0	328.4		628.7	1,190.8		381.0	2,805	
2005					300.7	270.9		705.6	1,204.1		384.4	2,866	
2006					336.1	272.0		795.7	1,275.3		481.8	3,161	
2007					335.9	530.9		837.9	1,190.8		266.4	3,162	
2008	**422.6***				701.9	661.1		485.0	1,095.7		683.0	4,049	*Eight (8) months of record
2009	547.3				329.1	260.1		726.9	1,206.9		88.6	3,159	
2010	467.1				264.3	203.9		561.6	658.6	**10.8***	145.9	2,312	*Two (2) months of record
2011	554.5				249.7	247.6		548.8	726.9	243.6	187.8	2,759	
2012	**559.9***				**156.3***	**315.2***		**826.9***	**1118.4***	**180.6***	**92.9***	3,250	*Eleven (11) months of record

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APPENDIX G: *VENTURA CITIES AND COUNTY 2040 POPULATION ESTIMATE*

The *Ventura Cities and County 2040 Population Forecast* can be found here:

https://docs.vcrma.org/images/pdf/planning/demographics/2040_revised_Decapolis%205_23_08_Final.pdf

APPENDIX H: FCGMA RESOLUTION 2014-01

Fox Canyon Groundwater Management Agency Resolution 2014-01 Establishing the Conejo Creek Water Pumping Program Involving Camrosa Water District and Pleasant Valley County Water District Using the Conejo Creek Diversion

Resolution 2014-01
of the
Fox Canyon Groundwater Management Agency

A RESOLUTION ESTABLISHING THE CONEJO CREEK WATER PUMPING PROGRAM INVOLVING CAMROSA WATER DISTRICT AND PLEASANT VALLEY COUNTY WATER DISTRICT USING THE CONEJO CREEK DIVERSION

WHEREAS, the Fox Canyon Groundwater Management Agency Ordinance Code allows an operator to obtain storage credits for water that has been determined by the Agency Board to be foreign water stored.

WHEREAS, Calleguas Municipal Water District ("Calleguas"), Camrosa Water District ("Camrosa"), the City of Thousand Oaks, and Pleasant Valley County Water District ("Pleasant Valley") entered into various agreements to cooperate in the appropriation and beneficial use of the recycled water and recaptured water, including the construction and operation of facilities ("Conejo Creek Project" or "Project") to convey recycled water and recaptured water (collectively, "Project Water") to Camrosa and Pleasant Valley.

WHEREAS, among the agreements referenced above was an agreement between Calleguas and Pleasant Valley in 1994 setting forth the terms by which Pleasant Valley may purchase from Calleguas certain Project Water diverted through the Project to Pleasant Valley for utilization within Pleasant Valley's jurisdictional boundaries ("1994 Agreement").

WHEREAS, the 1994 Agreement provided that certain credits may accrue to Pleasant Valley under Fox Canyon Groundwater Management Agency ("Agency") ordinances and that Pleasant Valley shall transfer, in accordance with Agency ordinances, an acre-foot of credits as earned to Calleguas for each acre-foot of water delivered to Pleasant Valley from the Conejo Creek Project.

WHEREAS, the Agency Board in May 28, 2003, determined, approved and conditioned that water diverted by the Conejo Creek Project is foreign water and that deliveries of surface water from the Conejo Creek Project to Pleasant Valley's storage reservoir qualify for credits.

WHEREAS, under the 2003 approved program, credits earned by Pleasant Valley for deliveries of Conejo Creek Project water to meet local irrigation demands in lieu of groundwater pumping were transferred from Pleasant Valley to Calleguas Municipal Water District which may in turn transfer those credits to United Water Conservation District ("United") under the Supplemental M&I Water Program.

WHEREAS, Calleguas and United intend to continue to utilize credits through the Supplemental M&I Program, but Calleguas wishes to terminate its future participation in the Conejo Creek Project and cease accruing additional credits after the 1994 Agreement is terminated.

WHEREAS, Camrosa and Pleasant Valley propose to enter into an agreement by which Camrosa will sell Conejo Creek Project Water to Pleasant Valley ("Water Sale Agreement").

The substantive provisions of the Water Sale Agreement generally mirror the provisions of the 1994 Agreement.

WHEREAS, the proposed Water Sale Agreement provides that, subject to Agency approval, Pleasant Valley shall transfer to Camrosa, pursuant to applicable Agency rules and regulations, credits as earned for each acre-foot of water delivered to Pleasant Valley from Camrosa through the Conejo Creek Project

WHEREAS, the Conejo Creek Project is recognized in the Agency's Groundwater Management Plan as one of several strategies for bringing the aquifers of the Agency into balance, and the proposed Water Sale Agreement will help ensure that Project Water will continue to be utilized by Pleasant Valley.

WHEREAS, the Agency Ordinance Code authorizes the adjustment of extraction allocations consistent with the goal of reaching safe yield.

WHEREAS, an Impact Analysis (Analysis), dated December 12, 2013, concludes: 1) Deliveries of Conejo Creek Project water to Pleasant Valley have significantly reduced groundwater pumping by Pleasant Valley; 2) Conejo Creek Project water has the added benefit of being drought-proof because of its component of recycled water; 3) Pumping is moved away from the pumping depression and the coast to a more-inland area of better stormwater recharge; 4) Without the agreement, Conejo Creek Project water is delivered elsewhere and Pleasant Valley pumping would increase to replace that water source, resulting in a further drop of groundwater elevations; and 5) thus, the Conejo Creek Water Pumping Program is a net advantage to the basin.

WHEREAS, to the extent that cumulative extractions by Camrosa never exceed deliveries to Pleasant Valley, the proposed Water Sale Agreement will result in a net benefit to the Pleasant Valley Basins.

NOW, THEREFORE, IT IS HEREBY ORDERED AND RESOLVED THAT:

1. The Board approves the Conejo Creek Water Pumping Program involving Camrosa Water District and Pleasant Valley County Water District using the Conejo Creek Diversion.

2. Camrosa's cumulative pumping extractions through this program shall never exceed the cumulative deliveries to Pleasant Valley through this program. *The transfer of credits between Pleasant Valley and Camrosa is approved, as set forth in the Pleasant Valley/Camrosa agreement attached hereto and made a part hereof by reference."*

3. Camrosa will actively meter extraction quantity and monitor:

    a. Water levels: Transducers in the Woodcreek Well and any new well Camrosa constructs in the PV Basin will record water levels on at least a monthly basis.
    b. Water quality: Camrosa will monitor at least annually the water quality of the Woodcreek Well and any new wells that are part of this Resolution.

4. Camrosa shall submit an Annual Report to the Agency by February 1st each year, which shall include:

   a. Conejo Creek Project water delivery amounts to Pleasant Valley;
   b. Credits retired in accordance with deliveries to Pleasant Valley;
   c. Camrosa's cumulative deliveries to Pleasant Valley;
   d. Well extractions under this program;
   e. Water quality data;
   f. Historical and past year water level well data from Camrosa's Pleasant Valley basin well(s); and
   g. Drawdown analysis from extractions.

5. For the purpose of determining net impacts to the basin as a result of this agreement the Agency and Camrosa shall meet during the first week of May annually to review the contents of the Annual Report and its conclusion. If there are disagreements with the findings of net detriment, the matter may be referred to the FCGMA Board.

6. Camrosa will incrementally phase in extractions as follows:

   a. Calendar Year 2014: Extractions will be limited to 200 AF.
   b. Calendar Year 2015: Extractions will be limited to 1,000 AF.
   c. Calendar Year 2016: Extractions will be limited to 2,000 AF.
   d. Calendar Year 2017: If monitoring data indicates the basin will support it, extractions will be limited to 3,000 AF.
   e. Calendar Year 2018: If monitoring data indicates the basin will support it, extractions will be limited to 4,500 AF.
   f. All subsequent years: If monitoring data indicates the basin will support it, extractions will be limited to 4,500 AF annually.

7. Camrosa shall extract from Camrosa-owned wells and may supply groundwater so extracted within its service territory in accordance with Agency Resolution No. 2011-01.

8. The extractions referenced in this agreement are in addition to Camrosa's existing 806 AF yearly allocation currently being pumped at Woodcreek Well. The existing 806 AF allocation will be the first utilized for extraction.

9. This resolution will terminate on the same date as the agreement between Camrosa and Pleasant Valley regarding this program or 30 days after mutual agreement between the Agency and Camrosa.

On motion of Director Craven, seconded by Director Bennett, the foregoing resolution was passed and adopted on this 26th day of March 2014.

By: ______________________
Lynn E. Maulhardt, Chair, Board of Directors
Fox Canyon Groundwater Management Agency

ATTEST: I hereby certify that the above is a true and correct copy of Resolution No. 2014-01.

By: ______________________
Jessica Kam, Clerk of the Board

APPENDIX I: RECYCLED WATER SALES/PURCHASE AGREEMENTS

Included in this appendix are the purchase agreement between Camrosa and the City of Thousand Oaks for Hill Canyon Treatment Plant effluent diverted at the Conejo Creek Diversion Facility; the sales agreement for that water between Camrosa and the Pleasant Valley County Water District; and the purchase agreement for recycled water between Camrosa and the City of Camarillo/Camarillo Sanitary District.

Agreement Between the City of Thousand Oaks and the Camrosa Water District for the Beneficial Use of Water Pursuant to State Water Resources Control Board Water Right Decision 1638

This Agreement is entered into this 28 the day of May, 2013 by and between the City of Thousand Oaks, a California general law city (hereinafter referred to as "***City***"); and the Camrosa Water District, a county water district organized under the County Water District Law of the State of California (hereinafter referred to as "***Camrosa***").

RECITALS

A. The City and Camrosa have a common interest in maximizing the beneficial use of waters available for appropriation as described in the State Water Resources Control Board Water Right Decision 1638 and corresponding Water Right Permit 20952 issued by the State Water Resources Control Board to the City (hereinafter referred to as "***City Water Rights***").

B. The City and Camrosa have cooperated in harmonizing the legal, institutional, financial, and operational aspects of their joint relationships to maximize the use of water made available under the City Water Rights.

C. The City and Camrosa acknowledge that cooperatively they can most effectively maximize the beneficial use of the water available under the City Water Rights.

D. In anticipation of the State Water Resources Control Board's Water Right Decision 1638 and based on the City's original Water Right application, first the City and the Calleguas Municipal Water District ("***Calleguas***"), and then Calleguas and Camrosa, executed agreements to cooperate in the appropriation of water pursuant to the pending water right decision. Subsequent to the State Water Resources Control Board's Water Right Decision 1638, but prior to appropriation of water under Water Right Permit 20952, the City and Calleguas renegotiated their previous agreement incorporating portions of Water Right Decision 1638 and portions of the City's original water right application. Camrosa and Calleguas continued to operate under their previous agreement.

E. With Camrosa's assumption of full operation of the physical facilities necessary to appropriate the water pursuant to the City Water Rights, and the recoupment of Calleguas' capital investment in said facilities, the City, Calleguas and Camrosa have proven amenable to Calleguas ceding any and all control over or participation in the operation and management of said facilities, as outlined in any previous agreement pertaining thereto, and the City and Camrosa desire to re-establish and consolidate the terms of their contractual relationship consistent with the City Water Rights and the parties' relative roles in developing the City Water Rights.

F. In re-establishing the terms under this Agreement, the parties wish to make this Agreement substantially cost or revenue neutral to all parties as compared to the terms of the previous agreements. This Agreement shall be interpreted consistent with this purpose.

G. The parties acknowledge that through their cooperation to maximize the beneficial use of the waters available for appropriation under the City Water Rights, they have developed a water resource with regional significance.

NOW, THEREFORE, IT IS AGREED as follows:

1. Definitions

For the purposes of this Agreement, the following definitions shall apply:

a. "***City Measurement Station***" shall refer to the flume and measurement apparatus placed by the City below the confluence of the north and south forks of the Arroyo Conejo to measure the combined flows from the Hill Canyon Wastewater Treatment Plant and water flowing downstream from the forks of the Arroyo Conejo. This facility is owned and operated by the City.

b. "***Camrosa Diversion***" shall refer to the Conejo Creek Diversion structure located downstream and adjacent to the U.S. Highway 101 bridge over Conejo Creek and designated by Decision 1638 as the point of diversion for water appropriated pursuant to any water right or license pursuant to Water Right Decision 1638. This facility is owned and operated by Camrosa.

c. "***PVCWD Pipeline***" shall refer to the pipelines constructed by Camrosa and Calleguas which extend from the Camrosa Storage Ponds pump station to the point of connection to the intersection of Laguna Road and Las Posas Road. This pipeline is owned and operated by Camrosa.

d. "***Camrosa Storage Ponds***" shall refer to Camrosa's ponds located east of Conejo Creek and adjacent to Old Dairy Road.

e. "***Camrosa/Pleasant Valley Metering Stations***" shall refer to the water metering station where water is metered for delivery into the Pleasant Valley County Water District's (PVCWD) irrigation water distribution system and any other meters connected to the Camrosa pipeline delivering water to the service area of PVCWD. These facilities are owned and operated by Camrosa.

f. "***CFS***" shall mean cubic feet per second, a measurement of flowing water, which on a continuous basis equates to 724 acre feet per year, or 0.646 million gallons per day.

g. "***City Water Rights***" shall refer to the City's Water Right Permit 20952 issued by the State Water Resources Control Board pursuant to Water Right Decision 1638, and any subsequent license granted by the State Water Resources Control Board relating to the same.

2. Cooperation and Diligence in Perfecting Water Right License and Sharing Records

The parties agree to cooperate and exercise due diligence in meeting the requirements of the City Water Rights as specified below: (See Exhibit A for Calendar of routine actions required by the City's Water Rights and this Agreement)

a. The City shall be responsible for submitting such documentation to the State Water Resources Control Board as required to comply with Water Right Permit 20952, including without limitation Section 6 regarding complete application of water authorized by said Permit by December 31, 2025 or any extension granted thereto. In the event that the parties concur that additional water could be applied to beneficial use within the quantities limited by Water Right Permit 20952, Section 5; the City shall be responsible for petitioning the State Water Resources Control Board for an extension for a reasonable amount of time to put the full quantity of water provided by Water Right Permit 20952 to beneficial use.

b. The City shall be responsible for submitting annual progress reports to the State Water Resources Control Board to comply with Water Right Permit 20952, Sections 15 and 16. The City shall provide copies of said progress reports to Camrosa.

c. Camrosa shall keep metered records of dates of diversion, quantity of water diverted, and records documenting the bypass flow as required by Water Right Permit 20952, Sections 15 and 16, regarding quantification of flows. Such records shall be made available to the City for use in submitting its annual progress report above or as necessary to document water use under Water Right Permit 20952.

d. Camrosa shall be responsible for submitting to the State Water Resources Control Board all reports documenting compliance with Water Right Permit 20952, Section 12, regarding water use efficiency and conservation. Camrosa shall provide copies of said reports to the City.

e. The parties agree to share and provide the documents and information specified on Exhibit A attached to this Agreement and such other documents and information as the parties deem reasonably necessary to maximize the water available under Water Right Permit 20952. It is the obligation of the City to timely advise Camrosa in writing of any such documents and information which are not specifically required in this Agreement.

3. Basis for Water Available for Sale

The City Water Rights provide the basis for the water available for sale by the City. Under Decision 1638, the quantity of water that the parties may put to beneficial use is described in terms of streamflow available at the Camrosa Diversion. That streamflow is quantified as:

Effluent discharged from the Hill Canyon Wastewater Treatment Plant

minus 2.0 CFS to account for channel losses en route to the point of diversion

minus 2.0 CFS dedicated by City to protect instream environmental resources

plus 4.0 CFS when the total streamflow at the Camrosa Diversion is greater than the sum of the effluent discharged from the Hill Canyon Treatment Plant plus the required downstream bypass of 6.0 CFS

minus 0.82 CFS to satisfy downstream Water Right License #12598, up to 306 acre feet per year.

As a practical matter, given the technical constraints in the continuous measurement and reconciliation of real-time flows, and various complicating factors, the parties agree that a reasonable and rational translation of Water Right Decision 1638's quantification of the City's Water Rights for the purposes of this Agreement is described in Section 4. Notwithstanding the foregoing, the City acknowledges and agrees that the City is ultimately responsible for maintaining the City's Water Rights including compliance with Water Right Decision 1638.

4. Quantification of Water Available for Sale

For the purposes of this Agreement, the parties agree that the water available for sale shall be determined annually and quantified as follows:

Twelve times the average monthly streamflow recorded at the City Measurement Station for the months of June, July, and August of the preceding year

minus 1448 acre feet to account for 2.0 CFS channel losses between the City Measurement Station and the Camrosa Diversion *minus* 4344 acre feet to account for 6.0 CFS bypass downstream from the Camrosa Diversion

minus 306 acre feet to account for Water Right License #12598 downstream from the Camrosa Diversion (see Exhibit B for example calculation of water available).

5. Availability of Water and Purchase Commitments Among the Parties

   a. The City agrees to make available to Camrosa the total quantity of water available for sale as quantified in Section 4. Camrosa agrees to purchase from the City all such water made available to Camrosa under this Agreement for the price determined under Section 6 of this Agreement.

   b. Camrosa agrees to make the 6.0 CFS bypass releases downstream of the Camrosa Diversion as quantified in Section 4.

   c. Pursuant to Water Right Decision 1638, all water made available under this Agreement is limited to use within the boundaries of Camrosa and within the boundaries of the PVCWD.

6. Cost for Water Made Available

   a. The unit price per acre foot of water covered under this Agreement upon the Effective Date of this Agreement is $104.89 per acre foot.

   b. On September 1st of each year, the parties agree to adjust the unit price per acre foot of water as described in subsections c and d below.

   c. The adjusted unit price per acre foot of water shall be determined by adjusting the previous year's unit price per acre foot of water by the annual percentage change from the preceding July to July period in the Consumer Price Index (Los Angeles-Riverside-Orange County, All Urban Consumers) as published by the U.S. Bureau of Labor Statistics (See Exhibit B for sample calculation). Notwithstanding the foregoing, in no event shall the adjusted unit price be more than 107% of the previous year's unit price and in no event shall the adjusted unit price be less than 93% of the previous year's unit price.

   d. The adjusted unit price so determined shall then be the amount per acre foot applied to the water available for sale, as quantified pursuant to Section 4, until the next September adjustment.

7. Costs Related to the Operation and Maintenance of Facilities (See Exhibit C for map of facilities).

a. The City agrees to operate and maintain the City Measurement Station at its sole expense.

b. Camrosa agrees to operate and maintain the Camrosa Diversion, Camrosa Storage Ponds, and the related pump station at the Camrosa Storage Ponds at its sole expense.

c. Camrosa agrees to operate and maintain the PVCWD Pipeline. Routine maintenance of this pipeline will be at Camrosa's sole expense and shall include routine inspection and surveillance of pipeline right-of-way, valves, and other appurtenances and first response to reported emergencies.

8. Water Quality and Quantity Limitation

a. The parties acknowledge that the City cannot guarantee to Camrosa the quality of water downstream of the City Measurement Station. Camrosa agrees to hold the City harmless from any and all claims, lawsuits, demands, judgments or other liability arising out of, directly or indirectly, the use of the water delivered under this Agreement, including but not limited to impurities, pollution, or chemicals which may be introduced downstream of the City Measurement Station into the water made available under this Agreement.

b. The City agrees to exercise its best efforts to comply with the requirements of its National Pollution Discharge Elimination Permit (hereinafter referred to as "***NPDES Permit***") as well as all other applicable Federal, State and County statutes, laws and ordinances regarding the City's discharge of effluent to Conejo Creek and surface waters constituting water made available by the City under this Agreement.

c. In the event that the City cannot treat its effluent substantially to the standards in applicable NPDES Permit or other applicable Federal, State, or County regulation, or in the event that the City is aware of a sewage spill or any other hazardous material introduced into the City's drainage system that would impair the quality of water subject to this Agreement, the City will immediately notify Camrosa by telephone. In particular, in the event that any substance listed pursuant to Public Health and Safety Code Section 25249.8 is discharged, the City shall immediately notify Camrosa by telephone. Camrosa shall provide the City at all times a current listing of emergency telephone numbers. The City will further notify by telephone Camrosa when water made available under this Agreement is no longer impaired and available for beneficial reuse.

d. Quantification of water impaired for reuse: Where water made available by the City at the City Measurement Station is rendered unusable for beneficial reuse due to failure to meet its NPDES Permit standards, hazardous materials spills, or standards in its municipal storm water permit, such water will be quantified by the City per day for every day or portion of any day when water is impaired for reuse and a pro-rated credit shall be applied to Camrosa for the cost of water as quantified in Section 6.

e. The parties recognize that certain actions by agencies with statutory authority to regulate the water governed by this Agreement may jeopardize the ability of the parties to place the City Water Rights to beneficial use. Examples of these actions include, but are not limited to: modification of the City Water Rights, new regulation on the use of surface water, or implementation of Clean Water Act standards limiting the beneficial uses of such water or requiring additional treatment facilities. Either party may, upon written notice of such action to the other parties, request consultation among the parties to negotiate such amendments to this Agreement as may be necessary to continue to maximize the beneficial use of water available to the parties under the City Water Rights. To the extent that any action by others limits the ability of the parties to place the City Water Rights to beneficial use, the provisions for payment under this Agreement, to the extent of such limitation, shall be suspended pending renegotiation of this Agreement.

f. The parties recognize that certain other conditions could substantially affect the balance of obligation and benefit among the parties such that the individual interests of one or more of the parties would no longer be rationally related to continued cooperation in maximizing the beneficial use of the water under the terms of this Agreement. Examples of these conditions include, but are not limited to: the inability of either party to deliver water due to distribution or treatment system failure, regulatory changes, or water quality degradation to the point that it is no longer acceptable to the customer base. In response to such changed conditions, either party may upon written notice of such action to the other party request consultation among the parties to negotiate such amendments to this Agreement as may be necessary to continue to maximize the beneficial use of water available to the parties under the City Water Rights. To the extent that any action by others limits the ability of the parties to place the City Water Rights to beneficial use, the provisions for payment of such water under this Agreement shall be suspended pending renegotiation of this Agreement.

9. Schedule for Payments

   a. City shall bill Camrosa no later than October 1st for payment due for the period twelve months preceding measured from September 1st through August 31st. Payments shall be made to the City by Camrosa on or about November 15 of each year during the term of this Agreement. Payment for the last year (or any partial year) of this Agreement will be based upon the number of full months the water was made available by the City during the last year of the term of this Agreement.

10. Term of the Agreement

The term of this Agreement is forty (40) years from the Effective Date of this Agreement. The parties, by mutual consent, may extend the term of the Agreement for additional five-year periods.

11. Cooperation and Exchange of Information

The parties agree to cooperate, exchange information, and provide the availability of records necessary for the maintenance of the City Water Rights, administration of this Agreement, and operation of associated facilities.

12. Conservation Credits

From the Effective Date of this Agreement, Camrosa agrees to use reasonable efforts to secure conservation credits from the Fox Canyon Groundwater Management Agency for waters delivered by the project which offset the need to extract groundwater from the aquifers within the Fox Canyon Groundwater Management Agency. Camrosa agrees that one-half of the accumulated credits will be made available to the City.

13. Deliveries to PVCWD

Camrosa agrees to use reasonable diligence in providing surplus water, not needed by Camrosa, to the PVCWD.

14. Assignment

The parties agree that this Agreement may not be assigned without the written consent of all of the non-assigning parties.

15. Waiver: Remedies Cumulative

Failure by a party to insist upon the strict performance of any of the provisions of this Agreement by another party, irrespective of the length of time for which such failure continues, shall not constitute a waiver of such parties' rights to demand strict compliance by such other party in the future. No waiver by a party of a default or breach by another party or parties shall be effective or binding upon such party unless made in writing by such party, and no such waiver shall be implied from any omission by a party to take any action with respect to such default or breach. No express written waiver of a specified default or breach shall affect any other default or breach, or cover any other period of time, other than any default or breach and/or period of time specified. All of the remedies permitted or available to a party under this Agreement, or at law or in equity, shall be cumulative and alternative, and invocation of any such right or remedy shall not constitute a waiver or election of remedies with respect to any other permitted or available right or remedy.

16. Construction of Language of Agreement

The provisions of this Agreement shall be construed as a whole according to its common meaning and purpose of providing a public benefit and not strictly for or against any party. It shall be construed consistent with the provisions hereof, in order to achieve the objectives and purposes of the parties. Wherever required by the context, the singular shall include the plural and vice versa, and the masculine gender shall include the feminine or neutral genders or vice versa.

17. Mitigation of Damages

In all situations arising out of this Agreement, the parties shall attempt to avoid and minimize the damages resulting from the conduct of the other parties.

18. Governing Law

This Agreement, and the rights and obligations of the parties, shall be governed and interpreted in accordance with the laws of the State of California.

19. Captions

The captions or headings in the Agreement are for convenience only and in no other way define, limit or describe the scope or intent of any provision or section of the Agreement.

20. Authorization

Each party represents and warrants to the other that the execution, delivery, election to participate in, and performance of this Agreement (i) are within its powers, (ii) has been duly authorized by all necessary actions on its behalf and all necessary consents or approvals have been obtained and are in full force and effect; and (iii) binds said party and its respective administrators, officers, directors, agents, employees, successors, assigns, principals, joint ventures, insurance carriers, and any others who may claim through it under this Agreement.

21. Entire Agreement Between Parties

This Agreement supersedes any other agreements, either oral or in writing, between or among any of the parties hereto with respect to the beneficial use of water available for appropriation pursuant to State Water Resources Control Board Water Right Decision 1638, and contains all of the covenants and agreements between the parties with respect thereto. Any modifications of this Agreement will be effective only if it is in writing and signed by all of the parties to this Agreement.

22. Partial Invalidity

If any provision in this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions will nevertheless continue in full force without being impaired or invalidated in any way. To the extent permissible the illegal or invalid provision shall be modified, amended, or construed to make it legal or valid and carry out the purposes of the parties hereto.

23. Relationship of the Parties

The relationship of the parties to this Agreement shall be that of independent contractors and in no event shall any party be considered a partner, officer, agent, servant or employee of any other party. Without limiting the foregoing, each party agrees to be solely responsible for any workers compensation, withholding taxes, unemployment insurance and any other employer obligations associated with the described work or obligations assigned to them under this Agreement.

24. Notices

Any notice required to be given hereunder shall be deemed to have been given by depositing said notice in the United States mail, postage prepaid, and addressed as follows:

To City:	City of Thousand Oaks Attn: Public Works Director 2100 Thousand Oaks Boulevard Thousand Oaks, CA 91362
To Camrosa:	Camrosa Water District Attn: General Manager 7385 Santa Rosa Road Camarillo, CA 93012

25. Effective Date.

This Agreement shall take effect on September 1, 2013, provided the following events have taken place (the "***Effective Date***"):

a. Upon due approval of this Agreement as required by its governing documents and applicable law, City shall execute this Agreement and deliver a duly executed original to Camrosa; and

b. Upon due approval of this Agreement as required by its governing documents and applicable law, Camrosa shall execute this Agreement and deliver a duly executed original to City; and

c. Upon receipt by Camrosa and City of (1) the Thousand Oaks – Calleguas Termination Agreement duly executed by City and Calleguas, and (2) the Camrosa – Calleguas Termination Agreement duly executed by Camrosa and Calleguas.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the Effective Date in Ventura County, California.

Dated: 6/5, 2013

CAMROSA WATER DISTRICT

By: Tony Stafford
Tony Stafford, General Manager

Dated: __ May 28 ________, 2013

CITY OF THOUSAND OAKS

By: Claudia Bill

Claudia Bill-de la Peña, Mayor

ATTEST:

Antoinette Marr

fr Linda D. Lawrence, City Clerk

APPROVED AS TO ADMINISTRATION:

for

Scott Mitnick, City Manager

APPROVED AS TO FORM:
Office of the City Attorney

Christopher G. Norman

Christopher G. Norman, Assistant City Attorney

Exhibit A
Calendar of Annual Actions
(Agreement Section 2)

The following actions are required by the Agreement between the City of Thousand Oaks and the Camrosa Water District for the Beneficial Use of Water Pursuant to State Water Resources Control Board Water Right Decision 1638.

Month/Action	**Responsible Party**	**Send to**
January		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Water diversion at Camrosa Diversion Annual Report (daily and monthly for the previous calendar year)	Camrosa	City
February, March, April & May		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
June		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Daily stream flows at City Measurement Station	City	Camrosa
Annual Progress Reports to SWRCB (due June 30)	City	SWRCB/Camrosa
July & August (August 31 is end of water year)		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Daily stream flows at City Measurement Station	City	Camrosa
September (1st is beginning of water year)		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Calculate average monthly stream flow based on June, July, and August	City	Camrosa
Calculate the adjusted unit price per acre foot of water (see Agreement Section 6 & Exhibit B)	City	Camrosa
Invoice for previous 12 months water usage, Sep 1-Aug 31 (due October 1- see Agreement Sections 4, 6 & 9, and Exhibit B)	City	Camrosa
October		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Compliance report for Water Right Permit 20952, Section 12 regarding water use efficiency. (every 5th year starting in 2014)	Camrosa	SWRCB/City
November		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Payment by Camrosa to City (due November 15)	Camrosa	City
December		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City

Exhibit B

Example Calculations of Quantity and Cost of Water Available for Sale
(Agreement Sections 4 and 6)

Example water available for sale quantity calculation:

(Example is for period September 1, 2012 through August 31, 2013)

Average daily flow for June, July and August 2012 = 11.48 mgd

Total water quantity = 11.48 mgd average flow x 365 days x 3.07 acre feet /mg = 12,864 acre feet

12,864 acre feet total water quantity
Less 1448 acre feet channel losses
Less 4344 acre feet downstream by-pass
Less 306 acre feet downstream existing water right

Equals 6,766 acre feet total water available for sale

(reduce total water available for sale further per Subsection 8d, if applicable)

Example water available for sale cost calculation:

(Calculation occurs in September of each year; example is for September 2013; CPI is for All Urban Consumers, Los Angeles – Riverside – Orange County, All Items, 1982-84 = 100)

2012 price per acre foot of water = $ 102.90

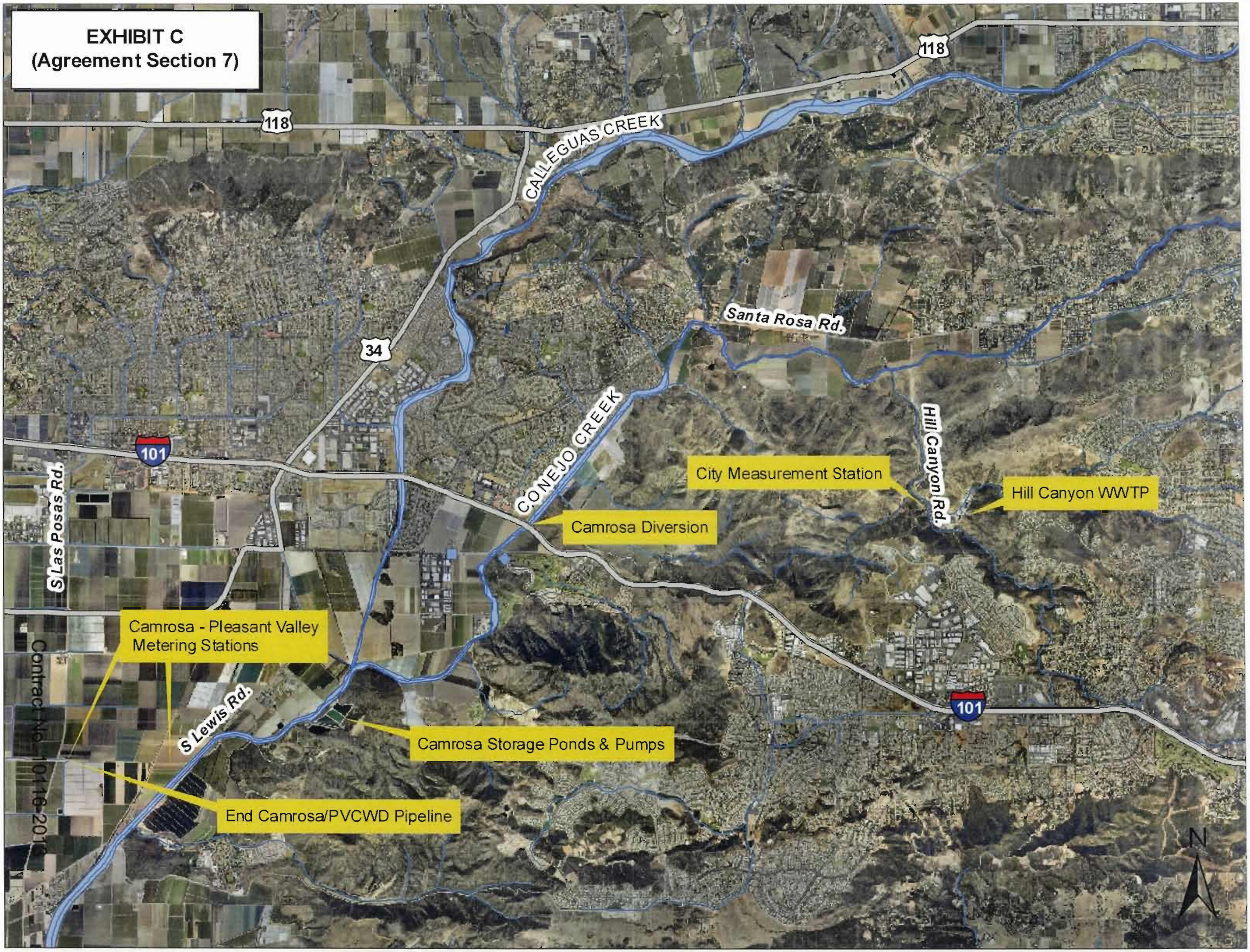
July 2012 CPI = 235.776
July 2011 CPI = 231.303

Annual percent CPI change = (2012 CPI - 2011 CPI) / 2011 CPI x 100 = (235.776 – 231.303) / 231.303 x 100 = 1.93%

Adjusted unit price for water = 2012 unit price x 1 + annual percent CPI change (decimal) = $102.90 x 1.0193 = $104.89 per acre foot

Cost for water available for sale = total water available for sale x adjusted unit price for water = 6,766 acre feet x $104.89 per acre foot = $709,686

EXHIBIT C
(Agreement Section 7)



Contract No. 10116-201

AGREEMENT BETWEEN
CAMROSA WATER DISTRICT AND
PLEASANT VALLEY COUNTY WATER DISTRICT
FOR THE SALE OF WATER PURSUANT TO STATE WATER RESOURCES CONTROL BOARD WATER RIGHT DECISION 1638

THIS AGREEMENT BETWEEN CAMROSA WATER DISTRICT AND PLEASANT VALLEY COUNTY WATER DISTRICT FOR THE SALE OF WATER PURSUANT TO STATE WATER RESOURCES CONTROL BOARD WATER RIGHT DECISION 1638 ("Agreement") is entered into this 10th day of April, 2014 between CAMAROSA WATER DISTRICT ("Camrosa") and PLEASANT VALLEY COUNTY WATER DISTRICT ("Pleasant Valley"), both California county water districts formed pursuant to California Water Code Section 30000, et seq. Camrosa and Pleasant Valley are at times collectively referred to as "Parties" or individually as "Party."

RECITALS

A. Camrosa's primary mission is to provide reliable and adequate supplies of quality, supplemental water through the acquisition and distribution of both regional and locally-developed water supplies in an environmentally-responsible manner.

B. Pleasant Valley's primary mission is to provide supplemental water to agricultural users within the boundaries of its district, and to maintain and preserve the limited groundwater resources within its district. The Oxnard Plain groundwater aquifers, which are the source of Pleasant Valley's groundwater supplies, are subject to overdraft, and Pleasant Valley is seeking alternative water supplies.

C. The City of Thousand Oaks ("Thousand Oaks") owns and operates the wastewater treatment facilities known as the Hill Canyon Wastewater Treatment Plant, from which treated wastewater ("Recycled Water") is discharged to Conejo Creek. Thousand Oaks petitioned the State Water Resources Control Board ("SWRCB") for certain water rights over the Recycled Water and certain return flows from imported water used within Thousand Oaks' corporate boundaries ("Recaptured Water").

D. In anticipation of the SWRCB's decision, and based upon Thousand Oaks' original Water Right application, Calleguas Municipal Water District ("Calleguas"), Camrosa, Thousand Oaks, and Pleasant Valley entered into various agreements to cooperate in the appropriation and beneficial use of the Project Water, including the construction and operation of facilities ("Conejo Creek Project") to convey Recycled Water and Recaptured Water (collectively, "Project Water") to Camrosa and Pleasant Valley.

E. Pleasant Valley and Calleguas entered into the Agreement for Sale of Water dated the "__________ day of ________ 1994" (without the date specified) (the "1994 Agreement") setting forth the terms by which Pleasant Valley may purchase from Calleguas certain Project Water diverted for delivery to Pleasant Valley for utilization within Pleasant Valley's jurisdictional boundaries.

F. Pleasant Valley and Calleguas have entered into a separate agreement setting forth the terms and conditions under which the 1994 Agreement shall terminate.

G. Thousand Oaks and Camrosa have now entered into a new agreement re-establishing and consolidating the terms of their relationship with respect to the Conejo Creek Project pursuant to State Water Resources Control Board Water Rights Decision 1638 ("Decision 1638") and the corresponding Water Right Permit 20952 issued by the SWRCB to Thousand Oaks. In accordance with that Agreement, Project Water may be available for sale by Camrosa to Pleasant Valley.

H. On March 26, 2014, the Fox Canyon Groundwater Management Agency ("FCGMA") adopted Resolution 2014-01, approving the transfer of credits between Pleasant Valley and Camrosa as set forth in this Agreement.

I. Camrosa and Pleasant Valley now desire to enter into this Agreement to establish new terms and conditions for the sale and purchase of Project Water in accordance with State Water Resources Control Board Water Rights Decision 1638 and the corresponding Water Right Permit 20952.

AGREEMENT

NOW THEREFORE, it is agreed as follows:

1. **Definitions**. For purposes of this Agreement,

(a) "Camrosa-Pleasant Valley Metering Station" means the water metering station installed by Camrosa located at Camrosa's Pond Pump site where the discharge of the Camrosa owned Pleasant Valley pumps are metered into Pleasant Valley's irrigation water distribution system. This facility is owned and operated by Camrosa and is where Conejo Creek Project water is stored, and if not used by Camrosa, is made available to Pleasant Valley.

(b) "Camrosa Diversion" means the Conejo Creek Diversion structure owned and operated by Camrosa and which is located downstream and adjacent to the U.S. Highway 101 bridge over the Conejo Creek and designated by Decision 1638 as the point of diversion for water appropriated pursuant to any water right or license pursuant to Decision 1638.

(c) "Conejo Creek Project" means the Conejo Creek Diversion Structure, the main pumping and distribution system for delivery of Conejo Creek water within Camrosa's service area, and the main transmission system for delivery of Conejo Creek water to Pleasant Valley.

(d) "Hill Canyon Wastewater Treatment Plant" means that treatment plant which is owned by Thousand Oaks, and which discharges Recycled Water into the Conejo Creek system.

(e) "Project Water" means the Recycled Water and Recaptured Water which is the subject of the Conejo Creek Project Agreement.

(f) "Conejo Creek Project Agreement" means the "Agreement Between the City of Thousand Oaks and the Camrosa Water District for the Beneficial Use of Water Pursuant to State Water Resources Control Board Water Right Decision 1638 dated May 28, 2013." A copy of the Conejo Creek Project Agreement is attached as Exhibit A and incorporated by this reference.

(g) "Resolution 2014-01" means the resolution adopted on March 26, 2014 by the FCGMA "Establishing the Conejo Creek Water Pumping Program Involving Camrosa Water District and

Pleasant Valley County Water District Using the Conejo Creek Diversion." A copy of Resolution 2014-01 is attached as Exhibit B and incorporated by this reference.

(h) "Termination Agreement" means the agreement between Pleasant Valley and Calleguas setting forth the terms and conditions by which the 1994 Agreement shall be terminated. A copy of the Termination Agreement is attached as Exhibit C and incorporated by this reference.

(i) "Water Year" means the period of September 1 through August 31.

2. **Conditions Precedent.** This Agreement shall not become enforceable or implemented until the 1994 Agreement between Pleasant Valley and Calleguas has been terminated in accordance with the terms and conditions set forth in the Termination Agreement.

3. **Availability of Water Pursuant to this Agreement**.

(a) Pleasant Valley acknowledges that Camrosa cannot guarantee, for whatever reason, to Pleasant Valley the amount of Project Water, if any, available for purchase by Pleasant Valley under this Agreement.

(b) During the Term of this Agreement, Camrosa shall make available to Pleasant Valley for purchase any excess Project Water not used by Camrosa pursuant to the Conejo Creek Project Agreement. The purchase price for such water is set forth in Section 5, below. As set forth in this Agreement, a Water Year shall be utilized to determine the amount of Project Water available to Pleasant Valley, and for other billing purposes.

(c) The Parties understand that no Project Water shall be guaranteed to Pleasant Valley. However, Camrosa shall utilize its best efforts to maximize the amount of Project Water harvested and delivered to Pleasant Valley from the Conejo Creek Project.

4. **Use Restrictions; Indemnification**. Pleasant Valley acknowledges and agrees that, pursuant to Decision 1638, all water delivered to Pleasant Valley pursuant to this Agreement must be used only within the boundaries of Pleasant Valley Water District. Pleasant Valley further acknowledges and agrees that all water made available to Pleasant Valley pursuant to this Agreement, including the appropriation and use thereof, is subject to Decision 1638, Water Right Permit 20952, and all other applicable laws, rules, and regulations governing the use of such water. Pleasant Valley shall defend, indemnify, and hold harmless Camrosa, its officers, directors, employees, managers, and agents from any and all claims, lawsuits, demands, judgments, or other liability arising out of, directly or indirectly, Pleasant Valley's distribution of Project Water delivered under this Agreement outside Pleasant Valley's jurisdictional boundaries or in any other manner prohibited by Decision 1638, Water Right Permit 20952.

5. **Monthly Payment**. Pleasant Valley has no obligation to take any Project Water from Camrosa under this Agreement. Pleasant Valley shall pay Camrosa for any Project Water delivered by Camrosa to Pleasant Valley ("Delivered Water") in accordance to with the following provisions:

(a) Subject to subparagraph 5(c), below, the base unit price per acre foot of Project Water is $154.89 per acre foot.

(b) On September 1st of each year, the Parties agree to adjust the unit price per acre foot of Project Water as described in subsection 5(c), below.

(c) The adjusted base unit price per acre foot shall be determined by adjusting the previous year's price per acre foot by the annual percentage change from the preceding July to July period in the Consumer Price Index (Los Angeles-Riverside-Orange County, All Urban Consumers) as published by the U.S. Bureau of Labor Statistics. Notwithstanding the foregoing, in no event shall the adjusted price be more than 107% of the previous year's price and in no event shall the adjusted price be less than 93% of the previous year's price. The adjusted price so determined shall then be the price per acre foot until the next September adjustment.

(d) Camrosa shall invoice Pleasant Valley on a monthly basis for Delivered Water during the prior month. Pleasant Valley shall render payment to Camrosa within thirty days of receiving a monthly invoice for Delivered Water.

6. Annual Payment.

(a) In the event that Pleasant Valley's total monthly purchases of Project Water during a given Water Year are less than three thousand acre-feet, Pleasant Valley shall be obligated to make an annual payment equal to the difference between what Pleasant Valley would have paid for the delivery of three thousand acre feet of Project Water in tbe applicable Water Year and the cost of Delivered Water during that same Water Year ("Annual Payment"). The price and payment terms for the Annual Payment shall be as provided below.

(1) On or before November 1st of each calendar year, Camrosa shall invoice Pleasant Valley for an amount equal to the difference between Delivered Water in acre-feet and three thousand acre-feet multiplied by the base unit price per acre of Project Water, as that price may be adjusted in accordance with Section 5(c), above, ("Minimum Payment").

(2) Subject to Section 6(b) below, Pleasant Valley shall render each Minimum Payment to Camrosa within thirty calendar days of invoice receipt.

(b) Pleasant Valley shall not be obligated to make the Minimum Payment to Camrosa unless all of the following conditions have been satisfied:

(1) Camrosa has made three thousand acre-fee of Project Water available to Pleasant Valley during the applicable Water Year;

(2) The Camrosa Diversion was operating normally and capable of delivering Project Water to Pleasant Valley during the applicable Water Year;

(3) The Minimum Payment for which Pleasant Valley is invoiced reflects only that amount of Project Water that Camrosa made available for delivery to Pleasant Valley and that, as a result of Pleasant Valley's failure to take delivery, was released downstream of the Camrosa Diversion; and

(4) Camrosa has (i) provided written notice (by email or other method agreed upon in writing) to Pleasant Valley within twenty-four hours of Pleasant Valley's failure at any time to accept delivery of Project Water made available to Pleasant Valley through the Camrosa Diversion and (ii) not later than the last day of any month in which Pleasant Valley fails to accept delivery of Project Water through the Camrosa Diversion, Camrosa provides written notice (by email or other method agreed upon in writing) to Pleasant Valley specifying the amount of Project Water released downstream of the Camrosa Diversion as a result of Pleasant Valley's failure to accept delivery of Project Water from Camrosa.

7. **Reimbursement of Energy Costs**. Pleasant Valley shall reimburse Camrosa for energy costs associated with delivery of the Project Water to Pleasant Valley in accordance with the following provisions:

(a) **Metering Station Energy Costs.** The energy costs to divert Project Water at the Camrosa Diversion shall be based on the total energy costs incurred at that facility divided by the total water diverted, with Pleasant Valley reimbursing Camrosa for a pro-rata share of such costs based on the subsequent deliveries through all metering stations delivering Project Water to Pleasant Valley;

(b) **Camrosa-Pleasant Valley Metering Station.** Regarding energy costs at the Camrosa-Pleasant Valley Metering Station, both Parties recognize that there are multiple interrelated variables that affect energy consumption and that the energy cost allocation described below is a reasonable, but not exact allocation of energy consumption;

(1) A kWh/af energy factor for pumping one acre foot of Project Water from the Camrosa Storage Ponds to Pleasant Valley is calculated on a monthly basis; and

(2) Energy costs for delivery of Project Water from the Camrosa Storage Ponds to Pleasant Valley shall be based upon the following formula:

> (af pumped to Pleasant Valley) x (kWh/af energy factor Pleasant Valley pumps) x ($/kWh) = Pleasant Valley allocation of energy costs at the Camrosa-Pleasant Valley Metering Station

(c) **Audit Verification.** At the request of Pleasant Valley, Camrosa shall fully cooperate to make available any and all records necessary for Pleasant Valley to audit Camrosa's energy costs and meter records that are involved with the determination of Pleasant Valley's allocation of energy costs at the Camrosa-Pleasant Valley Metering Station. If the audit results in a determination by Pleasant Valley, which determination shall be made in Pleasant Valley's sole and absolute discretion, that the allocation method set forth in Section 7(b), above, results in an unfair or inequitable result, Pleasant Valley and Camrosa agree to meet and confer and, upon mutual agreement, adjust the allocation and/or method of allocation to eliminate the inequity.

8. **Transfer of Storage Credits**. The Parties recognize that certain credits may accrue to Pleasant Valley pursuant to the applicable rules and regulations adopted by the FCGMA. Pleasant Valley shall transfer to Camrosa, pursuant to applicable FCGMA rules and regulations, one acre-foot of storage credits as earned for each acre-foot of water delivered to Pleasant Valley from Camrosa through the Conejo Creek Project under this Agreement ("Credit Transfer"). On March 26, 2014, the Fox Canyon Groundwater Management Agency ("Agency") adopted Resolution 2014-01, approving the Credit

Transfer. Should the FCGMA alter its rules or regulations or in any other manner prohibit the Credit Transfer contemplated by this Agreement, the Parties shall either develop a prompt, mutually acceptable accommodation, or either Party may terminate this Agreement upon sixty calendar days written notice to the other.

9. **Cooperation**. The Parties agree to cooperate, exchange information, and provide the availability of records as necessary for each Party to comply with its reporting obligations relating to the Conejo Creek Project, administration of this Agreement, and operation of associated facilities. Reporting requirements include, without limitation, those reporting requirements set forth in Fox Canyon Groundwater Management Agency Resolution 2013-02.

10. **Term**. The "Term" of this Agreement is forty years, and shall commence on the Effective Date.

11. **Water Quality**.

(a) Pleasant Valley acknowledges that Camrosa cannot guarantee to Pleasant Valley the quality of the Project Water available for purchase by, and/or delivered to, Pleasant Valley pursuant to this Agreement. If, in accordance with the Conejo Creek Project Agreement, Camrosa is formally notified by Thousand Oaks of any condition that impairs the quality of the Project Water available under this Agreement, Camrosa shall notify Pleasant Valley by telephone. Pleasant Valley shall provide to Camrosa the emergency phone number and contact at Pleasant Valley for purposes of this notification and shall promptly notify Camrosa in writing of any changes to this information during the term.

(b) Pleasant Valley shall hold Camrosa harmless from any and all claims, lawsuits, demands, judgments, or other liability arising out of, directly or indirectly, the use of water delivered under this Agreement, including but not limited to impurities, pollution, or chemical which may be introduced into the water made available under this Agreement. Notwithstanding the foregoing, Camrosa, its elective and appointive boards, officers, agents and employees, shall not be relieved from liability to Pleasant Valley for Camrosa's negligence or willful misconduct arising from or related to Camrosa's performance of its obligations under Section 11(a) of this Agreement.

12. Notices. Any notice required to be given hereunder shall be deemed to have been given by depositing said notice in the United States mail, postage prepaid, and addressed as follows:

CAMROSA:
General Manager
Camrosa Water District
7385 Santa Rosa Road
Camarillo, CA 93012

PLEASANT VALLEY:
John Mathews
Arnold, LaRochelle et al.
300 Esplanade Way Suite 2100
Oxnard, CA 93023
and

General Manager
Pleasant Valley County Water District
154 S Las Posas Rd
Camarillo, CA 93010-8570

13. Miscellaneous.

(a) **Assignment**. The Parties agree that this Agreement may not be assigned without the prior written consent of the other Party.

(b) **Waiver: Remedies Cumulative**. Failure by a Party to insist upon the strict performance of any of the provisions of this Agreement by another Party, irrespective of the length of time for which such failure continues, shall not constitute a waiver of such Parties` rights to demand strict compliance by such other Party in the future. No waiver by a Party of a default or breach by another Party or Parties shall be effective or binding upon such Party unless made in writing by such Party, and no such waiver shall be implied from any omission by a Party to take any action with respect to such default or breach. No express written waiver of a specified default or breach shall affect any other default or breach, or cover any other period of time, other than any default or breach and/or period of time specified. All of the remedies permitted or available to a Party under this Agreement, or at law or in equity, shall be cumulative and alternative, and invocation of any such right or remedy shall not constitute a waiver or election of remedies with respect to any other permitted or available right or remedy.

(c) **Construction**. The provisions of this Agreement shall be construed as a whole according to its common meaning and purpose of providing a public benefit and not strictly for or against any Party. It shall be construed consistent with the provisions hereof, in order to achieve the objectives and purposes of the Parties. Wherever required by the context, the singular shall include the plural and vice versa, and the masculine gender shall include the feminine or neutral genders or vice versa.

(d) **Mitigation of Damages**. In all situations arising out of this Agreement, the Parties shall attempt to avoid and minimize the damages resulting from the conduct of the other Party.

(e) **Governing Law**. This Agreement, and the rights and obligations of the Parties, shall be governed and interpreted in accordance with the laws of the State of California.

(f) **Captions**. The captions or headings in the Agreement are for convenience only and in no other way define, limit or describe the scope or intent of any provision or section of the Agreement.

(g) **Authorization**. Each Party represents and warrants to the other that the execution, delivery, election to participate in, and performance of this Agreement (i) are within its powers, (ii) has been duly authorized by all necessary actions on its behalf and all necessary consents or approvals have been obtained and are in full force and effect; and (iii) binds said Party and its respective administrators, officers, directors, agents, employees, successors, assigns, principals, join venturers, insurance carries, and any others who may claim through it under this Agreement.

(h) **Entire Agreement**. This Agreement supersedes any other agreements, either oral or in writing, between the Parties hereto with respect to the Conejo Creek Project and beneficial use of water available for appropriation pursuant to State Water Resources Control Board Water Right Decision 1638, and contains all of the covenants and agreements between the Parties with respect thereto. Any modifications of this Agreement will be effective only if it is in writing and signed by each Party to this Agreement.

(i) **Partial Invalidity**. If any provision in this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions will nevertheless continue in full force without being impaired or invalidated in any way.

(j) **Relationship of the Parties**. The relationship of the Parties to this Agreement shall be that of independent contractors and in no event shall any Party be considered an officer, agent, servant or employee of any other Party. Without limiting the foregoing, each Party agrees to be solely responsible for any workers compensation, withholding taxes, unemployment insurance and any other employer obligations associated with the described work or obligations assigned to them under this Agreement.

IN WITNESS WHEREOF, the Parties have entered into this Agreement.

CAMROSA COUNTY WATER DISTRICT

By: Tony Stafford
Tony Stafford, General Manager

Date: 4-10-14

PLEASANT VALLEY COUNTY WATER DISTRICT

By:
Thomas P. Vujovich Jr., President, Board of Directors

Date: 4/4/14

By:
David Souza, General Manager

Date: 4-4-14

APPROVED AS TO FORM:

By
John Mathews, General Counsel

Exhibit A

(Copy of Conejo Creek Project Agreement)

(See Attached)

Agreement Between the City of Thousand Oaks and the Camrosa Water District for the Beneficial Use of Water Pursuant to State Water Resources Control Board Water Right Decision 1638

This Agreement is entered into this 28 the day of May, 2013 by and between the City of Thousand Oaks, a California general law city (hereinafter referred to as "***City***"); and the Camrosa Water District, a county water district organized under the County Water District Law of the State of California (hereinafter referred to as "***Camrosa***").

RECITALS

A. The City and Camrosa have a common interest in maximizing the beneficial use of waters available for appropriation as described in the State Water Resources Control Board Water Right Decision 1638 and corresponding Water Right Permit 20952 issued by the State Water Resources Control Board to the City (hereinafter referred to as "***City Water Rights***").

B. The City and Camrosa have cooperated in harmonizing the legal, institutional, financial, and operational aspects of their joint relationships to maximize the use of water made available under the City Water Rights.

C. The City and Camrosa acknowledge that cooperatively they can most effectively maximize the beneficial use of the water available under the City Water Rights.

D. In anticipation of the State Water Resources Control Board's Water Right Decision 1638 and based on the City's original Water Right application, first the City and the Calleguas Municipal Water District ("***Calleguas***"), and then Calleguas and Camrosa, executed agreements to cooperate in the appropriation of water pursuant to the pending water right decision. Subsequent to the State Water Resources Control Board's Water Right Decision 1638, but prior to appropriation of water under Water Right Permit 20952, the City and Calleguas renegotiated their previous agreement incorporating portions of Water Right Decision 1638 and portions of the City's original water right application. Camrosa and Calleguas continued to operate under their previous agreement.

E. With Camrosa's assumption of full operation of the physical facilities necessary to appropriate the water pursuant to the City Water Rights, and the recoupment of Calleguas' capital investment in said facilities, the City, Calleguas and Camrosa have proven amenable to Calleguas ceding any and all control over or participation in the operation and management of said facilities, as outlined in any previous agreement pertaining thereto, and the City and Camrosa desire to re-establish and consolidate the terms of their contractual relationship consistent with the City Water Rights and the parties' relative roles in developing the City Water Rights.

F. In re-establishing the terms under this Agreement, the parties wish to make this Agreement substantially cost or revenue neutral to all parties as compared to the terms of the previous agreements. This Agreement shall be interpreted consistent with this purpose.

G. The parties acknowledge that through their cooperation to maximize the beneficial use of the waters available for appropriation under the City Water Rights, they have developed a water resource with regional significance.

NOW, THEREFORE, IT IS AGREED as follows:

1. Definitions

For the purposes of this Agreement, the following definitions shall apply:

a. "***City Measurement Station***" shall refer to the flume and measurement apparatus placed by the City below the confluence of the north and south forks of the Arroyo Conejo to measure the combined flows from the Hill Canyon Wastewater Treatment Plant and water flowing downstream from the forks of the Arroyo Conejo. This facility is owned and operated by the City.

b. "***Camrosa Diversion***" shall refer to the Conejo Creek Diversion structure located downstream and adjacent to the U.S. Highway 101 bridge over Conejo Creek and designated by Decision 1638 as the point of diversion for water appropriated pursuant to any water right or license pursuant to Water Right Decision 1638. This facility is owned and operated by Camrosa.

c. "***PVCWD Pipeline***" shall refer to the pipelines constructed by Camrosa and Calleguas which extend from the Camrosa Storage Ponds pump station to the point of connection to the intersection of Laguna Road and Las Posas Road. This pipeline is owned and operated by Camrosa.

d. "***Camrosa Storage Ponds***" shall refer to Camrosa's ponds located east of Conejo Creek and adjacent to Old Dairy Road.

e. "***Camrosa/Pleasant Valley Metering Stations***" shall refer to the water metering station where water is metered for delivery into the Pleasant Valley County Water District's (PVCWD) irrigation water distribution system and any other meters connected to the Camrosa pipeline delivering water to the service area of PVCWD. These facilities are owned and operated by Camrosa.

f. "***CFS***" shall mean cubic feet per second, a measurement of flowing water, which on a continuous basis equates to 724 acre feet per year, or 0.646 million gallons per day.

g. "***City Water Rights***" shall refer to the City's Water Right Permit 20952 issued by the State Water Resources Control Board pursuant to Water Right Decision 1638, and any subsequent license granted by the State Water Resources Control Board relating to the same.

2. Cooperation and Diligence in Perfecting Water Right License and Sharing Records

The parties agree to cooperate and exercise due diligence in meeting the requirements of the City Water Rights as specified below: (See Exhibit A for Calendar of routine actions required by the City's Water Rights and this Agreement)

a. The City shall be responsible for submitting such documentation to the State Water Resources Control Board as required to comply with Water Right Permit 20952, including without limitation Section 6 regarding complete application of water authorized by said Permit by December 31, 2025 or any extension granted thereto. In the event that the parties concur that additional water could be applied to beneficial use within the quantities limited by Water Right Permit 20952, Section 5; the City shall be responsible for petitioning the State Water Resources Control Board for an extension for a reasonable amount of time to put the full quantity of water provided by Water Right Permit 20952 to beneficial use.

b. The City shall be responsible for submitting annual progress reports to the State Water Resources Control Board to comply with Water Right Permit 20952, Sections 15 and 16. The City shall provide copies of said progress reports to Camrosa.

c. Camrosa shall keep metered records of dates of diversion, quantity of water diverted, and records documenting the bypass flow as required by Water Right Permit 20952, Sections 15 and 16, regarding quantification of flows. Such records shall be made available to the City for use in submitting its annual progress report above or as necessary to document water use under Water Right Permit 20952.

d. Camrosa shall be responsible for submitting to the State Water Resources Control Board all reports documenting compliance with Water Right Permit 20952, Section 12, regarding water use efficiency and conservation. Camrosa shall provide copies of said reports to the City.

e. The parties agree to share and provide the documents and information specified on Exhibit A attached to this Agreement and such other documents and information as the parties deem reasonably necessary to maximize the water available under Water Right Permit 20952. It is the obligation of the City to timely advise Camrosa in writing of any such documents and information which are not specifically required in this Agreement.

3. Basis for Water Available for Sale

The City Water Rights provide the basis for the water available for sale by the City. Under Decision 1638, the quantity of water that the parties may put to beneficial use is described in terms of streamflow available at the Camrosa Diversion. That streamflow is quantified as:

Effluent discharged from the Hill Canyon Wastewater Treatment Plant

minus 2.0 CFS to account for channel losses en route to the point of diversion

minus 2.0 CFS dedicated by City to protect instream environmental resources

plus 4.0 CFS when the total streamflow at the Camrosa Diversion is greater than the sum of the effluent discharged from the Hill Canyon Treatment Plant plus the required downstream bypass of 6.0 CFS

minus 0.82 CFS to satisfy downstream Water Right License #12598, up to 306 acre feet per year.

As a practical matter, given the technical constraints in the continuous measurement and reconciliation of real-time flows, and various complicating factors, the parties agree that a reasonable and rational translation of Water Right Decision 1638's quantification of the City's Water Rights for the purposes of this Agreement is described in Section 4. Notwithstanding the foregoing, the City acknowledges and agrees that the City is ultimately responsible for maintaining the City's Water Rights including compliance with Water Right Decision 1638.

4. Quantification of Water Available for Sale

For the purposes of this Agreement, the parties agree that the water available for sale shall be determined annually and quantified as follows:

Twelve times the average monthly streamflow recorded at the City Measurement Station for the months of June, July, and August of the preceding year

minus 1448 acre feet to account for 2.0 CFS channel losses between the City Measurement Station and the Camrosa Diversion *minus* 4344 acre feet to account for 6.0 CFS bypass downstream from the Camrosa Diversion

minus 306 acre feet to account for Water Right License #12598 downstream from the Camrosa Diversion (see Exhibit B for example calculation of water available).

5. Availability of Water and Purchase Commitments Among the Parties

   a. The City agrees to make available to Camrosa the total quantity of water available for sale as quantified in Section 4. Camrosa agrees to purchase from the City all such water made available to Camrosa under this Agreement for the price determined under Section 6 of this Agreement.

   b. Camrosa agrees to make the 6.0 CFS bypass releases downstream of the Camrosa Diversion as quantified in Section 4.

   c. Pursuant to Water Right Decision 1638, all water made available under this Agreement is limited to use within the boundaries of Camrosa and within the boundaries of the PVCWD.

6. Cost for Water Made Available

   a. The unit price per acre foot of water covered under this Agreement upon the Effective Date of this Agreement is $104.89 per acre foot.

   b. On September 1st of each year, the parties agree to adjust the unit price per acre foot of water as described in subsections c and d below.

   c. The adjusted unit price per acre foot of water shall be determined by adjusting the previous year's unit price per acre foot of water by the annual percentage change from the preceding July to July period in the Consumer Price Index (Los Angeles-Riverside-Orange County, All Urban Consumers) as published by the U.S. Bureau of Labor Statistics (See Exhibit B for sample calculation). Notwithstanding the foregoing, in no event shall the adjusted unit price be more than 107% of the previous year's unit price and in no event shall the adjusted unit price be less than 93% of the previous year's unit price.

   d. The adjusted unit price so determined shall then be the amount per acre foot applied to the water available for sale, as quantified pursuant to Section 4, until the next September adjustment.

7. Costs Related to the Operation and Maintenance of Facilities (See Exhibit C for map of facilities).

a. The City agrees to operate and maintain the City Measurement Station at its sole expense.

b. Camrosa agrees to operate and maintain the Camrosa Diversion, Camrosa Storage Ponds, and the related pump station at the Camrosa Storage Ponds at its sole expense.

c. Camrosa agrees to operate and maintain the PVCWD Pipeline. Routine maintenance of this pipeline will be at Camrosa's sole expense and shall include routine inspection and surveillance of pipeline right-of-way, valves, and other appurtenances and first response to reported emergencies.

8. Water Quality and Quantity Limitation

a. The parties acknowledge that the City cannot guarantee to Camrosa the quality of water downstream of the City Measurement Station. Camrosa agrees to hold the City harmless from any and all claims, lawsuits, demands, judgments or other liability arising out of, directly or indirectly, the use of the water delivered under this Agreement, including but not limited to impurities, pollution, or chemicals which may be introduced downstream of the City Measurement Station into the water made available under this Agreement.

b. The City agrees to exercise its best efforts to comply with the requirements of its National Pollution Discharge Elimination Permit (hereinafter referred to as "***NPDES Permit***") as well as all other applicable Federal, State and County statutes, laws and ordinances regarding the City's discharge of effluent to Conejo Creek and surface waters constituting water made available by the City under this Agreement.

c. In the event that the City cannot treat its effluent substantially to the standards in applicable NPDES Permit or other applicable Federal, State, or County regulation, or in the event that the City is aware of a sewage spill or any other hazardous material introduced into the City's drainage system that would impair the quality of water subject to this Agreement, the City will immediately notify Camrosa by telephone. In particular, in the event that any substance listed pursuant to Public Health and Safety Code Section 25249.8 is discharged, the City shall immediately notify Camrosa by telephone. Camrosa shall provide the City at all times a current listing of emergency telephone numbers. The City will further notify by telephone Camrosa when water made available under this Agreement is no longer impaired and available for beneficial reuse.

d. Quantification of water impaired for reuse: Where water made available by the City at the City Measurement Station is rendered unusable for beneficial reuse due to failure to meet its NPDES Permit standards, hazardous materials spills, or standards in its municipal storm water permit, such water will be quantified by the City per day for every day or portion of any day when water is impaired for reuse and a pro-rated credit shall be applied to Camrosa for the cost of water as quantified in Section 6.

e. The parties recognize that certain actions by agencies with statutory authority to regulate the water governed by this Agreement may jeopardize the ability of the parties to place the City Water Rights to beneficial use. Examples of these actions include, but are not limited to: modification of the City Water Rights, new regulation on the use of surface water, or implementation of Clean Water Act standards limiting the beneficial uses of such water or requiring additional treatment facilities. Either party may, upon written notice of such action to the other parties, request consultation among the parties to negotiate such amendments to this Agreement as may be necessary to continue to maximize the beneficial use of water available to the parties under the City Water Rights. To the extent that any action by others limits the ability of the parties to place the City Water Rights to beneficial use, the provisions for payment under this Agreement, to the extent of such limitation, shall be suspended pending renegotiation of this Agreement.

f. The parties recognize that certain other conditions could substantially affect the balance of obligation and benefit among the parties such that the individual interests of one or more of the parties would no longer be rationally related to continued cooperation in maximizing the beneficial use of the water under the terms of this Agreement. Examples of these conditions include, but are not limited to: the inability of either party to deliver water due to distribution or treatment system failure, regulatory changes, or water quality degradation to the point that it is no longer acceptable to the customer base. In response to such changed conditions, either party may upon written notice of such action to the other party request consultation among the parties to negotiate such amendments to this Agreement as may be necessary to continue to maximize the beneficial use of water available to the parties under the City Water Rights. To the extent that any action by others limits the ability of the parties to place the City Water Rights to beneficial use, the provisions for payment of such water under this Agreement shall be suspended pending renegotiation of this Agreement.

9. Schedule for Payments

a. City shall bill Camrosa no later than October 1st for payment due for the period twelve months preceding measured from September 1st through August 31st. Payments shall be made to the City by Camrosa on or about November 15 of each year during the term of this Agreement. Payment for the last year (or any partial year) of this Agreement will be based upon the number of full months the water was made available by the City during the last year of the term of this Agreement.

10. Term of the Agreement

The term of this Agreement is forty (40) years from the Effective Date of this Agreement. The parties, by mutual consent, may extend the term of the Agreement for additional five-year periods.

11. Cooperation and Exchange of Information

The parties agree to cooperate, exchange information, and provide the availability of records necessary for the maintenance of the City Water Rights, administration of this Agreement, and operation of associated facilities.

12. Conservation Credits

From the Effective Date of this Agreement, Camrosa agrees to use reasonable efforts to secure conservation credits from the Fox Canyon Groundwater Management Agency for waters delivered by the project which offset the need to extract groundwater from the aquifers within the Fox Canyon Groundwater Management Agency. Camrosa agrees that one-half of the accumulated credits will be made available to the City.

13. Deliveries to PVCWD

Camrosa agrees to use reasonable diligence in providing surplus water, not needed by Camrosa, to the PVCWD.

14. Assignment

The parties agree that this Agreement may not be assigned without the written consent of all of the non-assigning parties.

15. Waiver; Remedies Cumulative

Failure by a party to insist upon the strict performance of any of the provisions of this Agreement by another party, irrespective of the length of time for which such failure continues, shall not constitute a waiver of such parties' rights to demand strict compliance by such other party in the future. No waiver by a party of a default or breach by another party or parties shall be effective or binding upon such party unless made in writing by such party, and no such waiver shall be implied from any omission by a party to take any action with respect to such default or breach. No express written waiver of a specified default or breach shall affect any other default or breach, or cover any other period of time, other than any default or breach and/or period of time specified. All of the remedies permitted or available to a party under this Agreement, or at law or in equity, shall be cumulative and alternative, and invocation of any such right or remedy shall not constitute a waiver or election of remedies with respect to any other permitted or available right or remedy.

16. Construction of Language of Agreement

The provisions of this Agreement shall be construed as a whole according to its common meaning and purpose of providing a public benefit and not strictly for or against any party. It shall be construed consistent with the provisions hereof, in order to achieve the objectives and purposes of the parties. Wherever required by the context, the singular shall include the plural and vice versa, and the masculine gender shall include the feminine or neutral genders or vice versa.

17. Mitigation of Damages

In all situations arising out of this Agreement, the parties shall attempt to avoid and minimize the damages resulting from the conduct of the other parties.

18. Governing Law

This Agreement, and the rights and obligations of the parties, shall be governed and interpreted in accordance with the laws of the State of California.

19. Captions

The captions or headings in the Agreement are for convenience only and in no other way define, limit or describe the scope or intent of any provision or section of the Agreement.

20. Authorization

Each party represents and warrants to the other that the execution, delivery, election to participate in, and performance of this Agreement (i) are within its powers, (ii) has been duly authorized by all necessary actions on its behalf and all necessary consents or approvals have been obtained and are in full force and effect; and (iii) binds said party and its respective administrators, officers, directors, agents, employees, successors, assigns, principals, joint ventures, insurance carriers, and any others who may claim through it under this Agreement.

21. Entire Agreement Between Parties

This Agreement supersedes any other agreements, either oral or in writing, between or among any of the parties hereto with respect to the beneficial use of water available for appropriation pursuant to State Water Resources Control Board Water Right Decision 1638, and contains all of the covenants and agreements between the parties with respect thereto. Any modifications of this Agreement will be effective only if it is in writing and signed by all of the parties to this Agreement.

22. Partial Invalidity

If any provision in this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions will nevertheless continue in full force without being impaired or invalidated in any way. To the extent permissible the illegal or invalid provision shall be modified, amended, or construed to make it legal or valid and carry out the purposes of the parties hereto.

23. Relationship of the Parties

The relationship of the parties to this Agreement shall be that of independent contractors and in no event shall any party be considered a partner, officer, agent, servant or employee of any other party. Without limiting the foregoing, each party agrees to be solely responsible for any workers compensation, withholding taxes, unemployment insurance and any other employer obligations associated with the described work or obligations assigned to them under this Agreement.

24. Notices

Any notice required to be given hereunder shall be deemed to have been given by depositing said notice in the United States mail, postage prepaid, and addressed as follows:

To City:	City of Thousand Oaks Attn: Public Works Director 2100 Thousand Oaks Boulevard Thousand Oaks, CA 91362
To Camrosa:	Camrosa Water District Attn: General Manager 7385 Santa Rosa Road Camarillo, CA 93012

25. Effective Date.

This Agreement shall take effect on September 1, 2013, provided the following events have taken place (the "***Effective Date***"):

a. Upon due approval of this Agreement as required by its governing documents and applicable law, City shall execute this Agreement and deliver a duly executed original to Camrosa; and

b. Upon due approval of this Agreement as required by its governing documents and applicable law, Camrosa shall execute this Agreement and deliver a duly executed original to City; and

c. Upon receipt by Camrosa and City of (1) the Thousand Oaks – Calleguas Termination Agreement duly executed by City and Calleguas, and (2) the Camrosa – Calleguas Termination Agreement duly executed by Camrosa and Calleguas.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the Effective Date in Ventura County, California.

Dated: 6/5, 2013

CAMROSA WATER DISTRICT

By: Tony Stafford

Tony Stafford, General Manager

Dated: May 28, 2013

CITY OF THOUSAND OAKS

By: Claudia Bill

Claudia Bill-de la Peña, Mayor

ATTEST:

Antoinette Marr

for Linda D. Lawrence, City Clerk

APPROVED AS TO ADMINISTRATION:

For

Scott Mitnick, City Manager

APPROVED AS TO FORM:
Office of the City Attorney

Christopher G. Norman, Assistant City Attorney

Exhibit A
Calendar of Annual Actions
(Agreement Section 2)

The following actions are required by the Agreement between the City of Thousand Oaks and the Camrosa Water District for the Beneficial Use of Water Pursuant to State Water Resources Control Board Water Right Decision 1638.

Month/Action	**Responsible Party**	**Send to**
<u>January</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Water diversion at Camrosa Diversion Annual Report (daily and monthly for the previous calendar year)	Camrosa	City
<u>February, March, April & May</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
<u>June</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Daily stream flows at City Measurement Station	City	Camrosa
Annual Progress Reports to SWRCB (due June 30)	City	SWRCB/Camrosa
<u>July & August (August 31 is end of water year)</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Daily stream flows at City Measurement Station	City	Camrosa
<u>September</u> (1st is beginning of water year)		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Calculate average monthly stream flow based on June, July, and August	City	Camrosa
Calculate the adjusted unit price per acre foot of water (see Agreement Section 6 & Exhibit B)	City	Camrosa
Invoice for previous 12 months water usage, Sep 1-Aug 31 (due October 1- see Agreement Sections 4, 6 & 9, and Exhibit B)	City	Camrosa
<u>October</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Compliance report for Water Right Permit 20952, Section 12 regarding water use efficiency. (every 5th year starting in 2014)	Camrosa	SWRCB/City
<u>November</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City
Payment by Camrosa to City (due November 15)	Camrosa	City
<u>December</u>		
Daily & monthly diverted & by-pass flows at Camrosa Diversion	Camrosa	City

Exhibit B

Example Calculations of Quantity and Cost of Water Available for Sale
(Agreement Sections 4 and 6)

Example water available for sale quantity calculation:

(Example is for period September 1, 2012 through August 31, 2013)

Average daily flow for June, July and August 2012 = 11.48 mgd

Total water quantity = 11.48 mgd average flow x 365 days x 3.07 acre feet /mg = 12,864 acre feet

12,864 acre feet total water quantity
Less 1448 acre feet channel losses
Less 4344 acre feet downstream by-pass
Less 306 acre feet downstream existing water right

Equals 6,766 acre feet total water available for sale

(reduce total water available for sale further per Subsection 8d, if applicable)

Example water available for sale cost calculation:

(Calculation occurs in September of each year; example is for September 2013; CPI is for All Urban Consumers, Los Angeles – Riverside – Orange County, All Items, 1982-84 = 100)

2012 price per acre foot of water = $ 102.90

July 2012 CPI = 235.776
July 2011 CPI = 231.303

Annual percent CPI change = (2012 CPI - 2011 CPI) / 2011 CPI x 100 = (235.776 – 231.303) / 231.303 x 100 = 1.93%

Adjusted unit price for water = 2012 unit price x 1 + annual percent CPI change (decimal) = $102.90 x 1.0193 = $104.89 per acre foot

Cost for water available for sale = total water available for sale x adjusted unit price for water = 6,766 acre feet x $104.89 per acre foot = $709,686

EXHIBIT C
(Agreement Section 7)

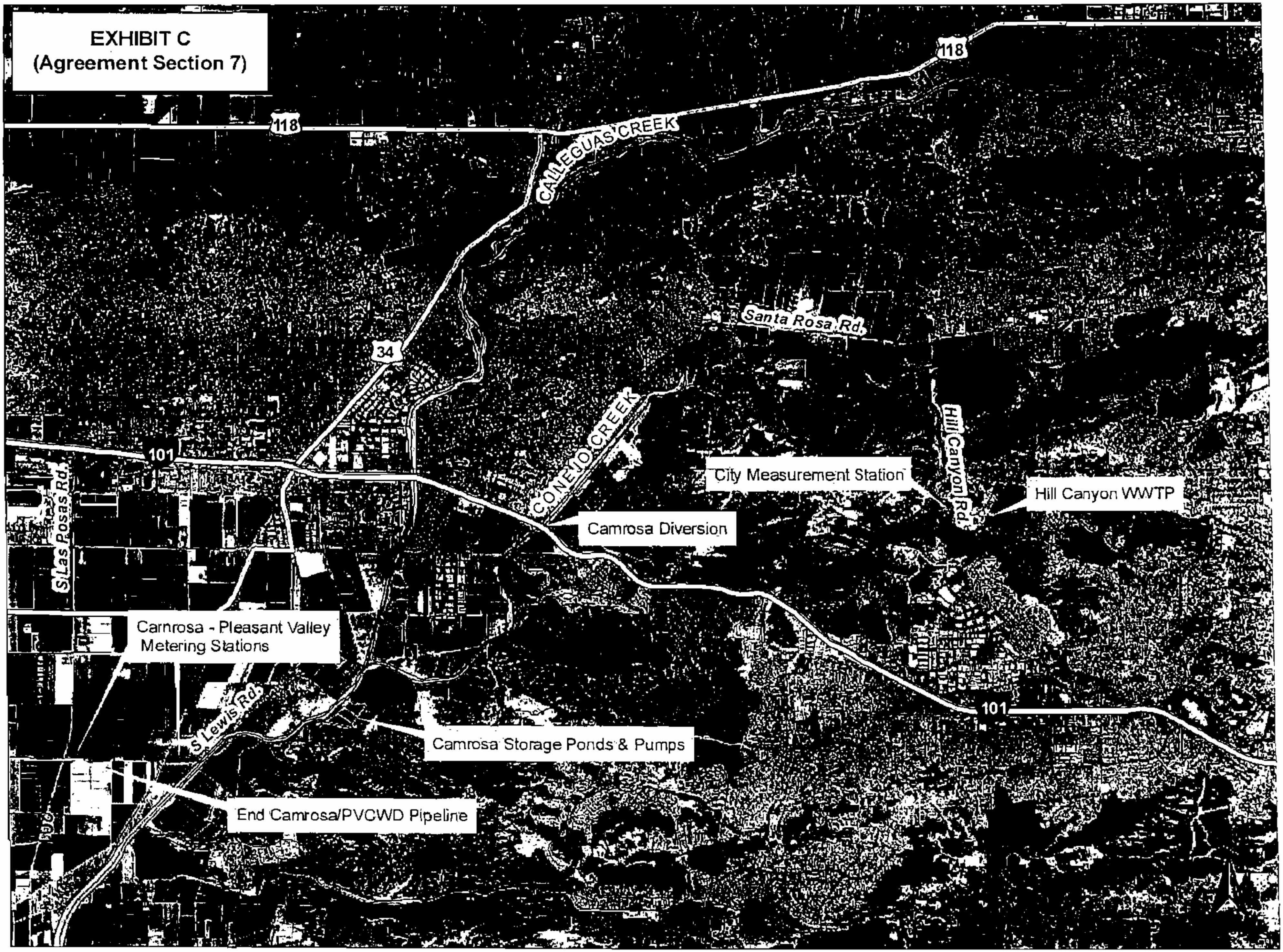


Exhibit B

(Copy of Fox Canyon Groundwater Management Agency Resolution 2014-01)

(See Attached)

Resolution 2014-01
of the
Fox Canyon Groundwater Management Agency

A RESOLUTION ESTABLISHING THE CONEJO CREEK WATER PUMPING PROGRAM INVOLVING CAMROSA WATER DISTRICT AND PLEASANT VALLEY COUNTY WATER DISTRICT USING THE CONEJO CREEK DIVERSION

WHEREAS, the Fox Canyon Groundwater Management Agency Ordinance Code allows an operator to obtain storage credits for water that has been determined by the Agency Board to be foreign water stored.

WHEREAS, Calleguas Municipal Water District ("Calleguas"), Camrosa Water District ("Camrosa"), the City of Thousand Oaks, and Pleasant Valley County Water District ("Pleasant Valley") entered into various agreements to cooperate in the appropriation and beneficial use of the recycled water and recaptured water, including the construction and operation of facilities ("Conejo Creek Project" or "Project") to convey recycled water and recaptured water (collectively, "Project Water") to Camrosa and Pleasant Valley.

WHEREAS, among the agreements referenced above was an agreement between Calleguas and Pleasant Valley in 1994 setting forth the terms by which Pleasant Valley may purchase from Calleguas certain Project Water diverted through the Project to Pleasant Valley for utilization within Pleasant Valley's jurisdictional boundaries ("1994 Agreement").

WHEREAS, the 1994 Agreement provided that certain credits may accrue to Pleasant Valley under Fox Canyon Groundwater Management Agency ("Agency") ordinances and that Pleasant Valley shall transfer. in accordance with Agency ordinances, an acre-foot of credits as earned to Calleguas for each acre-foot of water delivered to Pleasant Valley from the Conejo Creek Project.

WHEREAS, the Agency Board in May 28, 2003, determined, approved and conditioned that water diverted by the Conejo Creek Project is foreign water and that deliveries of surface water from the Conejo Creek Project to Pleasant Valley's storage reservoir qualify for credits.

WHEREAS, under the 2003 approved program, credits earned by Pleasant Valley for deliveries of Conejo Creek Project water to meet local irrigation demands in lieu of groundwater pumping were transferred from Pleasant Valley to Calleguas Municipal Water District which may in turn transfer those credits to United Water Conservation District ("United") under the Supplemental M&I Water Program.

WHEREAS, Calleguas and United intend to continue to utilize credits through the Supplemental M&I Program, but Calleguas wishes to terminate its future participation in the Conejo Creek Project and cease accruing additional credits after the 1994 Agreement is terminated.

WHEREAS, Camrosa and Pleasant Valley propose to enter into an agreement by which Camrosa will sell Conejo Creek Project Water to Pleasant Valley ("Water Sale Agreement").

The substantive provisions of the Water Sale Agreement generally mirror the provisions of the 1994 Agreement.

WHEREAS, the proposed Water Sale Agreement provides that, subject to Agency approval, Pleasant Valley shall transfer to Camrosa, pursuant to applicable Agency rules and regulations, credits as earned for each acre-foot of water delivered to Pleasant Valley from Camrosa through the Conejo Creek Project

WHEREAS, the Conejo Creek Project is recognized in the Agency's Groundwater Management Plan as one of several strategies for bringing the aquifers of the Agency into balance, and the proposed Water Sale Agreement will help ensure that Project Water will continue to be utilized by Pleasant Valley.

WHEREAS, the Agency Ordinance Code authorizes the adjustment of extraction allocations consistent with the goal of reaching safe yield.

WHEREAS, an Impact Analysis (Analysis), dated December 12, 2013, concludes: 1) Deliveries of Conejo Creek Project water to Pleasant Valley have significantly reduced groundwater pumping by Pleasant Valley; 2) Conejo Creek Project water has the added benefit of being drought-proof because of its component of recycled water; 3) Pumping is moved away from the pumping depression and the coast to a more-inland area of better stormwater recharge; 4) Without the agreement, Conejo Creek Project water is delivered elsewhere and Pleasant Valley pumping would increase to replace that water source, resulting in a further drop of groundwater elevations; and 5) thus, the Conejo Creek Water Pumping Program is a net advantage to the basin.

WHEREAS, to the extent that cumulative extractions by Camrosa never exceed deliveries to Pleasant Valley, the proposed Water Sale Agreement will result in a net benefit to the Pleasant Valley Basins.

NOW, THEREFORE, IT IS HEREBY ORDERED AND RESOLVED THAT:

1. The Board approves the Conejo Creek Water Pumping Program involving Camrosa Water District and Pleasant Valley County Water District using the Conejo Creek Diversion.

2. Camrosa's cumulative pumping extractions through this program shall never exceed the cumulative deliveries to Pleasant Valley through this program. *The transfer of credits between Pleasant Valley and Camrosa is approved, as set forth in the Pleasant Valley/Camrosa agreement attached hereto and made a part hereof by reference."*

3. Camrosa will actively meter extraction quantity and monitor:

    a. Water levels: Transducers in the Woodcreek Well and any new well Camrosa constructs in the PV Basin will record water levels on at least a monthly basis.
    b. Water quality: Camrosa will monitor at least annually the water quality of the Woodcreek Well and any new wells that are part of this Resolution.

4. Camrosa shall submit an Annual Report to the Agency by February 1st each year, which shall include:

   - a. Conejo Creek Project water delivery amounts to Pleasant Valley;
   - b. Credits retired in accordance with deliveries to Pleasant Valley;
   - c. Camrosa's cumulative deliveries to Pleasant Valley;
   - d. Well extractions under this program;
   - e. Water quality data;
   - f. Historical and past year water level well data from Camrosa's Pleasant Valley basin well(s); and
   - g. Drawdown analysis from extractions.

5. For the purpose of determining net impacts to the basin as a result of this agreement the Agency and Camrosa shall meet during the first week of May annually to review the contents of the Annual Report and its conclusion. If there are disagreements with the findings of net detriment, the matter may be referred to the FCGMA Board.

6. Camrosa will incrementally phase in extractions as follows:

   - a. Calendar Year 2014: Extractions will be limited to 200 AF.
   - b. Calendar Year 2015: Extractions will be limited to 1,000 AF.
   - c. Calendar Year 2016: Extractions will be limited to 2,000 AF.
   - d. Calendar Year 2017: If monitoring data indicates the basin will support it, extractions will be limited to 3,000 AF.
   - e. Calendar Year 2018: If monitoring data indicates the basin will support it, extractions will be limited to 4,500 AF.
   - f. All subsequent years: If monitoring data indicates the basin will support it, extractions will be limited to 4,500 AF annually.

7. Camrosa shall extract from Camrosa-owned wells and may supply groundwater so extracted within its service territory in accordance with Agency Resolution No. 2011-01.

8. The extractions referenced in this agreement are in addition to Camrosa's existing 806 AF yearly allocation currently being pumped at Woodcreek Well. The existing 806 AF allocation will be the first utilized for extraction.

9 This resolution will terminate on the same date as the agreement between Camrosa and Pleasant Valley regarding this program or 30 days after mutual agreement between the Agency and Camrosa.

On motion of Director Craven, seconded by Director Bennett, the foregoing resolution was passed and adopted on this 26th day of March 2014.

By: ________________________
Lynn E. Maulhardt, Chair, Board of Directors
Fox Canyon Groundwater Management Agency

ATTEST: I hereby certify that the above is a true and correct copy of Resolution No. 2014-01

By: Jessica Kam
Jessica Kam, Clerk of the Board

<u>Exhibit C</u>

(Copy of Termination Agreement)

(See Attached)

TERMINATION AND RELEASE AGREEMENT

This Termination and Release Agreement ("Agreement") is entered into between PLEASANT VALLEY COUNTY WATER DISTRICT ("Pleasant Valley"), a California county water district formed pursuant to California Water Code Section 30000, et seq. and CALLEGUAS MUNICIPAL WATER DISTRICT ("Calleguas"), a municipal water district formed pursuant to California Water Code Section 71000 et seq. Calleguas and Pleasant Valley are at times collectively referred to as "Parties" or individually as "Party."

RECITALS

A. Pleasant Valley's primary mission is to provide water to agricultural users within the boundaries of its district, and to maintain and preserve the limited groundwater resources within its district. The Oxnard Plain groundwater aquifers, which are the source of Pleasant Valley's groundwater supplies, are subject to overdraft, and Pleasant Valley is seeking alternative water supplies.

B. The City of Thousand Oaks ("Thousand Oaks") owns and operates the wastewater treatment facilities known as the Hill Canyon Wastewater Treatment Plant, from which treated wastewater ("Recycled Water") is discharged to Conejo Creek. Thousand Oaks petitioned the State Water Resources Control Board ("SWRCB") for certain water rights over the Recycled Water and certain return flows from imported water used within Thousand Oaks' corporate boundaries ("Recaptured Water").

C. In anticipation of the SWRCB's decision, and based upon Thousand Oaks' original Water Right application, Calleguas Municipal Water District ("Calleguas"), Camrosa, Thousand Oaks, and Pleasant Valley entered into various agreements to cooperate in the appropriation and beneficial use of the Project Water, including the construction and operation of facilities ("Conejo Creek Project") to convey Recycled Water and Recaptured Water (collectively, "Project Water") to Camrosa and Pleasant Valley.

D. Among the agreements referenced in Recital C, above, was an agreement between Pleasant Valley and Calleguas dated the "___ day of _______1994" (without the day and month specified) setting forth the terms by which Pleasant Valley may purchase from Calleguas certain Project Water diverted for delivery to Pleasant Valley for utilization within Pleasant Valley's jurisdictional boundaries ("1994 Agreement").

E. Thousand Oaks, Camrosa, Pleasant Valley and Calleguas all agree that the Conejo Creek Project will remain viable if Calleguas terminates its participation in the Project. Accordingly, Calleguas has entered into termination agreements with Thousand Oaks and Camrosa, and Thousand Oaks and Camrosa have now entered into a new agreement re-establishing and consolidating the terms of their relationship with respect to the Conejo Creek Project pursuant to State Water Resources Control Board Water Rights Decision 1638 ("Decision 1638") and the corresponding Water Right Permit 20952 issued by the SWRCB to Thousand Oaks. In accordance with that new agreement between Thousand Oaks and Camrosa, Project Water may be available for sale by Camrosa to Pleasant Valley.

F. Camrosa and Pleasant Valley have now entered into an agreement for the sale of water establishing the terms and conditions by which Camrosa may deliver Project Water to Pleasant Valley in accordance with State Water Resources Control Board Water Rights Decision 1638 and the corresponding Water Right Permit 20952.

G. The enforceability and implementation of the agreement between Camrosa and Pleasant Valley referenced in Recital F, above, is conditioned upon Pleasant Valley and Calleguas terminating the 1994 Agreement.

H. In order to facilitate the agreement for the sale of water between Camrosa and Pleasant Valley referenced in Recital F, above, Pleasant Valley and Calleguas now desire to enter into this Agreement setting forth the terms and conditions under which the 1994 Agreement shall be terminated and the Parties released from their respective obligations thereunder.

AGREEMENT

NOW, THEREFORE, it is agreed as follows:

1. **Incorporation**. The above Recitals are hereby incorporated into this Agreement by reference.

2. **Termination of the 1994 Agreement**.

2.1. The 1994 Agreement shall terminate on the date that Pleasant Valley notifies Calleguas in writing (the "Termination Notice") that all conditions precedent to the agreement between Pleasant Valley and Camrosa referenced in Recital F, above, have been satisfied ("Termination Date"). Pleasant Valley agrees to provide such notice as soon as reasonably possible upon satisfaction of such conditions precedent. Except as provided in Section 4, below, all obligations of the Parties under the 1994 Agreement shall terminate on the Termination Date in the same manner and with the same effect as if that date had been originally fixed in the 1994 Agreement for the expiration of the term.

2.2. Within two working days after Calleguas receives the Termination Notice, Calleguas shall obtain meter reads to document the amount of water delivered to Pleasant Valley through the Termination Date. Within sixty days after Calleguas receives the Termination Notice, Calleguas shall invoice Pleasant Valley and within forty-five days thereafter Pleasant Valley shall pay Calleguas for the water delivered through the Termination Date pursuant to the provisions of Section 4 of the 1994 Agreement. In January or July (whichever is earlier) immediately following the Termination Date, Calleguas and Pleasant Valley shall submit a joint letter to the Fox Canyon Groundwater Management Agency requesting transfer of groundwater storage credits equal to the amount of the water delivered from Calleguas to Pleasant Valley pursuant to the 1994 Agreement during the preceding six months. In accordance with Section 5 of the 1994 Agreement, all such storage credits shall be transferred to Calleguas.

3. **Release of Liability**. Except for each Party's obligations pursuant to this Agreement, and except as otherwise provided in Section 4, below:

3.1. As of the Termination Date, each Party to this Agreement mutually, fully and unconditionally releases and discharges the other, and their respective officers, directors, employees, and other representatives, from any and all claims, demands, causes of action, obligations, and liabilities of every kind and nature whatsoever which each had, or claims to have had, or now has, against the other, which relates to or arises out of the 1994 Agreement.

3.2. It is further understood and agreed that each Party hereby waives any and all rights under California Civil Code Section 1542, which reads as follows:

> "A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR."

Each Party acknowledges that it has received the advice of legal counsel with respect to the aforementioned waiver and understands the terms thereof.

4. **Continuing Liability**. Notwithstanding the termination of the 1994 Agreement and the release of liability provided for herein, Pleasant Valley shall remain liable, with respect to the term of the 1994 Agreement prior to the Termination Date, for the performance of all of its obligations under the 1994 Agreement, and Calleguas shall have all the rights and remedies with respect to such obligations as set forth in the 1994 Agreement. Without limiting the foregoing, Pleasant Valley is not released from its obligation to hold Calleguas harmless with respect to water quality as provided in Section 7 of the 1994 Agreement, and such obligation shall continue in full force and effect notwithstanding this Agreement.

5. **Governing Law**. This Agreement shall be governed and construed under the laws of the State of California.

6. **Counterparts**. This Agreement may be executed in counterparts, each of which shall be deemed an original, but such counterparts, when taken together, shall constitute one agreement.

7. **Binding Effect**. This Agreement shall inure to the benefit of, and shall be binding upon, the Parties.

8. **Time of the Essence**. Time is of the essence of this Agreement and the provisions contained herein.

9. **Further Assurances**. Pleasant Valley and Calleguas hereby agree to execute such further documents or instruments and take such actions as may be reasonably necessary or appropriate to carry out the intention of this Agreement.

10. **Voluntary Agreement**. The parties have read this Agreement and mutual release as set forth and have freely and voluntarily entered into this Agreement.

11. **Effective Date.** This Agreement shall be deemed effective upon execution by the last party to sign this Agreement.

IN WITNESS WHEREOF, the Parties have entered into this Agreement as of the Effective Date.

CALLEGUAS MUNICIPAL WATER DISTRICT

By: ______________________________ Date: ______________________

Susan Mulligan, General Manager

PLEASANT VALLEY COUNTY WATER DISTRICT

By: ______________________________ Date: ______________
Thomas P. Vujovich, President, Board of Directors

By: ______________________________ Date: ______________
David Souza, General Manager

APPROVED AS TO FORM:

By ______________________________
John Mathews, General Counsel

AGREEMENT
FOR
RECYCLED WATER

THIS AGREEMENT FOR RECYCLED WATER ("Agreement") is effective as of June 14, 2017, and is between Camrosa Water District ("Customer") and the CITY OF CAMARILLO, a California municipal corporation and general law city (referred to hereafter together with the District as "City").

RECITALS

A. City operates a water enterprise that supplies water for domestic, municipal, and irrigation use.

B. Camarillo Sanitary District, an agency of the City of Camarillo, operates a wastewater treatment facility that is able to treat to tertiary treatment levels and reclaim water for non-potable uses (including turf irrigation) ("recycled water system"), which water is hereafter referred to as "recycled water."

C. The wastewater treatment facility operates under a National Pollutant Discharge Elimination System (NPDES) permit for its wastewater treatment operations and a water reclamation permit, both issued by the California Regional Water Quality Control Board (CRWQCB).

D. City desires to make excess recycled water available for Customer's approved uses and Customer desires to purchase such recycled water for such uses subject to the terms and conditions of this Agreement.

E. The Customer owns and operates a non-potable distribution system, separate from the City's, approved by the Division of Drinking Water (DDW) to distribute and serve recycled water.

AGREEMENT

1. **Provision of Recycled Water.** Subject to the terms of this Agreement, City will deliver recycled water for irrigation use to the point of delivery as shown in Exhibit A.

2. **Limitation on Recycled Water Delivery and Use.**

   A. The City estimates the quantity of excess recycled water available for sale to Customer to be 500 acre-feet per year until December 31, 2017, and 800 acre-feet per year thereafter. These estimated quantities do not bind the City to a minimum delivery to Customer.

   B. Customer acknowledges that:

      1. City does not guarantee the availability of recycled water throughout the term of this Agreement due to possible changes in regulatory agency requirements, reduction in plant flow, or other conditions beyond City's control. Consequently, recycled water delivery may be intermittent,

inconsistent in volume, subject to reduction, or discontinued with or without notice.

2. The purpose of City's recycled water system is to control the biological quality of the recycled water resulting from its operation. As such, the recycled water system is not equipped to detect, treat, or remove harmful chemicals or toxic materials except to the extent required to meet federal, state, and local regulatory agency discharge standards.

3. City will conduct water quality sampling on a regular basis in accordance with the recycled water system's water reclamation permit. This sampling includes continuous monitoring for chlorine residual, a minimum of 90 minute disinfection contact time, turbidity, and daily coliform (total coliform). All other water quality monitoring will be conducted either daily, weekly, monthly, quarterly or annually. This information is available to Customer upon request.

C. Based on the above acknowledgments, Customer agrees to waive all claims against City for consequential or any other damages that might arise or result from: (1) City's failure to deliver recycled water; or (2) the use of recycled water on the Property to the extent such recycled water meets applicable federal, state and regulatory discharge standards.

3. **Pressure**. The recycled water to be delivered pursuant to this Agreement will, as far as possible, be delivered at a minimum pressure of approximately 75 psi to the point of delivery. The City will make efforts to deliver the recycled water at a 100 psi, as requested by the Customer. If the City is unable to deliver the recycled water at the requested pressure, the Customer is responsible for, at its cost, providing any and all additional equipment necessary to provide any higher pressure required to deliver the recycled water to the points of use.

4. **City Operational Responsibilities**.

A. City will provide recycled water up to the point of delivery in compliance with the applicable requirements of federal, state and local regulatory agencies.

B. As the producer of recycled water, ultimate responsibility for the use of recycled water rests with the City. While such responsibility grants the City the right to enter Customer's premises to monitor and inspect all on-site recycled water facilities, because the Customer is a DDW-certified recycled water distributor, the City cedes inspection responsibilities to the Customer and conditionally suspends the right to enter Customer property and inspect on-site facilities.

i. The condition of such suspension is that the Customer meet its Title-22/recycled water permit use-site reporting obligations; should the Customer miss two or more consecutive quarterly use-site reports, and/or refuse two consecutive requests by the City to either submit reports or perform coordinated inspections of on-site recycled water facilities (made by telephone to the contacts listed in Section 4.C), such suspension is automatically revoked and the City regains the right to enter the Customer's property and inspect all on-site recycled water facilities. The Customer agrees to grant the City access to its property for the purpose of such inspections; should the Customer fail to accommodate such a request from the City, recycled water service will be suspended until such time as the Customer files the delinquent use-site report(s), or the City is granted access to the Customer's property to perform inspections of one-site recycled water facilities and verify recycled water is being used in accordance with Title 22 rules and regulations.

ii. The City agrees to cede inspection responsibility to the Customer for any of the Customer's recycled water customers/users. The same conditions regarding the suspension of the City's right to access the Customer's property outlined in Section 4.B.i apply to the properties of any and all of the Customer's customers/users, as well.

C. If water quality requirements set by the City's Waste Discharge Requirements are not met and service is interrupted, City will promptly notify Customer by telephone. Contacts, in order of priority, are:

i. Bill Keyes (805.482.9625)

ii. Robert Barone (805.482.8673)

iii. The Camrosa main office (805.482.4677).

D. City will be responsible for construction, installation, and maintenance of the water metering station, which shall be installed at the point of connection between the City's recycled water system and the Customer's recycled water system. Said metering station shall include telemetry for reporting of meter activity, to which both the City and Customer have access.

5. **Customer Responsibilities and Use Requirements**.

A. Customer must pay all costs to accept delivery of recycled water and is responsible for the operation, surveillance, repair, and maintenance of its on-site recycled water facilities in compliance with all applicable laws and regulations.

B. Customer acknowledges receipt of and agrees to comply with the applicable provisions of the most current version of the Recycled Water User Manual ("Manual") prepared by the Los Angeles County Recycled Water Advisory Committee, as it may be amended from time to time. A copy of the current version of the Recycled Water User Manual is attached as Exhibit B.

C. Because the Customer also operates a recycled water distribution system permitted by the CRWQCB, upon receiving recycled water from the City, the Customer will be responsible for the protection of public health by following the most current version of the Manual. However, Customer acknowledges City has ultimate responsibility as the recycled water producer and therefore if Customer is found to violate any requirements of the Manual, then the City may cease delivery of recycled water without notice until corrections are made.

D. Customer to provide approved Use Site Reports to City for sites that may be the receiver of recycled water that originates from the City.

6. **Violations – Termination of Agreement.**

A. City reserves the right to decide if a violation of this Agreement has occurred. Violations may include, but are not limited to, non-compliance with any of the provisions of Section C of the Manual. In addition, any act of noncompliance, either willful or not, with any federal, state, or local regulation regarding the use of recycled water will constitute a violation of this Agreement.

B. If City determines that a violation has occurred, City will notify Customer of the violation and what corrective action must be taken. Upon receipt of a notice of violation, Customer must promptly take action to correct the violation.

C. If the violation is not corrected promptly, City reserves the right to terminate recycled water service or this Agreement due to Customer's noncompliance with this Agreement.

7. **Billing for Service.**

A. The purchase price for recycled water is $0 per acre-foot until Customer recoups its Capital Investment. Capital Investment is defined as the construction cost, determined at the time of Customer's bid opening, of the approximately three thousand (3,000) linear feet of pipeline and necessary appurtenances required to deliver recycled water to the Customer's non-potable distribution system. The duration of the recoupment period will depend on Customer's Capital Investment and the quantity of water delivered by the City. During the recoupment period, the value of recycled water will be defined by the rate the Customer charges their end users for non-potable water less administration, operations, and maintenance costs (estimated at $250 per acre-foot). The amount of water delivered to the Customer to fulfill the recoupment period will be defined by the following equation:

Water Delivered = (Capital Investment) / ($250 per acre-foot)

The Capital Investment will be determined at the time of Customer's bid opening; an estimated recoupment period will be established at that time, but is not expected to exceed eight years. Thereafter, the cost of recycled water shall be $111.20 per acre-foot and will be adjusted yearly in October by the change in Consumer Price Index for All Urban Users of the Los Angeles area (CPI-U).

B. Customer must make payments within 30 days of the date of issuance of a monthly bill. Any late payments will be considered delinquent and will be subject to City's standard penalty charges and disconnection procedures then in effect.

8. **Protection of Public Health**. City reserves the right to terminate service at any time and without prior notice to Customer's recycled water system in order to safeguard the public health. Promptly after termination of service, City will notify Customer, by telephone, at the contacts and according to the priorities listed in Section 4.C.

9. **Assignment**. Customer may not assign any of its individual or collective rights under this Agreement to any person or entity, or become associated with any other party involving, in any way, the recycled water to be delivered pursuant to this Agreement without the prior written consent of City. Any such approved assignee must execute and agree to be bound by this Agreement.

10. **Term**. Subject to the termination provisions of Section 6, and after the recoupment of the Customer's Capital Investment, the term of this Agreement will be 5 years, but can be extended for an additional 5 years by mutual agreement.

11. **Hold Harmless and Indemnification.**

    A. Customer agrees to indemnify, defend, protect and hold harmless City from and against, any and all liabilities, claims, actions, causes of action, proceedings, suits, damages, judgments, liens, levies, costs and expenses of whatever nature, including reasonable attorneys' fees and disbursements (collectively, "Claims"), which City may suffer or incur or to which City may become subject by reason of or arising out of any injury to or death of any person(s), damage to Property, loss of use of Property, economic loss or otherwise occurring as a result of or allegedly caused by the negligent or willfully wrongful acts or omissions of Customer, its officers, employees, or agents related Customer's use of recycled water on the Property or the performance of Customer's obligations under this Agreement.

    B. If any action or proceeding is brought against City by reason of any of the Claims that Customer has agreed to indemnify City as provided above, Customer, upon notice from City, must defend City at Customer's expense by counsel acceptable to City, such acceptance not to be unreasonably withheld. City need not have first paid for any of the matters to which City is entitled to indemnification in order to be so indemnified.

    C. For the purposes of this section, "City" includes City's officers, officials, employees, agents and volunteers.

    D. The provisions of this section do not apply to Claims occurring as a result of the City's sole negligence or willful acts or omissions.

    E. The hold harmless and indemnification obligations of this section will survive the termination of this Agreement.

12. **Notices.** All notices given or required to be given pursuant to this Agreement must be in writing and may be given by personal delivery, facsimile, or by mail. Notice sent by mail will be addressed as follows:

To CITY:

Water Superintendent
City of Camarillo
P.O. Box 248
601 Carmen Drive
Camarillo, CA 93011-0248
Fax: (805) 419-7818

To CUSTOMER:

General Manager
Camrosa Water District
7385 Santa Rosa Road
Camarillo, CA 93012
Phone: (805) 482-4697
Fax: (805) 987-4797

Such notice will be deemed given upon deposit in the United States mail, postage prepaid. In all other instances, notice will be deemed given at the time of actual delivery. Changes may be made in the names or addresses of persons to whom notices are to be given by giving notice in the manner prescribed in this section.

13. **General Provisions**.

A. Entire agreement. This Agreement and the attached Exhibits A and B which are incorporated by reference, sets forth the parties' entire understanding. There are no other understandings, terms or other agreements expressed or implied, oral or written.

B. Amendment. No alteration, change or amendment to the terms of the Agreement will be valid unless made in writing and signed by both parties. The City Manager is authorized to execute amendments for City.

C. Interpretation; venue. This Agreement is governed by the laws of the State of California. Exclusive venue for any action involving this Agreement will be in Ventura County.

[Signatures on the following page.]

THE UNDERSIGNED AUTHORIZED REPRESENTATIVES of the Parties execute this Agreement on the day and year entered above.

CITY OF CAMARILLO

David J. Norman, City Manager

ATTEST

Jmadland

Jeffrie Madland, City Clerk

CAMROSA WATER DISTRICT

Tony Stafford

Tony Stafford, General Manager

APPENDIX J: FCGMA GROUNDWATER SUSTAINABILITY PLANS

The Fox Canyon Groundwater Management Agency GSPs for the Oxnard and Pleasant Valley Basins are available here:

https://fcgma.org/groundwater-sustainability-plan

APPENDIX K: SHALLOW ZONE PUMPING TESTS

Included in this appendix are the 2010 Aquifer Pumping Test of Camrosa Water District University Well; Shallow Groundwater of the Eastern Pleasant Valley Basin; and Northeast Pleasant Valley Basin Ground and Surface Water Study

HOPKINS GROUNDWATER CONSULTANTS, INC.

PRELIMINARY HYDROGEOLOGICAL STUDY

NORTHEAST PLEASANT VALLEY BASIN
SURFACE WATER AND
GROUNDWATER STUDY
SOMIS, CALIFORNIA

Prepared for:
CALLEGUAS MUNICIPAL WATER DISTRICT
November 2008

HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

November 7, 2008
Project No. 03-007-07

Calleguas Municipal Water District
2100 Olsen Road
Thousand Oaks, California 91360

Attention: Mr. Henry Graumlich
Manager of Special Projects

Subject: Preliminary Hydrogeological Study of the Pleasant Valley Groundwater Basin in Somis, California.

Dear Mr. Graumlich:

Hopkins Groundwater Consultants, Inc. (Hopkins) is pleased to provide this final report summarizing the findings, conclusions, and recommendations developed from the subject preliminary hydrogeological study of conditions that are resulting in groundwater recharge to the northeast Pleasant Valley Groundwater Basin. The study findings indicate that the Arroyo Los Posas surface flows percolate into the ground in the Somis area which is defined by the study as the Pleasant Valley Forebay. The resulting groundwater elevation rise, water quality change, and isotopic fingerprint, measured at the City of Camarillo Well B location indicate a direct connection to recharge from the increased surface water inflows since 1994. We trust the information contained in this report sufficiently describes our understanding of groundwater basin conditions in the northeast Pleasant Valley Groundwater Basin based on available data. If you have any questions or need any additional information, please give us a call.

Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

REGISTERED GEOLOGIST
CURTIS J. HOPKINS
EG NO. 1800
CERTIFIED ENGINEERING GEOLOGIST
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Copies Submitted to Client: Five (5)

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EXECUTIVE SUMMARY

The preliminary groundwater study (Study) was conducted to develop a better understanding of the changing groundwater conditions observed in the northeast Pleasant Valley Groundwater Basin (PVB). The Study was conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) in coordination with Calleguas Municipal Water District (CMWD) staff between October 2007 and December 2007. The Study consisted of; a) obtaining and analyzing existing groundwater and surface water data, b) collecting a groundwater sample from the City of Camarillo (City) Well B, and c) measuring surface flows and collecting a water sample from the Arroyo Los Posas.

The findings of the Study indicate that the Arroyo Los Posas percolates into the ground and ceases flowing most of the year in the vicinity of Somis, California. Available data indicate that the northeast PVB has been recovering since the mid 1990's and is being directly recharged by surface water infiltration along the arroyo. Historical water quality data indicate that the chemical character of groundwater sampled from the City's well has changed over the last 10 years and closely resembles the surface water quality in the arroyo. Tritium test results support the groundwater is a young age while the oxygen and hydrogen isotope analyses indicate the well water is of similar isotopic composition to historical surface water samples tested by other studies (Izbicki, 1997). The nitrogen isotope signatures indicate that the surface water and well water samples were very close in their isotopic ratios and tend to exhibit a nitrogen source that is likely dominated by nitrate from wastewater treatment plant effluent.

The Study concludes that the groundwater degradation and rapid water level rise documented in the City wells is a direct result of surface water recharge emanating from the Arroyo Los Posas. Recharge began when the East Los Posas Groundwater Basin (located upstream) was filled along the arroyo and began to overflow into the PVB in approximately 1994. The surface flows rapidly percolated through the coarse alluvial sediments that comprise the river bed and into the underlying Saugus and Los Posas Sand Formations that comprise the primary aquifer system in the PVB. Available data indicate that surface water inflow since the beginning of the 1990's has likely resulted in annual groundwater recharge on the order of 10,000 to 15,000 acre-feet per year. Water level data appear to indicate that subbasin boundaries may be present and restrict the lateral migration of water from the area of recharge which comprises the Pleasant Valley Forebay. The study concludes that water quality in this area of the PVB will likely not improve in the foreseeable future and that the City should consider the use of treatment to allow continued municipal use of this groundwater supply.

INTRODUCTION

This report summarizes the findings, conclusions, and recommendations developed from a preliminary hydrogeological study of groundwater recharge occurring in the northeast Pleasant Valley Groundwater Basin (PVB). The study was conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) to assist the Calleguas Municipal Water District (CMWD) with developing an understanding of the conditions that are resulting in groundwater recharge from the Arroyo Las Posas/Calleguas Creek in an area recently recognized as the PVB Forebay. The area of study is located within the northeast portion of the PVB along the Arroyo Las Posas/Calleguas Creek reach which lies south of the Springville Fault Zone and north of the Camarillo Fault as shown on Plate 1 – Study Area Location Map.

The purpose of the study is to understand the changing groundwater conditions which are causing groundwater degradation in the northeast PVB and affecting the municipal use of groundwater in that area of the basin. The scope of work for the study was developed through conversations with Dr. Donald Kendall, General Manager with the CMWD, and Ms. Susan Mulligan, Manager of Engineering with the CMWD, and includes the following work tasks:

- Collect and review historical geology, hydrology, and hydrogeology data
- Develop a refined interpretation of the hydrogeology in the northeast portion of the Pleasant Valley Groundwater Basin
- Conduct creek flow measurements
- Collect creek water samples and well water samples for laboratory analysis
- Compile and present the data and study findings in this report

Included with this report are appendices that present technical information that was compiled and used by the study. These appendices include; Appendix A - Water Quality Data Appendix B – Aerial Photographs of Arroyo Las Posas, Appendix C - Stream Flow Survey, and Appendix D – Laboratory Test Results of Surface and Groundwater Analyses. A list of references used during the study is included at the end of this report.

FINDINGS

Historical Data

Initial work tasks for the study consisted of collecting and reviewing hydrogeological information in the northeastern PVB for the purpose of refining the historical understanding of the subsurface materials and geological structures that form the aquifer system in this area of the basin. Data were collected from sources that include the Ventura County Watershed Protection District (County), United Water Conservation District (UWCD), City of Camarillo (City), CMWD, United States Geological Survey (USGS), and California Division of Mines and Geology (CDMG). From these data we reviewed the local stratigraphy and previous interpretations developed by other studies, interpreted and correlated available well logs (State well driller reports and geophysical surveys), reviewed historical water level measurements and available groundwater quality test results as part of our analysis to understand groundwater movement within this portion of the basin. We reviewed historical stream flow data provided from monitoring locations upstream of the observed groundwater recharge area. Based on these data we developed the following findings, conducted additional field work, and performed the analyses presented in the following sections of this report.

Hydrogeology

Local Geology

The geologic formation materials that comprise the aquifers which have historically supported groundwater production in the study area consist of Quaternary geologic age young and older alluvium, the Quaternary/Tertiary age Saugus Formation and the Las Posas Sand Formation which have been grouped by others as the San Pedro Formation (SWRB, 1953). The young and older alluvium is comprised of largely unconsolidated sediment locally deposited by outwash from the Camarillo Hills and flows in the Arroyo Las Posas. These alluvial deposits unconformably lie on top of marine and nonmarine mudstone, sandstone, and conglomerate deposits that comprise the Saugus and underlying Las Posas Sand Formations.

Numerous agencies have conducted studies to understand the geological conditions in the vicinity of the study area. For this study Hopkins primarily utilized the surface geology mapped by T.W. Dibblee, Jr. and the geological formations defined by this source which are presented as Plate 2 – Surface Geology Map. This information was combined with geologic mapping provided by CDMG (CDMG, 1973) which is presented as Plate 3 – Study Area Geological Structures and includes an interpretation with numerous buried features in the study area. These data were subsequently correlated with well log information and projected into hydrogeological cross-sections that were constructed to define water bearing units (aquifers) within the study area. The location of wells within the study area that provided historical data and the location of the hydrogeological cross-sections constructed for this study are shown on Plate 4 - Hydrogeological Cross-Section and Well Location Map. The subsurface hydrogeology inferred from data sources available for this study is shown on Plates 5 and 6 – Hydrogeological Cross-Section A-A’ and B-B’, respectively.

As shown on Plate 2, the active channel of the Arroyo Los Posas emerges from the Las Posas Valley and crosses through the river-eroded gap (at Somis) into the Pleasant Valley area.

The river bed is comprised of Recent alluvium that is predominantly a very coarse-grained sand and fine gravel material. These alluvial deposits unconformably lie on top of the Saugus and Las Posas Sand Formations (and possibly older alluvial deposits) which have been uplifted and are exposed in the Las Posas Hills to the east and the Camarillo Hills to west (see Plate 2). In the Somis gap area surface water in the arroyo readily percolates into the river bed alluvium (which is believed to be on the order of 60 to 100 feet thick) and into the underlying aquifers in the Saugus and Las Posas Sand Formations. For the purpose of this study we have named the Somis gap groundwater recharge area the PVB Forebay, and we are defining a forebay as the portion of an unconfined alluvial aquifer that allows surface water percolation to recharge aquifer zones that become confined by overlying aquitard or aquiclude layers outside the area of recharge.

Groundwater Basin Boundaries

The groundwater basin boundaries have been defined and redefined through time as additional information becomes available. This is exemplified by the delineation of the East and West Las Posas Basin (ELPB and WLPB) which were originally defined as the North Las Posas Basin. The groundwater basin boundaries utilized by this study were provided from the newly updated Fox Canyon Groundwater Management Agency (FCGMA) Groundwater Management Plan (FCGMA, 2007). The location of groundwater basin boundaries in and around the study area is shown on Plate 4 along with the approximate location of the inferred PVB Forebay. The Springville Fault effectively defines the northern boundary of the PVB. However, it is unclear how other inferred geologic structures in and around the northeast portion of the PVB affect groundwater movement.

Groundwater Conditions

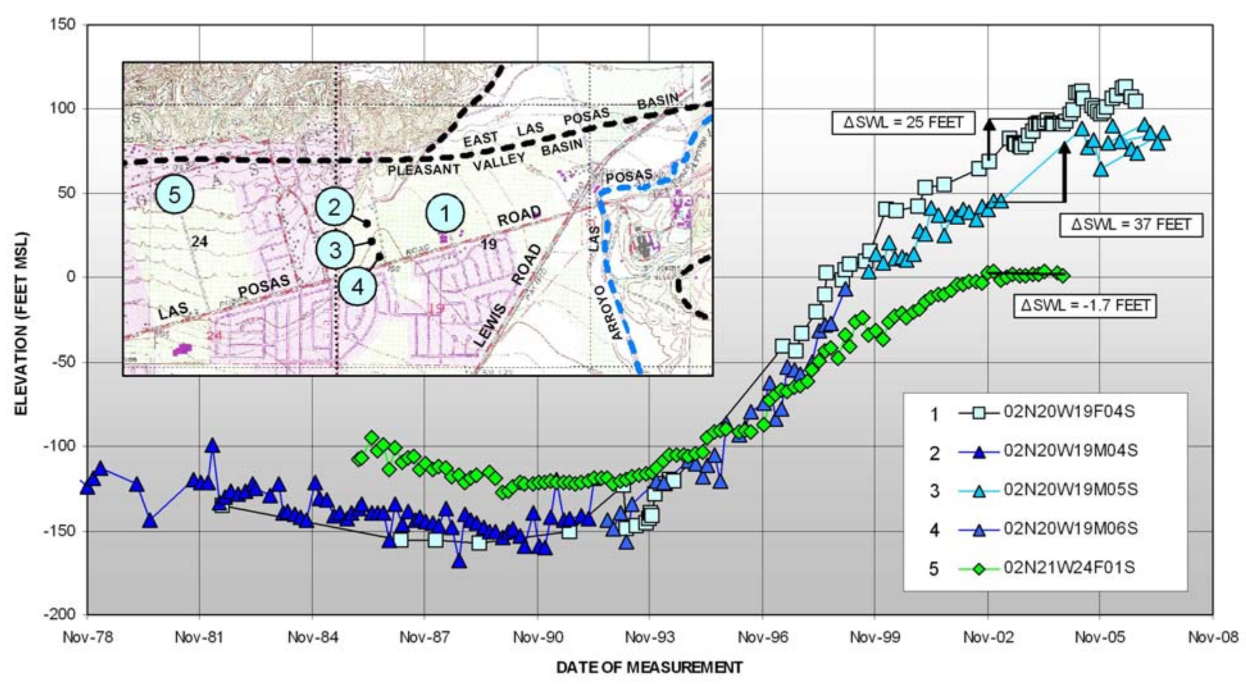
Groundwater conditions change over time as a response to recharge and discharge within the natural system. Historical changes in groundwater quality and groundwater levels have been monitored by the State, County, Cities, and UWCD. Available data from these sources have been combined to provide the basis of the analysis in this study.

Water Levels

Groundwater level measurements collected upstream of the study area provide important information for understanding the present conditions in the PVB Forebay. Groundwater levels measured in key wells located in the South Las Posas Basin and subsequently in the ELPB were observed to rise and then level off as the groundwater mound beneath the arroyo rose to the level of the active channel. The migration of the groundwater mound downstream along the arroyo is shown on Plate 7 – Groundwater Recharge Mound Hydrographs and is coincident with the live reach of the arroyo. Groundwater recharge within the live reach is supported year-round by discharges from shallow groundwater dewatering operations located in Simi Valley and wastewater effluent discharges to the arroyo from the Simi Valley wastewater treatment plant.

Water level data that indicate groundwater trends in the vicinity of the study area are provided by the 19 wells which are shown on Plate 8 – Groundwater Hydrographs. These data show water level trends from the mid 1980's through the year 2006. As indicated by these data, the water levels in the ELPB, and subsequently the PVB Forebay, have risen to levels substantially above sea level while wells in the surrounding areas have not. While all wells have shown a water level rise since the end of the 1986 to 1991 drought period, the recovery trend in most wells has flattened out in recent years. The water level trends observed in the PVB and WLPB wells indicate that natural recharge and pumping cutbacks have resulted in a general rise in basin water levels within the recent past (see Plate 8). However, the water levels in the PVB Forebay have continued to rise while the water levels in surrounding basins leveled off as the groundwater recharge and demand reached a balance.

Figure 1 – Forebay Water Level Trends



As previously mentioned, the North Las Posas Basin was segregated into the ELPB and WLPB which were largely delineated based on observed water level differences that indicated the presence of a flow barrier. As shown above in Figure 1, groundwater level recoveries at three well locations (City Well B [-19F04], Pleasant Valley Mutual Water Company wells [19M04, 05, 06], and a private well [24F01]) appear to show a diverging trend between 2002 and 2004 (the last 3 years of data). We believe this may indicate the presence of another undocumented groundwater barrier which may partition the basin and impound groundwater in a relatively small area around the forebay and impede flow into adjacent portions of the PVB.

Water level data from the years 1986, 1994, and 2004 were utilized to construct groundwater contour maps that indicate the inferred groundwater gradient changes over time. The maps are provided as Plates 9 through 11 – 1986, 1994, and 2004 Groundwater Elevation Contour Maps, respectively. The interpretation of available groundwater data was conducted by using some of the inferred geological structures shown on Plate 3. While the scarcity of data points required some speculation to project water level changes between wells, we believe these interpretations are reasonable to explain the considerable changes that have occurred over the 18-year period. As shown on Plate 11, there is clearly a mound that has developed in the forebay area that does not appear to affect wells located to the east or west of the inferred forebay boundaries.

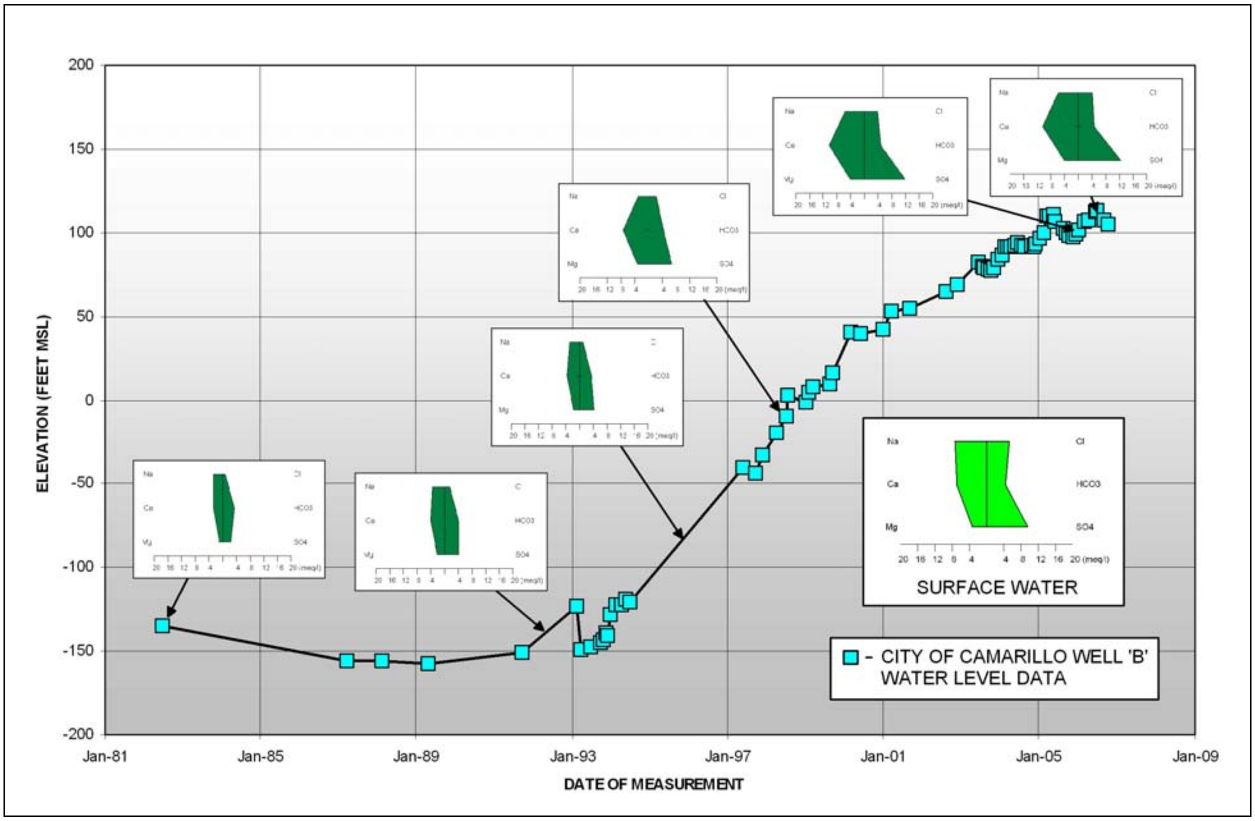
Future water level monitoring will be a key component to determine groundwater movement of recharge that originates in the PVB Forebay. However as shown on Plate 11, by 2004 the aggressive County well destruction program effectively removed 12 of the wells historically used for groundwater monitoring in the study area.

Water Quality

Groundwater quality is a dynamic property influenced by a combination of factors that include: a) the quality of the recharge sources (surface water infiltration, irrigation return flows, and subsurface inflow from adjacent basins, etc.), b) the mineralogy of the aquifer materials and their solubility under the specific aquifer conditions, c) the amount of time the water remains in the basin, and d) the dynamic changes in the aquifer that are caused by pumping. Sources of groundwater degradation in the PVB Forebay may include upwelling of poor quality water from the underlying bedrock (affecting the deepest aquifer zones during periods of low water levels), poor quality agricultural return flows, pore fluid seepage from silt and clay layers, subsurface inflows from the ELPB, and infiltration of surface flows from the Arroyo Las Posas. The primary sources of surface flow infiltration includes upstream discharges from shallow groundwater dewatering operations located in Simi Valley and wastewater effluent discharges to the arroyo from the Simi Valley wastewater treatment plant. These sources of surface flow blend with agricultural irrigation runoff and seasonal precipitation runoff prior to recharging the PVB Forebay.

The correlation between rising water levels and changes in the groundwater chemical character in City Well B is shown below in Figure 2. A stiff diagram comparison of the major anions and cations present in the surface water and groundwater samples collected for this study is shown on Plate 12 – Stiff Diagrams of Study Samples. As shown by the stiff diagrams on Figure 2 the present chemical character of the well water sample has changed to more closely resemble the surface water sample over the last 10 years ago.

Figure 2 – Groundwater Elevation and Chemical Character Change



Historical water quality data indicate that the groundwater in the study area ranges in quality and can generally be described as fair to poor quality for direct potable use. Appendix A contains graphical presentations of various general mineral constituents in all the City PVB wells. The total dissolved solids (TDS) concentration in the groundwater produced by the City wells has reportedly ranged from 366 to 1,420 milligrams per liter (mg/l). Plate A1 graphically presents available TDS data that begins in 1990. These data indicate that since the early 1990's there has been a significant increase in TDS concentration in both Wells A (State Well No. 02N20W19L05) and B (State Well No. 02N20W19F04) and only a minor increase in Well D (State Well No. 02N21W34C01). At the present time neither City Well A nor B can meet the State secondary maximum contaminant level (MCL) of 1,000 mg/l without blending or treatment. Plates A2, A3, and A4 show similar increasing trends for total hardness, sulfate, and chloride concentrations, respectively (see Appendix A). In recent years the groundwater produced from Wells A and B has exceeded the secondary MCL for sulfate (500 mg/l) while the sulfate concentration in Well D located in the main PVB remains below this level (see Plate A3).

Groundwater in the PVB is also demerited by concentrations of iron and manganese. Water produced from Well A exceeds the State secondary MCL's for both constituents by about 400 percent. Plates A5 and A6 (see Appendix A) show the historical trend for these two constituents in the City wells. These data indicate that water produced from Well D in the main PVB complies with drinking water standards for both constituents. The concentration of iron in groundwater from Well B is increasing but it is still below the MCL of 300 micrograms per liter (µg/l). The most recent data indicate that Well B has experienced a significant increase in manganese concentration and during the last 5 years values have ranged between 200 and 300 percent above the secondary MCL of 50 µg/l (see Plate B6).

The water produced from City Wells A and B presently has a calcium sulfate chemical character. However, through the years the chemical character has changed. The ionic composition in the groundwater from Well B varied through the 1990's and was tested as sodium-calcium bicarbonate (1990), sodium bicarbonate (1992), and calcium bicarbonate-sulfate (1995) (see Plate 12). The chemical character of groundwater from Well D has changed slightly from sodium-calcium bicarbonate (in the early 1990's) to the present calcium bicarbonate.

Changes in the produced water quality and chemical character are believed to result primarily from changes in pumping patterns and head conditions in the aquifer produced by these wells. The declining water quality in Well B appears to be a direct result of the rising water levels in the forebay portion of the basin. City Wells A and B produce from virtually the same aquifer zone(s) as well 02N20W19F02 shown in the hydrogeological cross-section on Plate 6. Well construction information is listed below in Table 1 – City Well Construction Details and indicates the well screen depths where the produced water quality is being degraded.

Table 1 – City Well Construction Details

STATE WELL NO.	CITY WELL NAME	CASING DIAMETER INCHES	PERFORATED INTERVAL (DEPTH IN FEET)
02N20W19F02	WELL C	18-INCH	444 TO 850
02N20W19L05	WELL A	18-INCH	467 TO 830
02N20W19F04	WELL B	18-INCH	449 TO 759
02N20W19F02	WELL D	18-INCH	700 TO 910

Surface Water Conditions

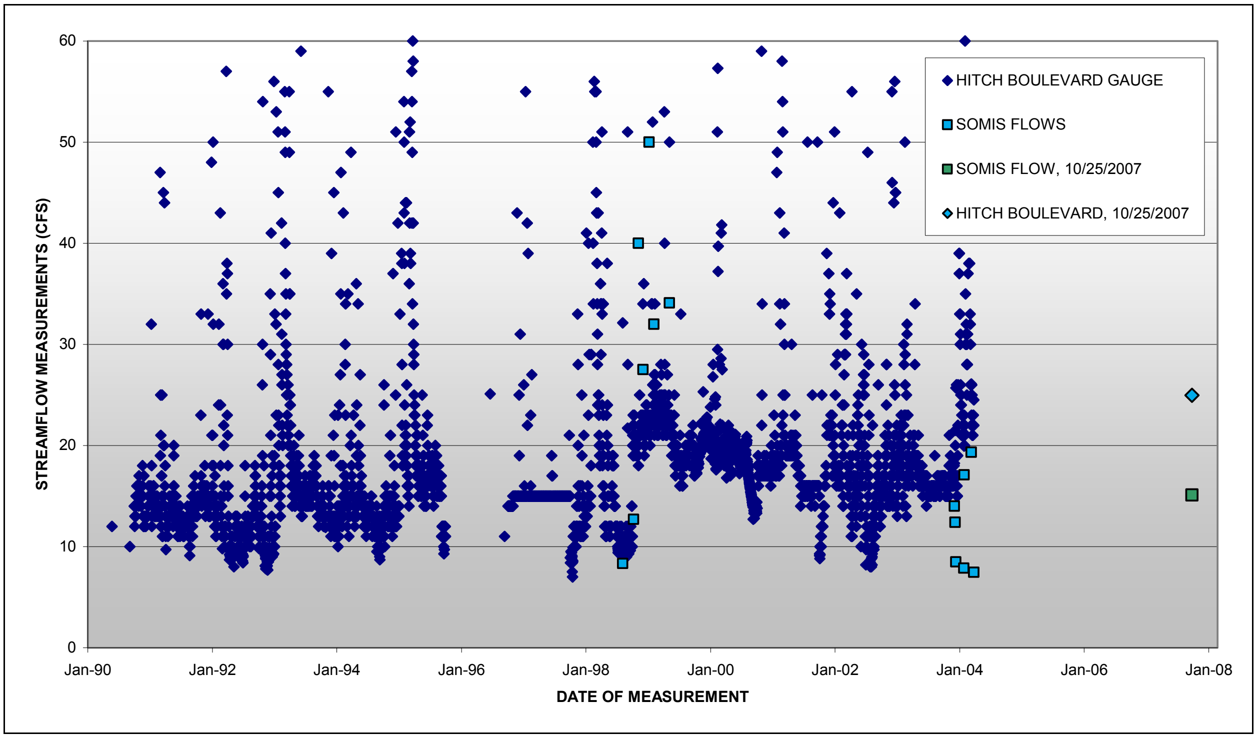
Surface water flows in the Arroyo Las Posas have recently been measured during detailed studies conducted for the Calleguas Creek Watershed Management Plan (WMP, 2004 and 2005). Data developed by these studies were utilized to understand the magnitude of flow that comes into the PVB Forebay area in the arroyo that is recharging the groundwater basin.

Stream Flow

Historical stream flow data have been collected by the County upstream of the study area where the Arroyo Las Posas flows under the Hitch Boulevard Bridge. Streambed conditions between the County gauging station and the Somis area where surface flows are recharging the PVB Forebay are shown on aerial photographs provided in Appendix B.

The Calleguas Creek Watershed Management Plan study (also referred to as the Conejo/Calleguas Creek Study [CCCS]) collected stream flow measurements at the Hitch Boulevard location as well as the same Somis gauging station that was used by this study. These data are presented along with the County stream flow data below in Figure 3.

Figure 3 – Stream Flow Measurements and Wastewater Discharges

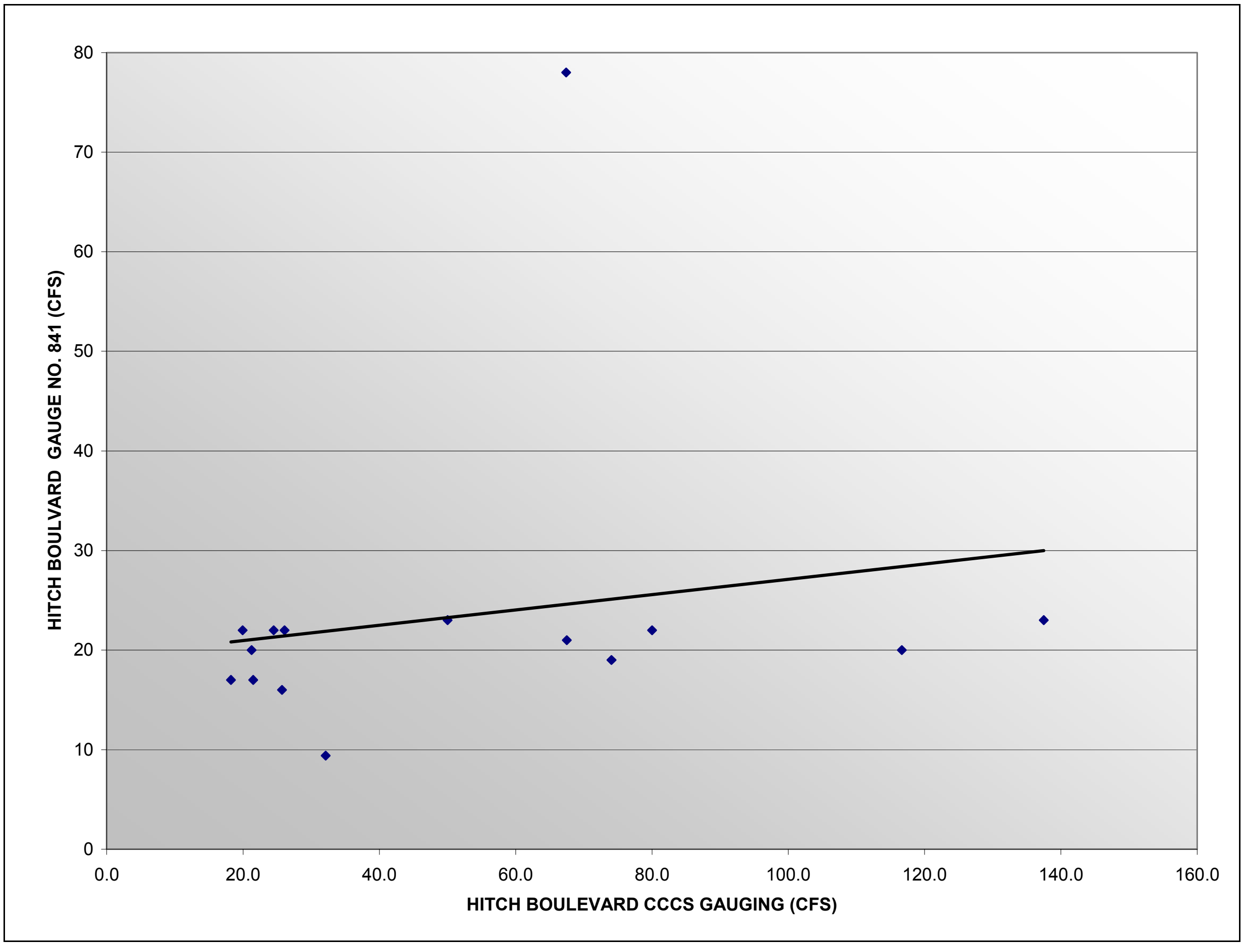


As shown by these data the arroyo commonly flows between 10 and 30 cubic feet per second (cfs). While summer flows are observed to dip below 10 cfs, winter flows often exceed

50 cfs (see Figure 3). Data available over the 13-year period between 1991 and 2003 indicate that over 24,000 acre-feet per year (afy) was measured by the County to flow past the Hitch Boulevard Gauge.

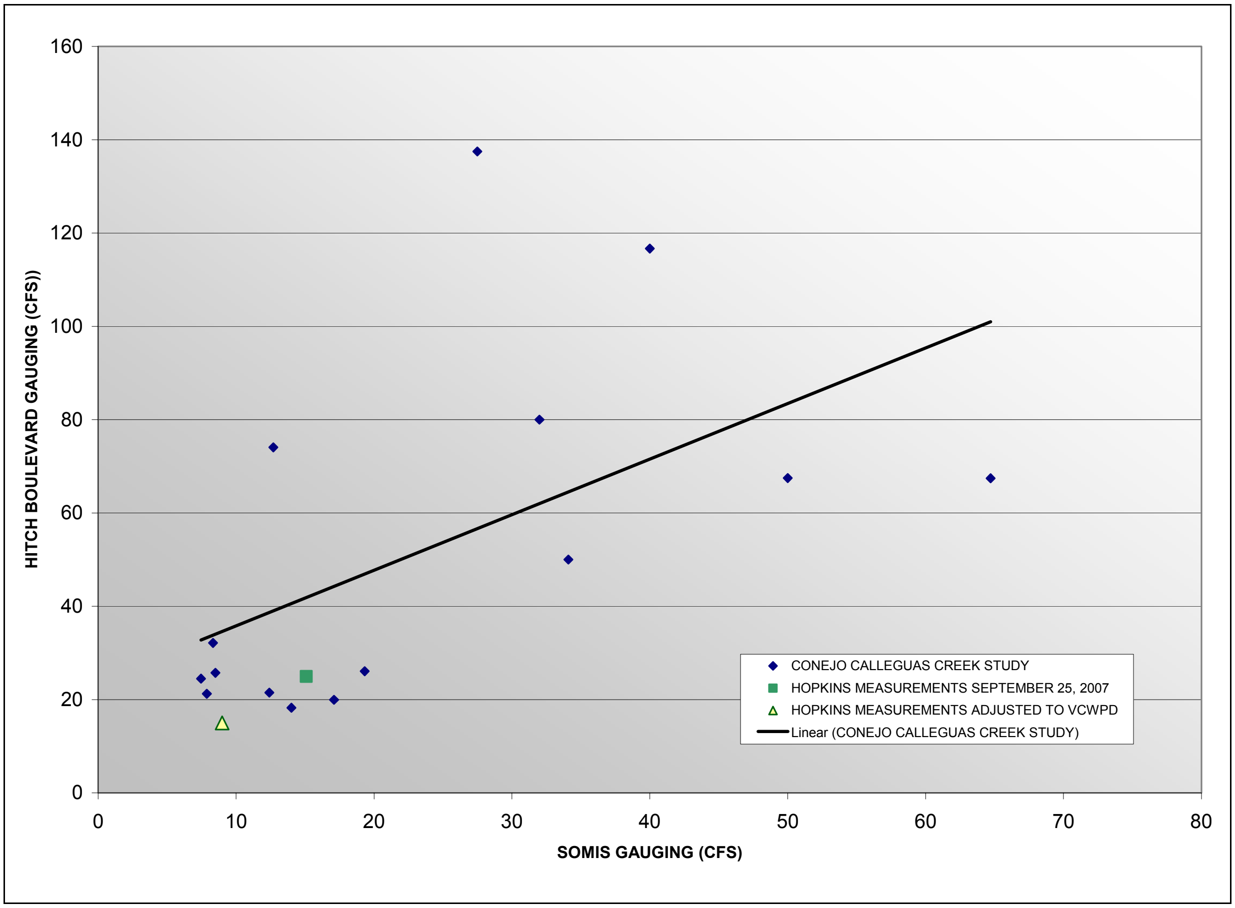
Stream flow measurements collected by in-stream methods were compared with the County Hitch Boulevard gauging station measurements (Station No. 841) and are presented below in Figure 4. As shown, the County gauge records are comparable at the lower flow rates but are considerably less than the watershed study measurements at higher flow rates. This variation may be a function of gauge position and/or configuration.

Figure 4 – Comparison of County Gauge and Watershed Study Data



To understand the magnitude of water that has historically been measured to pass Hitch Boulevard and flow into the PVB Forebay the watershed study measurements that were collected at both stations (Hitch Blvd. and Somis) on the same day were correlated. These data are presented on Figure 5 below and indicate that roughly 55 percent of the water that flows past the County station is presently reaching the PVB Forebay. These data suggest that on average over 13,000 afy of water flows across the Forebay where a majority percolates and recharges groundwater.

Figure 5 – Correlation of Stream Flow Measurements

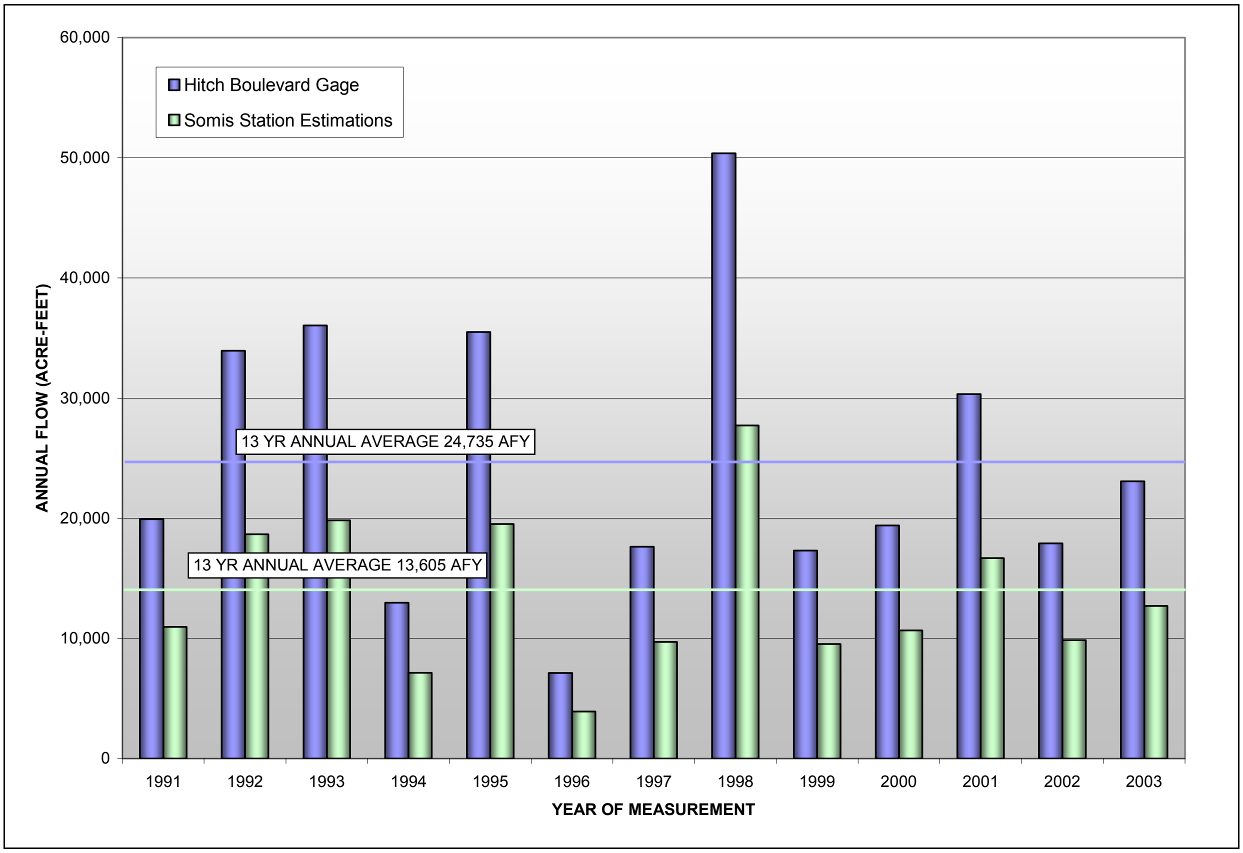


Based on the comparison of stream flow measurement methods (see Figure 4) the annual flow volumes shown in Figure 6 (which is calculated from daily County data) may be low. The factors that may presently influence the ability to accurately estimate historical flow volumes into the PVB Forebay are believed to include:

1. Prior to repair of the County gauge in 2004, many of the low flow measurements were not being accurately recorded by the station,

2. The average of 5 measurements during 2004 indicated that approximately 60 percent of the flow was passing the Somis gauging location,
3. Infiltration that is recharging the PVB Forebay upstream of the Somis station would not be measured at the present gauging location.

Figure 6 – Annual Stream Flow into PVB Forebay



Field Sampling and Laboratory Testing

Stream Flow Measurements

Field work conducted for this study was intended to generate information that would validate available historical data and obtain a recent comparison of flows at the Somis station. On September 25, 2007 Hopkins conducted 2 measurements of flow in the Arroyo Las Posas. Measurements were conducted downstream of the Hitch Boulevard Bridge near the existing County gauging station (No. 841) and approximately 200 feet south of a private bridge near the town of Somis, California. The stream flow measurement locations are indicated on Plate 7.

The survey measurement results are tabulated and provided in Appendix C along with photographs that document surface flow conditions at the time of the study and the stream flow measurement locations.

Utilizing a surveyor's tape and depth gauge, the creek bottom profile and water level was measured and recorded at each station. Depth measurements were collected at approximate 1 foot intervals (except where physical conditions required a different spacing). Subsequently these data were utilized to approximate the cross-sectional area of the creek at each location. An impeller type stream flow meter that provided electronic readings of flow velocity in feet-per-second was used to gauge the flow rate of the stream. The surveyor's tape was used as a guide for the location of the stream flow measurements. Flow rates were measured and recorded across the creek at approximate 1 foot intervals except where flow anomalies required a different spacing. The '6-tenths method' recommended by the USGS for stream flow-rate measurement was utilized to determine impeller depth setting and obtain an average flow of the stream at each point of measurement. The USGS asserts that an overall average flow rate of a column of water in a stream can be estimated by the measurement collected at a depth below the water surface that is equal to 0.6 times the total water depth.

The resulting stream flow readings are included on Figure 5 along with historical data and indicate that 25 cfs and 15 cfs were flowing at the Hitch Boulevard and Somis gauging stations, respectively. These data indicate that at the time of the study the flow at the Somis station was approximately 60 percent of the upstream measurement.

Subsequent comparison of the field measurement results of this study with County data collected by the automated gauge at Hitch Boulevard indicated that the County gauge measured approximately 60 percent of the flow measured for this study (15 cfs versus 25 cfs). To discern the origin of the discrepancy in flow calculation results, field verification measurements were performed by Hopkins and County staff on October 28, 2008. The results of both measurements were virtually identical and indicate a consistent bias in the instrumentation and/or method of measurement. Because the County utilizes a higher quality instrument for its measurements, we believe the County measurement is likely more accurate. A data point representing the County measurement at Hitch Boulevard and the adjusted value for the Somis Station measurement (60 percent flow) is included on Figure 5.

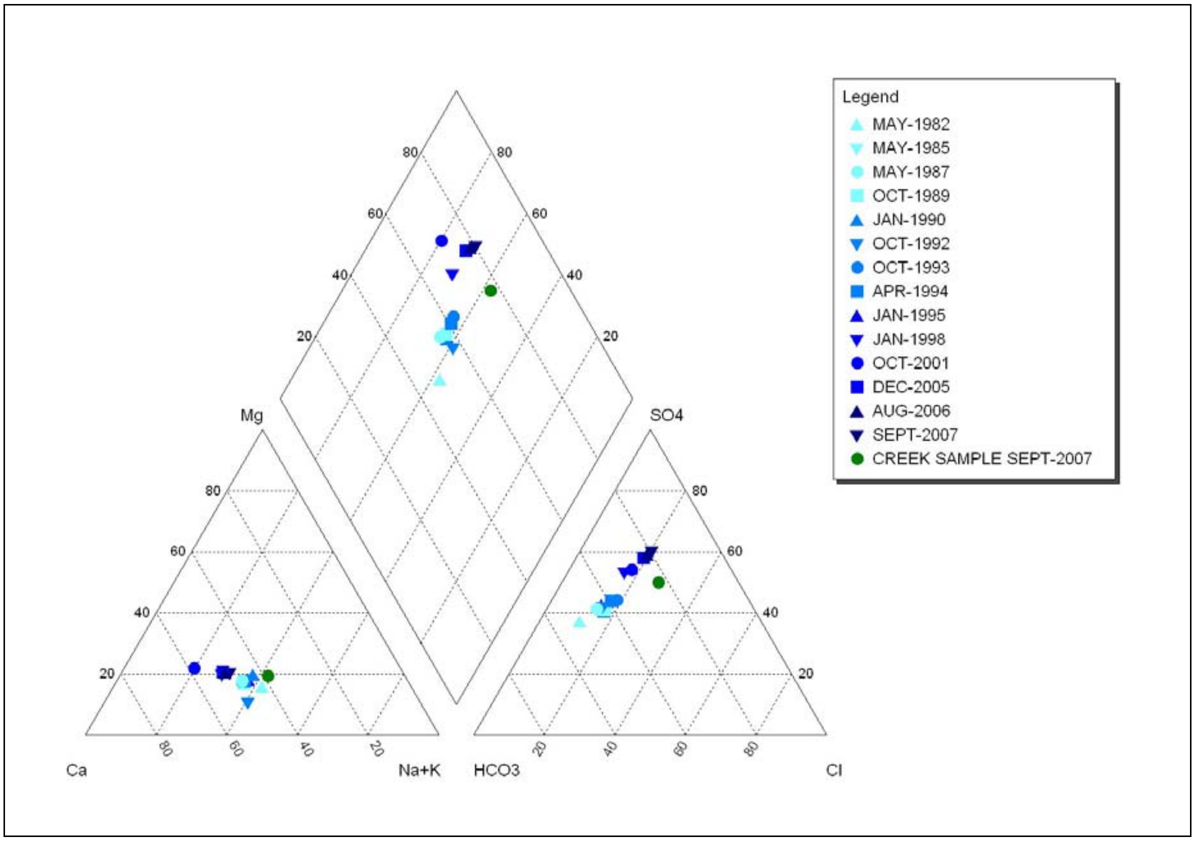
Water Quality Sampling and Testing

Prior to stream flow measurement, Hopkins collected samples of surface water from the Arroyo Las Posas at the Somis Gauging Station. After stream flow activities were concluded Hopkins collected samples of groundwater from the City of Camarillo's Well B. Samples were collected and preserved in accordance with laboratory specifications and submitted to FGL Environmental (FGL) of Santa Paula, California (for general-mineral analysis), Zymax Forensics (Zymax) of San Luis Obispo, California (for deuterium, nitrate and oxygen isotope analyses), and Isotech of Champaign, Illinois (for tritium analysis). Copies of the laboratory report forms presenting test results are provided in Appendix D. The creek water quality likely reflects the influence of the rainfall event that occurred 3 days prior to the sampling event. The creek flow rates were observed to be noticeably greater after the rain event than the flows observed 1 week prior to the scheduled sampling.

General Mineral

Laboratory test results for the surface water sample indicate the Arroyo Las Posas flow at the time of the study had a sodium calcium-sulfate chemical character with a specific conductance of 1,700 micromhos per centimeter (mmhos/cm) and a total dissolved solids concentration of 1,180 mg/l. The creek water has a relatively high iron concentration of 840 μg/l.

Figure 7 – Trilinear Diagram of City Well B Water Quality Data



Laboratory test results for groundwater samples indicate the groundwater in the northeast PVB is historically of a calcium-sulfate chemical character. The groundwater from City Well B has a specific conductance of 1,930 mmhos/cm and a total dissolved solids concentration on the order of 1,440 mg/l. Data acquired from the study were combined with historical water quality data from City Well B to provide a graphical presentation of the major anions and cations in the water samples which is shown above in Figure 7. As indicated by these data, the water quality in the City well has migrated over time toward the quality of the arroyo and has been influenced by changes in the arroyo recharge. A notable separation in quality is seen between the 1995 and 1998 sample events and can be seen as a grouping of chemical character prior to and after the time of these samples (see Figure 7).

Tritium

Tritium (^{3}H or T) is a radioactive isotope naturally produced in the atmosphere. The most important source of tritium for modern groundwater studies has been from thermonuclear weapons testing between 1952 and 1969. Tritium in groundwater is not significantly affected by geochemical processes, however given a half-life of 12.3 years, the usefulness of tritium as an age dating isotope diminishes over time. The most important use of tritium has historically been to distinguish between water that entered aquifers prior to 1953 and water that was in contact with the atmosphere after 1953. Because of the variable source of tritium and uncertainties due to possible mixing, tritium can not be used by this study for age dating in the conventional way.

Laboratory test results of the present tritium levels in the surface water and groundwater samples are presented below in Table 2 – Tritium Test Results. These results suggest the well water may be a blend of groundwater sources but also that a large component of the groundwater produced from the City well is from recent recharge.

Table 2 – Tritium Test Results

SAMPLE IDENTIFICATION	TRITIUM (TU)	STANDARD DEVIATION
CREEK SAMPLE	3.87	0.23
CITY WELL B SAMPLE	2.84	0.22

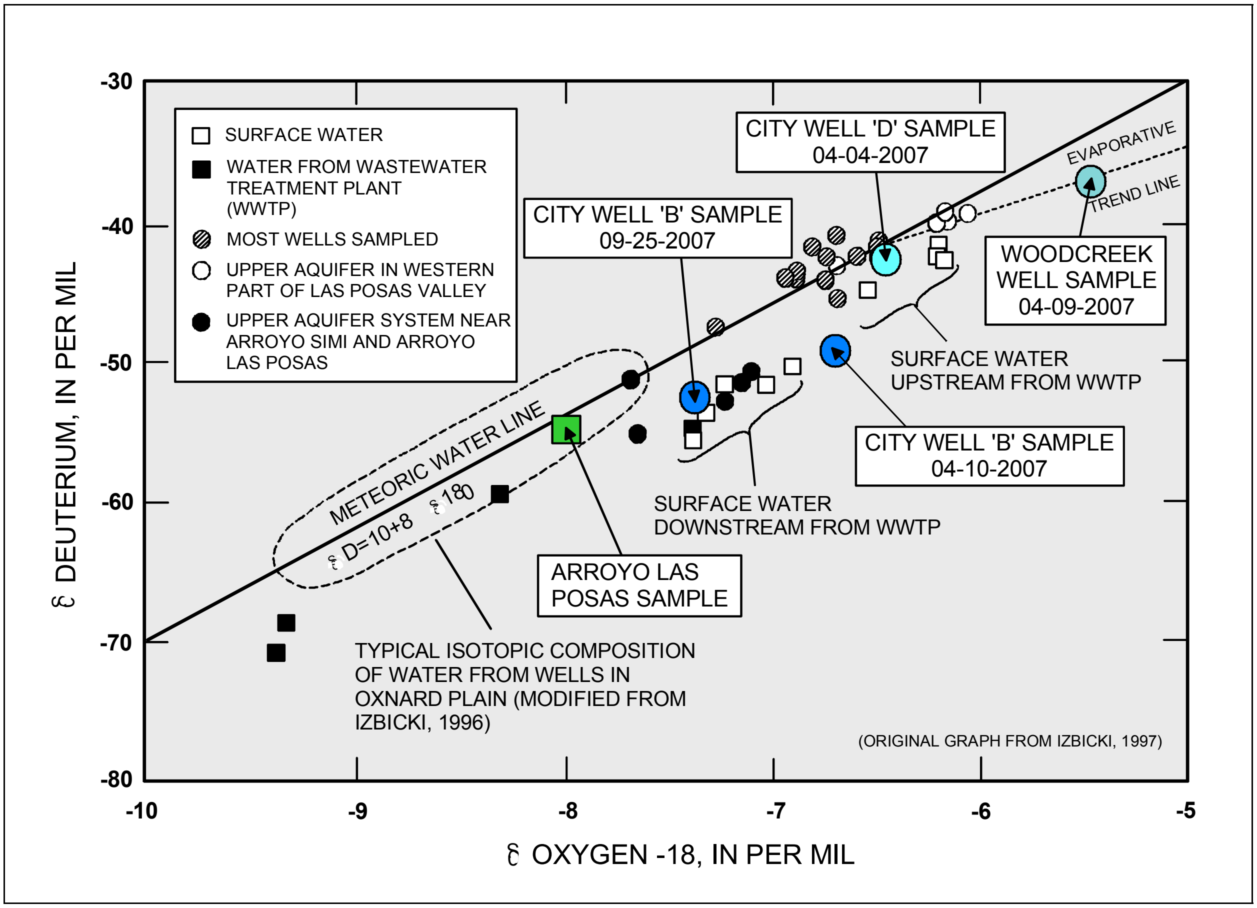
TU - Tritium Unit

Oxygen-18 ($\delta^{18}O$), Deuterium (δD), and Nitrogen ($\delta^{15}N$)

Isotopes are different forms of the same element which differ only in the number of neutrons contained in the nucleus of the atom. Although radioactive isotopes, like tritium, are unstable, most isotopes are stable. While different isotopes of an element have a nearly identical chemical behavior, the different physical properties can cause a slight variation in reaction rates and result in isotopic fractionation. Fractionation caused by physical and anthropogenic processes can result in different isotopic ratios forming in the same compound to create a specific "isotopic fingerprint."

The water samples collected during the study were analyzed for isotopes of oxygen, hydrogen, and nitrogen. The purpose of isotopic testing was to allow a comparison of present surface water and groundwater isotopic fingerprints with those from historical studies and to determine if upstream discharges from wastewater treatment plants can be linked to the recharge of groundwater in the PVB Forebay.

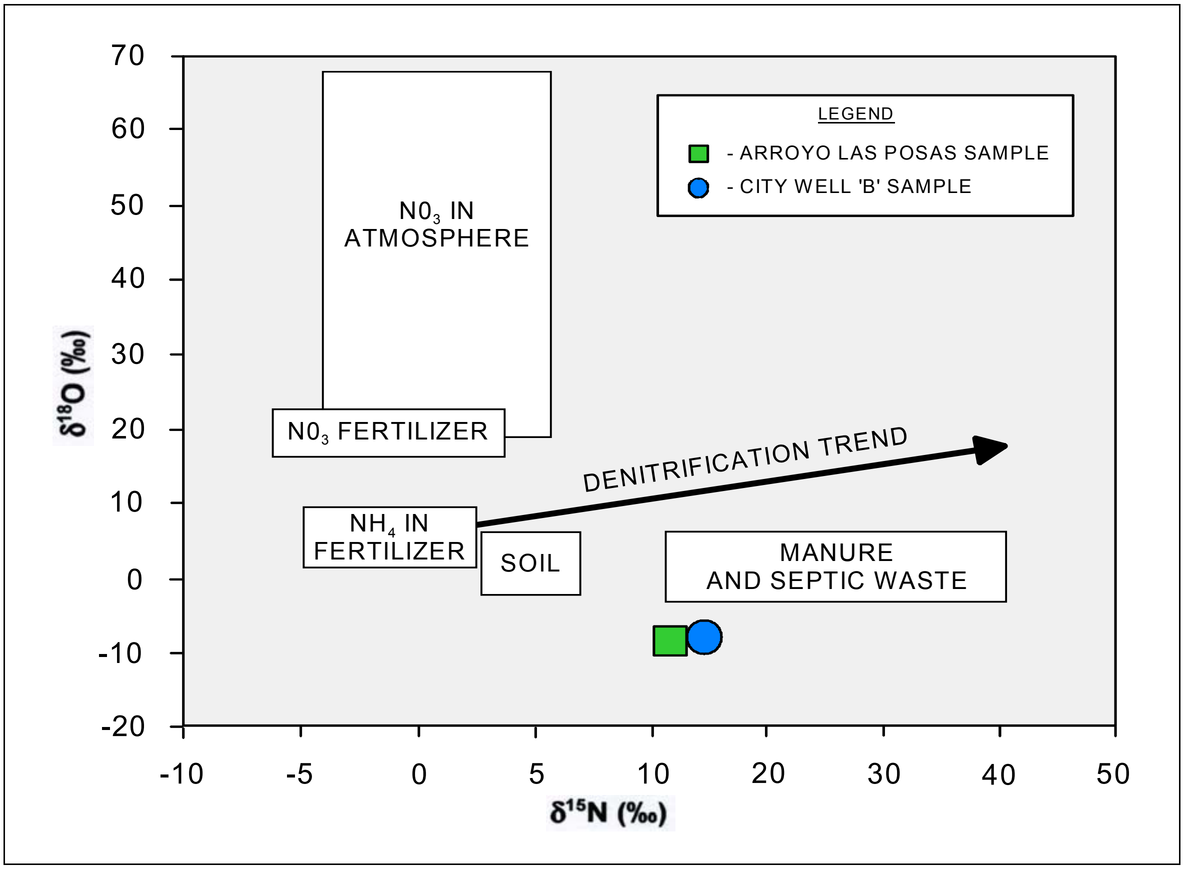
Figure 8 – Delta Oxygen-18 as a Function of Delta Deuterium



The alternating process of evaporation and condensation of water in the atmosphere occurs as part of the hydrologic cycle and results in fractionation of the naturally occurring oxygen and hydrogen isotopes. Past studies of local groundwater and surface waters have utilized these isotopes to evaluate the source and movement of water through aquifer systems within proximate groundwater basins (Izbicki, 1996 and 1997). Figure 8, shown above, compares the sample results obtained from this study with the results of water sampling conducted by the USGS in the Oxnard Plain and Las Posas Valley.

As indicated by these results, the groundwater sample has an isotopic fingerprint that closely resembles the surface water sampled downstream of the regional wastewater treatment plant during the 1997 study. The surface water samples were coincidentally taken at the same time the groundwater recharge from the Arroyo Los Posas was initially sustained in the PVB Forebay. As previously mentioned, the surface water sample for this study was collected within 3 days after a significant rain event. The surface water sample collected during the study appears to show the influence from rainwater. We anticipate that sampling of water in the arroyo will likely yield seasonal results that reflect the source(s) contributing most to its flow.

Figure 9 – Typical Isotope Signatures of Nitrate from Various Sources



Nitrogen in the atmosphere contains about one atom of the stable isotope ^{15}N per 273 atoms of ^{14}N. During various biochemical reactions that involve nitrogen, fractionation occurs. The fractionation processes are complex and not fully understood. However, nitrogen isotopes have been used to identify sources of nitrogen in natural waters. The interpretation of such results may be somewhat controversial (Drever, 1982).

Nitrates produced from different sources carry distinctly different nitrogen and oxygen isotopic compositions which can be used for source identification. Provided in Figure 9 above are the general fields that represent the range of delta oxygen-18 versus delta nitrogen-15 where nitrogen fractionation may be used to link nitrate to a particular source. As indicated, the surface water sample and well water sample were very close in their isotopic ratios and tend to exhibit a nitrogen source that is likely dominated by nitrate from wastewater treatment plant effluent.

CONCLUSIONS AND RECOMMENDATIONS

The findings of the study indicate that flows in the Arroyo Los Posas are presently percolating into the riverbed in a reach between Somis and Camarillo and recharging groundwater in an area described as the PVB Forebay. Recent observations indicate that except for extremely high river flow events the entire flow in the arroyo goes underground into the coarse-grained alluvial deposits that readily transmit water into the underlying Saugus and Los Posas Sand Formations. These formations comprise the primary aquifer system in the PVB. Available data since 1991 indicate that average annual groundwater recharge from the arroyo is likely in the range of 10,000 to 15,000 afy (see Figure 5).

The study concludes that the groundwater degradation and rapid water level rise (about 250 feet) documented in City Wells A and B is a direct result of surface water recharge from the Arroyo Los Posas. Substantial recharge began when the ELPB filled along the arroyo and began to overflow into the PVB in approximately 1994 (or before). Historical water quality data indicate that the chemical character of groundwater sampled from the City’s well has changed and closely resembles the surface water quality in the arroyo which is a combination of sources including; a) upstream discharges from shallow groundwater dewatering operations located in Simi Valley b) effluent discharges to the arroyo from the Simi Valley wastewater treatment plant c) agricultural irrigation runoff, and d) seasonal precipitation runoff. Over the last 10 years the groundwater quality degradation resulting from arroyo recharge has caused numerous chemical constituents in City Wells A and B to exceed the MCL standards for drinking water (i.e., TDS, sulfate, iron, manganese, see Appendix A).

Tritium test results support the groundwater is a young age while the oxygen and hydrogen isotope analyses indicate the well water is of similar isotopic composition to upstream surface water samples tested by other studies (Izbicki, 1997)(see Figure 8). The nitrogen isotope signatures of the groundwater and surface water samples are characteristic of a legacy waste water effluent source (see Figure 9). This is consistent with the observation that the arroyo base flows have been sustained largely by year-round discharges from upstream wastewater treatment plants after the winter storm flows subside (see Plate 3).

Water level data appear to indicate that potential groundwater flow boundaries may restrict the lateral flow of groundwater from the area of recharge located northeast of the City in the Somis area. The study concludes that water quality in this area of the PVB will likely not improve in the foreseeable future and that the City must consider the use of a treatment facility that can restore the potable quality of this groundwater supply. To the extent the PVB Forebay is connected to the main portion of the PVB south of the Camarillo Fault, water level and water quality changes of similar magnitude can be anticipated to occur.

If the PVB Forebay is constrained by no-flow/low-flow barriers that impede the lateral movement of groundwater then the water level will likely continue to rise until the partitioned portion of the basin fills. Upon filling the forebay could refuse some portion of the recharge and the surface flow could continue downstream and would cross the confined portion of the PVB (where it cannot percolate into the basin) and subsequently would flow to the ocean.

We recommend that future groundwater basin management efforts establish new monitoring wells to replace the County key wells destroyed in the 2004 well destruction program. Future basin monitoring efforts should reestablish a network of appropriately distributed wells that will facilitate the observation of groundwater conditions. Monitoring points may be established by seeking to obtain permission and access to allow measurement of existing well facilities within or proximate to the northeast PVB. The location of existing wells at the time of the study is indicated on Plate 13 – Proposed Monitoring Well Location Map. We recommend augmenting the areal distribution of these potential existing monitoring facilities with new monitoring wells constructed to facilitate future observations proximate to the PVB Forebay. The proposed areas for future monitoring well construction are shown on Plate 13. We recommend a well siting study be conducted to identify suitable locations for monitoring well construction within or proximate to the areas shown on Plate 13.

CLOSURE

This report has been prepared for the exclusive use of the Calleguas Municipal Water District and its agents for specific application to groundwater recharge in the northeast Pleasant Valley Groundwater Basin located in Somis, California. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted hydrogeological practices. No other warranty, express or implied is made.

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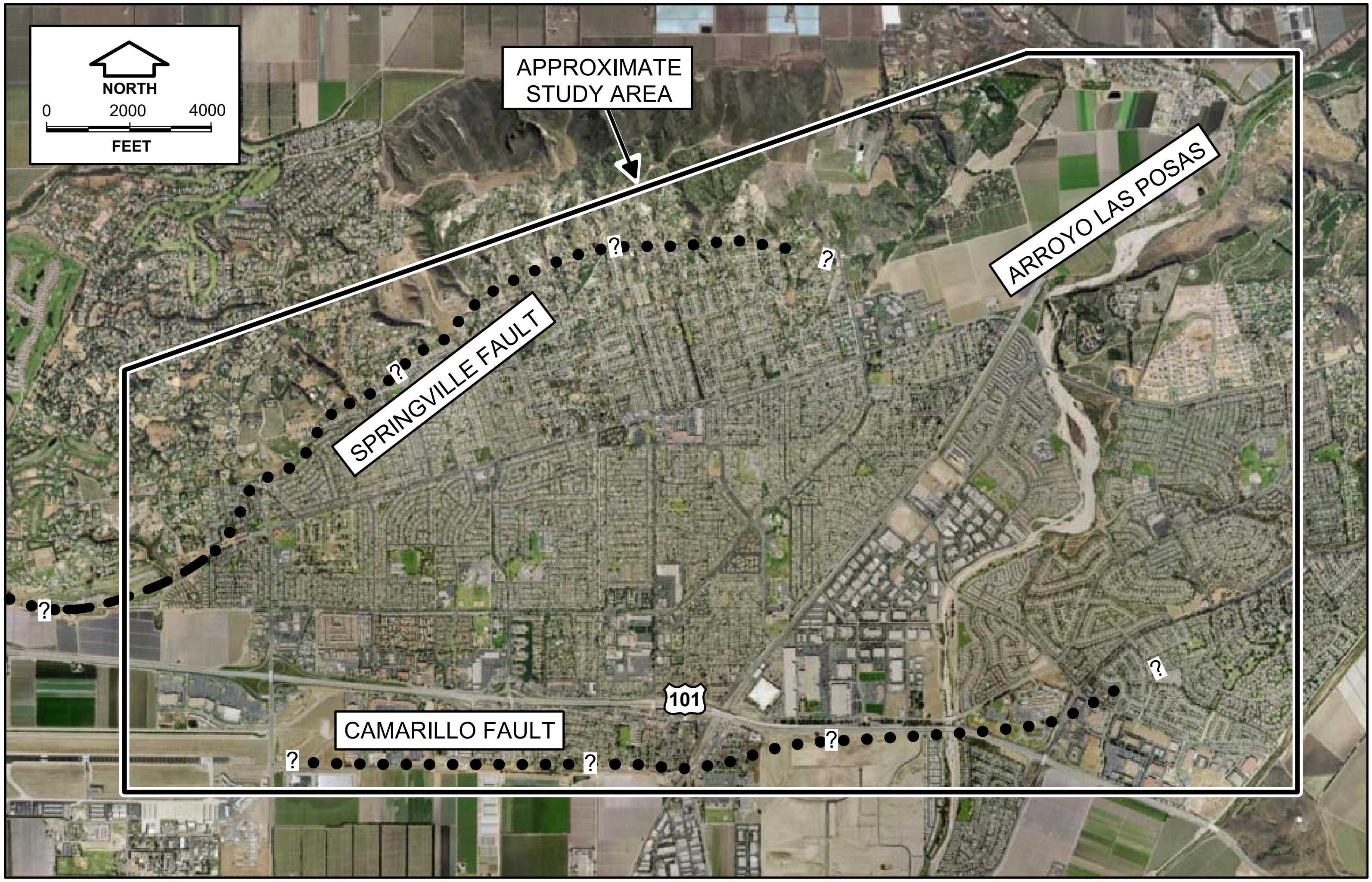
PLATES



STUDY AREA LOCATION MAP

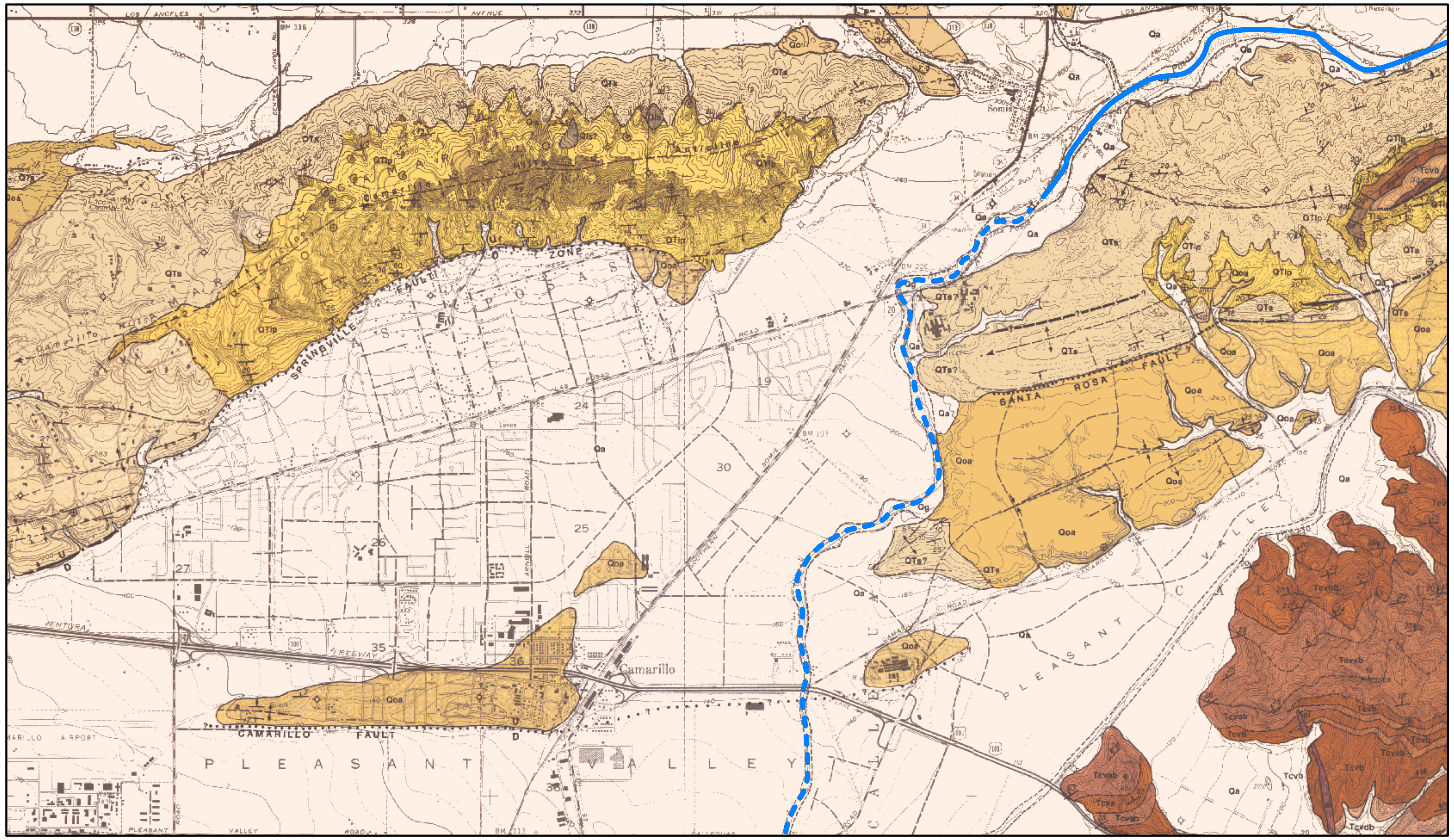
Pleasant Valley Forebay Recharge Study

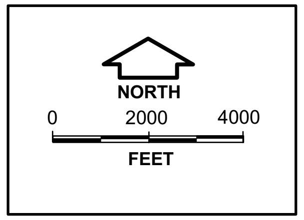
Calleguas Municipal Water District
Camarillo, California

November 2008
Project No. 03-007-07

HOPKINS
GROUNDWATER
CONSULTANTS

PLATE 1





LEGEND

Qa Qg	**SURFICIAL SEDIMENTS -** **Qa** - valley and floodplain deposits of silt, sand and gravel **Qg** - stream channel deposits of gravel, sand and silt
Qoa	**OLDER DISSECTED SURFICIAL SEDIMENTS -** remnants of weakly consolidated stream terrace and alluvial fan deposits of silt, sand and gravel
QTs	**SAUGUS FORMATION -** light gray to light brown pebble-cobble gravel, sand and clay
QTlp	**LAS POSAS SAND -** light gray to yellow-tan, fine to medium-grained massive sand

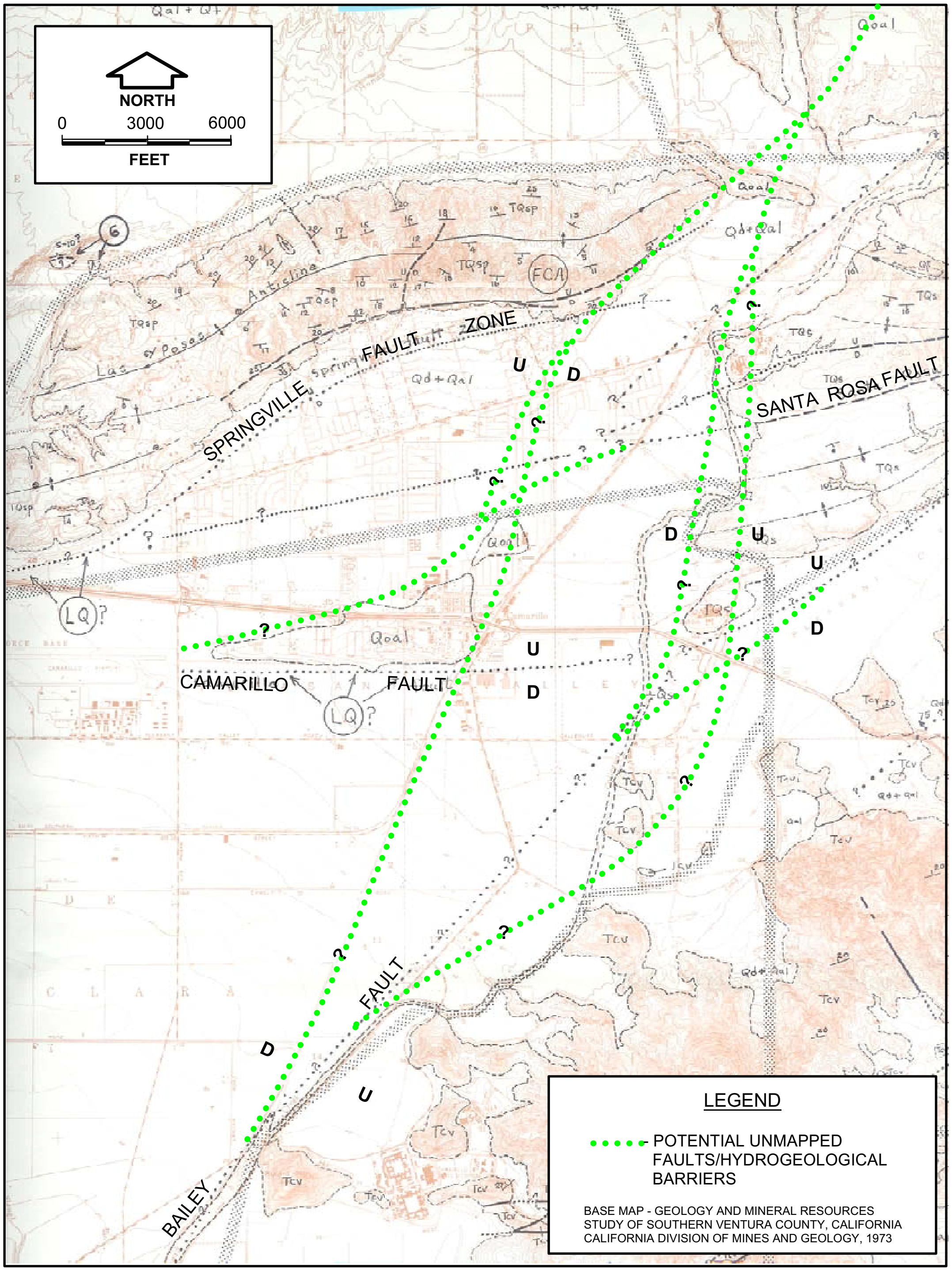
SYMBOLS

— — —	Formation contact - dashed where inferred or indefinite
← ✝ —	Anticline - arrow on axis indicates direction of plunge
← ✝ —	Syncline - arrow on axis indicates direction of plunge
▬▬ • •	Fault - dashed where indefinite or inferred, dotted where concealed
45	Strike and dip of stratified rocks:
25	inclined (approximate)
49	overturned bedding
+	vertical bedding
━ - -	- ARROYO LAS POSAS (SOLID WHERE PERENNIAL DASHED WHERE EPHEMERAL)

(Geology by THOMAS W. DIBBLEE, 1990 GEOLOGIC MAP
OF THE CAMARILLO AND NEWBURY PARK,
SANTA PAULA, AND MOORPARK QUADRANGLES)

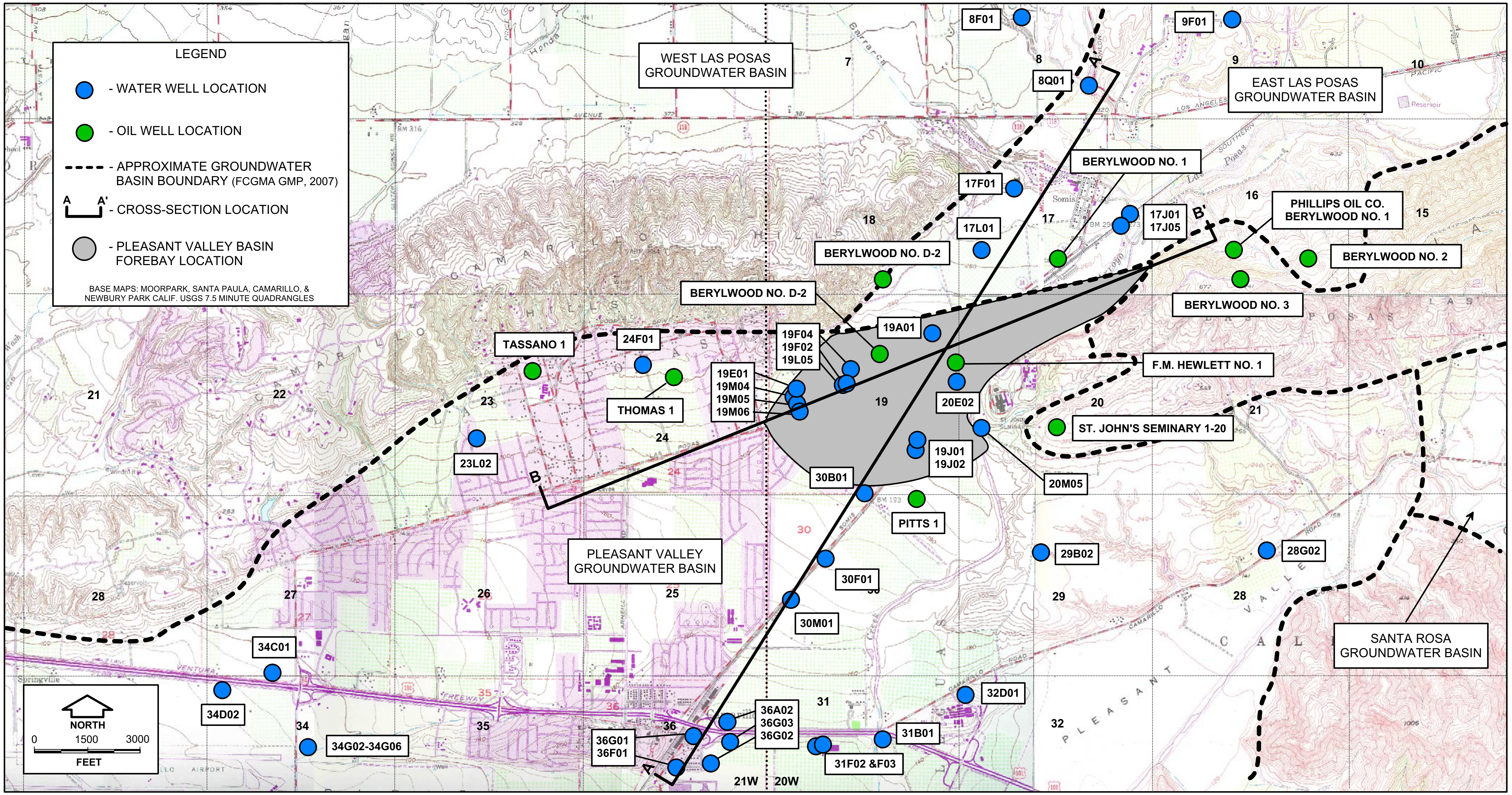
SURFACE GEOLOGY MAP
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE 2



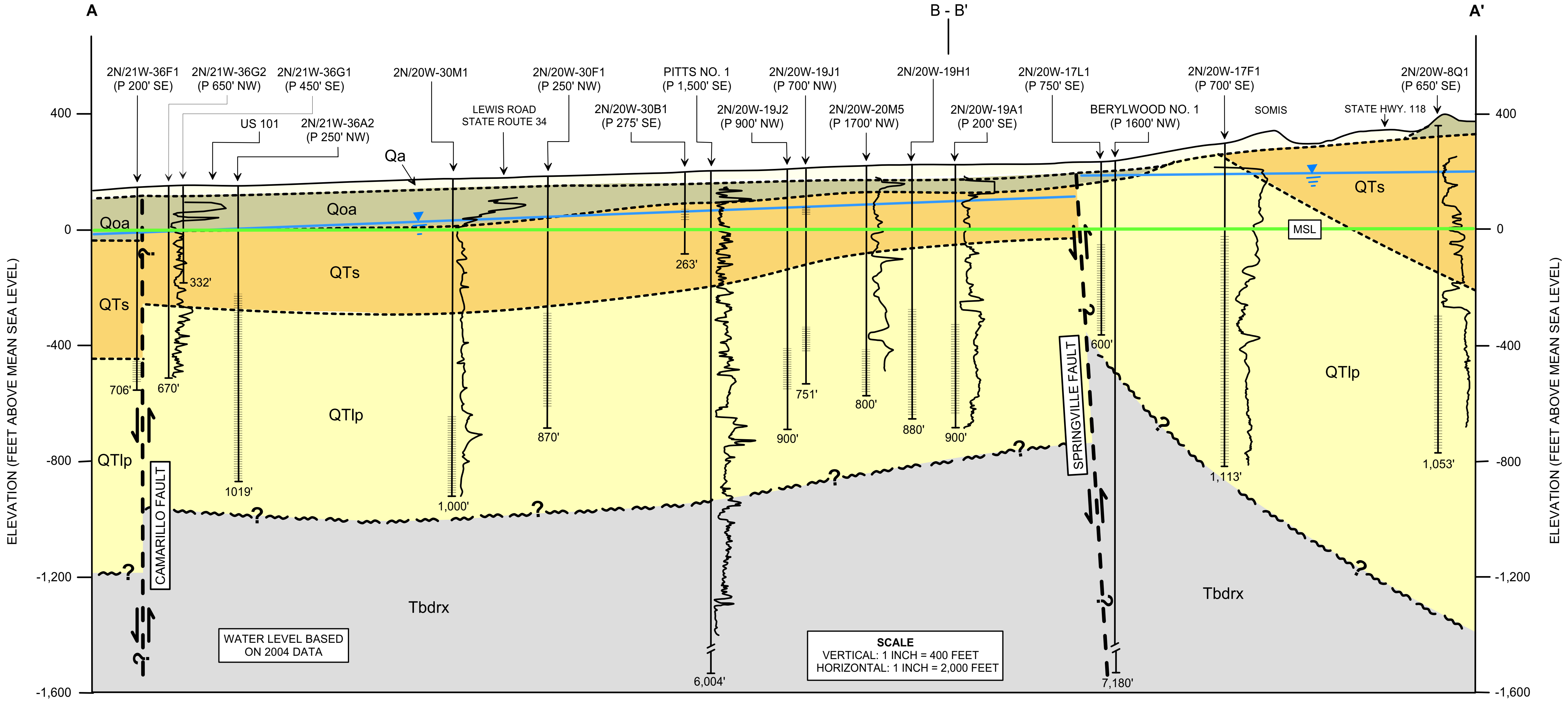
BASE MAP - GEOLOGY AND MINERAL RESOURCES
STUDY OF SOUTHERN VENTURA COUNTY, CALIFORNIA
CALIFORNIA DIVISION OF MINES AND GEOLOGY, 1973

STUDY AREA GEOLOGICAL STRUCTURES
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California



HYDROGEOLOGICAL CROSS-SECTION AND WELL LOCATION MAP

Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California



LEGEND

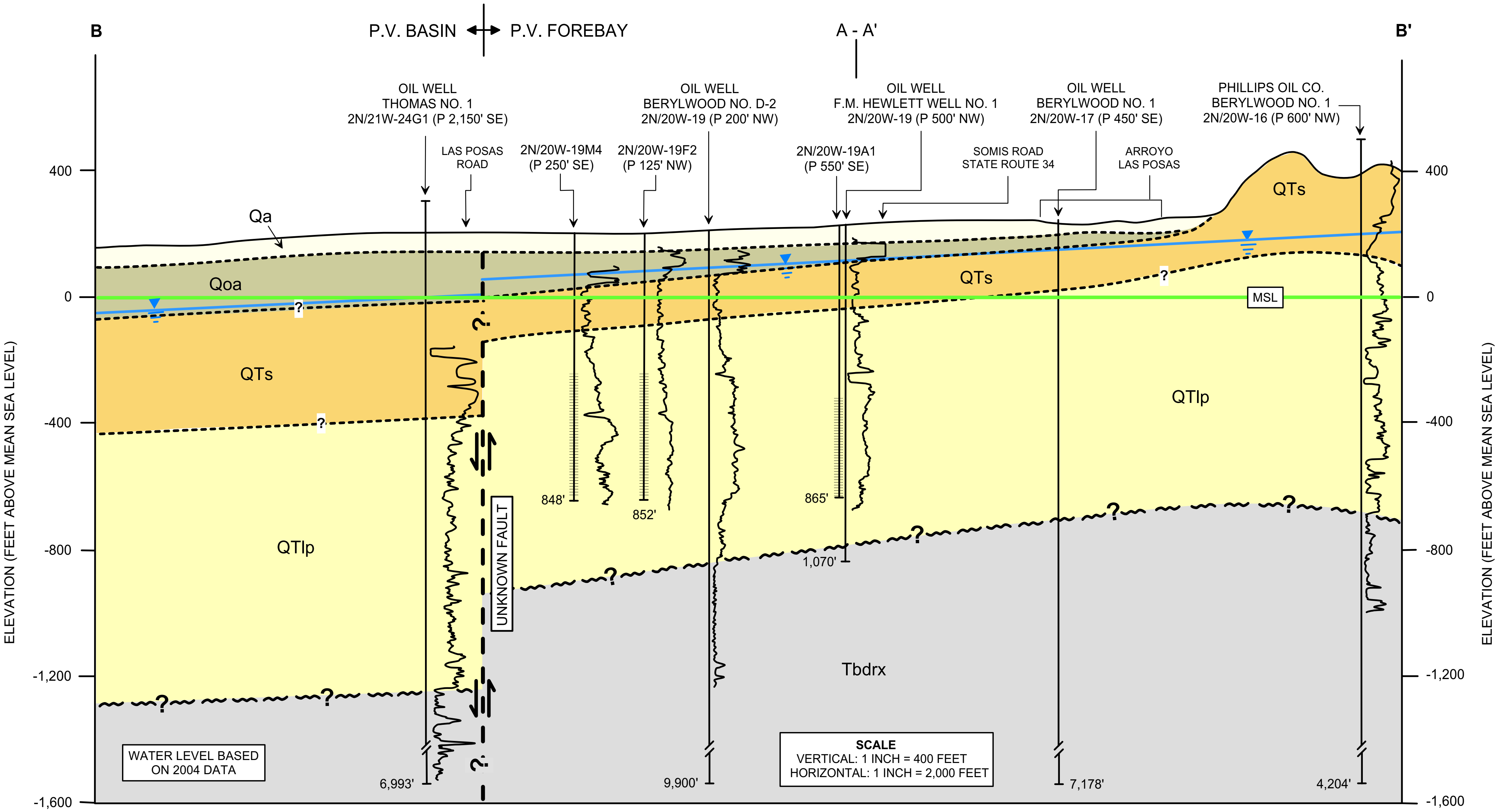
Qa	**SURFICIAL SEDIMENTS -** valley and floodplain deposits of silt, sand and gravel
Qoa	**OLDER DISSECTED SURFICIAL SEDIMENTS -** remnants of weakly consolidated stream terrace and alluvial fan deposits of silt, sand and gravel
QTs	**SAUGUS FORMATION -** light gray to light brown pebble-cobble gravel, sand and clay
QTlp	**LAS POSAS SAND -** light gray to yellow-tan, fine to medium-grained massive sand
Tbdrx	**UNIDENTIFIED BEDROCK -** effective base of alluvial aquifer

SYMBOLS

┄┄┄	Formation Contact
━ ⇌ ━	Fault - Arrows indicate direction of slip
∿∿∿	Alluvium\Bedrock Contact
▼	Water Level
MSL	Mean Sea Level

HYDROGEOLOGICAL CROSS-SECTION A-A'
Pleasant Valley Forebay Recharge Study

Calleguas Municipal Water District
Camarillo, California



LEGEND

Qa	**SURFICIAL SEDIMENTS -** valley and floodplain deposits of silt, sand and gravel
Qoa	**OLDER DISSECTED SURFICIAL SEDIMENTS -** remnants of weakly consolidated stream terrace and alluvial fan deposits of silt, sand and gravel
QTs	**SAUGUS FORMATION -** light gray to light brown pebble-cobble gravel, sand and clay
QTlp	**LAS POSAS SAND -** light gray to yellow-tan, fine to medium-grained massive sand
Tbdrx	**UNIDENTIFIED BEDROCK -** effective base of alluvial aquifer

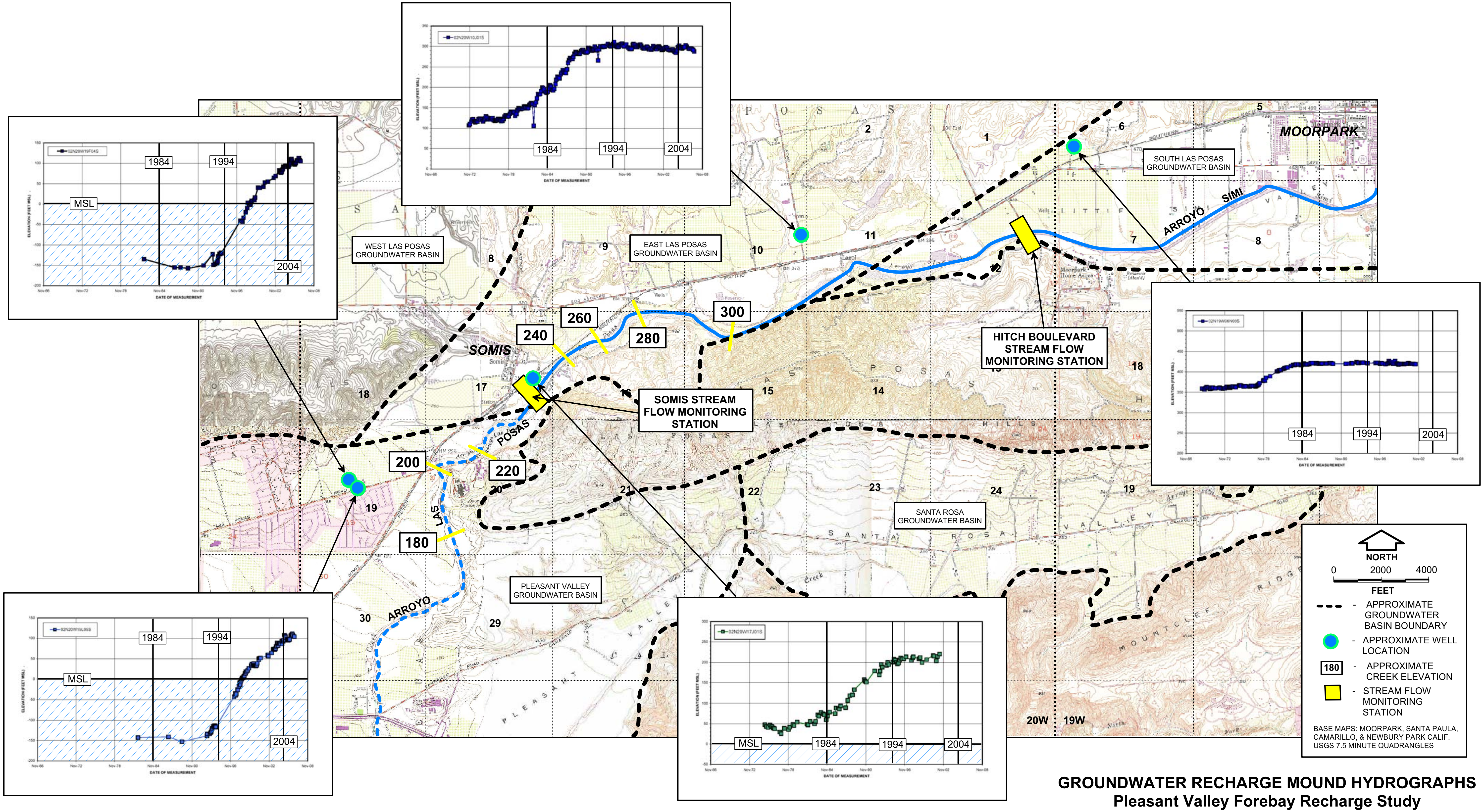
SYMBOLS

--------	Formation Contact
— ⇆ —	Fault - Arrows indicate direction of slip
∼∼∼	Alluvium\Bedrock Contact
▽	Water Level
MSL	Mean Sea Level
2N/20W-19A1 (P 550' SE)	WELL PROJECTED 550 FEET SOUTHEAST

HYDROGEOLOGICAL CROSS-SECTION B-B'

Pleasant Valley Forebay Recharge Study

Calleguas Municipal Water District
Camarillo, California



GROUNDWATER RECHARGE MOUND HYDROGRAPHS

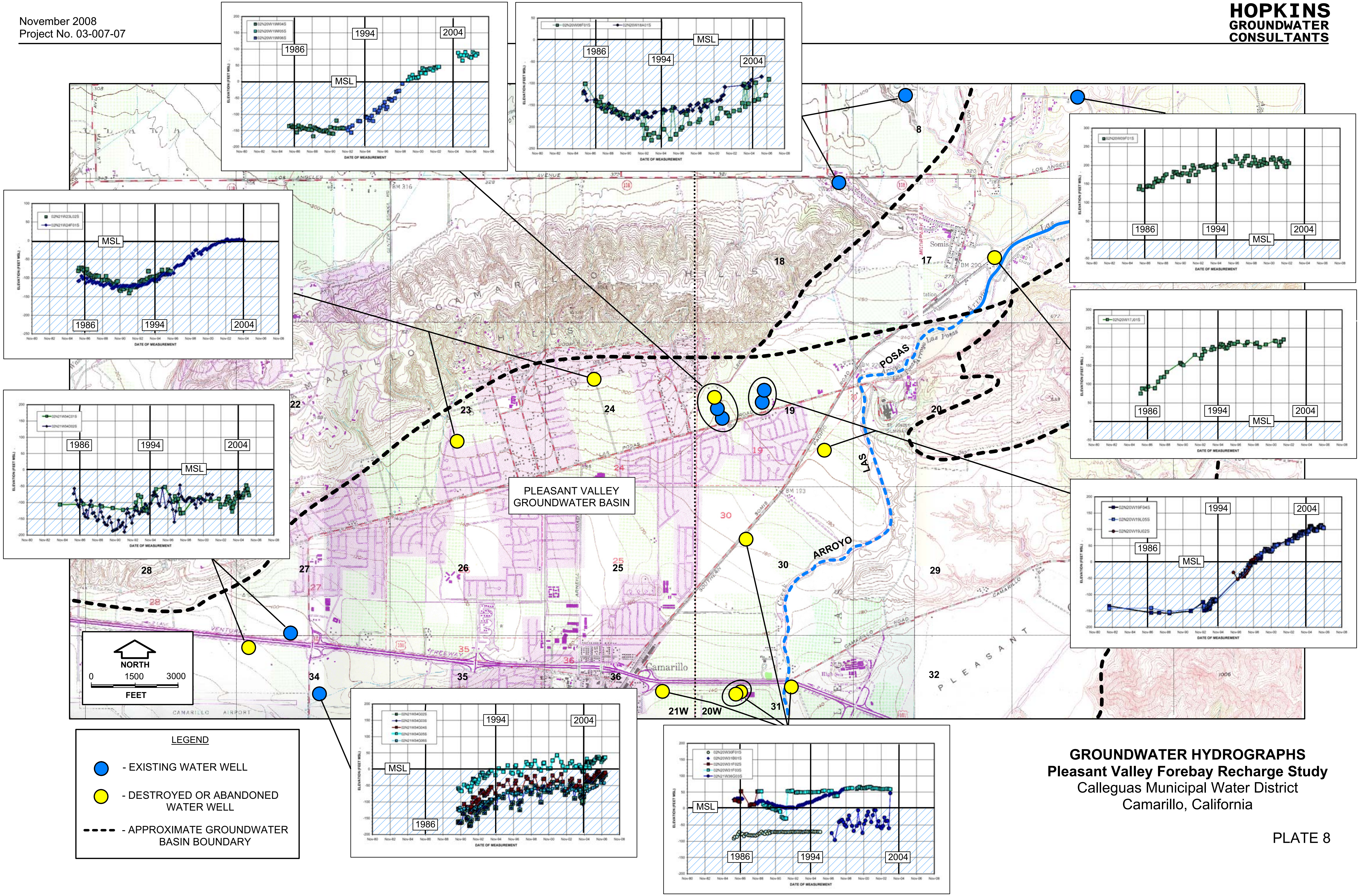
Pleasant Valley Forebay Recharge Study

Calleguas Municipal Water District
Camarillo, California

PLATE 7

November 2008
Project No. 03-007-07

HOPKINS
GROUNDWATER
CONSULTANTS



LEGEND

- EXISTING WATER WELL

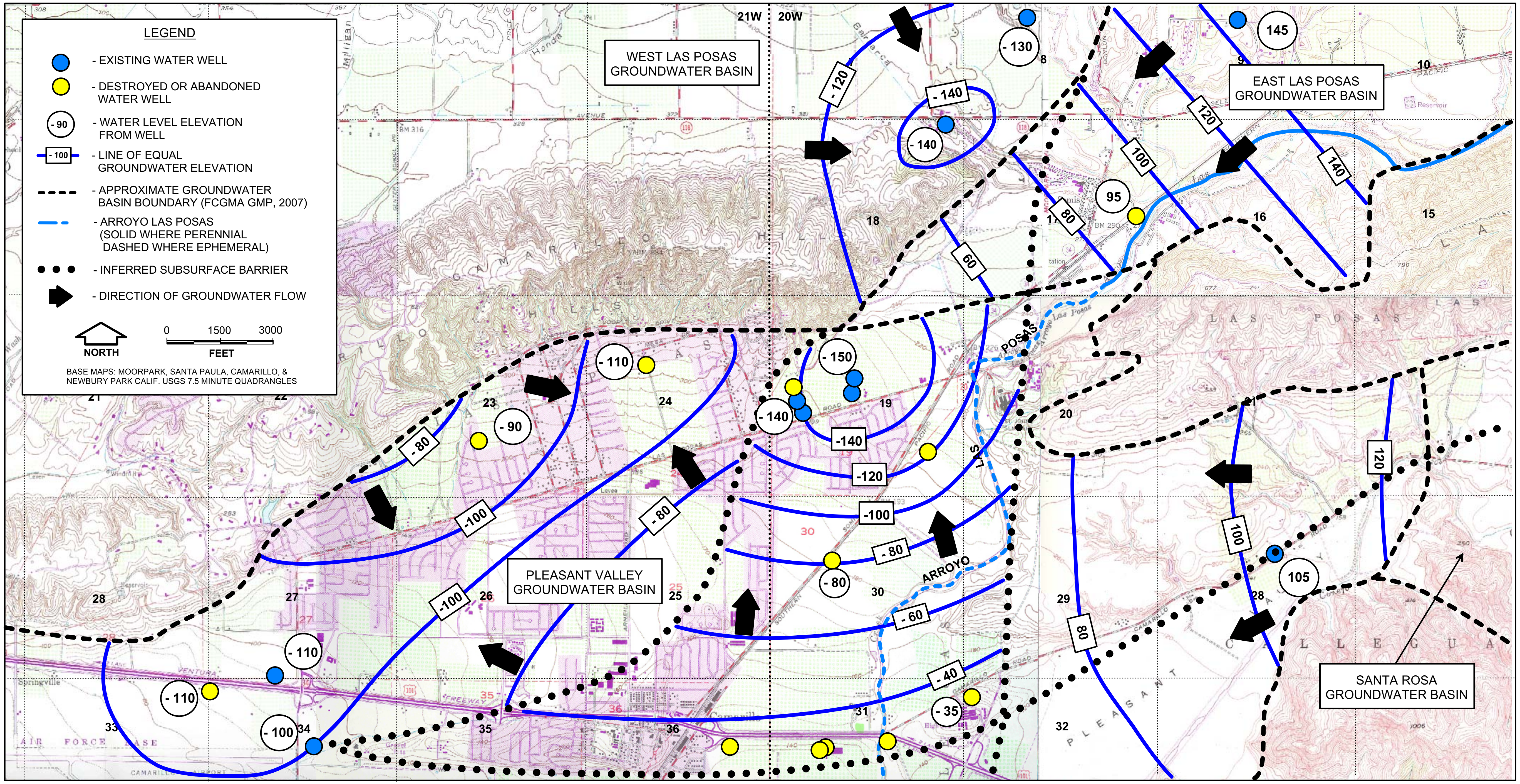
- DESTROYED OR ABANDONED WATER WELL

- APPROXIMATE GROUNDWATER BASIN BOUNDARY

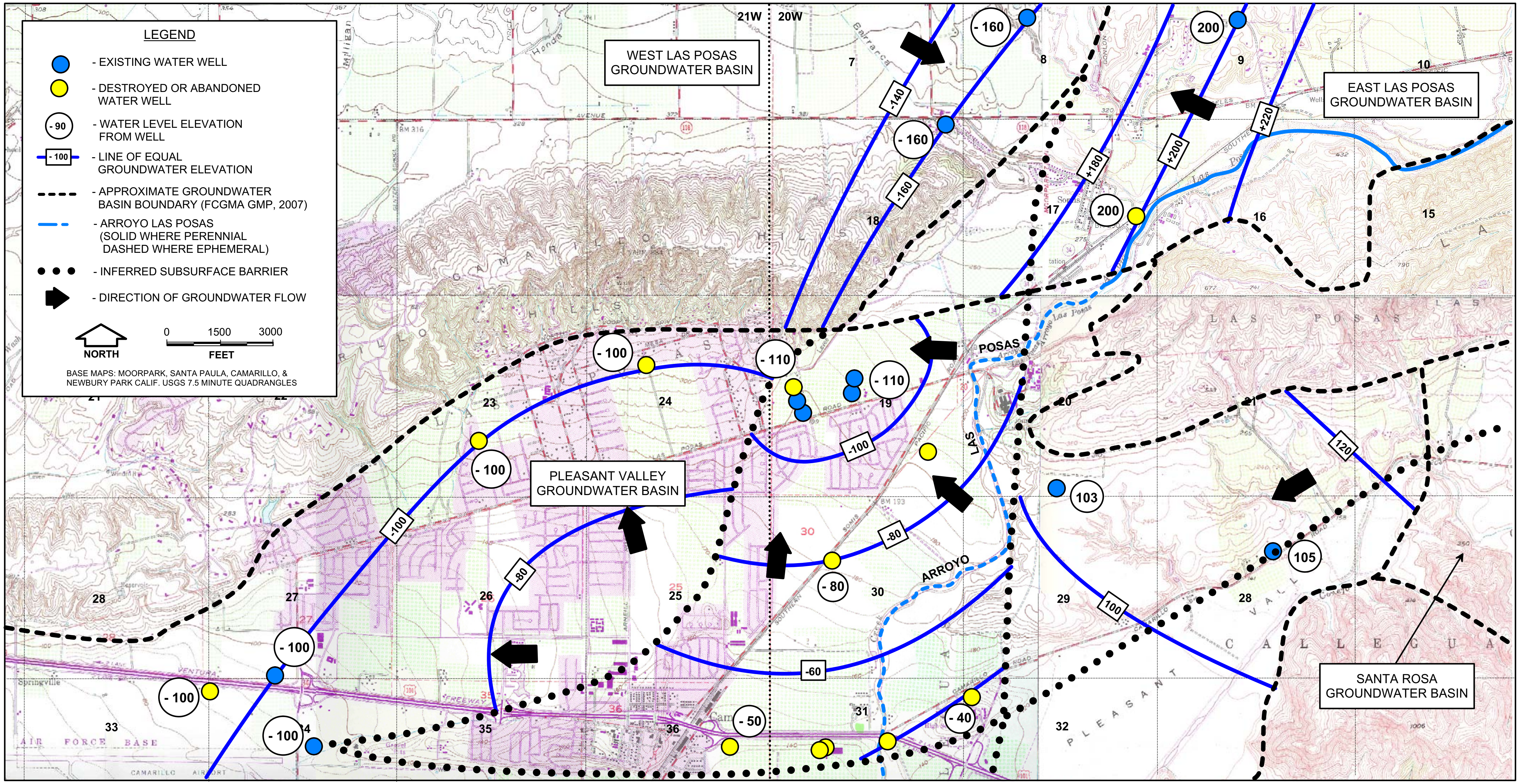
GROUNDWATER HYDROGRAPHS
Pleasant Valley Forebay Recharge Study

Calleguas Municipal Water District
Camarillo, California

PLATE 8



1986 GROUNDWATER ELEVATION CONTOUR MAP
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

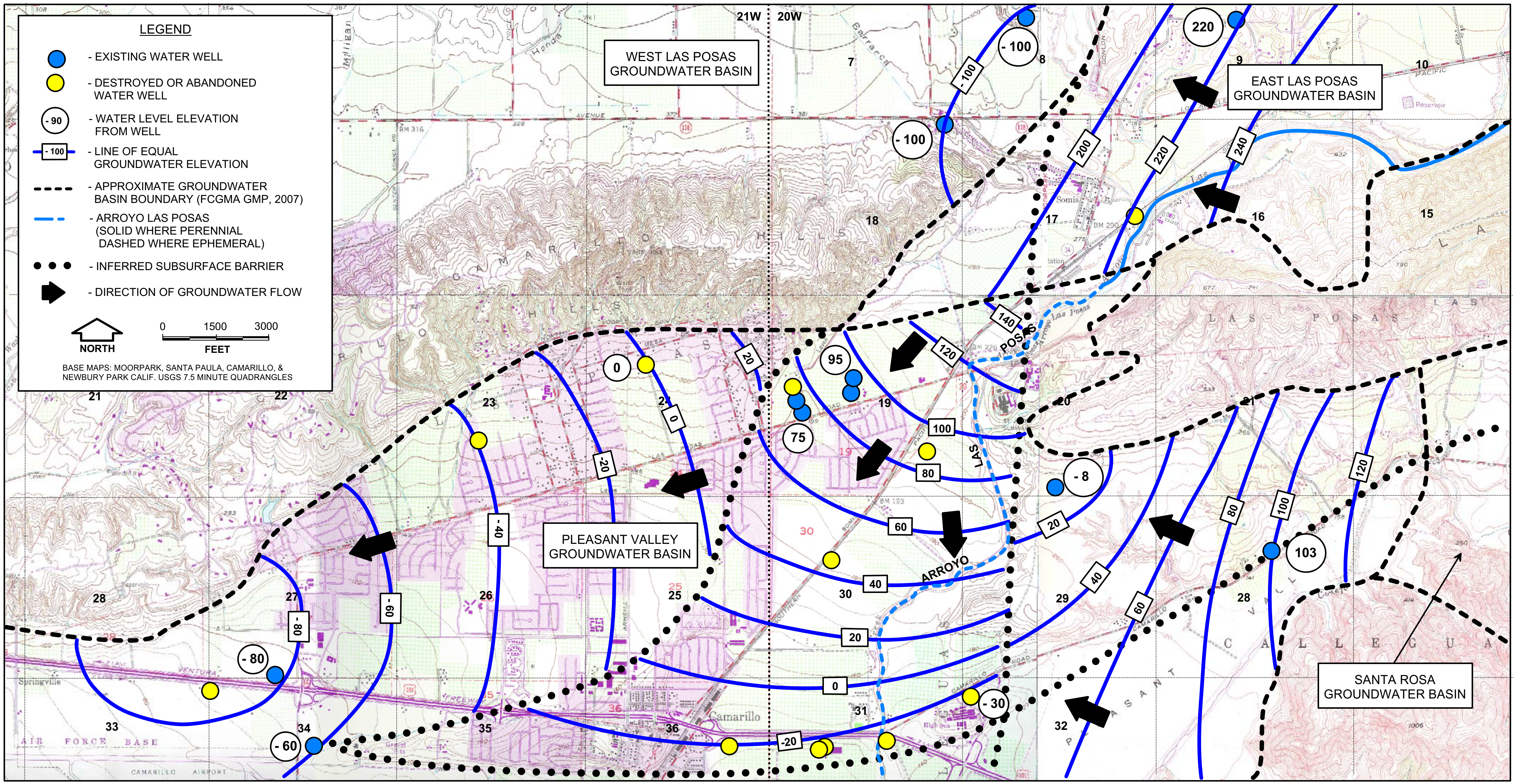


1994 GROUNDWATER ELEVATION CONTOUR MAP

Pleasant Valley Forebay Recharge Study

Calleguas Municipal Water District
Camarillo, California

PLATE 10

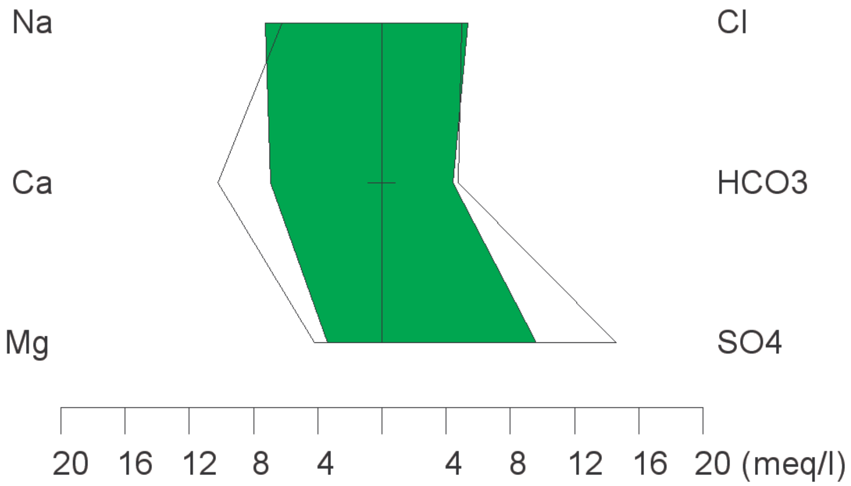


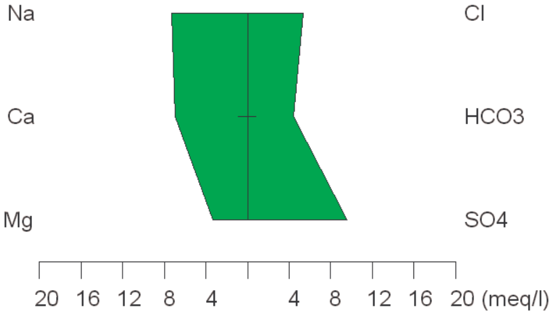
2004 GROUNDWATER ELEVATION CONTOUR MAP

Pleasant Valley Forebay Recharge Study

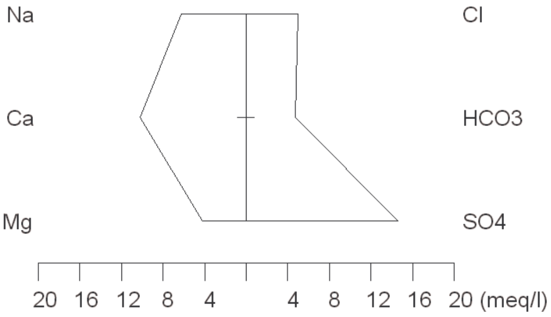
Calleguas Municipal Water District
Camarillo, California

PLATE 11





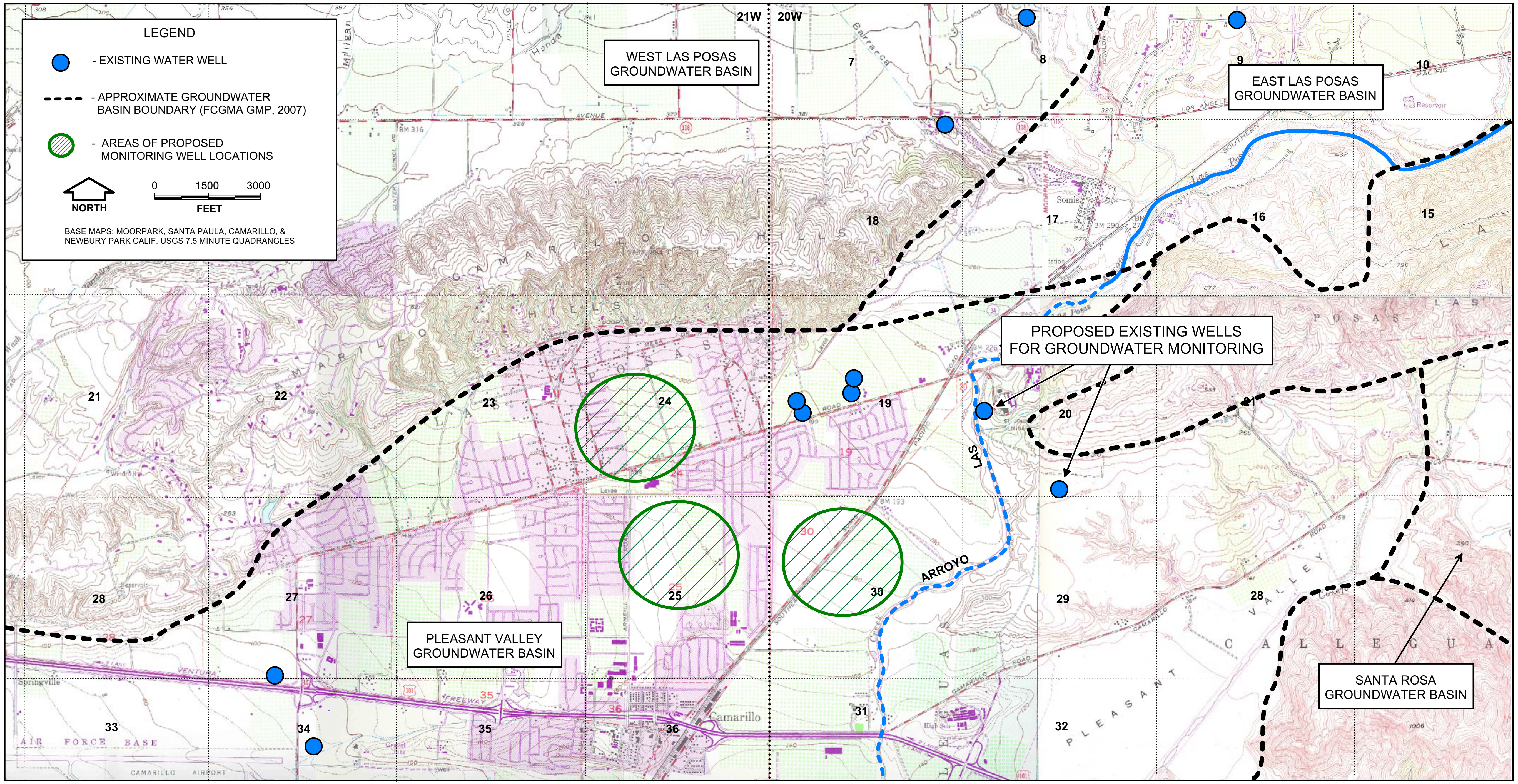
CREEK SAMPLE



WELL SAMPLE

STIFF DIAGRAMS OF STUDY SAMPLES
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

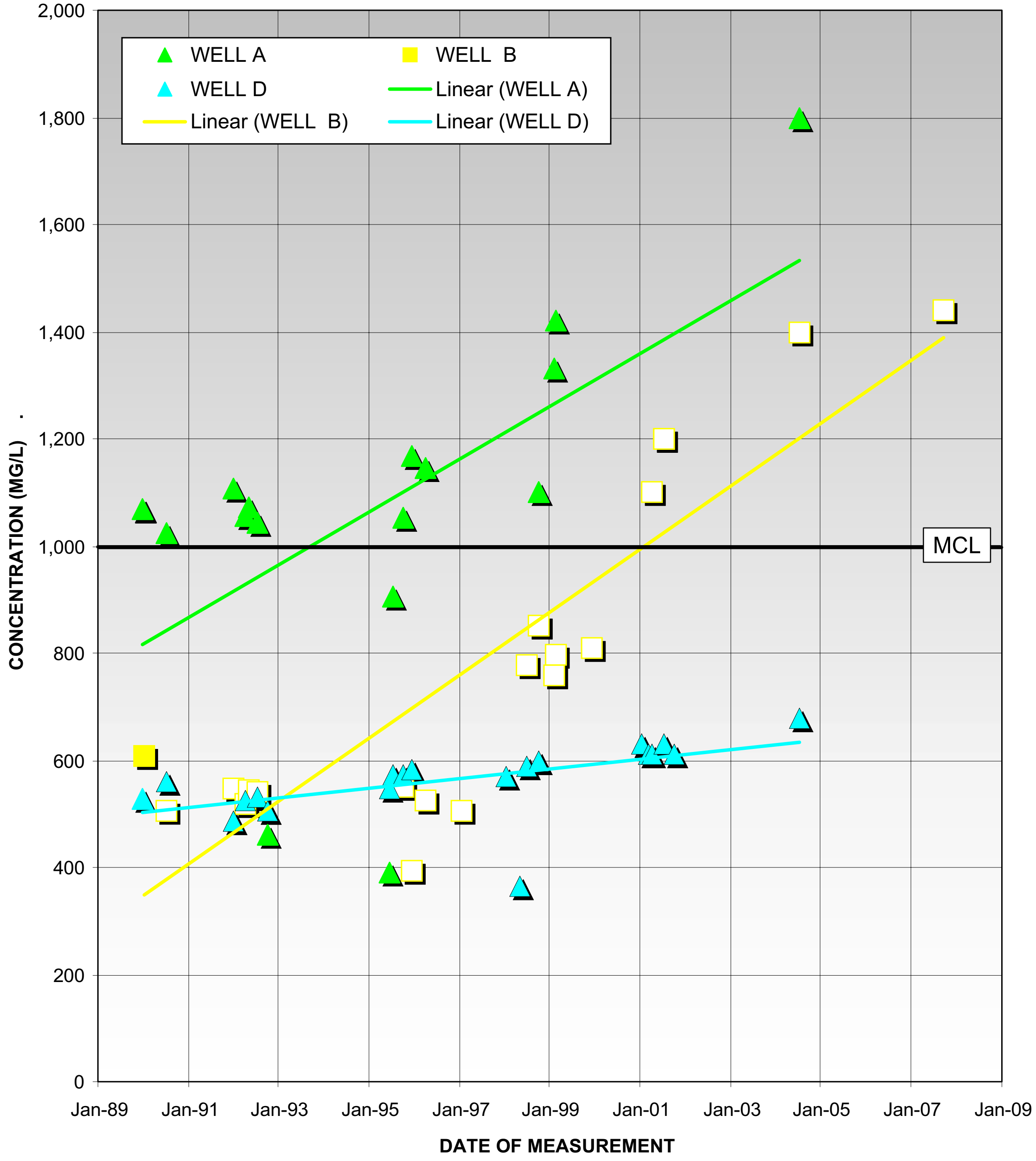
PLATE 12



PROPOSED MONITORING WELL
LOCATION MAP
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

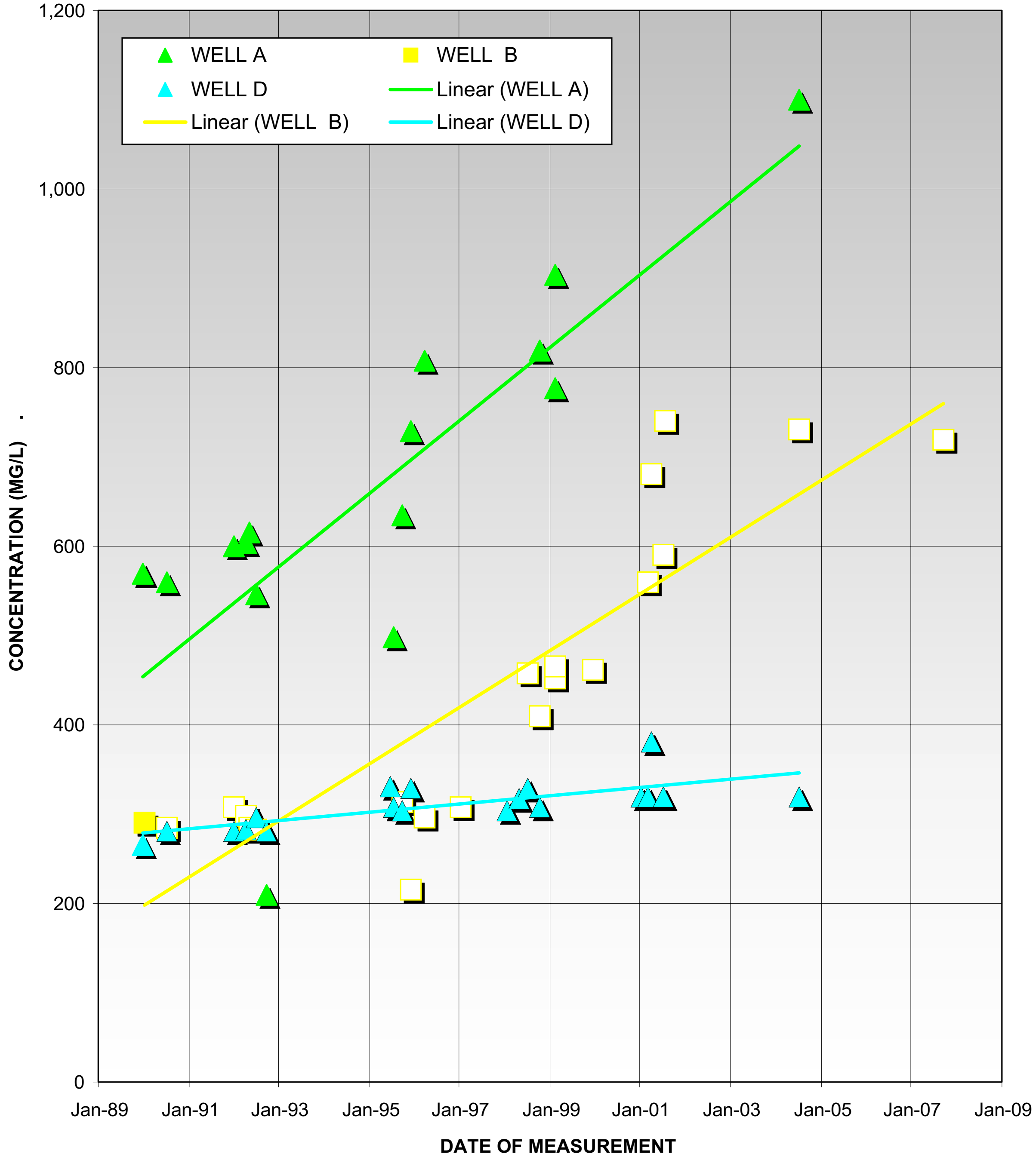
PLATE 13

APPENDIX A
WATER QUALITY DATA



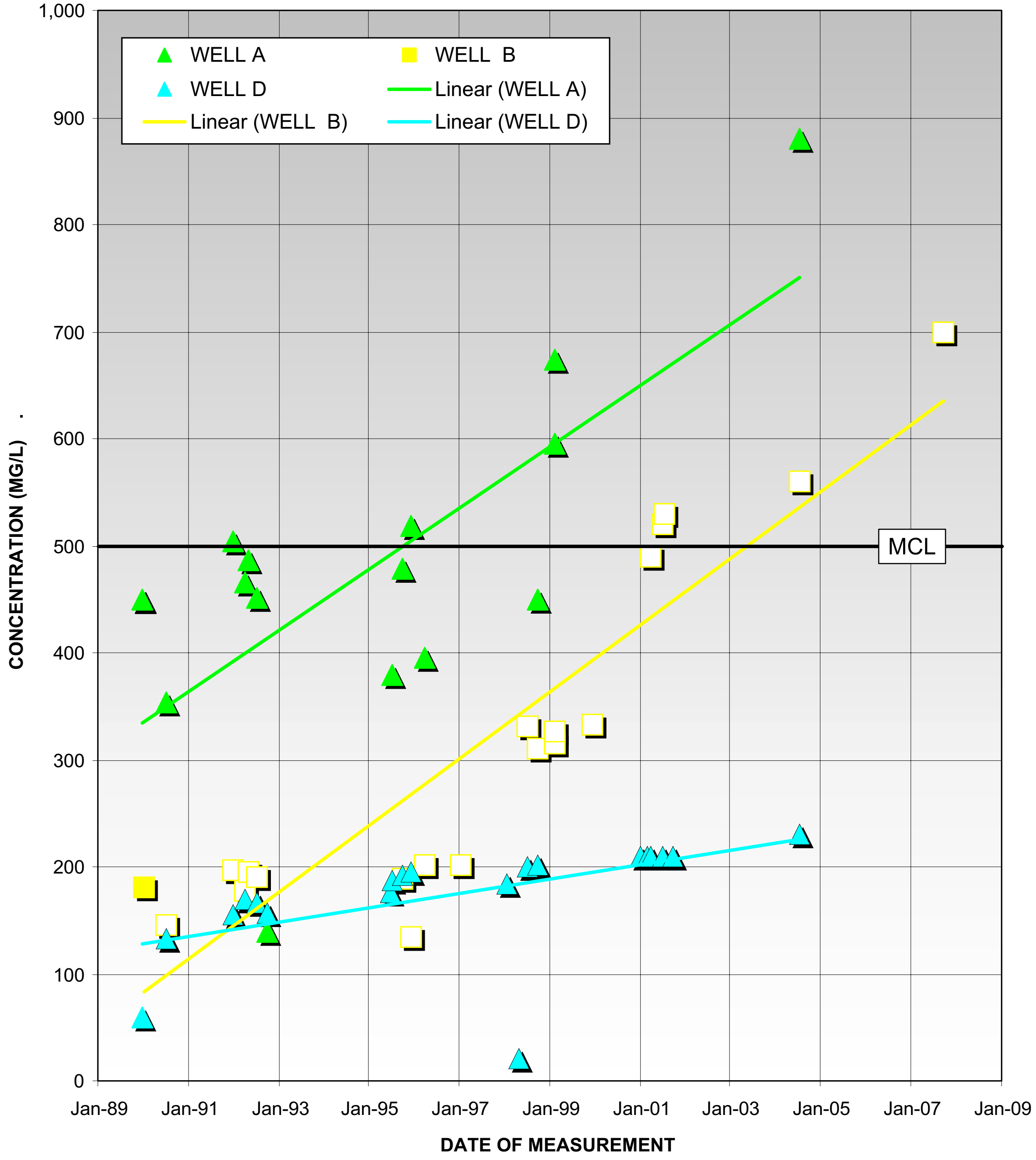
TOTAL DISSOLVED SOLIDS
CITY OF CAMARILLO WELLS
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE A1



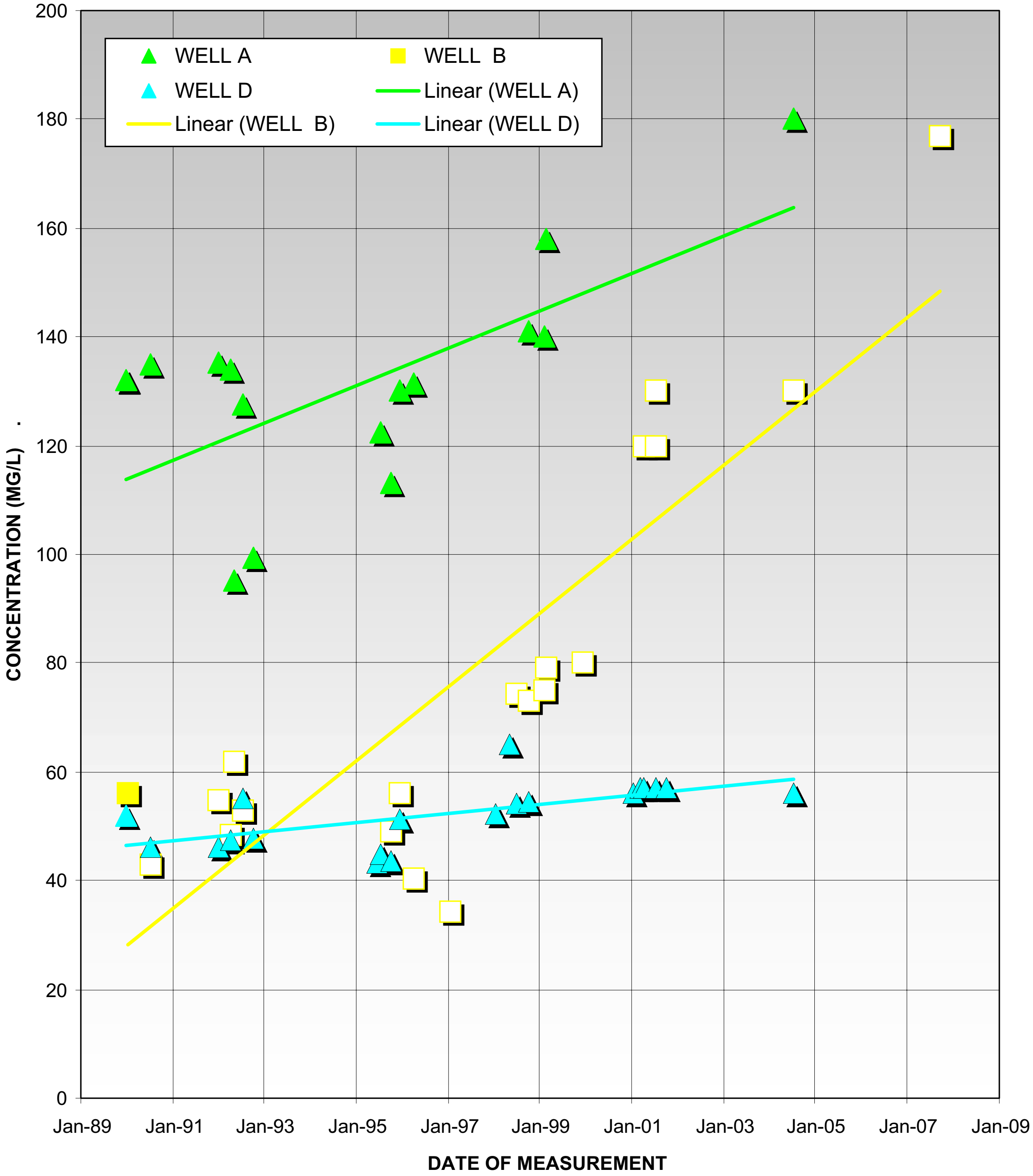
TOTAL HARDNESS (AS CaC03)
CITY OF CAMARILLO WELLS
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE A2



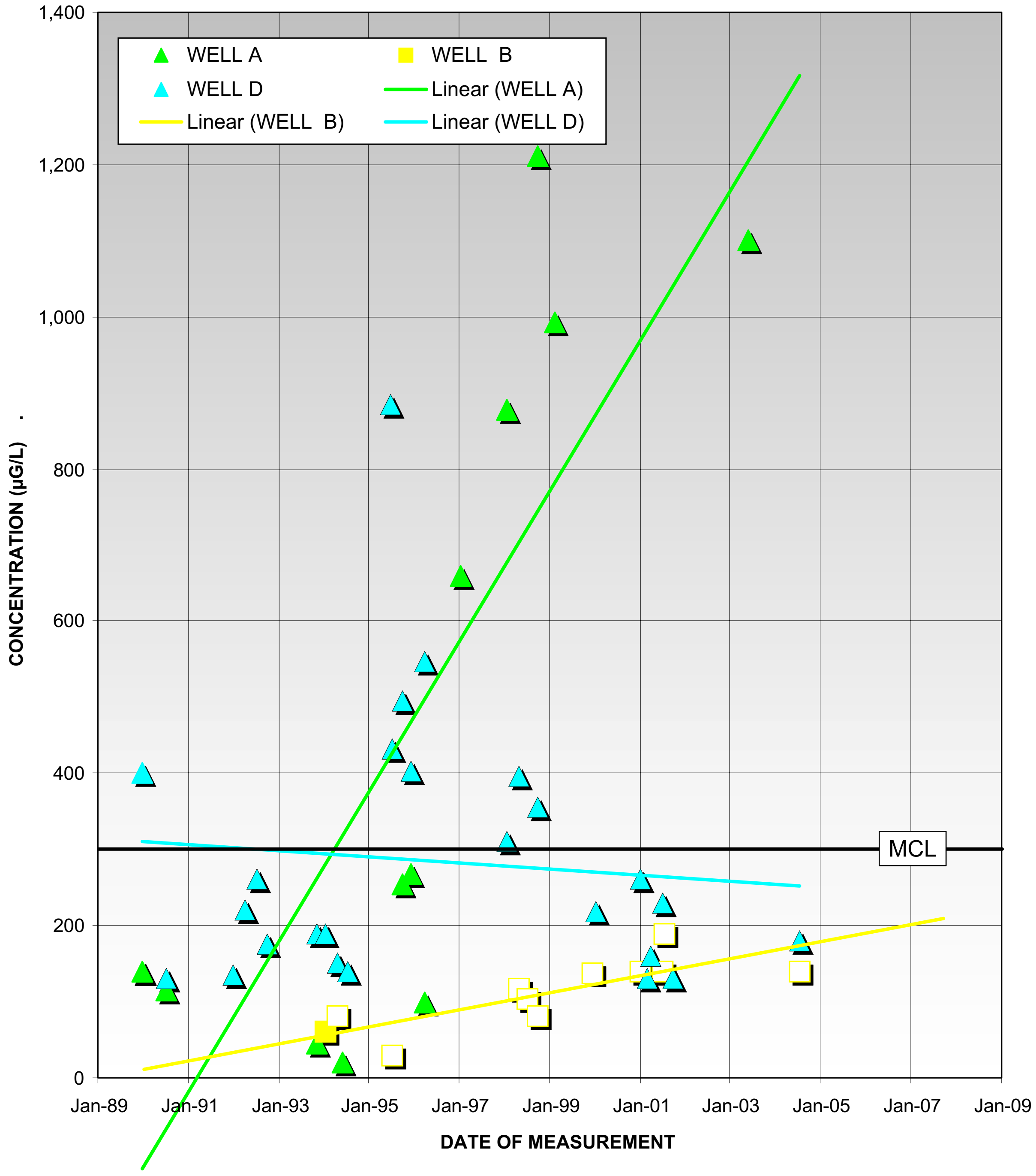
SULFATE
CITY OF CAMARILLO WELLS
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE A3



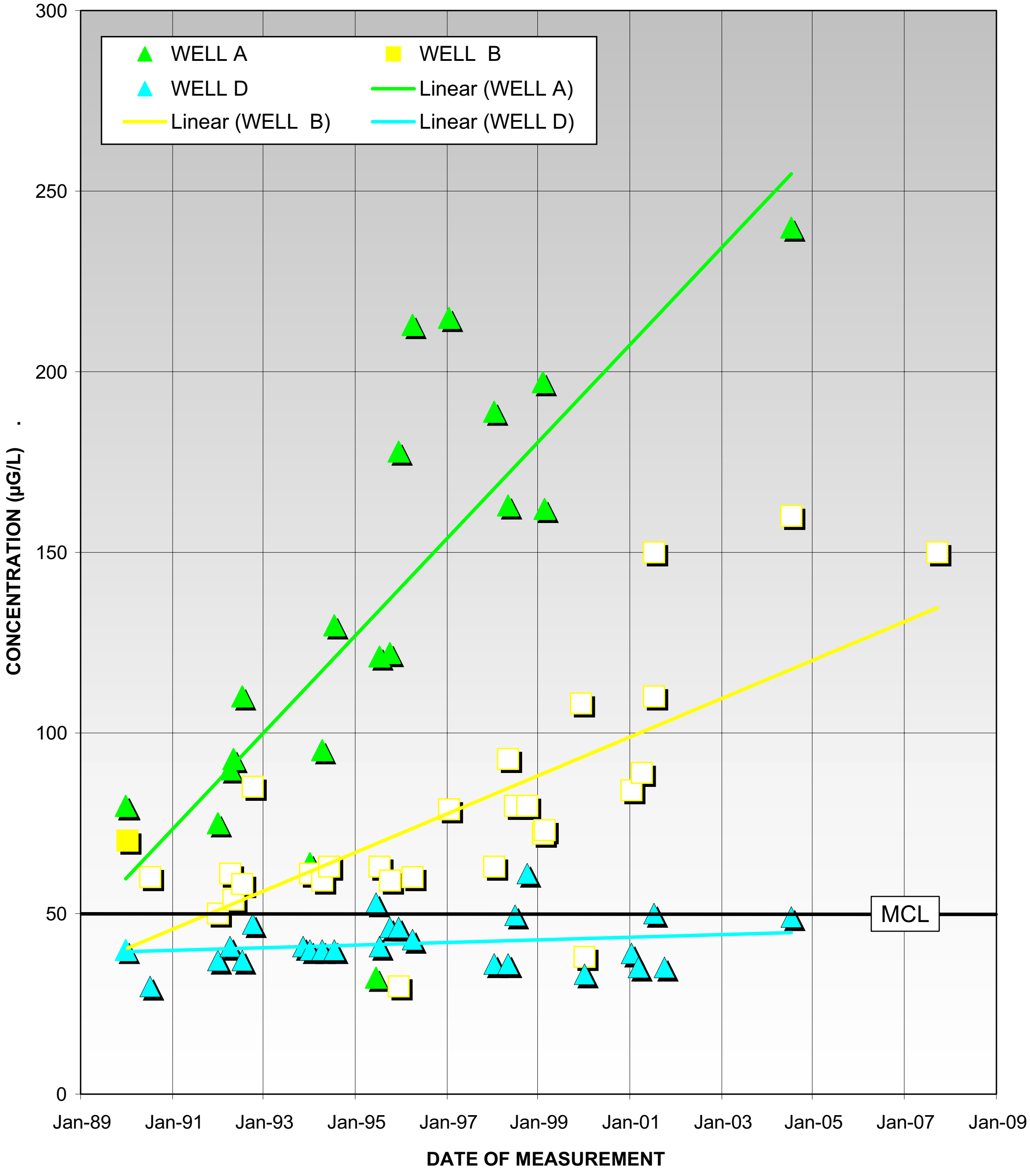
CHLORIDE
CITY OF CAMARILLO WELLS
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE A4



IRON
CITY OF CAMARILLO WELLS
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE A5

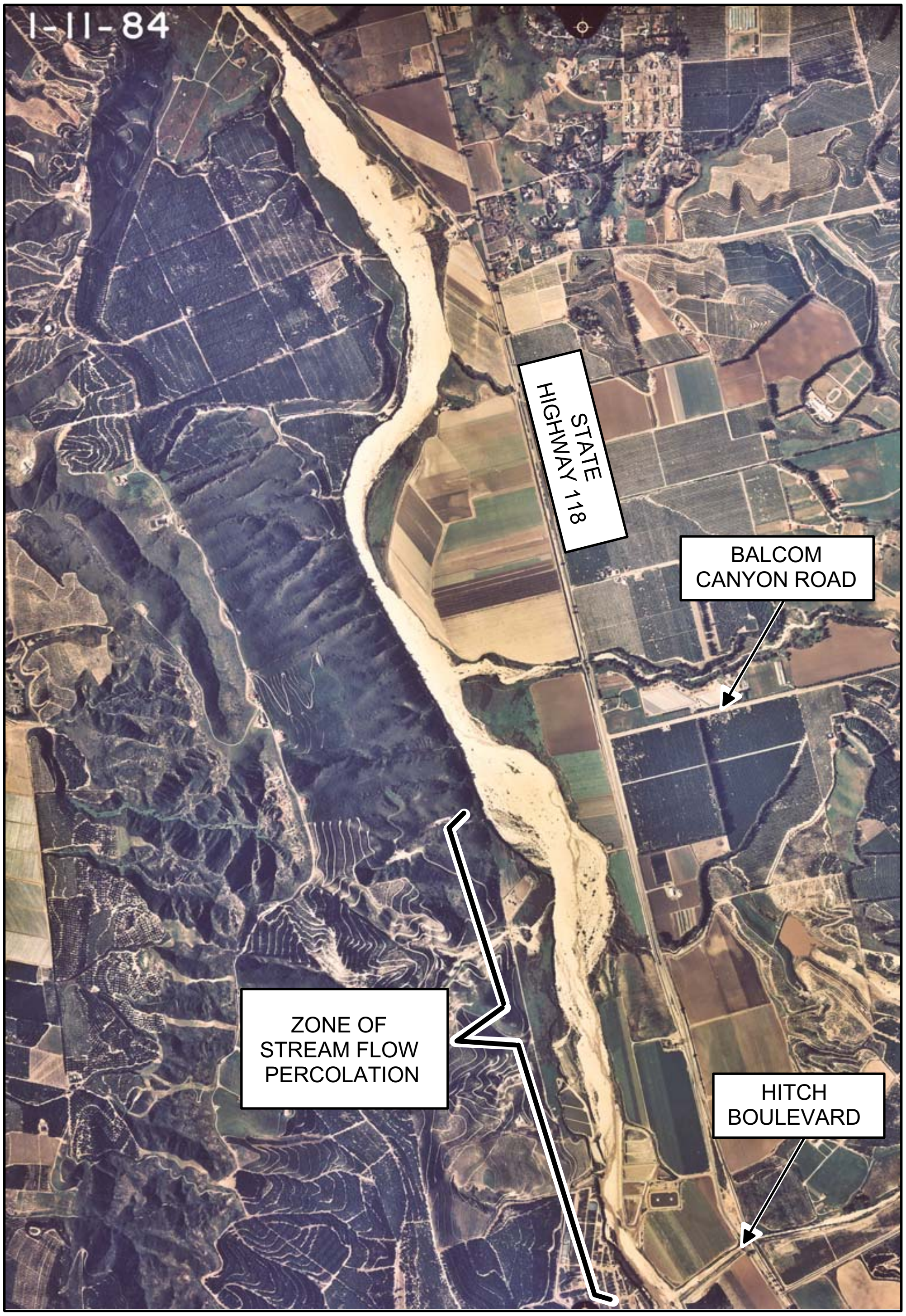


MANGANESE
CITY OF CAMARILLO WELLS
Pleasant Valley Forebay Recharge Study

Calleguas Municipal Water District
Camarillo, California

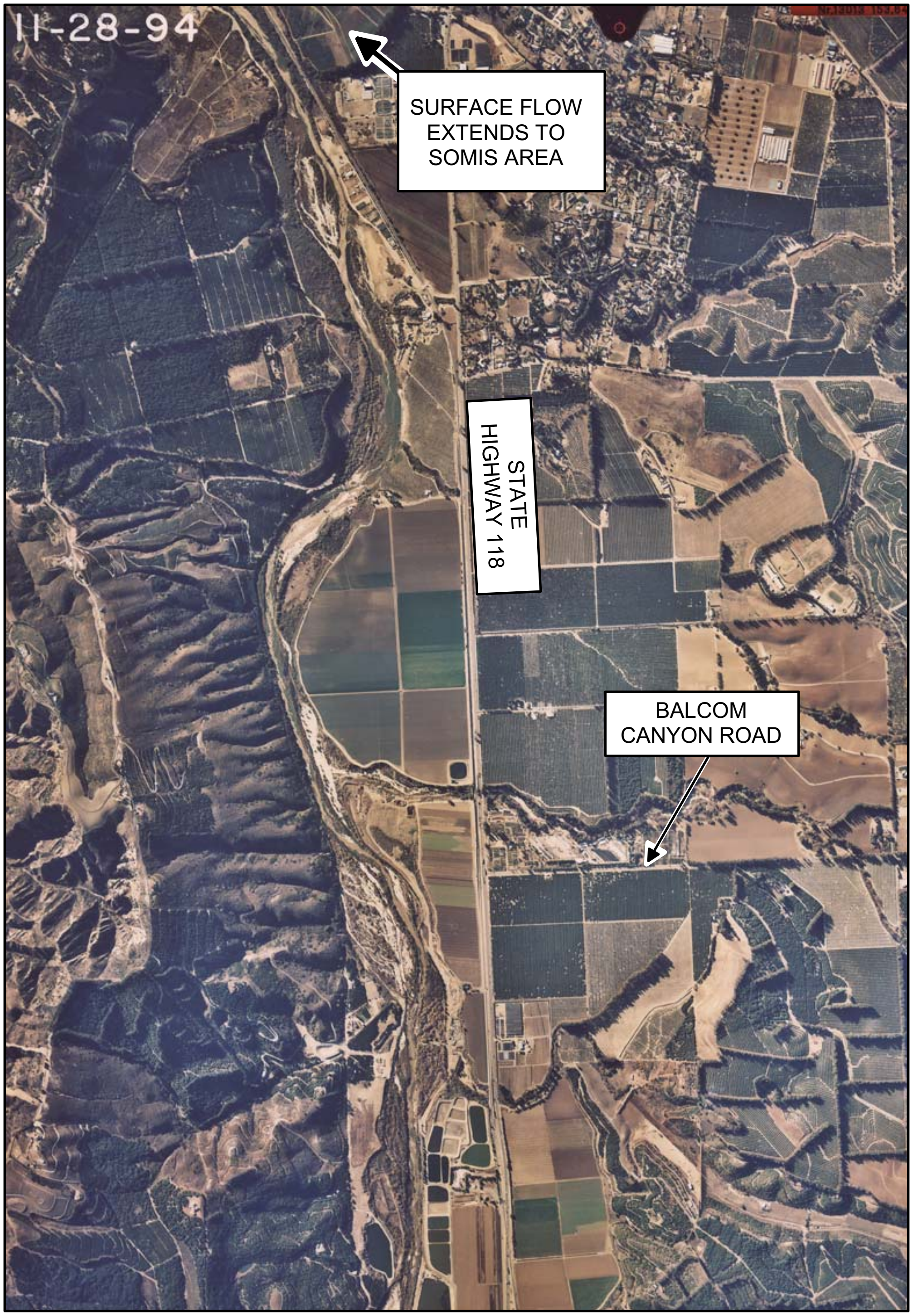
PLATE A6

APPENDIX B
AERIAL PHOTOGRAPHS OF ARROYO LAS POSAS



JANUARY 1984

PLATE B1



NOVEMBER 1994

2005 (MONTH UNKNOWN)

PLATE B3

APPENDIX C
STREAM FLOW SURVEY

Table C1 – Stream Flow Data

ARROYO LAS POSAS AT HITCH BOULEVARD GAUGING STATION			
SECTION	AREA (SQUARE FEET)	VELOCITY (FEET/SEC)	FLOW RATE (CFS)
1	0.350	1.45	0.508
2	0.338	1.93	0.651
3	0.430	1.83	0.787
4	0.500	1.67	0.835
5	0.580	1.95	1.131
6	0.688	2.05	1.409
7	0.615	1.62	0.996
8	0.465	1.65	0.767
9	0.445	1.88	0.837
10	0.490	1.70	0.833
11	0.450	1.96	0.882
12	0.450	2.13	0.959
13	0.440	2.08	0.915
14	0.495	2.59	1.282
15	0.655	2.50	1.638
16	0.580	2.28	1.322
17	0.655	2.15	1.408
18	0.880	2.60	2.288
19	1.045	2.40	2.508
20	1.020	2.45	2.499
21	0.465	1.11	0.516
TOTAL RATE OF FLOW (CFS)			24.971
TOTAL RATE OF FLOW (GPM)			11,207

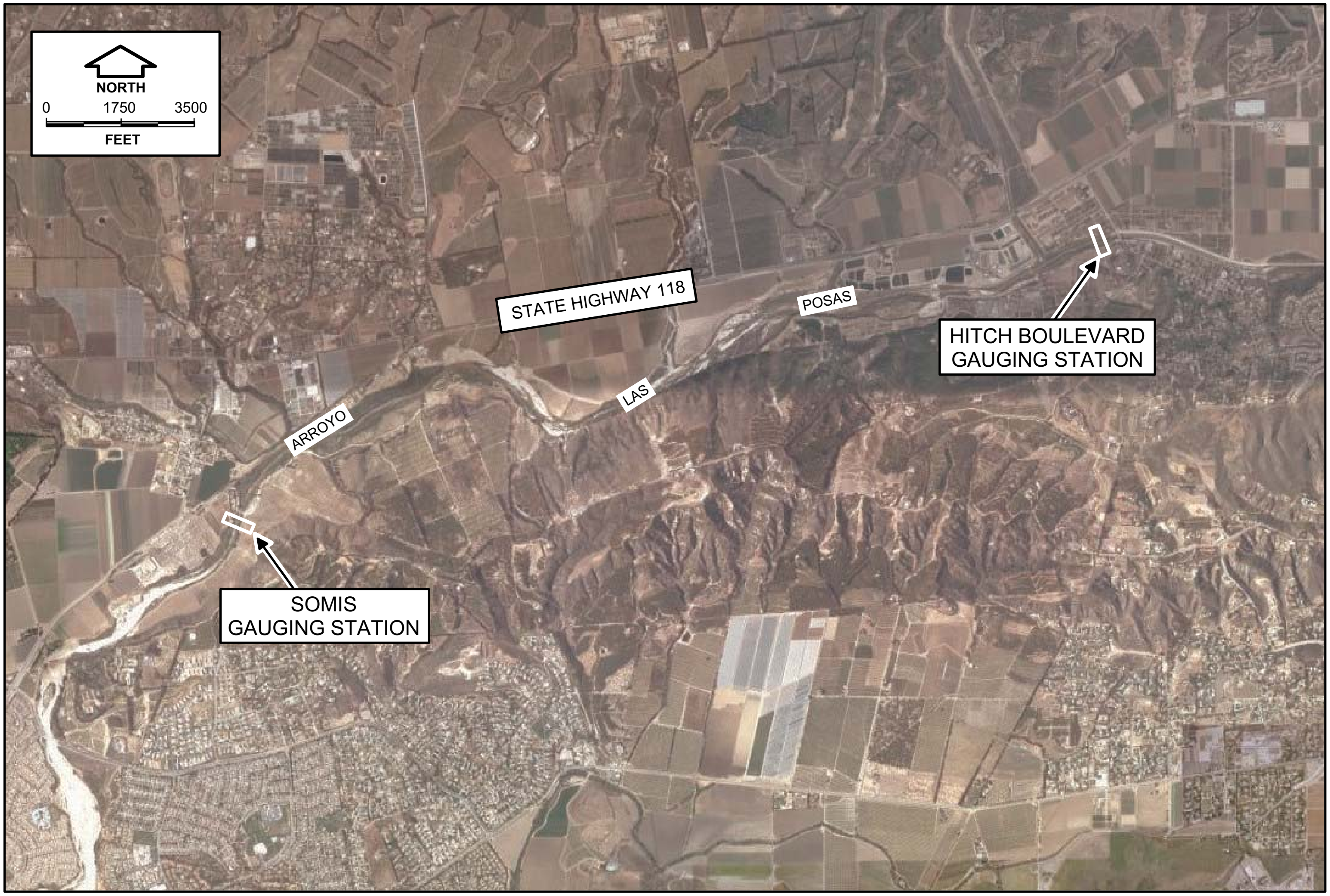
ARROYO LAS POSAS AT SOMIS GAUGING STATION			
SECTION	AREA (SQUARE FEET)	VELOCITY (FEET/SEC)	FLOW RATE (CFS)
1	0.410	2.38	0.976
2	0.565	2.62	1.480
3	0.510	2.97	1.515
4	0.525	2.88	1.512
5	0.515	2.79	1.437
6	0.585	3.02	1.767
7	0.600	3.45	2.070
8	0.793	2.77	2.195
9	1.025	2.09	2.142
TOTAL RATE OF FLOW (CFS)			15.094
TOTAL RATE OF FLOW (GPM)			6,774

Table C2 – Stream Flow Data

DATE	HOPKINS MEASUREMENTS[1] HITCH BOULEVARD (CFS)	HOPKINS MEASUREMENTS[1] SOMIS (CFS)	VCWPD STREAM GAUGE READING HITCH BOULEVARD (CFS)	VCWPD MEASUREMENTS[2] HITCH BOULEVARD (CFS)
09/25/2007	25	15	15	NA[3]
10/28/2008	25	NA[3]	NA[3]	15

[1] – Measurement conducted with an impeller actuated flow meter.
[2] – Measurement conducted with a Pygmy meter having an axial cup actuator.
[3] – Not Available

November 2008
Project No. 03-007-07



STREAM GAUGING STATION LOCATION MAP
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE C1

HOPKINS
GROUNDWATER
CONSULTANTS

HITCH BOULEVARD GAUGING STATION
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE C2

SOMIS GAUGING STATION
Pleasant Valley Forebay Recharge Study
Calleguas Municipal Water District
Camarillo, California

PLATE C3

STREAM FLOW MEASUREMENTS AT HITCH BOULEVARD GAUGING STATION

STREAM FLOW MEASUREMENTS AT SOMIS GAUGING STATION

PRE-SURVEY CONDITION AT SOMIS STATION

TERMINATION OF STREAM FLOW

APPENDIX D
LABORATORY TEST RESULTS OF SURFACE AND GROUNDWATER ANALYSES

FGL ENVIRONMENTAL
GENERAL MINERAL ANALYSIS

ENVIRONMENTAL

ANALYTICAL CHEMISTS

October 25, 2007

Hopkins Groundwater Consultants Inc.
P. O. Box 3596
Ventura, CA 93006-3596

Lab ID : SP 0710727
Customer : 2-20807

Laboratory Report

Introduction: This report package contains total of 7 pages divided into 3 sections:

Case Narrative	(2 Pages)	: An overview of the work performed at FGL.
Sample Results	(2 pages)	: Results for each sample submitted.
Quality Control	(3 pages)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
03-007-07 Creek Sample No.1	09/25/2007	09/25/2007	SP 0710727-001	SW
03-007-07 Well Sample No.2	09/25/2007	09/25/2007	SP 0710727-002	GW

Sampling and Receipt Information: All samples were received, prepared and analyzed within the method specified holding except those as listed in the table below. The holding time for pH is listed as immediate. Logistically this is very difficult to obtain. FGL policy is to analyze all samples requiring pH on the same day of receipt at the laboratory. If this presents any problem please call.

Lab ID	Analyte/Method	Required Holding Time	Actual Holding Time
SP 0710727-001	pH	15	406.2 Minutes
SP 0710727-002	pH	15	259.2 Minutes

All samples arrived on ice. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Inorganic - Metals QC

200.7	10/01/2007:210057 All analysis quality controls are within established criteria.
	10/01/2007:209567 All preparation quality controls are within established criteria.

October 25, 2007
Hopkins Groundwater Consultants Inc.

Lab ID : SP 0710727
Customer : 2-20807

Inorganic - Wet Chemistry QC

2320B	09/28/2007:209945	All analysis quality controls are within established criteria.
	09/28/2007:209470	All preparation quality controls are within established criteria.
2510B	09/26/2007:209813	All analysis quality controls are within established criteria.
	09/26/2007:209352	All preparation quality controls are within established criteria.
2540 C,E	09/27/2007:209399	All preparation quality controls are within established criteria.
300.0	10/10/2007:210483	All analysis quality controls are within established criteria.
	10/08/2007:209789	All preparation quality controls are within established criteria.
4500-H B	09/25/2007:209335	All preparation quality controls are within established criteria.
4500HB	09/25/2007:209800	All analysis quality controls are within established criteria.
4500NO2B	09/25/2007:209804	All analysis quality controls are within established criteria.
	09/26/2007:209343	All preparation quality controls are within established criteria.
4500NO3F	09/27/2007:210013	All analysis quality controls are within established criteria.
	09/27/2007:209403	All preparation quality controls are within established criteria.
5540C	09/25/2007:209799	All analysis quality controls are within established criteria.
	09/25/2007:209337	All preparation quality controls are within established criteria.

Certification: I certify that this data package is in compliance with NELAC standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

Approved By **Kelly A. Dunnahoo, B.S.**

Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2007-10-25

FGL ENVIRONMENTAL
ANALYTICAL CHEMISTS

October 25, 2007

Hopkins Groundwater Consultants Inc.
P. O. Box 3596
Ventura, CA 93006-3596

Lab ID : SP 0710727-001
Customer ID : 2-20807

Sampled On : September 25, 2007-10:43
Sampled By : B. Cosner
Received On : September 25, 2007-16:55
Matrix : Surface Water

Description : 03-007-07 Creek Sample No.1
Project : Water Monitoring

Sample Results - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral $^{P:1'4}$								
Total Hardness	516	2.5	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Calcium	139	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Magnesium	41	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Potassium	8	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Sodium	167	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Total Cations	17.8	0.1	meq/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Boron	0.7	0.1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Copper	ND	10	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Iron	840	50	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Manganese	180	10	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Zinc	ND	20	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
SAR	3.2	0.1	meq/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Total Alkalinity (as CaCO3)	220	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Hydroxide	ND	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Carbonate	ND	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Bicarbonate	270	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Sulfate	460	10	mg/L		300.0	10/08/07:209789	300.0	10/10/07:210483
Chloride	189	5	mg/L		300.0	10/08/07:209789	300.0	10/10/07:210483
Nitrate	30.7	0.4	mg/L		4500NO3F	09/27/07:209403	4500NO3F	09/27/07:210013
Nitrite as N	ND	0.1	mg/L		4500NO2B	09/26/07:209343	4500NO2B	09/25/07:209804
Fluoride	0.3	0.1	mg/L		300.0	10/08/07:209789	300.0	10/10/07:210483
Total Anions	19.8	0.1	meq/L		2320B	09/28/07:209470	2320B	09/28/07:209945
pH	7.2	---	units		4500-H B	09/25/07:209335	4500HB	09/25/07:209800
Specific Conductance	1700	1	umhos/cm		2510B	09/26/07:209352	2510B	09/26/07:209813
Total Dissolved Solids	1180	20	mg/L		2540 C,E	09/27/07:209399	2540C	09/28/07:209924
MBAS (foaming agents)	ND	0.1	mg/L		5540C	09/25/07:209337	5540C	09/25/07:209799
Aggressiveness Index	12.1	0	--		4500-H B	09/25/07:209335	4500HB	09/25/07:209800
Langlier Index	0.2	0	--		4500-H B	09/25/07:209335	4500HB	09/25/07:209800

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic Preservatives: H2SO4 pH < 2, HNO3 pH < 2

FGL ENVIRONMENTAL
ANALYTICAL CHEMISTS

October 25, 2007

Lab ID : SP 0710727-002
Customer ID : 2-20807

Hopkins Groundwater Consultants Inc.
P. O. Box 3596
Ventura, CA 93006-3596

Sampled On : September 25, 2007-13:10
Sampled By : B. Cosner
Received On : September 25, 2007-16:55
Matrix : Ground Water

Description : 03-007-07 Well Sample No.2
Project : Water Monitoring

Sample Results - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral $^{P:1'4}$								
Total Hardness	719	2.5	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Calcium	204	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Magnesium	51	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Potassium	5	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Sodium	143	1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Total Cations	20.7	0.1	meq/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Boron	0.5	0.1	mg/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Copper	ND	10	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Iron	180	50	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Manganese	150	10	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Zinc	ND	20	ug/L		200.7	10/01/07:209567	200.7	10/01/07:210057
SAR	2.3	0.1	meq/L		200.7	10/01/07:209567	200.7	10/01/07:210057
Total Alkalinity (as CaCO3)	230	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Hydroxide	ND	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Carbonate	ND	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Bicarbonate	290	10	mg/L		2320B	09/28/07:209470	2320B	09/28/07:209945
Sulfate	700	10	mg/L		300.0	10/08/07:209789	300.0	10/10/07:210483
Chloride	177	5	mg/L		300.0	10/08/07:209789	300.0	10/10/07:210483
Nitrate	ND	0.4	mg/L		4500NO3F	09/27/07:209403	4500NO3F	09/27/07:210013
Nitrite as N	ND	0.1	mg/L		4500NO2B	09/26/07:209343	4500NO2B	09/25/07:209804
Fluoride	0.1	0.1	mg/L		300.0	10/08/07:209789	300.0	10/10/07:210483
Total Anions	24.3	0.1	meq/L		2320B	09/28/07:209470	2320B	09/28/07:209945
pH	7.1	---	units		4500-H B	09/25/07:209335	4500HB	09/25/07:209800
Specific Conductance	1930	1	umhos/cm		2510B	09/26/07:209352	2510B	09/26/07:209813
Total Dissolved Solids	1440	20	mg/L		2540 C,E	09/27/07:209399	2540C	09/28/07:209924
MBAS (foaming agents)	ND	0.1	mg/L		5540C	09/25/07:209337	5540C	09/25/07:209799
Aggressiveness Index	12.2	0	--		4500-H B	09/25/07:209335	4500HB	09/25/07:209800
Langlier Index	0.2	0	--		4500-H B	09/25/07:209335	4500HB	09/25/07:209800

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic Preservatives: H2SO4 pH < 2, HNO3 pH < 2

October 25, 2007 | Lab ID : SP 0710727

Hopkins Groundwater Consultants, Inc. | Customer : 2-20807

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Boron	200.7	10/01/2007:209567	MS	mg/L	4.000	91.5 %	75-125	
			MSD	mg/L	4.000	92.6 %	75-125	
			MSRPD	mg/L	800.0	1.0%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	5.000	94.9 %	90-110	
			CCB	ppm		0.065	0.10	
			CCV	ppm	5.000	92.1 %	90-110	
			CCB	ppm		0.032	0.10	
Calcium	200.7	10/01/2007:209567	MS	mg/L	12.50	69.7 %	<¼	
			MSD	mg/L	12.50	63.9 %	<¼	
			MSRPD	mg/L	800.0	0.5%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	25.00	93.9 %	90-110	
			CCB	ppm		0.02	1.0	
			CCV	ppm	25.00	93.3 %	90-110	
			CCB	ppm		0.02	1.0	
Copper	200.7	10/01/2007:209567	MS	ug/L	800.0	90.9 %	75-125	
			MSD	ug/L	800.0	90.5 %	75-125	
			MSRPD	ug/L	800.0	0.4%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	1.000	93.8 %	90-110	
			CCB	ppm		0.0019	0.01	
			CCV	ppm	1.000	92.7 %	90-110	
			CCB	ppm		0.0019	0.01	
Iron	200.7	10/01/2007:209567	MS	ug/L	4000	88.7 %	75-125	
			MSD	ug/L	4000	89.0 %	75-125	
			MSRPD	ug/L	800.0	0.3%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	5.000	92.9 %	90-110	
			CCB	ppm		-0.0119	0.05	
			CCV	ppm	5.000	92.3 %	90-110	
			CCB	ppm		-0.0097	0.05	
Magnesium	200.7	10/01/2007:209567	MS	mg/L	12.50	85.8 %	75-125	
			MSD	mg/L	12.50	83.4 %	75-125	
			MSRPD	mg/L	800.0	0.6%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	25.00	91.4 %	90-110	
			CCB	ppm		0.02	1.0	
			CCV	ppm	25.00	90.8 %	90-110	
			CCB	ppm		0.02	1.0	
Manganese	200.7	10/01/2007:209567	MS	ug/L	800.0	87.9 %	75-125	
			MSD	ug/L	800.0	87.7 %	75-125	
			MSRPD	ug/L	800.0	0.2%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	1.000	92.4 %	90-110	
			CCB	ppm		0.0016	0.01	
			CCV	ppm	1.000	91.6 %	90-110	
			CCB	ppm		0.0017	0.01	
Potassium	200.7	10/01/2007:209567	MS	mg/L	12.50	103 %	75-125	
			MSD	mg/L	12.50	102 %	75-125	
			MSRPD	mg/L	800.0	0.6%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	25.00	94.5 %	90-110	
			CCB	ppm		-0.02	1.0	
			CCV	ppm	25.00	93.7 %	90-110	
			CCB	ppm		0.05	1.0	
Sodium	200.7	10/01/2007:209567	MS	mg/L	12.50	70.3 %	<¼	
			MSD	mg/L	12.50	59.2 %	<¼	
			MSRPD	mg/L	800.0	0.8%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	25.00	90.7 %	90-110	
			CCB	ppm		0.15	1.0	
			CCV	ppm	25.00	89.7 %	90-110	

October 25, 2007 Lab ID : SP 0710727

Hopkins Groundwater Consultants, Inc. Customer : 2-20807

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Sodium	200.7	10/01/2007:210057	CCB	ppm		0.21	1.0	
Zinc			MS	ug/L	2000	90.2 %	75-125	
			MSD	ug/L	2000	90.9 %	75-125	
			MSRPD	ug/L	800.0	0.8%	≤20.0	
	200.7	10/01/2007:210057	CCV	ppm	1.000	91.9 %	90-110	
			CCB	ppm		0.0057	0.02	
			CCV	ppm	1.000	92.0 %	90-110	
			CCB	ppm		0.0063	0.02	
Wet Chem								
Alkalinity (as CaCO3)	2320B	09/28/2007:209470	Dup	mg/L		0.3%	3.42	
	2320B	09/28/2007:209945	ICV	mg/l	234.9	101 %	90-110	
			CCV	mg/l	234.9	100 %	90-110	
Bicarbonate	2320B	09/28/2007:209470	Dup	mg/l		0.3%	4.78	
Carbonate			Dup	mg/l		0.0	10	
Chloride	300.0	10/08/2007:209789	LCS	mg/L	25.00	105 %	90-110	
			MS	mg/L	500.0	116 %	86-128	
			MSD	mg/L	500.0	116 %	86-128	
			MSRPD	mg/L	100.0	0.05%	≤23.0	
	300.0	10/10/2007:210483	CCB	ppm		0.06	1	
			CCV	ppm	25.00	108 %	90-110	
			CCB	ppm		0.06	1	
			CCV	ppm	25.00	109 %	90-110	
Conductivity	2510B	09/26/2007:209813	ICB	umhos/cm		0.1	1	
			CCV	umhos/cm	998.0	101 %	95-105	
			CCV	umhos/cm	998.0	101 %	95-105	
E. C.	2510B	09/26/2007:209352	Blank	umhos/cm		ND	<1	
			Dup	umhos/cm		0.1%	0.372	
Fluoride	300.0	10/08/2007:209789	LCS	mg/L	2.500	110 %	90-110	
			MS	mg/L	50.00	118 %	81-126	
			MSD	mg/L	50.00	119 %	81-126	
			MSRPD	mg/L	100.0	0.4%	≤12.1	
	300.0	10/10/2007:210483	CCB	ppm		0.000	0.1	
			CCV	ppm	2.500	109 %	90-110	
			CCB	ppm		0.000	0.1	
			CCV	ppm	2.500	110 %	90-110	
Hydroxide	2320B	09/28/2007:209470	Dup	mg/l		0.0	10	
MBAS	5540C	09/25/2007:209337	MS	mg/L	1.000	100 %	90-110	
			MSD	mg/L	1.000	100 %	90-110	
			MSRPD	mg/L	1.000	0.0	≤0.1	
	5540C	09/25/2007:209799	CCB	mg/L		0.000	0.1	
			CCV	mg/L	1.000	100 %	99-101	
Nitrate + Nitrite as N	4500NO3F	09/27/2007:209403	MS	mg/L	4.000	61.0 %	5-285	
			MSD	mg/L	4.000	61.0 %	5-285	
			MSRPD	mg/L	4.000	0.0%	≤30.4	
	4500NO3F	09/27/2007:210013	CCB	mg/l		-0.011	0.1	
			CCV	mg/l	4.000	96.8 %	90-110	
			CCB	mg/l		-0.005	0.1	
			CCV	mg/l	4.000	95.5 %	90-110	
Nitrite as Nitrogen	4500NO2B	09/25/2007:209804	CCV	mg/L	0.1522	95.7 %	90-110	
			CCB	mg/L		-0.0007	0.1	
			CCV	mg/L	0.1522	96.6 %	90-110	
			CCB	mg/L		-0.0007	0.1	
	4500NO2B	09/26/2007:209343	MS	mg/L	0.4568	23.4 %	1-173	
			MSD	mg/L	0.4568	22.8 %	1-173	
			MSRPD	mg/L	0.4568	0.0028	≤0.1	
pH	4500-H B	09/25/2007:209335	Dup	units		0.8%	4.80	
	4500HB	09/25/2007:209800	CCV	units	8.000	101 %	95-105	

October 25, 2007 Lab ID : SP 0710727
Hopkins Groundwater Consultants, Inc. Customer : 2-20807

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Wet Chem								
pH	4500HB	09/25/2007:209800	CCV	units	8.000	100 %	95-105	
Solids, Total Dissovled			Blank	mg/L		20	20	
			LCS	mg/L	1000	99.6 %	90-110	
			LCS	mg/L	1000	103 %	90-110	
			Dup	mg/L		1.6%	10.0	
Sulfate	300.0	10/08/2007:209789	LCS	mg/L	50.00	104 %	90-110	
			MS	mg/L	1000	115 %	78-137	
			MSD	mg/L	1000	115 %	78-137	
			MSRPD	mg/L	100.0	0.2%	≤12.3	
	300.0	10/10/2007:210483	CCB	ppm		1.08	2	
			CCV	ppm	50.00	106 %	90-110	
			CCB	ppm		1.06	2	
			CCV	ppm	50.00	106 %	90-110	

Definition

ICV : Initial Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
ICB : Initial Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
CCV : Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
CCB : Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
Blank : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
LCS : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
MS : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyted. The recoveries are an indication of how that sample matrix affects analyte recovery.
Dup : Duplicate Sample - A random sample with each batch is prepared and analyzed in duplicate. The relative percent difference is an indication of precision for the preparation and analysis.
MSRPD : MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
ND : Non-detect - Result was below the DQO listed for the analyte.
<¼ : High Sample Background - Spike concentration was less than one forth of the sample concentration.
DQO : Data Quality Objective - This is the criteria against which the quality control data is compared.

FGL ENVIRONMENTAL

CHAIN OF CUSTODY
AND ANALYSIS REQUEST DOCUMENT

ORIGINAL

CLIENT DETAILS — SECTION I

Client: HOPKINS GROUNDWATER
☐ New Customer Customer Number: ____
Address: P.O. BOX 3596
VENTURA, CA 93006
Phone: 805-~~6~~653-5306
FAX: 805-653-5346
Project name: ____
Contact person: C. HOPKINS
Billing Information (if different from above)
Name: ____
Address: ____
Phone: ____
FAX: ____
Contact person: ____
Purchase order/contract/FGL quote number: ____
Pre Log Required: yes ____ Frequency: Monthly ☐ Weekly ☐ Quarterly ☐ Other ☐ ____

SAMPLING — SECTION II

Sampler (s) : B. COSNER
Comp Sampler Set up Date: ____ Time: ____
Time: ____ Mileage: ____
Shipping Charge: ____ Pickup Charge: ____

REPORT INFORMATION — SECTION III

Rush Analysis (surcharge will apply):
☐ 5 Day ☐ 4 Day ☐ 3 Day
☐ 2 Day ☐ 24 hour
Rush pre-approval by lab: ____ inital
Electronic Data Transfer: yes ____ no ____
If yes, To: State ____ Client ____ Other ____
Lab number : 10727

SAMPLE INFORMATION — SECTION IV

Sample Number	Location/Description	Date Sampled	Time Sampled	Type of Sampling: Composite(C) Grab(G)	Number of Containers	Type of Containers: (G) Glass (P) Plastic (V) VOA (MT) Metal Tube	(P) Potable (NP) Non-Potable	(SW) Surface Water (GW) Ground Water (WW) Wastewater (MW) Monitoring Well (TB) Travel Blank (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	BacT: (Sys) System (SRC) Source (W) Waste	BacT: Routine (ROUT) Repeat (RPT) Other (OTH) Replace (RPL)	(LT) Leaf Tissue (PET) Petiole Tissue (PRD) Produce	Preservative: (1) NaOH + ZnAc, (2) NaOH, (3) HCl, (4) H2SO4, (5) HNO3, (6) Na2S2O3, (7) Other	ANALYSES REQUESTED: GEN-MIN
1	03-007-07 CREEK SAMPLE NO. 1	09-25-07	10:43	G	3	P	P	SW					4,5	X
2	03-007-07 WELL SAMPLE NO. 2	09-25-07	13:10	G	3	P	P	GW					4,5	X

To Lab D/I:

REMARKS — SECTION V

CUSTODY — SECTION VI

Relinquished by and subject to the terms and conditions on the reverse of this document:
B. Cosner Date 09-25-07 Time 16:31
Received by: Date 9-25-07 Time 16:31
Relinquished by: Date 9-25-07 Time 1655
Received by: Date 9/25/07 Time 1655

Relinquished by: ____ Date ____ Time ____
Received by: ____ Date ____ Time ____
Relinquished by: ____ Date ____ Time ____
Received by: ____ Date ____ Time ____

CORPORATE OFFICE & LABORATORY
P.O. Box 272/853 Corporation Street
Santa Paula, CA 93061-0272
Tel. (805) 659-0910
FAX: (805) 525-4172

OFFICE & LABORATORY
2500 Stagecoach Road
Stockton, CA 95215
Tel (209) 942-0181
FAX: (209) 942-0423

FIELD OFFICE
Visalia, California
Tel: (559) 734-9473
Mobile: (559) 737-2399
FAX (559) 734-8435

Santa Paula - Condition Upon Receipt (Attach to COC)

Sample Receipt:

1. Number of ice chests/packages received: OTC
   Note as OTC if received over the counter unpackaged.
2. Were samples received in a chilled condition? Temps: ROI / ____ / ____ / ____ / ____
   Acceptable is above freezing to 6° C. Also acceptable is received on ice (ROI) for the same day of sampling or received at room temperature (RRT) if sampled within one hour of receipt. Client contact for temperature failures must be documented below. If many packages are received at one time check for tests/H.T.'s/rushes/Bacti's to prioritize further review. Please notify Microbiology personnel immediately of bacti samples received.
3. Do the number of bottles received agree with the COC? [✓ Yes] No N/A
4. Were samples received intact? (i.e. no broken bottles, leaks etc.) [✓ Yes] No
5. Were sample custody seals intact? [✓ N/A] Yes No

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? [✓ Yes] No
2. Did bottle labels correspond with the client's ID's? [✓ Yes] No
3. Were all bottles requiring sample preservation properly preserved? [✓ Yes] No N/A FGL
4. Were all analyses within holding times at time of receipt? [✓ Yes] No
5. Have rush or project due dates been checked and accepted? [✓ N/A] Yes No

Attach labels to the containers and include a copy of the COC for lab delivery.

Sample Receipt, Login and Verification completed by (initials): ________

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: ____________ Phone Number: ________
   Initiated By: ____________ Date: ________
   Problem:

   Resolution:

2. Person Contacted: ____________ Phone Number: ________
   Initiated By: ____________ Date: ________
   Problem:

   Resolution:

ZYMAX FORENSICS
DELTA OXYGEN-18, DELTA DEUTERIUM, AND DELTA NITROGEN-15 ANALYSES

REPORT OF ANALYTICAL RESULTS

Client:	Brian Cosner Hopkins Groundwater Consultants P.O.B. 3596 Ventura, CA 93006-3596	Lab Number:	40702
		Received:	9/26/2007
		Matrix:	Water
Project:	Isotopes	Sample Description:	See Below
Project Number:	03-007-07	Analyzed:	10/26/2007
Collected by:	Client	Method:	CF-IRMS

$\delta^{18}O$ δD

LAB NUMBER	SAMPLE DESCRIPTION	$\delta^{18}O$ ‰	δD ‰
40702-1	03-007-07 Creek Sample No.1	-8.0	-55.0
40702-2	03-007-07 Well Sample No.2	-7.4	-52.6
Analytical Precision (1-sigma)		0.2	0.7

Submitted by,
Zymax Forensics, a DPRA company

River He, PhD
Isotope Lab Manager

40702-1h2o.xls
RH D12.03 04

REPORT OF ANALYTICAL RESULTS

Client:	Brian Cosner Hopkins Groundwater Consultants P.O.B. 3596 Ventura, CA 93006-3596
Lab Number:	40702
Received:	9/26/2007
Matrix:	Water
Project:	Isotopes
Project Number:	03-007-07
Collected by:	Client
Sample Description:	See Below
Analyzed:	10/31/2007
Method:	CF-IRMS

$\delta^{15}N$ $\delta^{18}O$ (Nitrate)

LAB NUMBER	SAMPLE DESCRIPTION	$\delta^{15}N$ ‰
40702-1	03-007-07 Creek Sample No.1	10.9
40702-2	03-007-07 Well Sample No.2	12.4
Analytical Precision (1-sigma)		0.4

Submitted by,
Zymax Forensics, a DPRA company

River He, PhD
Isotope Lab Manager

40702-1NO3.xls
RH

ISOTECH LABORATORIES
TRITIUM ANALYSIS

Isotech Water Data

Job 8883

Project 03-007-07

Isotech Lab No.	Sample Name	Tritium TU	Std. Dev.
124384	Creek Sample #1	3.87	0.23
124385	03-007-07 Well Sample #2	2.84	0.22

SHALLOW GROUNDWATER OF EASTERN PLEASANT VALLEY BASIN

Report Prepared for:

Camrosa Water District

Report Prepared by:

Norman N. Brown, Ph.D.

PRELIMINARY DRAFT – FOR DISCUSSION PURPOSES ONLY

April 26, 2005

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EXECUTIVE SUMMARY

A study of the geology and groundwater characteristics of the eastern Pleasant Valley basin was conducted to assist in determination of shallow aquifer geology and likely groundwater connectivity with other regional aquifers. Particular focus was given to the area immediately north of Round Mountain and the CSU–Channel Islands campus.

In the area of study, principal water-bearing zones correspond with regional shallow aquifers and the regional groundwater basin's Upper Aquifer System. The Lower Aquifer System of the Oxnard Plain and other adjacent basin areas is widely regarded as absent in the study area adjacent to the Santa Monica Mountains. Groundwater of the shallow aquifer in the study area may be in hydraulic connection with Upper Aquifer System strata but is most likely relatively isolated from the regional Lower Aquifer System because:

- Significant thicknesses of clay are recognized in the stratigraphy for much of the study area and for the regional basin, separating the shallow aquifer from portions of the Upper Aquifer System, and separating these units from the Lower Aquifer System,
- In the regional basin adjacent to the study area, groundwater levels in the Upper and Lower Aquifer Systems are substantially different, and
- Seasonal and long-term water level fluctuations have different characteristics for each of the shallow, Upper and Lower aquifer systems.

The special study area north of Round Mountain, while historically characterized by poor water quality and limited supply reliability, also provides an opportunity for managed water resource benefits by providing a location:

- Potentially well separated hydraulically from the Lower Aquifer System of the main groundwater basin,
- Hydraulically connected with Calleguas Creek,
- Directly adjacent to the CSUCI campus and which, if managed, could provide an alternative water supply source to this facility, and

- Potentially well-suited to water quality management of combined surface water and shallow aquifer resources of eastern Pleasant Valley basin.

Recommendations for developing a managed water resource program in the special study area include:

- Survey of borehole conditions and water quality from existing, accessible water wells in the area,
- Characterization of aquifer storage capacity for different target groundwater units in the managed area,
- Characterization of areas or specific wells most important for evaluating potential impacts and benefits of any such water management program,
- Consideration of potential surface water gaging of Calleguas Creek at Round Mountain, and
- Determination of specific monitoring points important for such a water management program.

INTRODUCTION

Study of the groundwater geology of the eastern Pleasant Valley basin was conducted to assist in the understanding of the shallow groundwater regime of this portion of the regional aquifer. In particular, the study was conducted to:

- Identify and characterize geological features that may be important for governing groundwater flow within the area,
- Identify and characterize groundwater conditions within the principal aquifer systems of the area, particularly for improving the technical understanding of connectivity between the aquifer systems,
- Evaluate hydrogeological data specific to the region immediately north of Round Mountain and the CSU–Channel Islands campus ("special study area"),
- Develop preliminary technical findings for the special study area regarding shallow aquifer characteristics and groundwater connectivity with adjacent portions of the regional aquifer system, and
- Develop preliminary recommendations for the special study area pursuant to the use of groundwater resources of this area for regional water management and alternative water supply for the CSU campus.

Initial study was conducted for a portion of eastern Pleasant Valley approximately bounded by Pleasant Valley Road on the north, Calleguas Creek on the west, Round Mountain on the south, and the bedrock rangefront of the Santa Monica Mountains on the east (Figure 1). As discussed below, special focus was given to the area of sedimentary materials immediately north of Round Mountain and the CSUCI campus (formerly the California State Hospital).

Data used for the study includes publicly-available data concerning groundwater levels and groundwater quality, regional groundwater flow modeling, specialized geologic and groundwater studies conducted for nested monitoring well sites in the regional aquifer, and previous technical studies conducted for both the regional basin and the special study area. Work for the study also included acquisition of confidential state water well drillers' reports for portions of the study area; these are attached as Appendix A to the report. Much of the data were assembled and evaluated using standard database and GIS software; associated digital files acquired on behalf of Camrosa Water District are provided under separate cover.

GROUNDWATER GEOLOGY

Flow between aquifer units in any portion of the regional groundwater system is governed by several factors, including the differences in water level between water-bearing units. In addition, flow can occur through, or be inhibited by features such as:

- Sedimentary units, such as sands and gravels that transmit groundwater and clay-rich strata that are barriers to groundwater flow;
- Geological contacts that juxtapose basin strata of different origin or hydrologic character;
- Geological structures such as faults that may control local movement of groundwater through juxtaposition of different rock types and/or through hydrologic characteristics of the fault zone itself; and
- Modern, constructed features such as wells that create hydraulic connections between aquifers that are otherwise separated by aquitards (e.g., discussion in UWCD, 2004 and citations therein).

Discussion of groundwater levels in and around the study area is provided in section "Groundwater Conditions" below, following discussion of geological features such as stratigraphy and structure.

STRATIGRAPHY

Water well lithologic logs and completion reports provide an important basis for evaluating geological elements that localize and control groundwater flow within and between aquifers of the study area. Of particular interest for the goals of this study are:

- Significant thicknesses of coarse- and fine-grained sediments that either transmit or block groundwater flow,
- Laterally-contiguous stratigraphic packages that are recorded in many wells over broad portions of the study area, and
- Differences in stratigraphy that mark sedimentary transitions adjacent to the Santa Monica Mountains rangefront, and across areas of structural disruption, such as the hypothesized Bailey fault.

Stratigraphic Nomenclature

This study follows the interpretations and findings of most previous studies concerning the general basin stratigraphy (e.g., Dibblee and Ehrenspeck, 1990; Hanson et al, 2003). The lowermost strata consist of marine sediments of the Pleistocene Santa Barbara and San Pedro Formations. The San Pedro Formation is unconformably overlain by mixed marine and terrestrial alluvial deposits of late Pleistocene and Holocene age, designated Older Alluvium and Recent Alluvium (Figure 2).

In the study area, basin sediments lie unconformably on bedrock, consisting primarily of Tertiary Conejo volcanic rocks. In adjacent portions of the basin, bedrock basement is comprised of the volcanics and other Tertiary and older sedimentary rocks. None of the bedrock units, whether sedimentary or volcanic, are meaningful sources of groundwater production, except for local water supply from fractured volcanics in some mountain-front areas such as portions of the Santa Rosa valley.

Hydrostratigraphy

For this study, water-bearing units of the study area and adjacent portions of the regional groundwater basin are grouped in three general categories: (*i*) Lower Aquifer System (LAS), (*ii*) Upper Aquifer System (UAS), and (*iii*) shallow aquifers.

In the study area, the shallow aquifers are designated as the uppermost water-bearing units in hydraulic connection with surface and associated stream flow of Calleguas and Conejo Creeks. These aquifers may be semi-perched, unconfined or semi-confined, and are recognized as lenticular and laterally discontinuous in the basin margin area of this study.

In contrast, both the Lower Aquifer System and Upper Aquifer System include productive strata that are regionally contiguous in the study area and in adjacent portions of the regional basin (California DWR, 1971). The Lower Aquifer System consists of regionally-prevalent and important water supply units including the Grimes Canyon and Fox Canyon Aquifers. These confined aquifers correspond with the Santa Barbara and San Pedro Formations and are stratigraphically lower (and older) than other sedimentary aquifers of the Pleasant Valley and adjacent basin areas. Of particular significance for this study, the LAS is mostly absent in the area east of Calleguas Creek, along the eastern margin of the Pleasant Valley basin. Absence of the LAS in the easternmost Pleasant Valley basin of the study area is based on the elevations of regional aquifers, elevation of top-of-bedrock, and water level elevations.

For areas of Pleasant Valley and the adjacent Oxnard Plain that contain both Upper and Lower Aquifer Systems, the UAS is separated from LAS strata by intervening, regionally-contiguous clays up to several hundred feet thick. In some wells, the clays are also interlayered with silty and sandy horizons typically less than 10 or 20 feet thick. The clay strata provide a relatively consistent physical barrier to groundwater flow between the LAS and UAS in the regional basin, but some flow ("leakance") is believed to occur between the two aquifer systems (Turner, 1975; Hanson et al, 2003). Based on head differences between the LAS and UAS during the last several decades, any such flow would be downward, from the UAS units to the LAS (refer also to discussion in section "Groundwater Levels" below).

Regional studies of the groundwater basin may group all of the aquifers above the LAS into the UAS (e.g., Hanson et al, 2003), or may separate the uppermost aquifer, which is commonly designated as a perched or semi-perched aquifer (e.g., Woodward-Clyde, 1997). In the study area, the UAS zone is confined or locally semi-confined, whereas the shallow aquifers are primarily unconfined, with local groundwater level characteristics that may correspond with semi-perched conditions. In general, this study attempts to distinguish to between shallow aquifers in the uppermost 100 to 200 feet of basin strata, characterized by laterally-discontinuous horizons, with more laterally-uniform, and generally confined UAS groundwater horizons underlying the shallow materials in the study area and in adjacent portions of the basin.

STRUCTURE

Regionally, the Simi-Santa Rosa fault zone is responsible for uplift of the Camarillo Hills and related features of the region. Fault segments of this structural zone, including the Springville and Camarillo faults have been active in the late Quaternary or Holocene, based on geological relationships in folded areas transected by the faults (Blake, 1991).

In the study area at the eastern margin of Pleasant Valley basin, geologic structure has an important impact on the location and characteristics of the principal aquifers. In the subsurface, the geometry of the bedrock surface is associated with truncation of the Lower Aquifer System along a zone roughly contiguous with the surface location of Calleguas Creek. In addition, lithologic relationships between wells in this vicinity indicate that portions of the basin close to the mountain-front are geologically irregular and likely disrupted by faulting.

Previous investigations have postulated the presence of a fault – commonly called the Bailey Fault – coincident with this zone of geological complexity, comprising an extension of the Simi-Santa Rosa fault zone. Geological evidence allows the presence of such a fault zone, probably existing as a region of echelon fault segments sub-parallel to the range front (Figures 3 and 4).

Previous investigations have noted differences in water level elevations in alluvial aquifers to either side of the Camarillo fault (Blake, 1991; California Mines and Geology, 2002). Similarly, Boyle Engineering Corp (1997) describes a low-permeability boundary condition in a groundwater model along the Bailey fault, describing the fault as providing resistance to groundwater flow. However, potential fault-related disruption to groundwater flow in the study area is not well supported by hydrologic data.

On that basis, this study assumes that any structural disruption to the basin stratigraphy in the study area does not create special disruption of groundwater flow across the area of possible faulting, and that this structural zone contains sufficient "windows" of hydraulic connection between water-bearing units to either side of the fault to allow groundwater connection between units of similar elevation on either side of the zone.

Despite uncertainty over any groundwater flow disruption caused by faulting in the study area, stratigraphic relationships from wellbore information suggest significant variability and lateral discontinuity of basin strata in this area, producing a heterogeneous flow regime within shallow aquifers and potentially also the Upper Aquifer System in the study area. Drillers' well logs present inconsistent information with regard to the lateral continuity of major water-bearing units of the shallow and UAS strata, but generally support a conceptual model in which sufficiently thick and interlayered clayey units would inhibit vertical migration of groundwater in the study area. This conceptual model is supported by water level information.

GROUNDWATER CONDITIONS

Groundwater levels and water quality in different aquifers provide an indicator of hydrologic separation or connectivity between different aquifer units, and within individual aquifer zones across the area of study.

GROUNDWATER LEVELS

Several important relationships and characteristics of the study area's groundwater regime are noted in water level data:

- In the area west of Calleguas Creek, where the basin stratigraphy includes the Lower Aquifer System, there exists a significant difference in water level between the LAS and UAS. During the last several decades, LAS water levels have been consistently lower than other aquifers, typically in the range 50 to 100 feet below sea level. In recent years, UAS water levels are generally above sea level. Increasing separation in water levels within the two aquifer systems can be seen for two relatively close wells near the study area (Figure 5). Hydrographs of groundwater levels in LAS aquifers exhibit characteristics of confined aquifers; UAS groundwater conditions are also commonly confined but may also have local characteristics of semi-confined aquifers.

- The most shallow aquifers exhibit water level trends expected for either unconfined or semi-perched aquifers. Whereas perched aquifer conditions are cited in many studies addressing regional hydrogeology (e.g., Woodward-Clyde, 1997), few wells in the study area with groundwater level data exhibit true perched aquifer behavior, fluctuating instead in a manner consistent with unconfined aquifer conditions or transient semi-perched behavior (Figure 6). In consideration of the geologic complexity of the area, combinations of semi-perched and unconfined conditions are expected for the most shallow aquifers.

- In areas adjacent to surface water streams (Calleguas and Conejo Creeks) in the study area, groundwater levels fluctuate roughly in concert with stream discharge, indicating hydraulic connection between the streams and the near-surface aquifers (Figure 7).

- Shallow aquifers that are known from lithologic logs to have fine-grained layers between the aquifer and surface display a range of water level characteristics showing that such shallow aquifers can be locally unconfined, semi-confined or semi-perched (Figure 8).

GROUNDWATER QUALITY

Like groundwater level information, groundwater quality is a basic standard for comparing aquifers and interpreting inter-aquifer flow regimes. In the area of study, groundwater quality information is relatively limited, but provides information consistent with other hydrogeological data and findings:

- Near-surface aquifers adjacent to surface water stream display water quality parameters consistent with hydraulic connection between surface water and the uppermost aquifers (Figure 9).

- In nested monitoring wells in the Oxnard Plain, individual aquifers can have greatly different water quality characteristics consistent with hydrologic separation between aquifers – as measured in concentration of chloride, for example (Table 1), or by different temporal trends in water quality for different aquifer units.

- Water quality in the shallow aquifers adjacent to the Santa Monica Mountains rangefront is commonly highly mineralized, and in regions adjacent to the southern portion of the study area, is generally higher in constituents such as chloride than groundwater in the LAS or UAS farther west in the main basin (in areas not impacted by seawater or related marine sediment brines; Figures 10 and 13). This difference in water chemistry suggests limited hydraulic connection between the shallow aquifers of the special study area aquifer zones of the adjacent main groundwater basin, and/or limited contribution of groundwater from the local, more mineralized aquifers to the regional groundwater regime. In contrast, portions of the Pleasant Valley basin in the northern portion of the study area and adjacent regions show relatively high TDS and chloride for a broader region including both the rangefront and the basin south of Camarillo Hills (the leftmost – most northern – portions of Figures 10 and 13).

OTHER INDICATORS

Other factors are helpful for interpreting groundwater and geologic data in the study area. For example, the US Geological Survey conducted a regional groundwater flow model for the broad area including the eastern portion of Pleasant Valley basin (Hanson et al., 2003). The model differentiates only between the UAS and LAS aquifer zones (shallow aquifers are included in the UAS), and concludes there has been total vertical flow of approximately 15,000 afy (from UAS to LAS) throughout the entire Pleasant Valley basin for the period

1984-1993. This vertical flow is calculated to occur over an area of nearly 30 mi^2, approximately 10 times larger than the study area for this investigation.

In contrast, DWR (1971) estimated only 6,000 afy downward leakance from the uppermost ("semi-perched") aquifer to the UAS's Oxnard Aquifer, over the complete regional groundwater basin.

SHALLOW AQUIFER CHARACTERISTICS IN PLEASANT VALLEY BASIN SPECIAL STUDY AREA

For the study, particular attention was given to the margin of the basin east of Calleguas Creek and north of Round Mountain and the CSU–Channel Islands campus (the "special study area"; Figure 11). The area is historically characterized by relatively poor water quality, and by groundwater level drawdown resulting in water supply reliability concerns during the time that the state hospital was served by a local water supply well (the CSUCI campus now occupies the location of the former state hospital).

Nonetheless, this region has geological and groundwater features that are potentially well-suited to broader water reclamation and management goals being developed by Camrosa Water District. Accordingly, this study provides a preliminary view of groundwater geology of the special study area, with particular emphasis on potential hydrologic connections between the shallow aquifers of this area and regional water supply aquifers, as well as the use of this area in a managed water supply and reclamation project.

The special study area was the focus of a previous data survey and investigation (Woodward-Clyde, 1997); this study updates and expands portions of the data described therein, and provides further geological evaluation of the area in context of water supply and management programs now being developed by Camrosa Water District.

GEOLOGY AND HYDROSTRATIGRAPHY

Water well lithologic logs and well completion reports provide the principal basis for determining geology and aquifer units of the special study area. Consistent with the geologic environment of the area, strata in this margin of the basin are relatively less well correlated laterally than the principal aquifer zones and intervening clay-rich layers of the main basin. As such, shallow aquifers within approximately the upper 150 feet of the basin margin are more likely to be in hydraulic connection with one another and with surface than might be expected in more central portions of the basin.

However, clay horizons with thicknesses of 10 to 70 feet are recognized in the upper 200 to 300 feet of most wells of the special study area, suggesting also that any interconnection between shallow aquifers is largely isolated from groundwater of the main UAS and LAS zones of the basin. Figure 12 (and associated well log information contained in Appendix A's Figure A1) provides a schematic view of the subsurface in this area. The cross sections shown in Figures 12B, 12C and 12D are schematic only, and represent just one of many possible subsurface geometries regarding bedrock structure. The cross-sections are oriented with the Santa Monica Mountains rangefront – the eastern end of the section – on the left. This follows the standard convention of orienting the section so that the viewer is looking down-gradient. The sections note the approximate location and thickness of dominantly clay units in the subsurface (horizontal bands), and bedrock depth where known. Several features of the cross-sections are important for discussion:

- Clay Strata. Depiction of clay units is restricted to fine-grained strata with thickness greater than 10 feet, and wherein the lithologic logs describe such clay horizons without significant sand content. Based on comparison with lithologic logs for portions of the Oxnard Plain where more detailed well logging has occurred (e.g., Densmore, 1996), this approach yields a rather conservative view, understating the number of such fine-grained layers that may inhibit vertical migration of groundwater. In this regard, wells that show minimal or no clay layers are more likely to contain such units, but detailed information concerning this stratigraphy is unknown from existing information.

- Bedrock Geometry. Depictions of faulting and top-of-bedrock geometry are based on reasonable structural geology interpretations for such a basin margin, but are not unique descriptions of possible subsurface conditions. For example, the faults drawn could readily exist with much steeper geometry, or with graben-like features within the rangefront area. In addition, complex faulting patterns are not generally well-described from lithologic logs, and borehole penetrations of broken or brecciated bedrock are subject to uncertainty.

- Age of Faulting. Faulting within the bedrock subsurface is depicted as pre-dating alluvial sediment deposition, but more recent displacement on such structures may disrupt portions of the stratigraphy, as is found for some faults in the northern Pleasant Valley (see section "Structure" above; Blake, 1991)

GROUNDWATER CONDITIONS

Groundwater quality in the special study area is known for high mineral content (limited TDS data indicate concentrations of 1,500 to 2,000 mg/l are typical; Woodward-Clyde, 1997; Bookman-Edmonston, 2000). Whereas other portions of the Pleasant Valley basin also have high-TDS groundwater, areas west of the southern Pleasant Valley basin have relatively less mineralized groundwater in wells producing from UAS and LAS zones of the main groundwater basin (Figure 13). This local difference in dissolved solids and other water quality constituents is consistent with: (*i*) relatively poor hydraulic connection between the shallow aquifers of the special study area and the adjacent UAS and LAS, (*ii*) relatively small amounts of groundwater flow away from the shallow aquifer zones into the main basin, or (*iii*) both limited hydraulic connection and limited groundwater flow away from shallow aquifers of the basin margin to other parts of the basin.

The presence of a limited water resource within the special study area is suggested also by water well completions in the area north of the former state hospital (now CSUCI campus), at least one of which yielded insufficient water for intended use at the facility. Shallow aquifer groundwater supply from other wells near the facility was subject to sufficient drawdown (Figure 14) that water wells became unreliable for continuous water supply.

SURFACE WATER

In contrast to potentially limited connectivity between shallow aquifers and regional UAS and LAS zones, the shallow groundwater-bearing horizons of the special study area are likely to be in relatively close hydraulic connection with streamflow in Calleguas Creek. Such surface water connection is inferred from geologic analysis, and by analogy with upstream portions of Calleguas Creek. For example, calculation of stream gains and losses along different reaches of Calleguas and Conejo Creeks suggest as much as 6,100 afy infiltration to shallow aquifers from Calleguas Creek, for the northern portion of the study area and adjacent upstream reaches of the creek (Hanson et al, 2003). Limited data from shallow aquifer wells immediately adjacent to Calleguas Creek indicate groundwater levels modulated by surface water flow, with consistent seasonal variation and limited groundwater level excursions outside a consistent range of water levels.

Stream gaging is conducted at the upstream margin of the special study area (at University Drive). However, absent a downstream gaging location near Round

Mountain (e.g., at the Potrero Road bridge), any exchange between surface flow in Calleguas Creek and the adjacent and underlying shallow aquifers in the special study area cannot be quantified.

DISCUSSION

The special study area north of Round Mountain, while historically characterized by poor water quality and limited supply reliability, also provides an opportunity for managed water resource benefits by providing a location:

- Relatively well separated from the Lower Aquifer System of the main groundwater basin,
- Hydraulically connected with Calleguas Creek,
- Directly adjacent to the CSUCI campus and which, if managed, could provide an alternative water supply source to this facility, and
- Potentially well-suited to water quality management of combined surface water and shallow aquifer resources of eastern Pleasant Valley basin.

Water well lithologic information suggests that much of the area contains alluvial material to depths of approximately 400 feet (Figure 15), with a portion of this thickness comprised of coarse-grained aquifer materials. As part of a project under consideration by Camrosa Water District, it may be possible to extract a portion of the shallow groundwater within the special study area for treatment and use within the basin. Such a program would likely combine the shallow groundwater and Calleguas Creek surface water in a conjunctively managed program. Potential advantages of the program include water quality improvements and increased utilization of a basin margin area that currently experiences little production or management of poor native water quality.

To the extent that groundwater storage capacity in the shallow aquifers of the study area can be managed with combinations of extraction, replenishment and treatment of water resources, such a program suggests several possible benefits to the basin:

- Improvements to water quality in the basin-margin shallow aquifers,
- Improvements to water supply reliability in the special study area,

- Improvements to water quality of any shallow groundwater that migrates away from the basin margin to other aquifers of the basin, whether these are part of the regional shallow aquifer, or components of the UAS or even LAS.

In addition, in the region immediately adjacent to the special study area, most wells produce groundwater from the Lower Aquifer System, such that extractions from the shallow aquifer would be expected to cause little if any interference with existing groundwater production.

As a potential project focusing on a relatively small area of shallow aquifers in the basin, the amount of potential groundwater storage capacity associated with such a project is relatively small in comparison with groundwater storage and productivity of the Pleasant Valley basin as a whole. The principal advantages of managing water resources in the special study area stem from the combination of its location, existing poor water quality, the opportunity for conjunctive management of surface and groundwater resources, and existing low utilization of groundwater in the area. For the special study area, a preliminary summary of aquifer storage capacity, based on simple assumptions for shallow aquifer geometry, suggests that groundwater storage capacity on the order of 2,000 to 6,000 acre-feet may be possible for a water management project (Table 2).

Initial planning by Camrosa Water District describes a framework in which any treatment and conjunctive management project in the study area would be conducted on a staged basis, with an initial pilot project to assess the characteristics and impacts of a full program. A pilot project would also afford the opportunity to gather information important to determination of aquifer connectivity in the area. Examples of work that could be conducted through such preliminary and pilot work include:

- Survey of borehole conditions and collection of water level data and water quality samples from existing, accessible water wells in the area,
- Detailed lithologic and related borehole logging of new, test wells, including acquisition of water level data and water samples for laboratory analysis of water quality
- Pumping tests utilizing existing and any new wells,
- Establishing a temporary gauging station at the Potrero Road bridge for measurement of streamflow gains/losses in the area, and

- Conduct a small-scale seismic reflection study to improve lateral stratigraphic correlations in the special study area.

Not all these activities may be necessary in a pilot program, but some combination of such work could be used to more accuracy specify shallow aquifer connectivity and lateral continuity, aquifer storage capacities, and linkages between surface water and groundwater.

In addition, the work would help to guide the placement and monitoring for any pilot implementation of a treatment and conjunctive use project. Through resultant understanding of the area hydrogeology and pilot-scale project performance, feasibility and design criteria for a full scale program could be better developed, including determination of important monitoring points and criteria that would be expected to accompany any such program.

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APPENDIX A – CONFIDENTIAL SUPPORTING INFORMATION

Figure A1(A) is identical to Figure 12(A), with corresponding cross-sections providing information concerning significant clay strata and well perforation intervals. Limitations and uncertainties concerning these cross-sections are discussed in section "Geology and Hydrostratigraphy" above, in context of Figure 12. The long perforation intervals of many wells highlights the concern for cross-aquifer flow at individual water wells (see also UWCD, 2004 and discussion therein) and the importance of monitoring and management for any water reclamation project in the special study area.

Water well drillers' reports acquired for this study are also provided:

1N-20W-06
- A1
- B2
- Unlabelled well near B2
- C2
- C3
- E1
- H2
- L1
- P1

1N-20W-07
- H3
- E1
- H2

1N-21W-11
- A1
- D1
- D2
- G1
- G3
- G4
- L1
- P1
- R1
- R2

- 1N-21W-12
  - B2
  - B3
  - B4
  - C1
  - C3
  - C4
  - C5
  - D1
  - D2
  - E1
  - E4
  - F3
  - G1
  - G2
  - H1

- 1N-21W-14
  - A1
  - B1 (see also 14F2)
  - B2
  - B3
  - C1
  - F1
  - F2 (deepening of 14B1)
  - F3
  - H1
  - J1

- 2N-20W-30
  - C1
  - H1
  - H2
  - K2
  - M1
  - N2
  - N3

2N-20W-31

- Unlabelled well S of Hwy101
- Unlabelled well N of Hwy101
- B1
- B2
- C2
- E1
- F1
- F2
- F3
- R1

Figure 1. Study area location map.

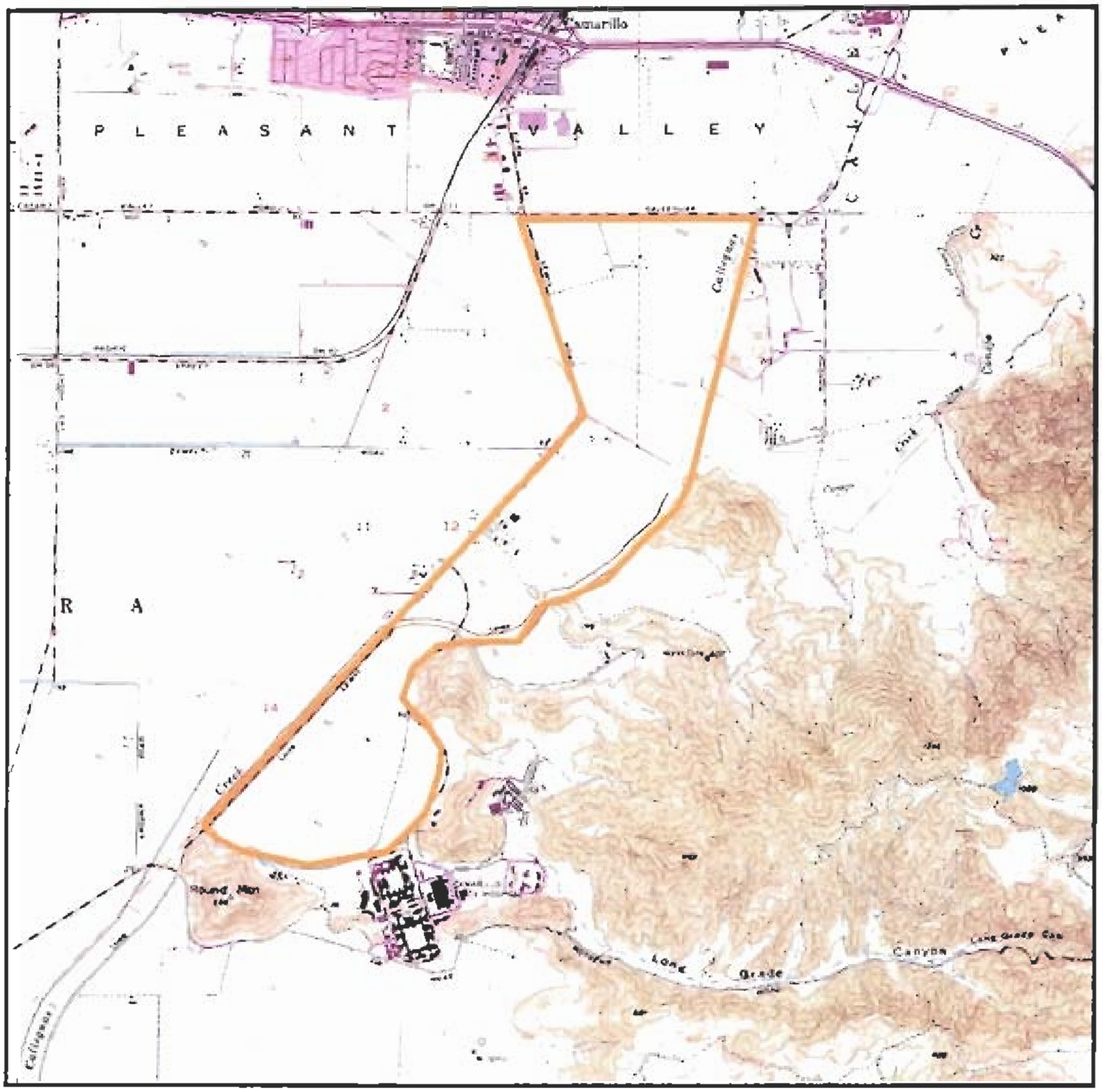


Figure 2. Stratigraphic column of principal Quaternary sedimentary units of the study area, showing aquifer designations (from Hanson et al, 2003).

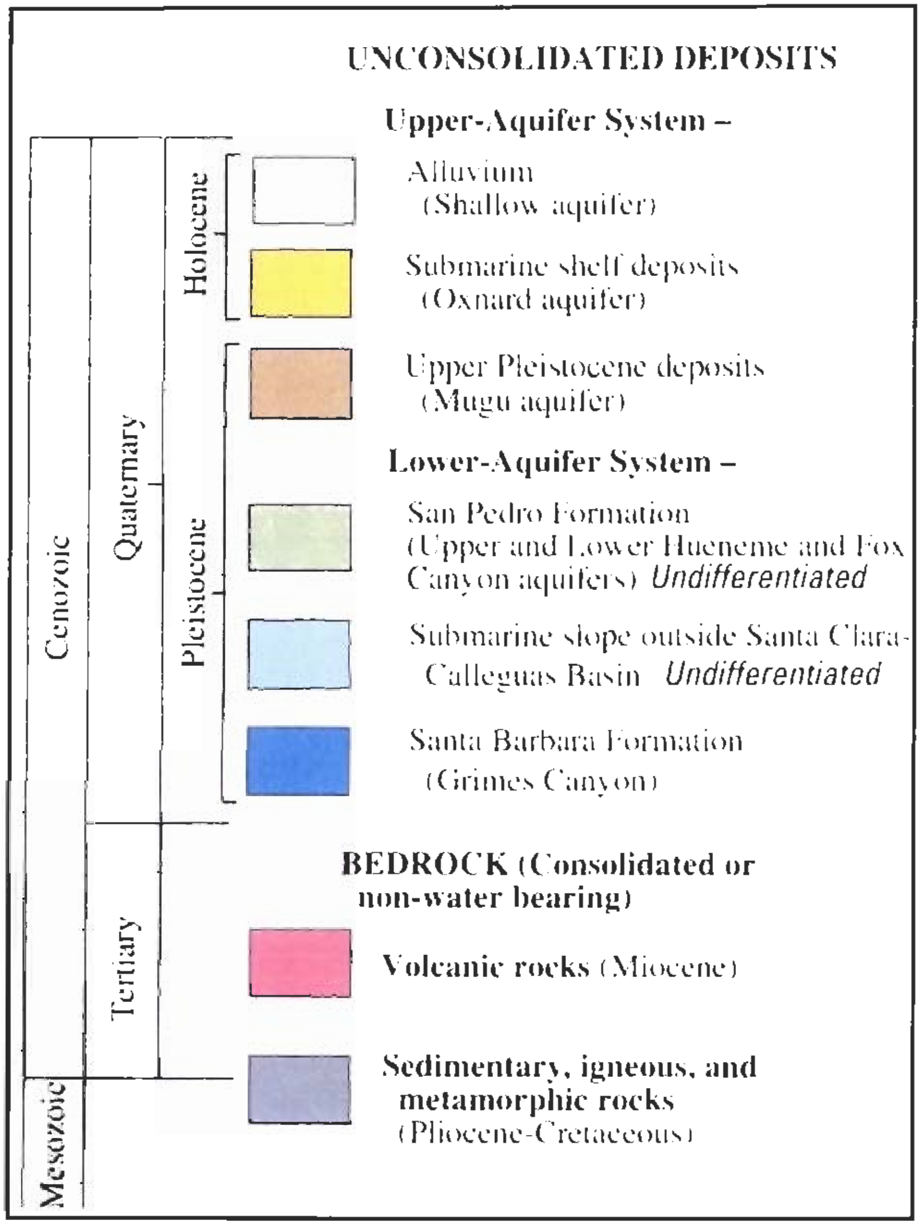


Figure 3. Location map showing well locations and Bailey structure zone (gray-green). Wells with water level or water quality data are displayed in blue. The area of special study is northwest of CSUCI campus and east of the Bailey structure zone, in section 14. Fault segments of the Simi – Santa Rosa fault zone are in light green.

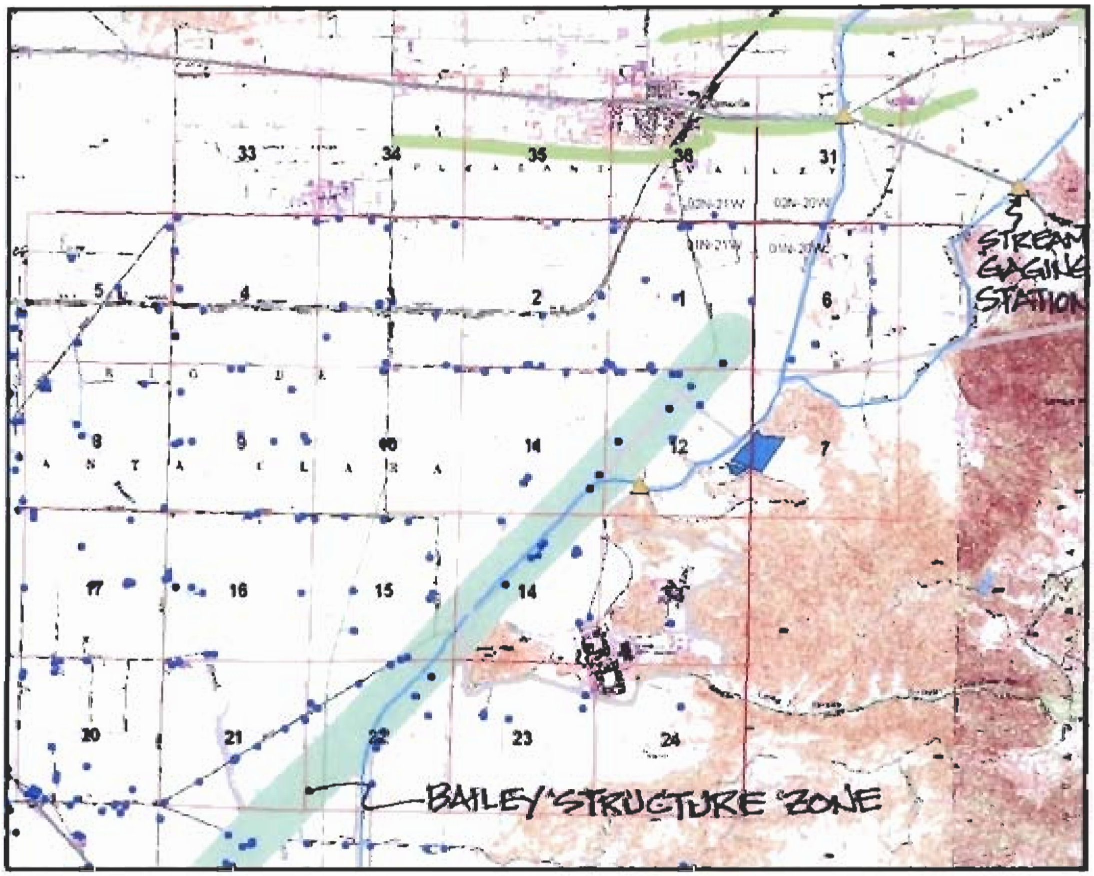
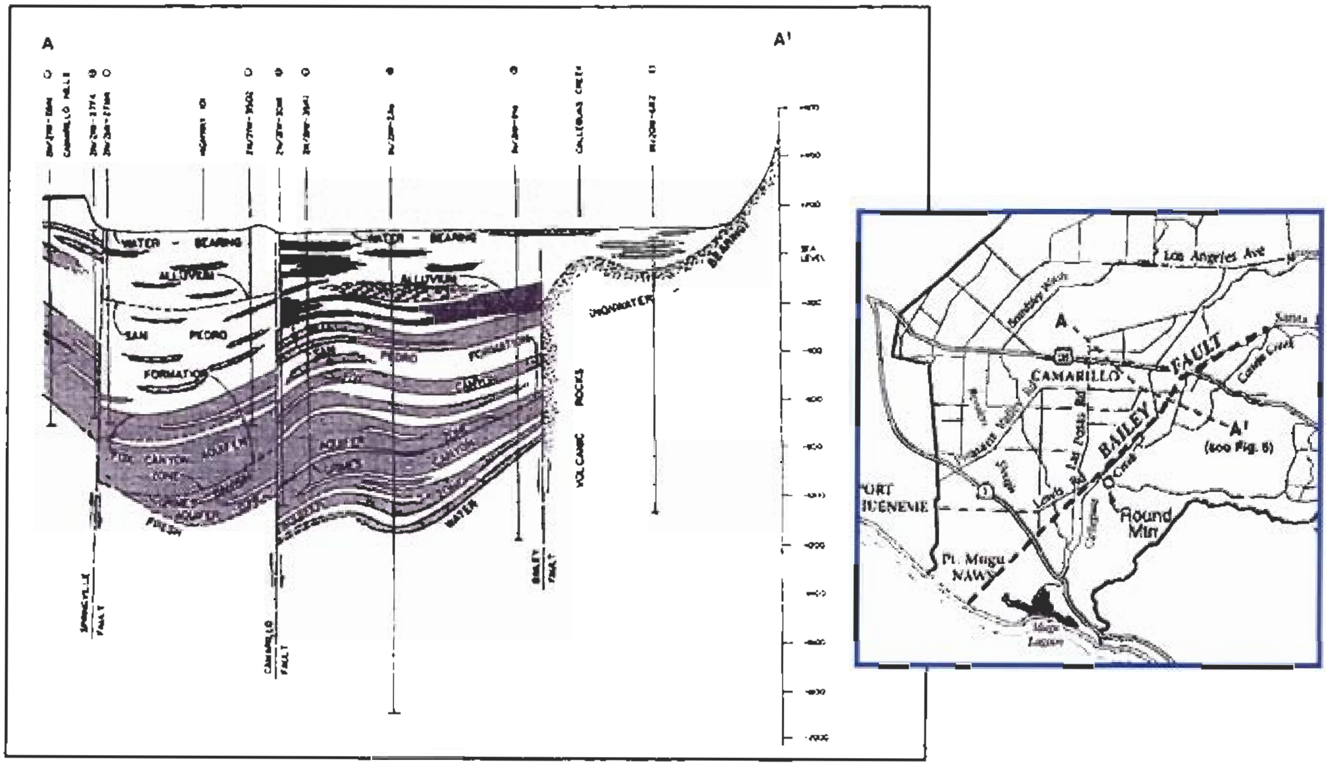


Figure 4. Schematic cross-sections of study area. Above, geologic section near confluence of Calleguas and Conejo Creeks, showing absence of LAS east of Bailey structure zone (section from DWR, 1971). Below, section near coastline, from Hanson et al (2003). Unconformity on top of LAS (Upper Hueneme) is highlighted; color schemes follow stratigraphic legend of Figure 2.



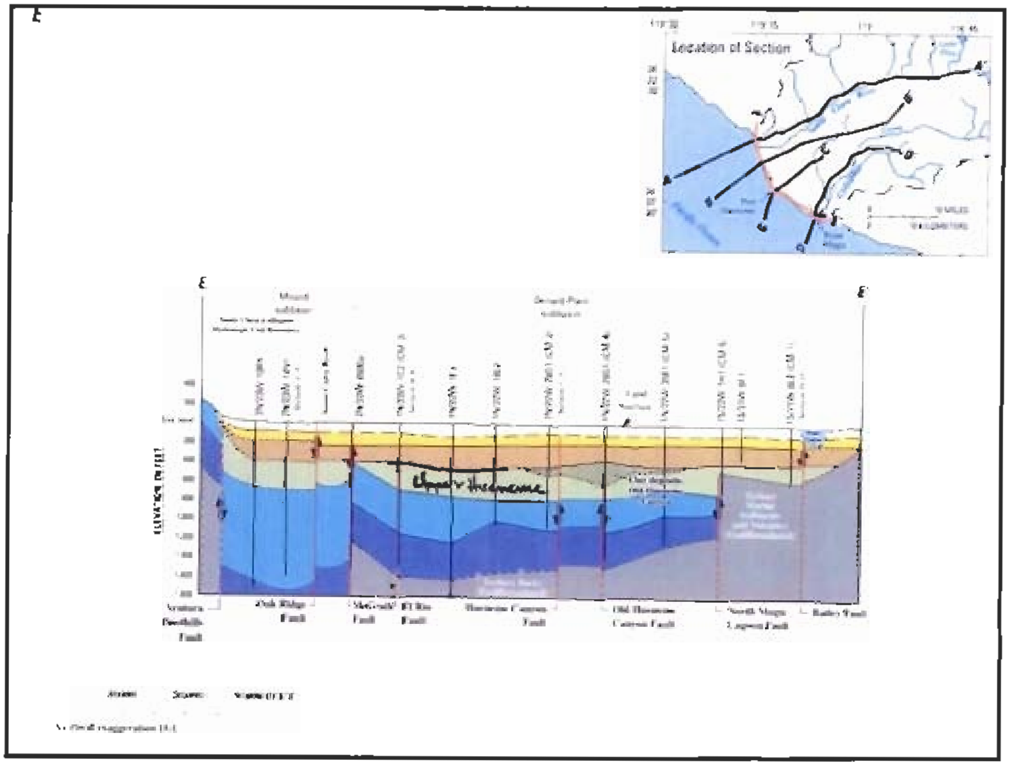
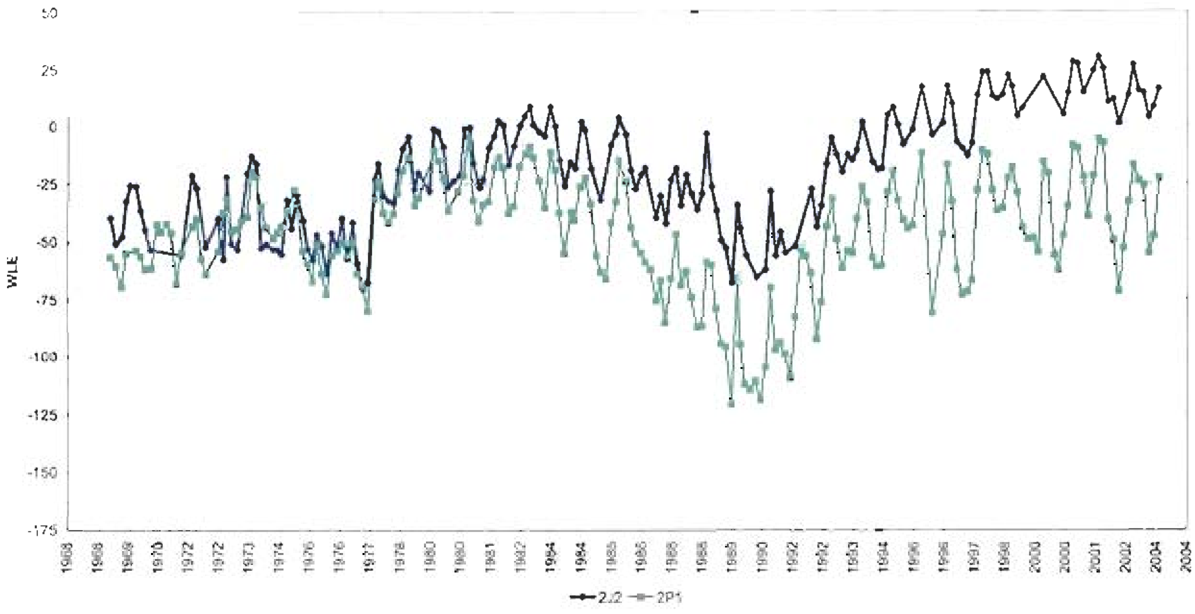


Figure 5. Water levels for 1N/21W-2J2 (UAS; RP- 91') and
1N/21W-2P1 (LAS; RP 68')



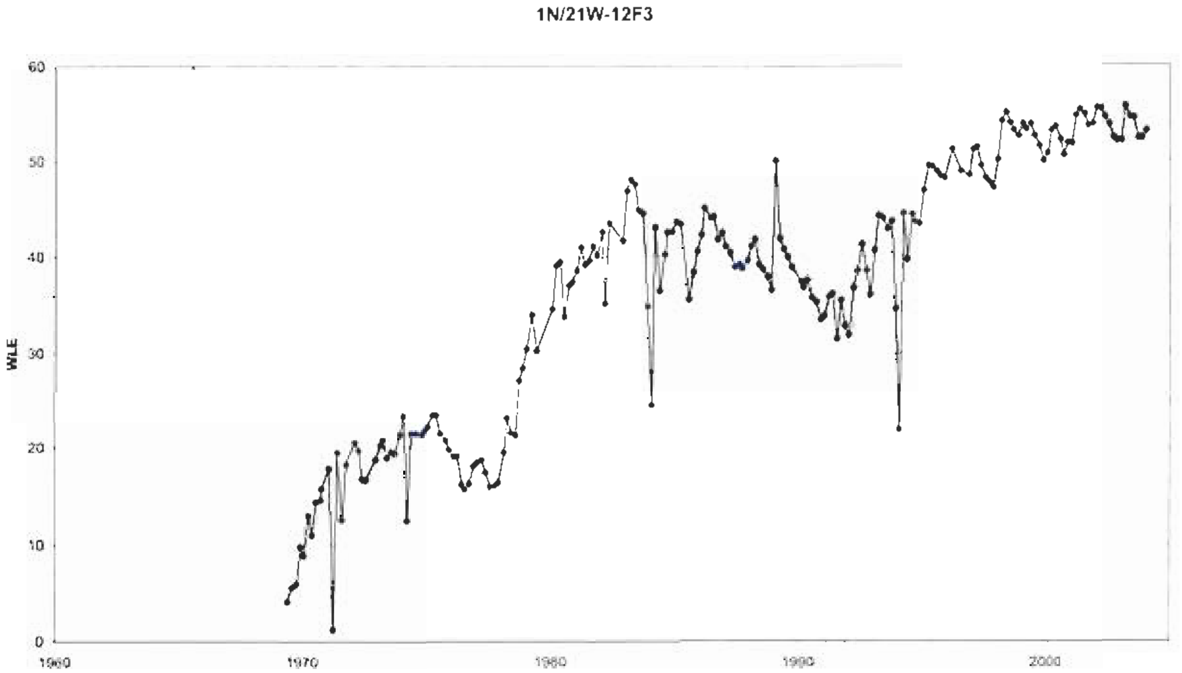


Figure 6. Groundwater Levels, Well 1N-21W-12F3

Figure 7. Calleguas Creek Discharge at University Drive (3-mo-avg); Shallow groundwater levels for wells 14A1 and 12F3

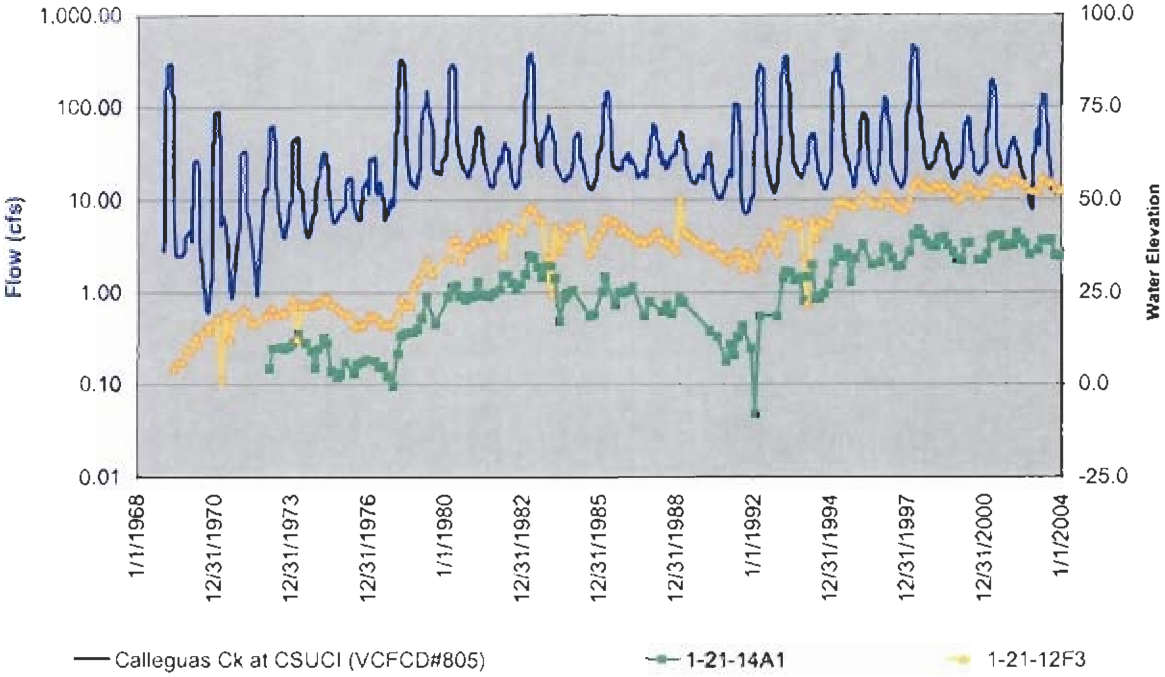
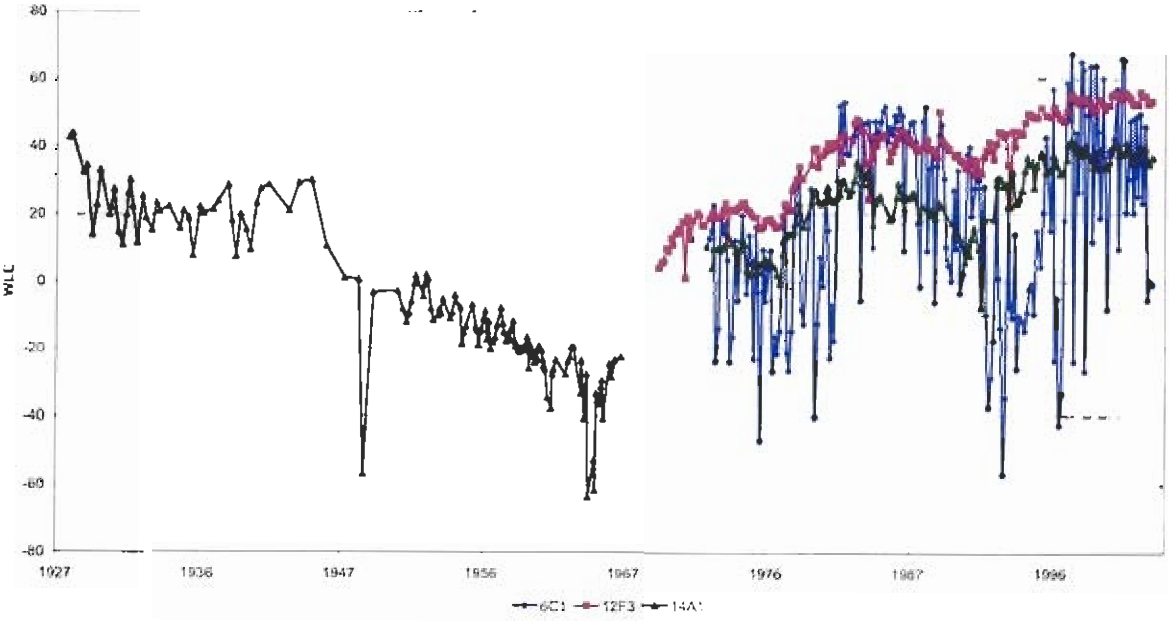


Figure 8. Water Levels for wells 1N/20W-6C1, 1N/20W-12F3, 1N/20W-14A1



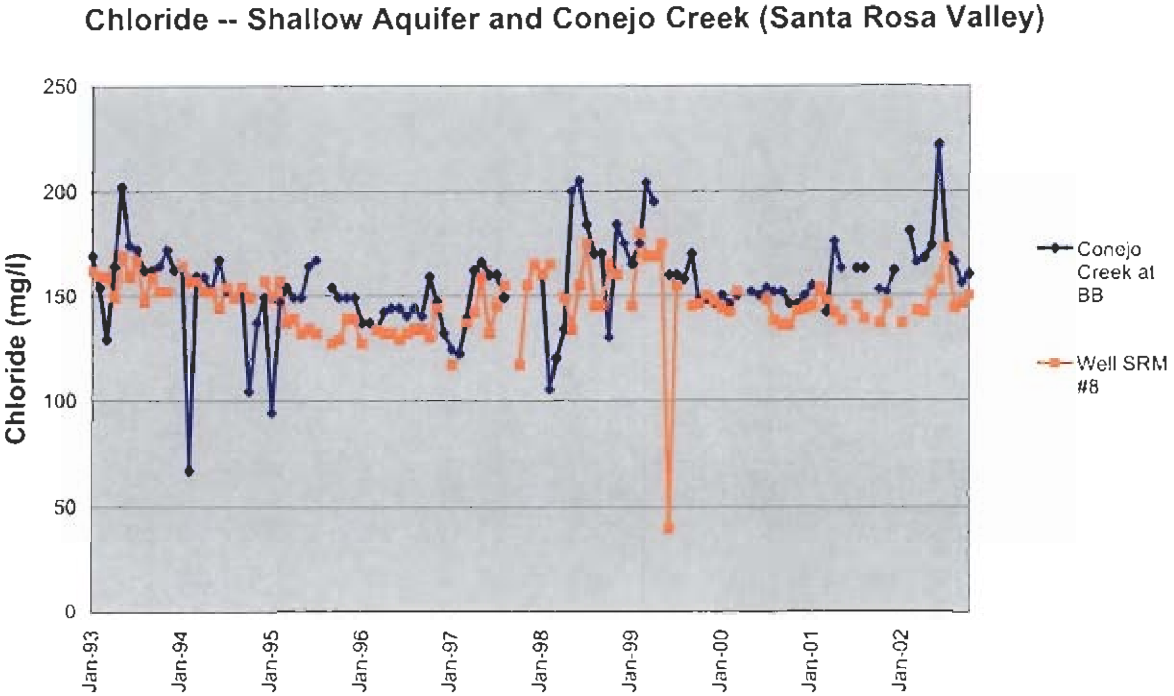


Figure 9. Comparison of shallow groundwater and surface water chloride concentrations.

Figure 10. Representative water chemistry in the eastern margin of Pleasant Valley basin (TDS concentrations; from Woodward-Clyde, 1997).

TDS concentration (mg/l) is written beneath the short well number. Numbers in parentheses describe period of record for averaged data.

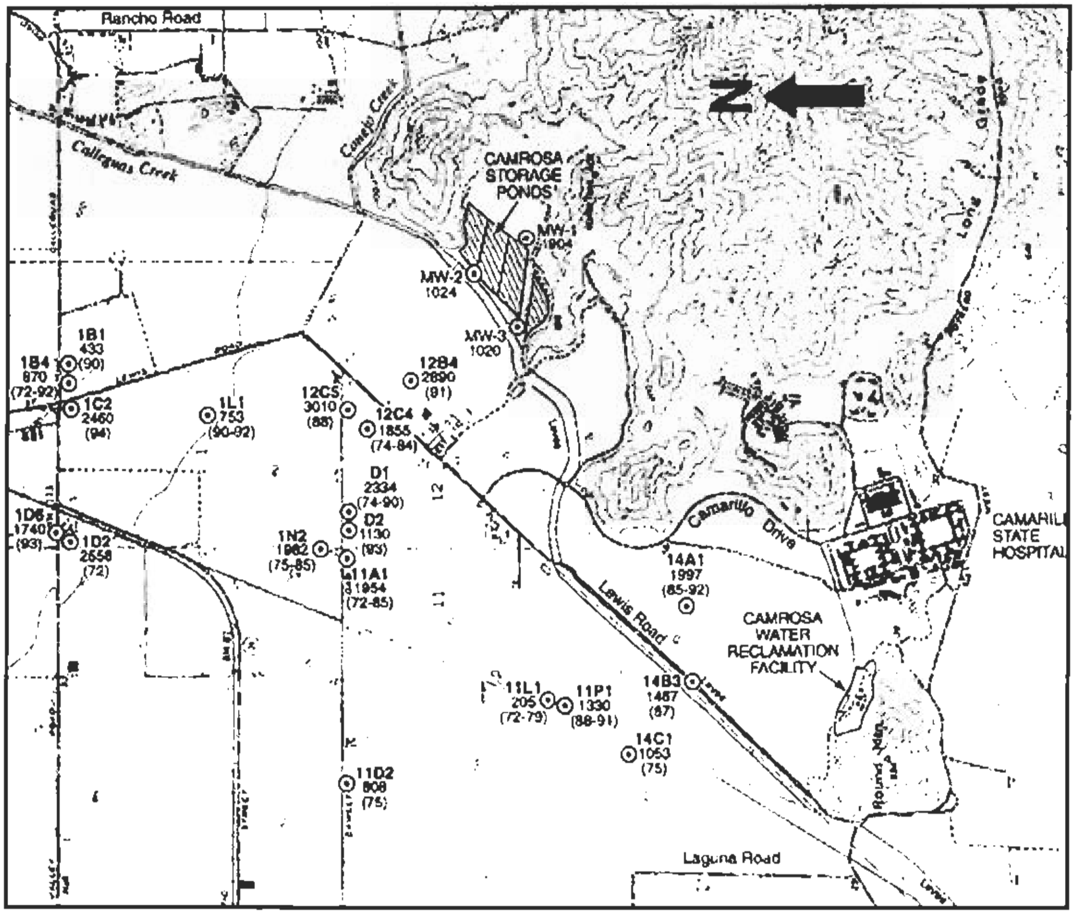


Figure 11. Location map for special study area.

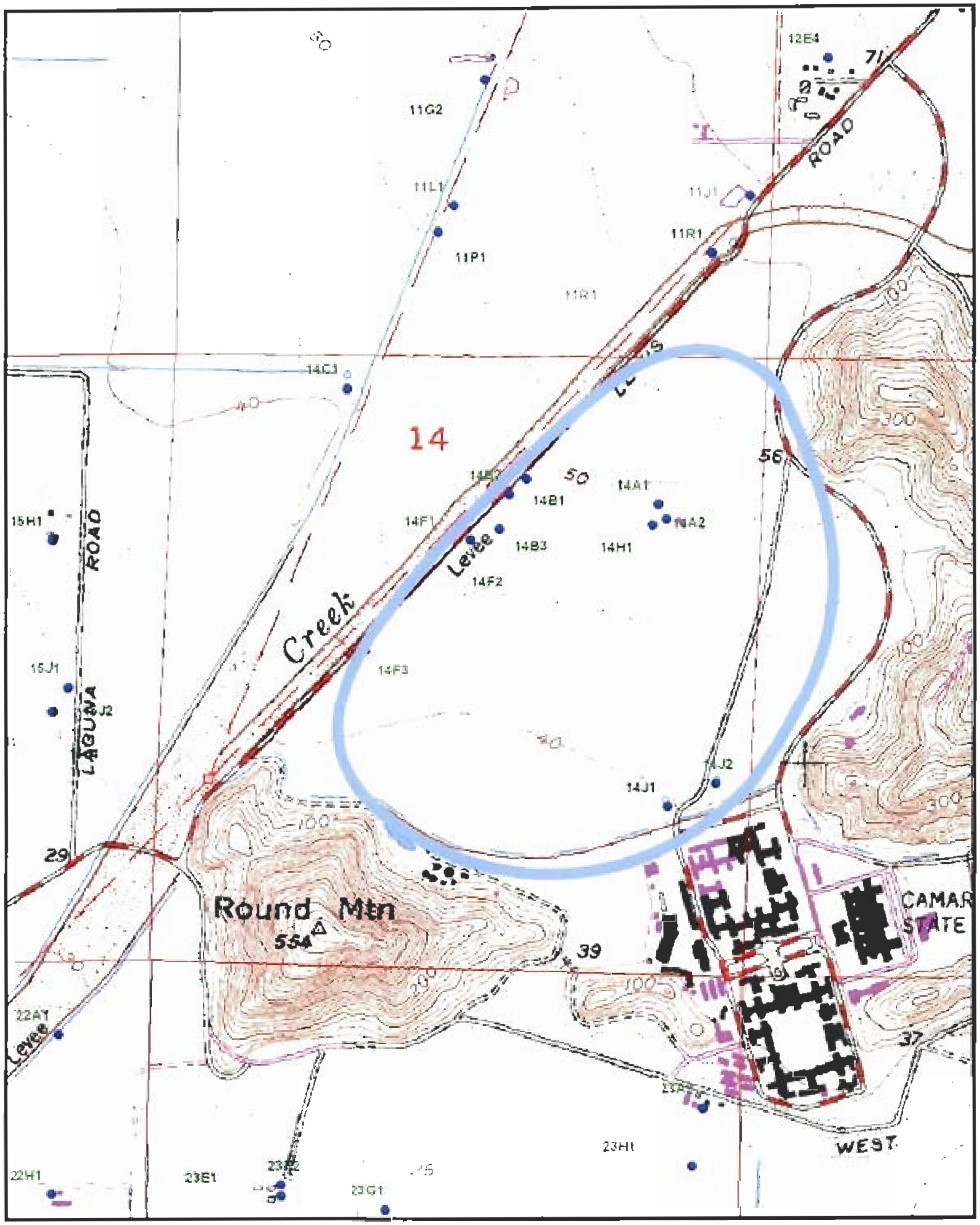


Figure 12A. Map showing schematic cross-section locations for special study area.

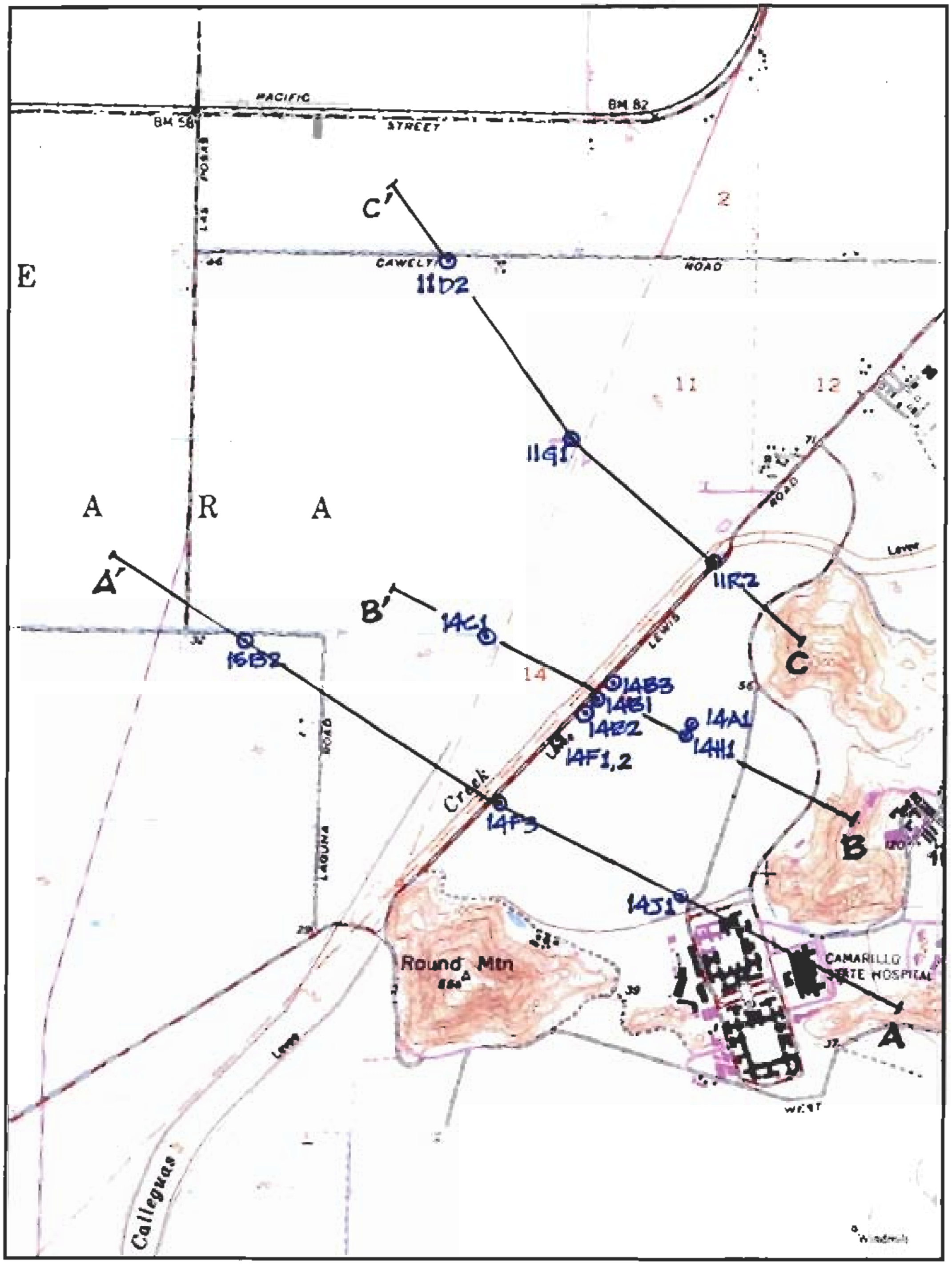


Figure 12B. Schematic cross-section A-A'. Subsurface geology is representative and schematic only; many other geometries of basement structure are possible.

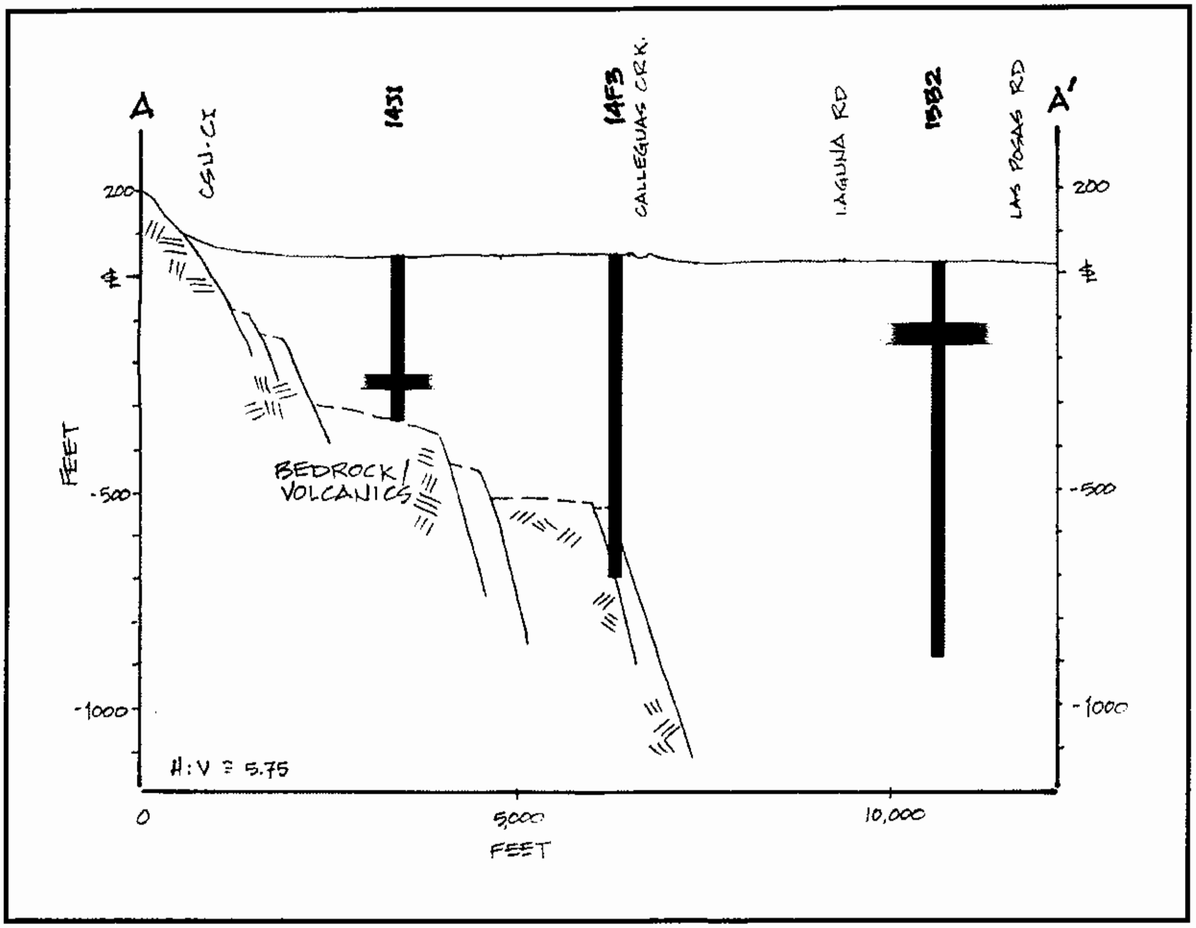


Figure 12C. Schematic cross-section B-B'. Subsurface geology is representative and schematic only; many other geometries of basement structure are possible.

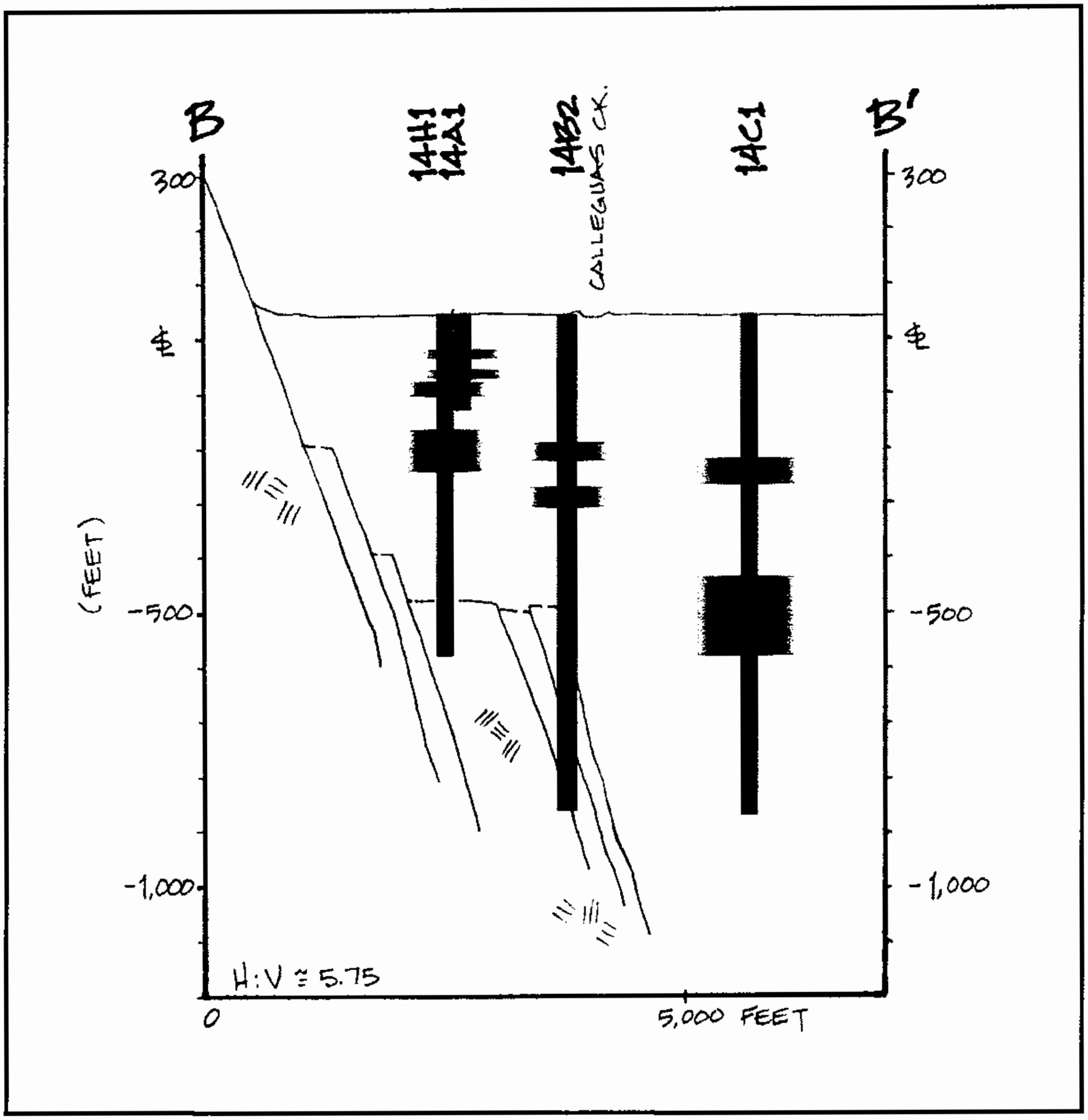


Figure 12D. Schematic cross-section C-C'. Subsurface geology is representative and schematic only; many other geometries of basement structure are possible.

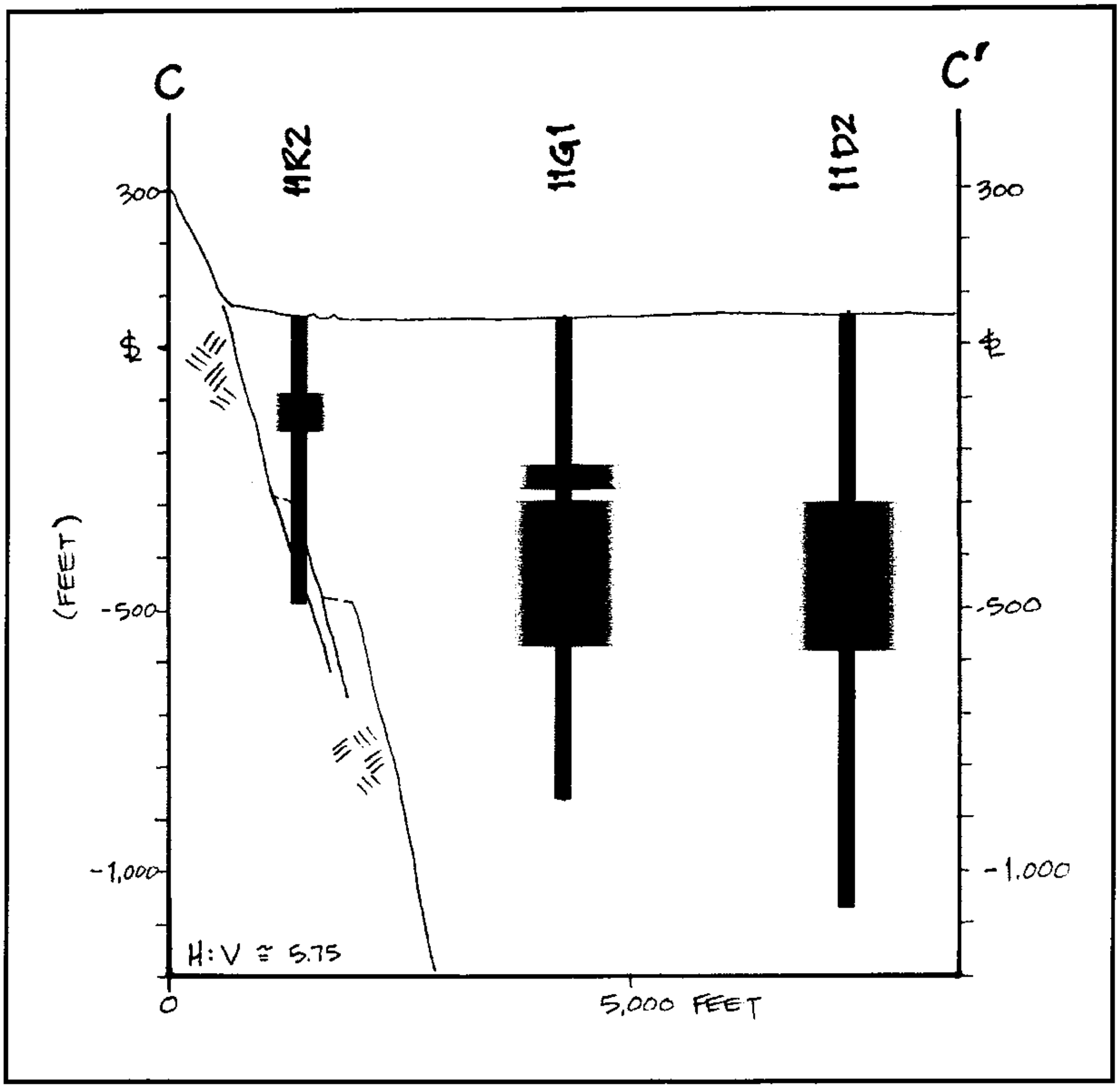


Figure 13. Chloride concentrations within and adjacent to the special study area (from Woodward-Clyde, 1997).

Cl concentration (mg/l) is written beneath the short well number. Numbers in parentheses describe period of record for averaged data.

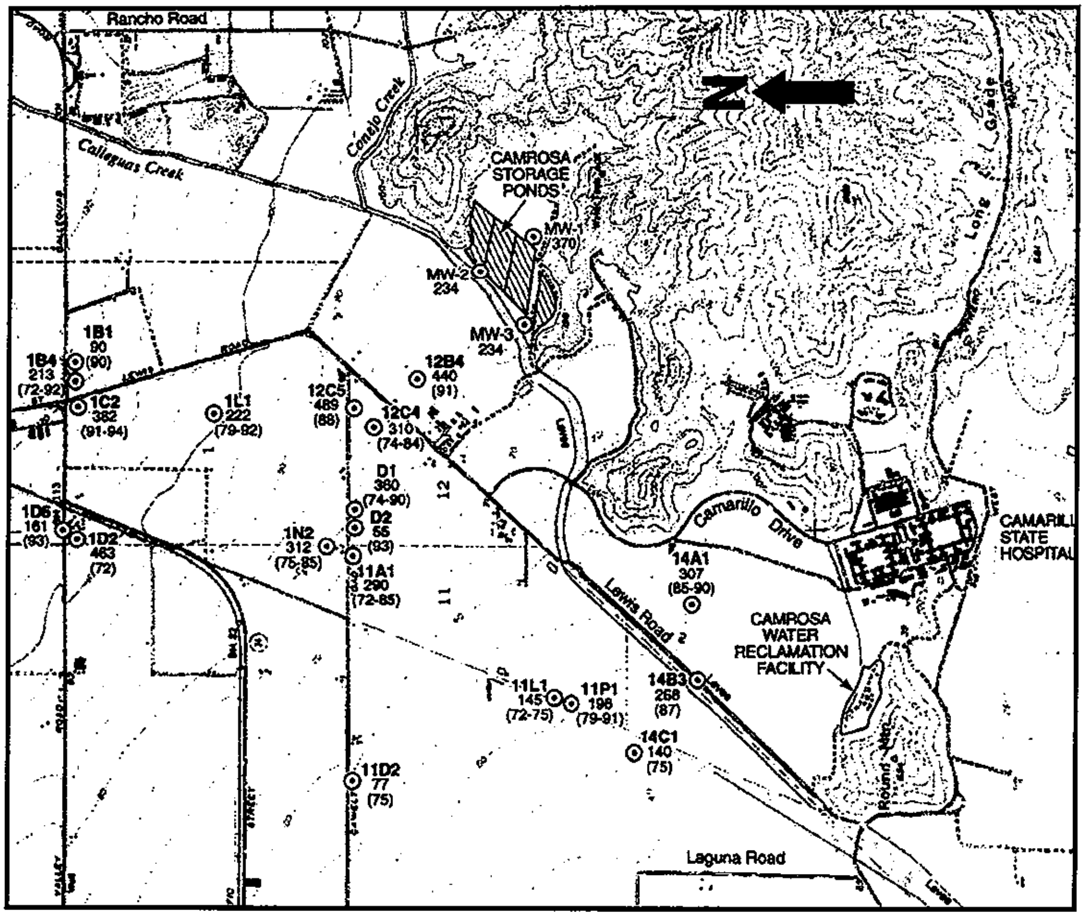


Figure 14. Groundwater levels, well 1N/21W-14A1

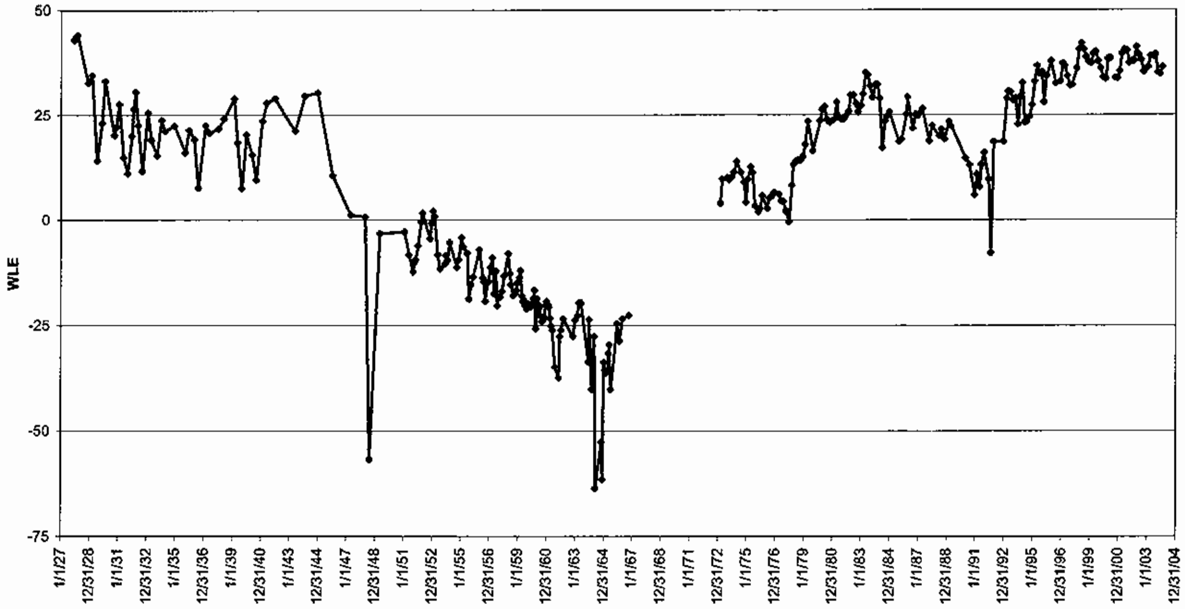


Figure 15. Depth to bedrock (ft) in special study area.

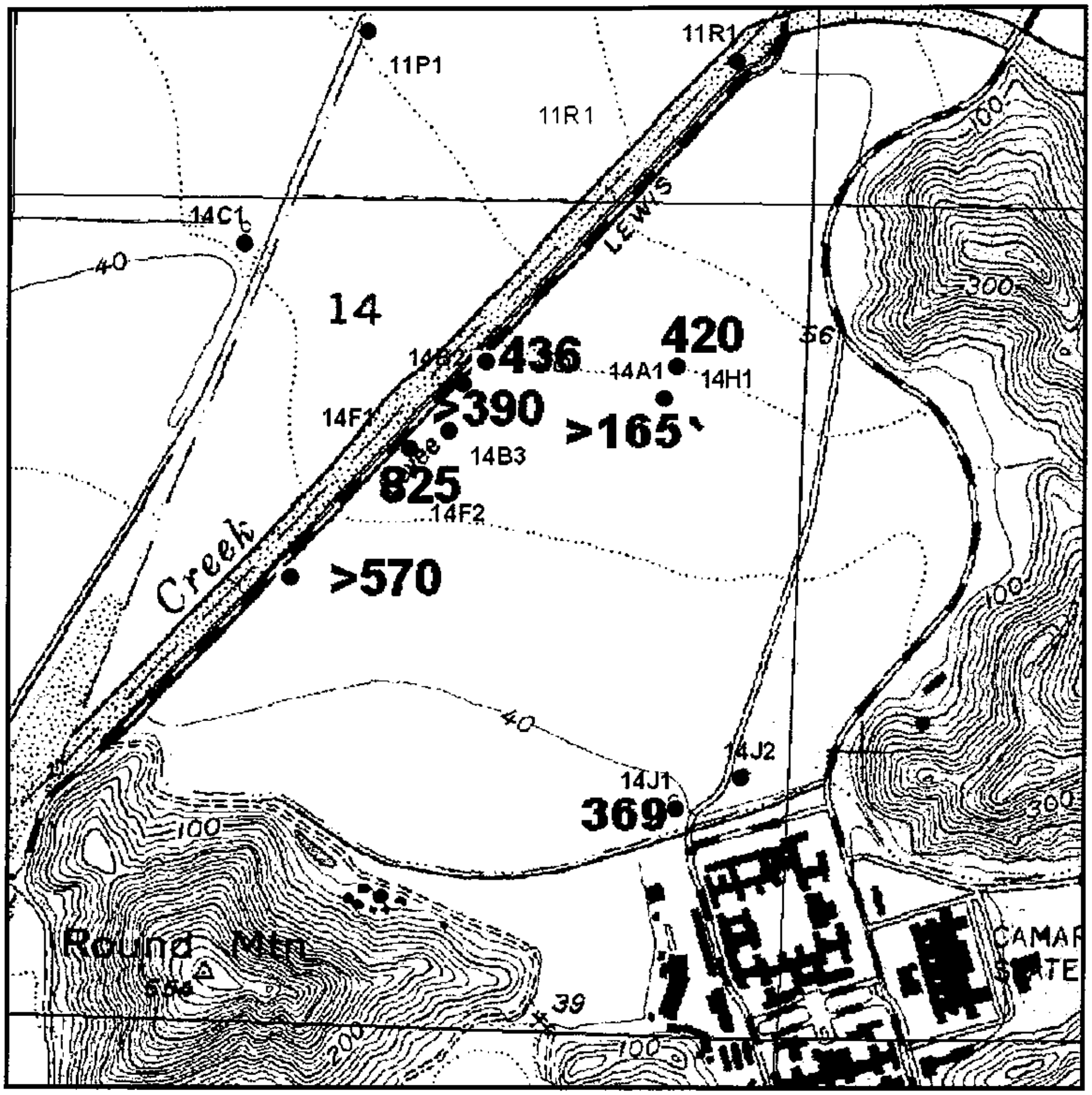


Table 1. USGS Nested Monitoring Well 1N-21W-32Q, with representative water quality.

Well Designation	*Perforation Interval (Depth)*	*Representative TDS (mg/l)*	*Representative Chloride (mg/l)*
Q6	180' - 220'	920	105
Q7	275' - 285'	5,810	2,600
Q5	330' - 370'	5,000	2,100
Q4	600' - 640'	10,700	4,900
Q3	800' - 840'	24,200	12,500
Q2	930' - 970'	6,800	3,600

Table 2. Schematic aquifer storage capacity for shallow aquifers of the special study area (sample calculations)

Calculations are based on simplifying assumptions of uniform thickness and hydraulic properties for each water-bearing horizon. The area of all aquifer materials is assumed to be approximately 200 acres for these schematic calculations.

Depth to top of water-bearing unit (ft)	***Thickness (ft)***	***Specific Yield (%)***	***Storage Capacity (acre-feet)***
Schematic Calculation 1:			
42	18	5%	180
90	12	15%	360
111	7	15%	210
118	41	25%	2,050
			2,800 Total (af)
Schematic Calculation 2:			
95	13	5%	130
155	57	20%	2,280
417	103	20%	4,120
			6,530 Total (af)
Schematic Calculation 3:			
21	53	20%	2,120
74	48	5%	480
122	9	25%	450
131	127	5%	1,270
258	5	25%	250
263	51	5%	510
314	15	25%	750
329	40	5%	400
			6,230 Total (af)

Figure A1(A). Map showing schematic cross-section locations for special study area.

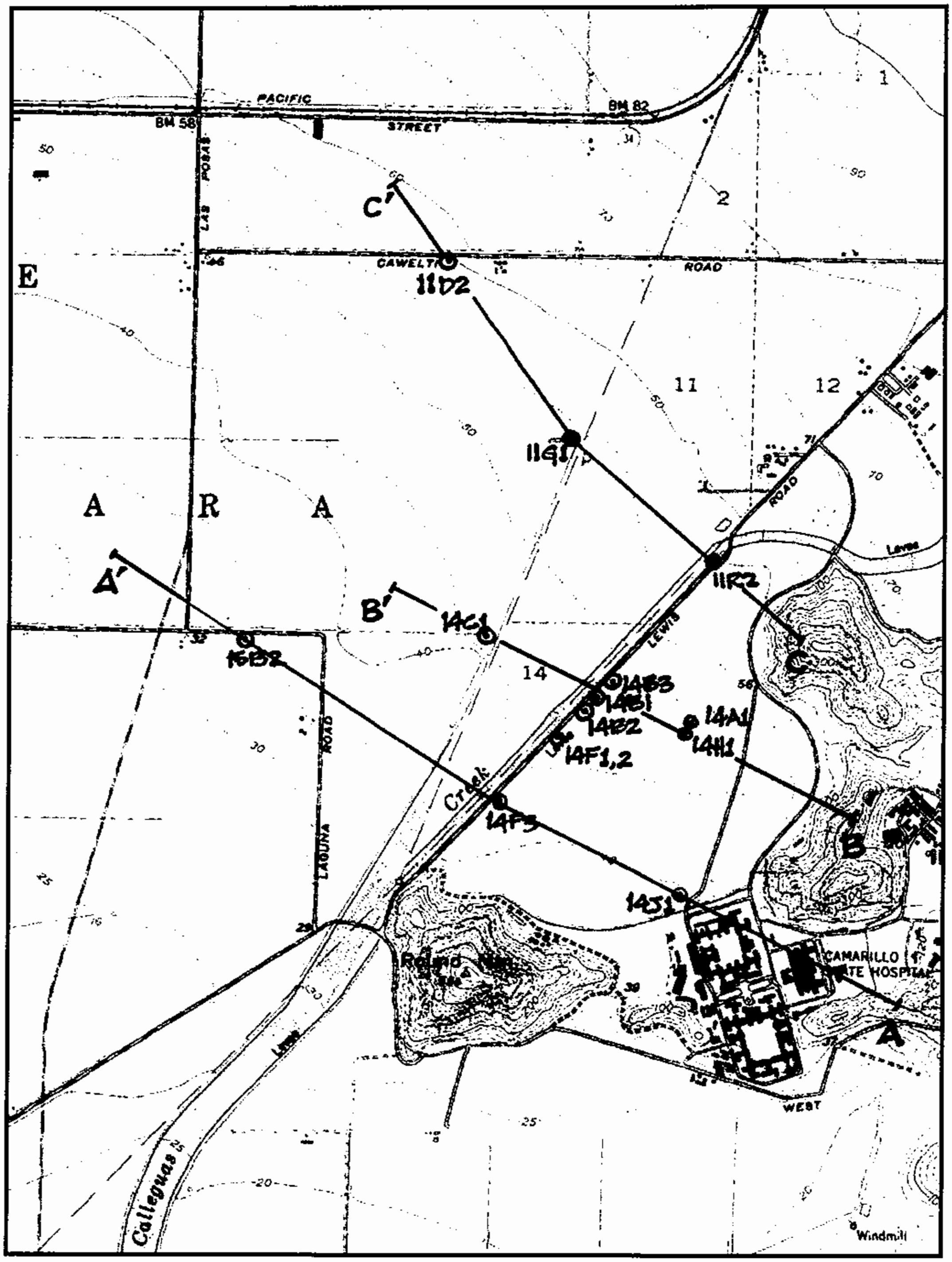


Figure A1(B). Schematic cross-section A-A'. Subsurface geology is representative and schematic only; many other geometries of basement structure are possible.

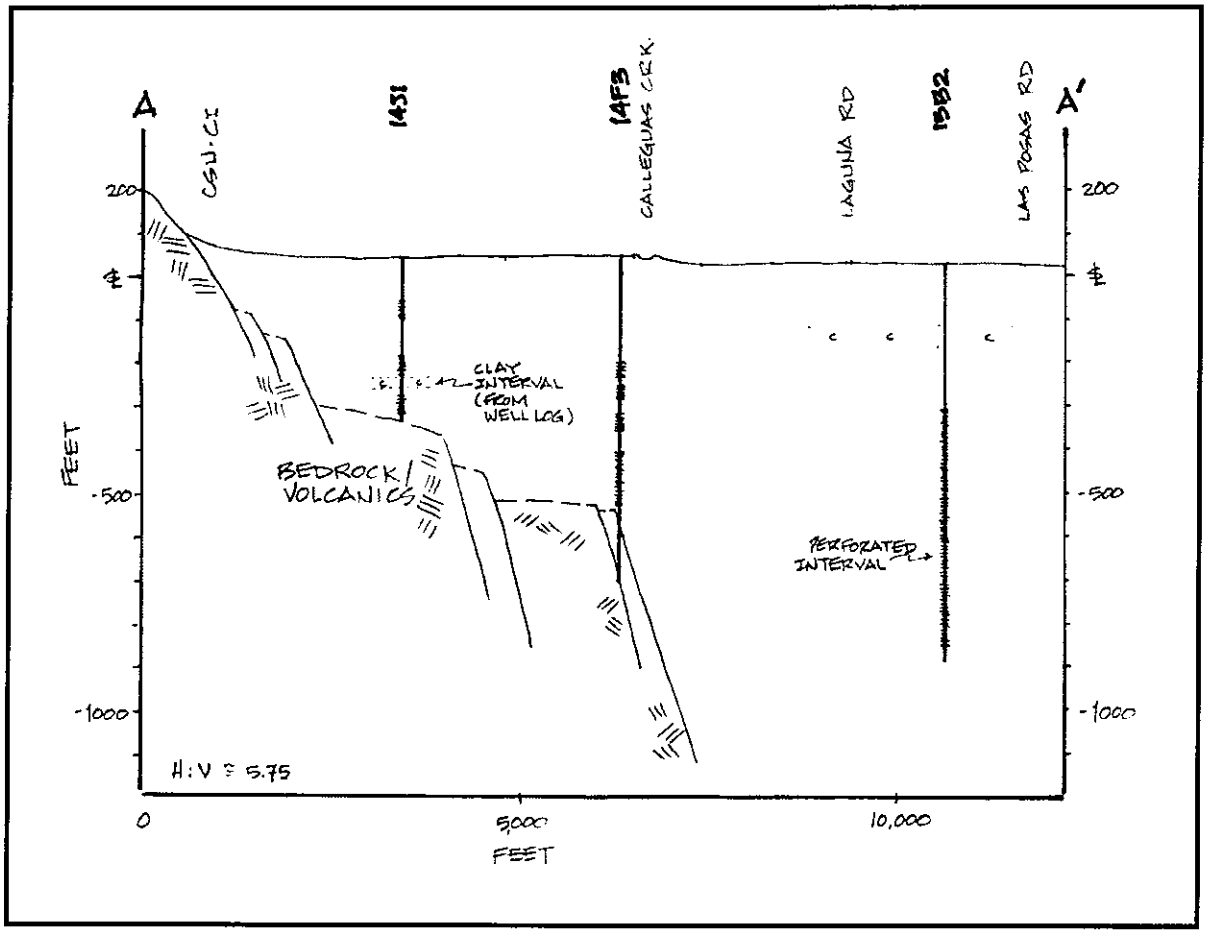


Figure A1(C). Schematic cross-section B-B'. Subsurface geology is representative and schematic only; many other geometries of basement structure are possible.

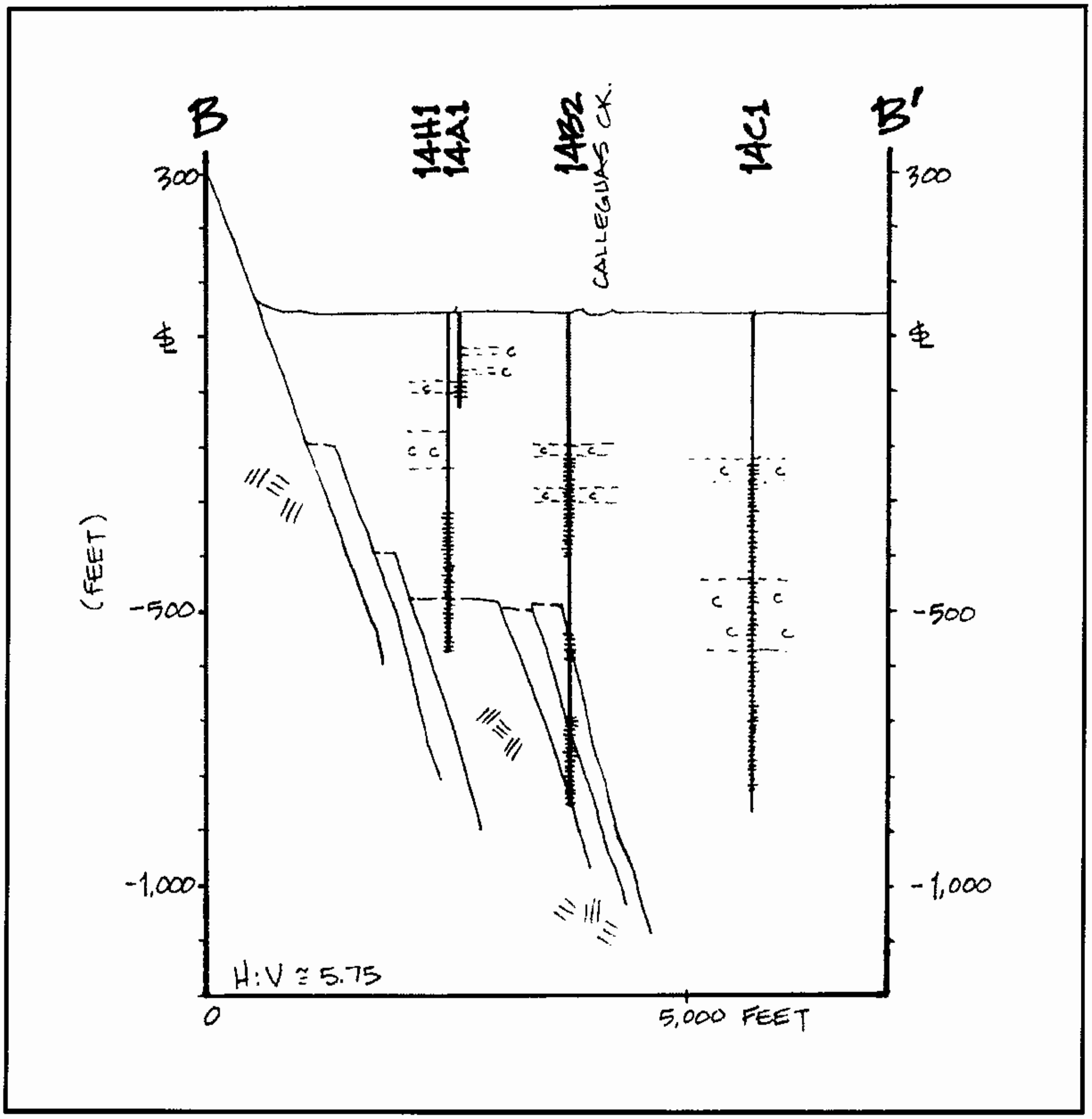
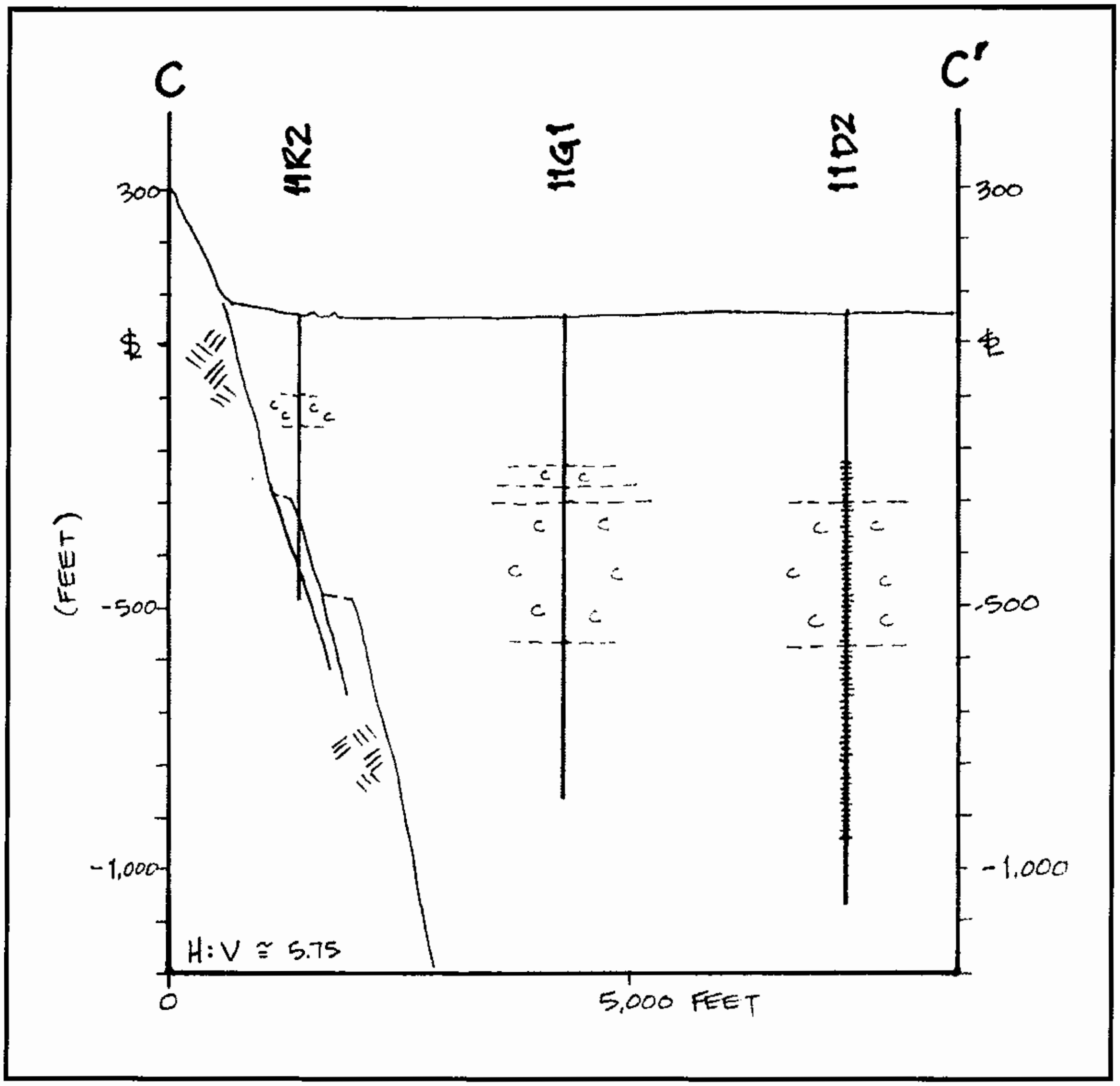


Figure A1(D). Schematic cross-section C-C'. Subsurface geology is representative and schematic only; many other geometries of basement structure are possible.



AQUIFER PUMPING TEST OF CAMROSA WATER DISTRICT "UNIVERSITY" WELL

EVALUATION OF TEST RESULTS

Prepared for:

Camrosa Water District

Prepared by:

Norman N. Brown, Ph.D.

DRAFT,
CONTAINS CONFIDENTIAL WELL INFORMATION

December 17, 2010

Executive Summary

This technical report describes results of aquifer pumping tests conducted using Camrosa Water District's "University" well (1N/21W-14B3). Two tests were conducted in August and November 2010, including both pumping and recovery water level monitoring. Water levels were recorded in the pumping well and in six additional wells in the general area. Three of the wells also provided a continuous record of water temperature. Water quality samples were available from weekly monitoring of the pumping well.

Aquifer response to pumping exhibits a range of characteristics, with elements of confined and "leaky" aquifer responses, resulting from complex geology and a test area location that is relatively close to the bedrock mountain front. Combined results of step-drawdown test and a 48-hour constant-rate test suggest that a long-term production rate of approximately 1,000 gpm is possible for the University well. The current project design production rate of ~870 gpm would produce drawdown in the well to a level approximately 95 feet above the existing pump inlet elevation, providing a significant operating buffer in the pumping water level.

Long-term responses to sustained well production may be influenced by untested factors, such as drawdown in proximity to the mountain front, and the effects of other local production (for agricultural irrigation). Combined with the complex geology of the area, these considerations provide strong encouragement for diligent long-term monitoring of water levels and water quality in the area, to support a management strategy for groundwater production from the University well.

Pumping Test Program Overview

Aquifer testing was conducted in two phases, to provide a combination of data about the production well, the aquifers that provide groundwater to it, and how the well is hydraulically connected with nearby observation wells. The program consisted of:

1. A short-term step-test. This test was eight hours long, with four two-hour rate steps at 400, 600, 800 and 1,210 gpm. Pre- and post-production water level monitoring occurred in the pumping well and surrounding monitoring wells.
2. A medium-term constant-rate test. This 48-hour test was conducted at a constant production rate of 1,000 gpm, and included pre-and post-production water level monitoring.

Pre-production monitoring occurred for at least several hours prior to production, to establish baseline water levels before pumping. For both test phases, the production well was idle for at least 24 hours prior to the test, and nearby agricultural production was not observed. Post-production recovery water level monitoring was conducted over several days following each of the two production tests.

Water level monitoring was conducted by an air-line device in the production well and downhole pressure transducers in three of the monitoring wells, all of which provided effectively continuous water level records for the duration of each test. The three monitoring wells equipped with downhole transducers also provided a continuous record of water temperature during the two tests. Three other nearby wells were monitored for water levels using a manual tape.

Discharge from all the tests was piped to the District's wastewater system. This method of discharge was especially useful for the tests because it removed discharge from the area of the pumping test and correspondingly avoided potential impacts of increased infiltration to shallow aquifers during the test. Both tests were conducted on days without rainfall.

Hydrogeological Environment

Complex aquifer characteristics are expected in the study area because of:

- The study area location at the margin of the basin, where depositional characteristics of the aquifer's sedimentary layers are known to be heterogeneous and variable over both vertical and horizontal distances,
- Lithologic logs from the producing well, several of the monitoring wells and surrounding wells, all of which suggest highly variable stratigraphy in the area, and
- Variable bedrock "basement" depth below the sedimentary layers which, together with the proximity to the bedrock exposures of Round Mountain and the bedrock areas east of the study area, define an irregular geometry of producing layers, including probable truncations and disruptions of water-bearing units, particularly in the lowermost portion of the University well's perforated interval.

The University well and many of the monitoring wells used in the pumping tests can be seen in Figure 1 (from Brown, 2005). In this figure, the pumping well is noted by its short well number, 14B3. Of the three cross-section lines in Figure 1, only B-B' is reproduced in this report. Section B-B' (Figure 2) is a schematic cross-section (with vertical exaggeration) that illustrates the potential complications due to the relative proximity of the bedrock mountain front and the presence of a subsurface bedrock escarpment.

The section B-B' includes well information for 14B2, which was used as a monitoring well for the pumping tests and is close to 14B3. Wells 14B2 and 14B3 have very similar top and bottom perforation elevations.

Lithologic logs from many wells near the University well show significant clay layers at various depths; prominent zones of clay, or stratigraphic packages with dominant clay interbeds are noted with "c" in Figure 2. Even over the relatively short horizontal distances between these wells, significant clay layers are not easily correlated between wells. This finding may partly reflect the inherent inaccuracies and generalities of many well logs, but certainly also reflects a complicated stratigraphy in which local layers of clay or sand are interleaved and laterally discontinuous.

The result of this stratigraphy is an aquifer which, for the University well, produced mixed signatures of confined and semi-confined conditions during the aquifer tests. The University well penetrates the two principal aquifer packages recognized in the CSUCI study area: the Upper Aquifer System of the Pleasant Valley and Oxnard Plain Basins, and the overlying "Shallow" aquifers. Much of the shallow system is above the University well's top perforations, but the discontinuous stratigraphy may allow some vertical hydraulic connection between these units.

The lateral variation in aquifer units can help to create an environment where aquifer confinement can exist on a local scale, but more complex aquifer responses ("leaky" or semi-confined conditions) may exist over longer time periods or greater distances.

For the University well, the lowermost perforations may be associated with bedrock or a structurally-disrupted zone of mixed bedrock and sediment, such that a portion of production to the well may even come from fracture flow associated with bedrock structures at the subsurface bedrock-alluvial interface.

Wells Utilized in the Study

Using nomenclature preserved from previous hospital/university ownership of area wells, well 14B3 is shown in Figure 3 as "#4", and other wells are similarly shown by their former university system number. For convenience, the numbering used in Figure 3 will be retained for the discussion and display of well water level responses during the pumping tests.

Well #4 is equipped with a pump and was used as the production well for both tests, with all other numbered wells in Figure 3 utilized as observation wells during the tests.

Well Construction

A simplified cross-section drawn along Lewis Road from well #1 to well #5 (with wells #6 and 7 projected onto the section) illustrates the different depths and perforated intervals of wells used in the aquifer analysis (Figure 4).

The University test pumping well (#4) has a perforated interval over 600 feet long, beginning at 280 feet depth. Monitoring well #2, located 400 feet from the pumping well, has a very similar perforated interval, with exception of some blank portions in the middle of the perforated section. Top-of-perforation elevations are similar also in monitoring wells #1 and #3, but neither of these two wells produces from aquifer levels as deep as the pumping well and monitoring well #2.

Monitoring well #6 is relatively shallow, with only a short, shallow perforation. Its background water levels and test responses show these shallow aquifers maintain a different water level signature, but are also in limited hydraulic communication with the deeper units perforated in the other monitoring wells.

Pumping Tests

The step-drawdown and constant-rate tests were conducted using the District's installed pump in the University well. An air line with a data logging manifold was used to determine water levels in this well at 15-second intervals. The two nearest monitoring wells -- #2 and #3 -- were equipped with downhole pressure transducers with wellhead data loggers, providing 30-second interval water level (and temperature) measurements. During the constant-rate test, well #1 was also equipped with a downhole transducer and recorded data at 30-second intervals.

Given the aquifer complexity and likely conditions of vertical leakance, barometric adjustments were not considered necessary. However, some environmental influences can be seen in the pumping well water levels, particularly during the step-test, probably due to solar heating of wellhead equipment associated with the air line.

Step-Drawdown Test

An eight-hour step test was conducted beginning the morning of August 31, 2010. Very stable background water levels were recorded during the half hour prior to pumping. Of the numbered wells utilized in this study (Figure 3), only well #4 is equipped with a pump, and other area agricultural irrigation supply wells were not known to be active during the test. Discharge from the test was to a pipe, with all discharge water delivered to the District's nearby treatment facility.

Pre-production, static water levels exist in a range of about 20 feet elevation -- from about sea level in #4, to about -20' in #3. Well #5, which is believed to be a shallow well based on its previous use and very similar water levels to #6 (Figure 4), has water levels more than 30 feet higher than any of the other wells during this test.

Responses to pumping stresses, and post-production recovery of water levels are readily observed in all but one of the wells (during the step-test, well #6 did not yield reliable water level data); see Figure 5. The environmental degradation of the pumping well water level measurements can be observed in the following two days of recovery data, and is consistent with influences from solar heating of the data logging device (Figure 6). The magnitude of the artificial signal in the two recovery days (approximately 10' influence, September 1 and 2) suggest that the pumping water levels observed during the daytime step-test may be subject to similar error. This condition increases the value of the monitoring data collected from the other wells, which were measured with different instruments that are immune to this potential problem.

For the step-test, the most useful data are from wells #2, #3 and #4. Well #2 is 400' southwest of the University well, and well #3 is half-way between them (Figures 3 and 4). Temperature profiles for wells #2 and #3 show a very small but readily observed cooling of produced water during the pumping portion of the test, with rebound that strongly mimics water level recovery in the same wells (Figure 7).

At the end of the four production increments of 400, 600, 800 and 1,210 gpm (each with a duration of two hours), drawdown in the pumping well reached a maximum of 49 feet. Two hundred feet away in well #3, maximum drawdown was 12'. At four hundred feet distance in well #2, maximum drawdown was 11' (Figure 8). In the pumping well, maximum incremental drawdowns for each of the pumping steps provides a simple opportunity to estimate specific capacity (Q/s, where Q is production rate and s is drawdown in the well). Normally, specific capacity decreases with lowering water levels and higher production rates, but in this case, all three higher production rates produce $Q/s \cong 25$ gpm/ft (see inset table in Figure 9). The uniform result across all three production intervals may result partly from meteorological effects in the pumping well water levels, and the resulting distribution of specific capacity values prohibits methods to estimate coefficients for laminar and turbulent losses that are sometimes otherwise possible for near-field analysis.

The spike in water levels shortly after the start of the 1,210 gpm interval corresponds with a very brief period of non-pumping, just long enough for the well water levels to surge back up the well column before the pump restarted.

Figures 10 and 11 show drawdown and recovery curves for monitoring wells #2 and #3. Well #2, which is farther from the pumping well, and includes perforations at deeper units such as those penetrated by the pumping well, displays relatively smooth, progressive drawdown increases with each increase in production amount. Well #3 behaves similarly, but with more pronounced responses, as expected from its closer location to pumping well #4. The short-term "surge" in water levels associated with the brief cessation in pumping can be seen in the well #2 drawdown curve, but is only a very small signal at well #3.

Recovery data from monitoring wells #2 and #3 were evaluated using methods of Cooper-Jacob (1946), which assumes confined conditions without leakage from overlying or underlying units, and Hantush (1960), which accommodates leakage to the producing aquifer of the test. Both methods require simplifying assumptions about homogeneity of aquifer properties and flow, conditions that clearly generalize the complex conditions of basin-margin geology and aquifer flow that is governed by local, lenticular aquifer units and may even include a component of fracture flow. Nonetheless, such methods can provide a guide for investigation and delineation of aquifer properties, and a straightforward, initial estimate of aquifer transmissivity is provided by the Cooper-Jacob method, in which:

$$T = 264 * Q/\Delta s \tag{1}$$

where T is aquifer transmissivity (gpd/ft), Q is production rate (gpm) and Δs is the change in drawdown over one log cycle (ft). This approximation of transmissivity results in values of 31,000 to 45,000 gpd/ft (Figure 11). This estimated range in T may overestimate true bulk aquifer transmissivity but is consistent with aquifer materials such as fine sand.

Constant-Rate Production Test

A 48-hour constant-rate test was conducted beginning the morning of November 16, 2010. Data acquisition methods were very similar to the step-drawdown test, except the environmental influences on well #4 (pumping well) water levels were greatly diminished by on-site shading of equipment at the pumping well. In addition, a pressure transducer was installed in observation well #1 for continuous recording of water levels (and temperature).

Figure 12 shows water level data for all wells during the test. The production portion of the test was conducted at a constant rate of 1,000 gpm, sustained for 48 hours. A more detailed view of the continuous-record data is provided in Figure 13. Temperature data is also included in Figure 13, showing the small but distinct temperature changes that mirror water level drawdown and recovery during the test period. Water levels in all wells do not completely stabilize during the test but, as with the step-test, are adequate for simple approximations of aquifer characteristics.

Following the method of equation (1), aquifer transmissivity is calculated to be T = 37,000 gpd/ft based on drawdown in the pumping well during the constant-rate test, and T = 24,000 gpd/ft based on recovery of water levels in the pumping well after cessation of production (Figures 14 and 15, respectively). Observation wells yield similar results, with T between 32,000 and 50,000 gpd/ft from data acquired during pumping (Figure 16). A similar range of transmissivity values is derived from observation well recovery data (Figures 17 and 18). For clarity and discussion the linear lines of fit are omitted from Figures 17 and 18; these two figures provide two views of the same data, both with residual drawdown on the vertical axis.

The range of T values derived from the production and observation well data largely reflect the difference between a geologically complex area and estimation methods that assume much more uniform aquifer properties. In this context, differences between well responses can be useful even if bulk aquifer characteristics are only able to be approximated. For example, In recovery data from the constant-rate test (e.g., Figure 17), wells #2 and #3 display considerable slope variability during the main period of water level recovery, again reflecting real-world complexities of the aquifer, but with well #3 indicating higher T. Well #3 has only a relatively short perforated interval, coincident with the upper perforated portion of well #2 (Figure 4), suggesting aquifer units in the higher portion of the perforated zone of the University well may be more hydraulically conductive than deeper zones.

Water level responses to pumping also show the possibility of a hybrid aquifer condition, in which local confined conditions evolve during well production to include a delayed yield from leaky units and potentially even an unconfined component during extended periods of pumping (Figure 19). This is one reason that estimates of storativity from the aquifer test data are not considered adequately reliable.

As an example of hybrid aquifer condition response to pumping, consider the shallow aquifer water levels recorded in wells #5 and #6 (Figure 12). These levels are distinctly different from aquifer water levels associated with the other wells -- a difference that cannot be attributed to ground surface elevation differences between the wells or other external characteristics. These shallow aquifers are at least are in some hydraulic communication with various shallow unconfined aquifer units (Brown, 2005). In contrast, the deeper aquifer units will have some degree of confinement, based on known geology at the wells and on comparable aquifer horizons of the Upper Aquifer System in adjacent portions of the Oxnard Plain Basin (Hanson et al., 2003). But in the study area, adjacent to the bedrock boundary of the mountain front, pumping from the deeper horizons in well #4 still produces a small but noticeable response in water levels in shallow wells #5 and #6 (Figure 12). In aggregate, the data for the aquifer horizons produced by well #4 suggest an aquifer system with at least locally confined conditions, some leaky confined aquifer units and, over time also some hydraulic communication with overlying partially-confined or unconfined units.

Using the method of Cooper-Jacob (1946), observation well responses can be used to estimate the steady-rate cone of depression limit (r_o) using a distance-drawdown analysis (Figure 20). The method is an approximation, but any range of reasonable r_o values derived from the graph would suggest that the University well's sphere of influence will extend to include more heterogeneous stratigraphy (and associated aquifer characteristics) toward the east and bedrock boundaries, potentially including strong hydraulic conductivity contrasts associated with bedrock-alluvial contacts (for comparison, see the distances shown in Figure 2).

Well Yield

Based on the test pumping results, drawdown is estimated for a range of University well pumping rates (Figure 21). At a rate of 1,000 gpm, total drawdown of 56 feet is predicted after 100 days (this period spans two log cycles of time for estimated responses and is a standard guide for long-term effects). With starting water level elevation of -5 ft msl and a ground surface elevation of 49 ft, in this scenario pumping water levels would be about 110 feet below surface, or about 90 feet above the existing pump inlet elevation (the inlet elevation is 198 feet below ground surface). Figure 21 shows predicted drawdown for other production amounts also, including the current project design production rate of approximately 870 gpm. At the design pumping rate, long-term production well drawdown is predicted to be 49 feet, with resulting pumping water levels 95 feet above the inlet elevation, providing a substantial operating buffer in pumping levels, and allowing for considerable differences between actual long-term pumping responses and those predicted from the pumping tests.

The predicted long-term production levels are simplifications that may overestimate drawdown if leaky conditions are prevalent and if regional hydraulic connection with shallow aquifer horizons is pronounced. Conversely, long-term sustained production may produce aquifer effects that extend to bedrock or other basin-margin geological boundaries that serve to limit recharge, correspondingly increasing production well drawdown. Such effects have not been tested by the 48-hour constant-rate study and create uncertainty for well yield predictions. In light of such uncertainty, a careful monitoring program will need to be developed in association with any long-term production of the University well.

Temperature

Temperature responses to pumping are readily evident in observation wells #1, #2 and #3 during both tests (#1 only during the constant-rate test), and mirror the drawdown and recovery behavior of water levels. Production is associated with cooler water flux through the observation wells. The 200-foot set-depth of the transducers would suggest these cooler waters are migrating through the observation points from relatively higher stratigraphic horizons, consistent also with general increasing temperature with depth in large basins. However, the lack of temperature data from other wells in the Pleasant Valley basin makes such conclusions generally supportive of the aquifer analysis but not conclusive of groundwater migration paths.

Water Quality

Water quality samples were acquired from the University well weekly for months prior to the pumping tests and during the general test periods. During this period water quality varied little, with consistently high chloride (~290 mg/l), sulfate (~650 mg/l) and TDS (~1,750 mg/l), as has been historically typical for this well. Water quality samples were not able to be collected at more frequent intervals during the test pumping and recovery periods, so short-term changes that may have been associated with well production are not documented.

Summary

Two aquifer pumping tests were conducted using Camrosa Water District's "University" well (1N/21W-14B3). The tests were conducted in August and November 2010, and included a step-drawdown test and a constant-rate test. Both tests included pre- and post production water level monitoring in the production well and six observation wells. The production well and three observation wells were fitted with continuous-recording devices for water level measurements. Three of the wells also provided a continuous record of water temperature. Water quality samples were available from weekly monitoring of the pumping well.

Aquifer response to pumping exhibits a wide range of characteristics, with elements of confined production (transmissivity ≅ 35,000 gpd/ft), "leaky" aquifer responses and delayed recharge, and hydraulic connection with overlying strata that are partially unconfined. Collectively, these well responses suggest both that the constant-rate production rate of 1,000 gpm and the project design pumping rate of 870 gpm could be sustained as long-term production rates, with a production water level operating buffer of 90 to 95 feet above the existing pump inlet elevation. An estimate of the well specific capacity from the step-test is 25 gpm/ft at an 800-1,000 gpm production rate range.

Geologic complexity associated with the aquifers, together with the basin-margin pumping location create uncertainty in predicted pumping well drawdown. To track aquifer responses over long term management periods, careful monitoring will be required to help understand local conditions that create uncertainty in the prediction of aquifer responses:

- Basin-margin subsurface characteristics include locally heterogeneous aquifer units that are likely lensoidal, interleaved and laterally discontinuous. Such conditions violate many of the assumptions used in traditional aquifer analysis and make quantitative conclusions about aquifer properties from the pumping tests useful approximations, but not firm fact.
- The bedrock mountain front boundary east of the University well, and the subsurface bedrock geology of this area have the potential to create highly asymmetric recharge zones to the University well, including possible recharge boundaries associated with the bedrock-alluvial interface.
- The lowermost screened portion of the University well may penetrate or abut bedrock (volcanics and volcanic sediments); contributions to well yield resulting from bedrock fracture flow potentially create unusual well responses to pumping and complications to long-term recharge patterns.

Long-term responses to sustained well production may also be influenced by other factors, such as well interference effects of other local production (for agricultural irrigation). Agricultural production was not believed to occur during either of the tests conducted for this study.

References

Brown, N.N., 2005, Shallow groundwater of eastern Pleasant Valley Basin: Report prepared for Camrosa Water District.

Jacob, C.E., 1946, Drawdown test to determine the effective radius of an artesian aquifer: Proc. Amer. Soc. Civil Engineers, v. 72, no. 5.

Hanson, R.T., P. Martin and K.M. Koczot, 2003, Simulation of ground-water/surface-water in the Santa Clara-Calleguas ground-water basin, Ventura County, California: USGS WRI, no. 02-4136.

Hantush, M.S., 1960, Modification of the theory of leaky aquifers: Jour. Geophys. Research, v. 65, no. 11, pp.3713-3725.

Figure 1. Map showing the regional area, from a shallow groundwater study of eastern Pleasant Valley Basin (Brown, 2005). The University well used for production in the pumping test is 14B3. Only section B-B' is reproduced in this report, for discussion purposes.

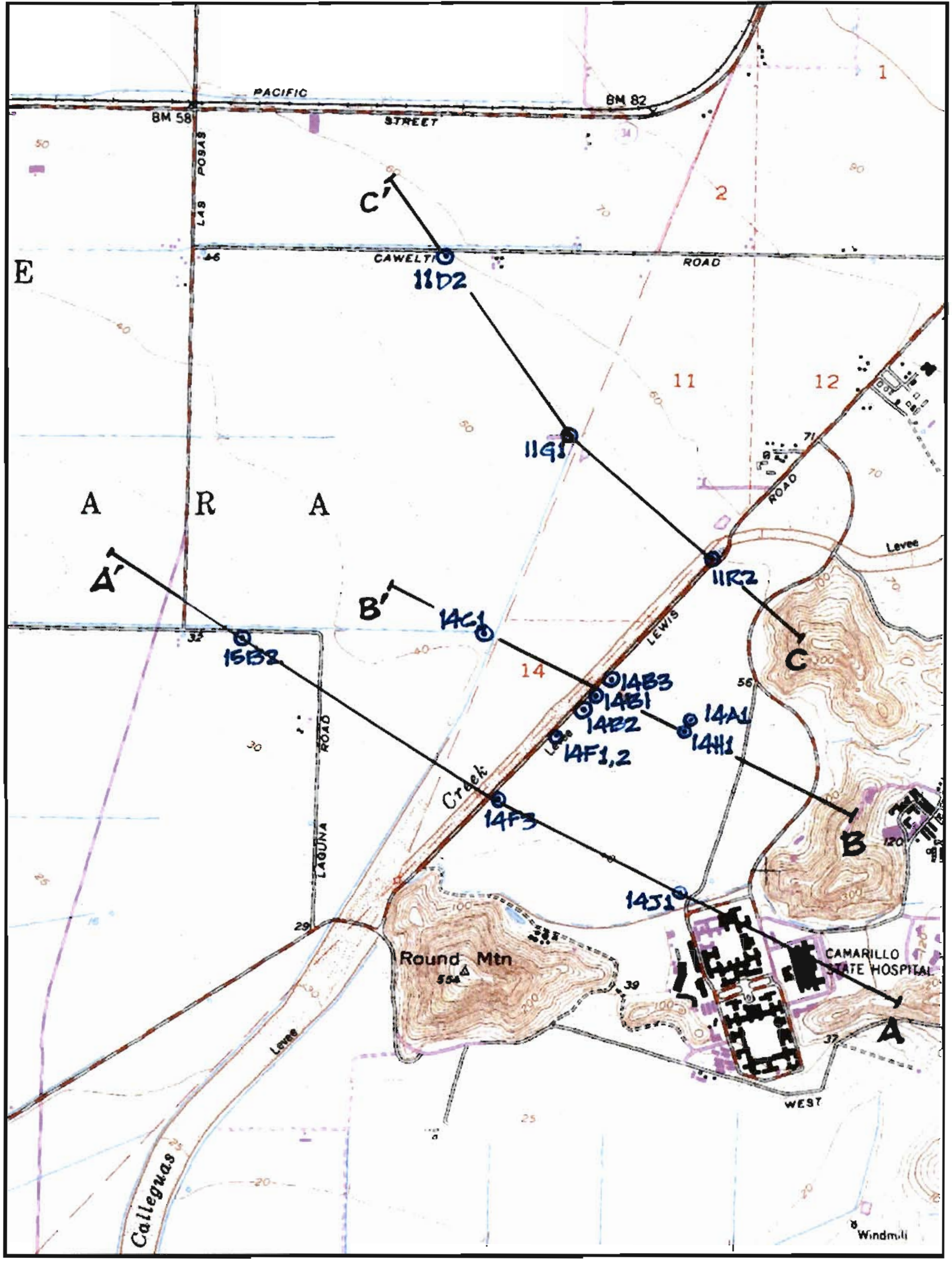
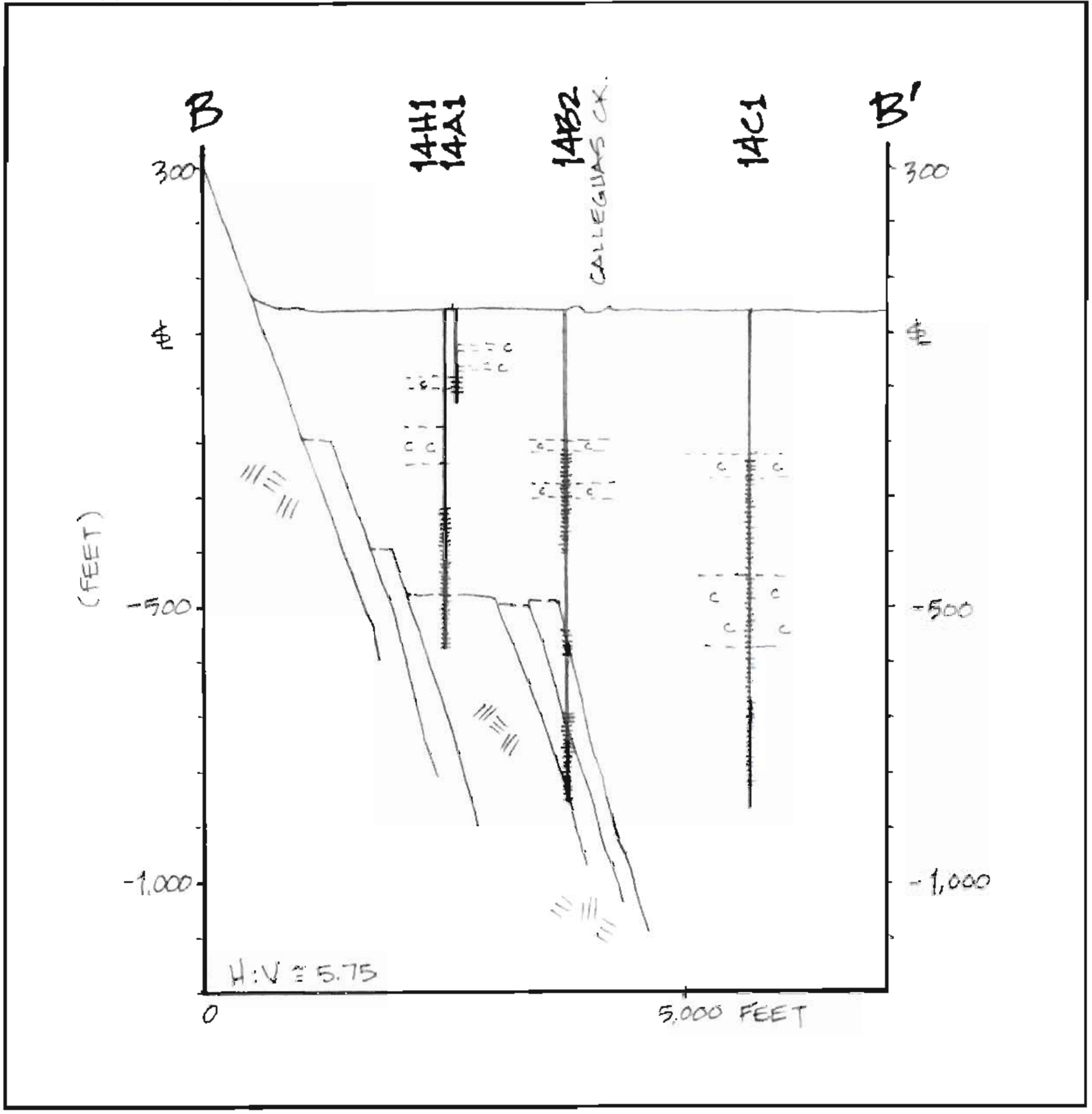


Figure 2. Cross-section B-B'; subsurface geology is schematic. Stratigraphic packages of all clay or predominantly clay units are demarcated by "c" labels. The University well is very close to well 14B2 and has approximately the same overall perforated interval. Note significant vertical exaggeration.



(from Brown, 2005)

Figure 3. Map of wells used in the pumping tests. Well #4 is the pumping well (same as 14B3 in previous figures).

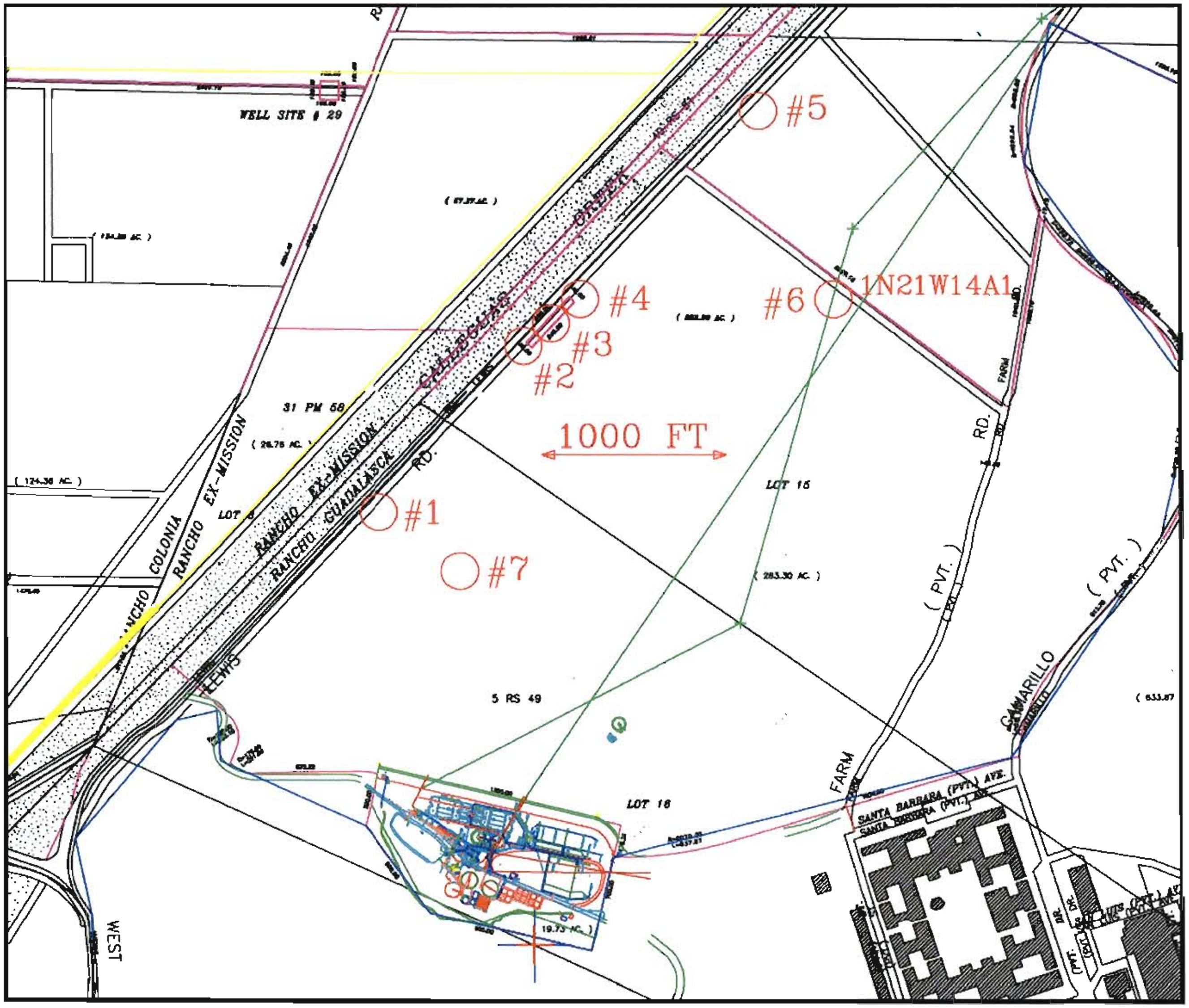


Figure 4. Cross-section of wells monitored during the University well pumping tests; perforated intervals are marked for wells with known construction details. The section is drawn along Lewis Road, through wells 1, 2, 3, 4 and 5. Note that there is slight vertical exaggeration.

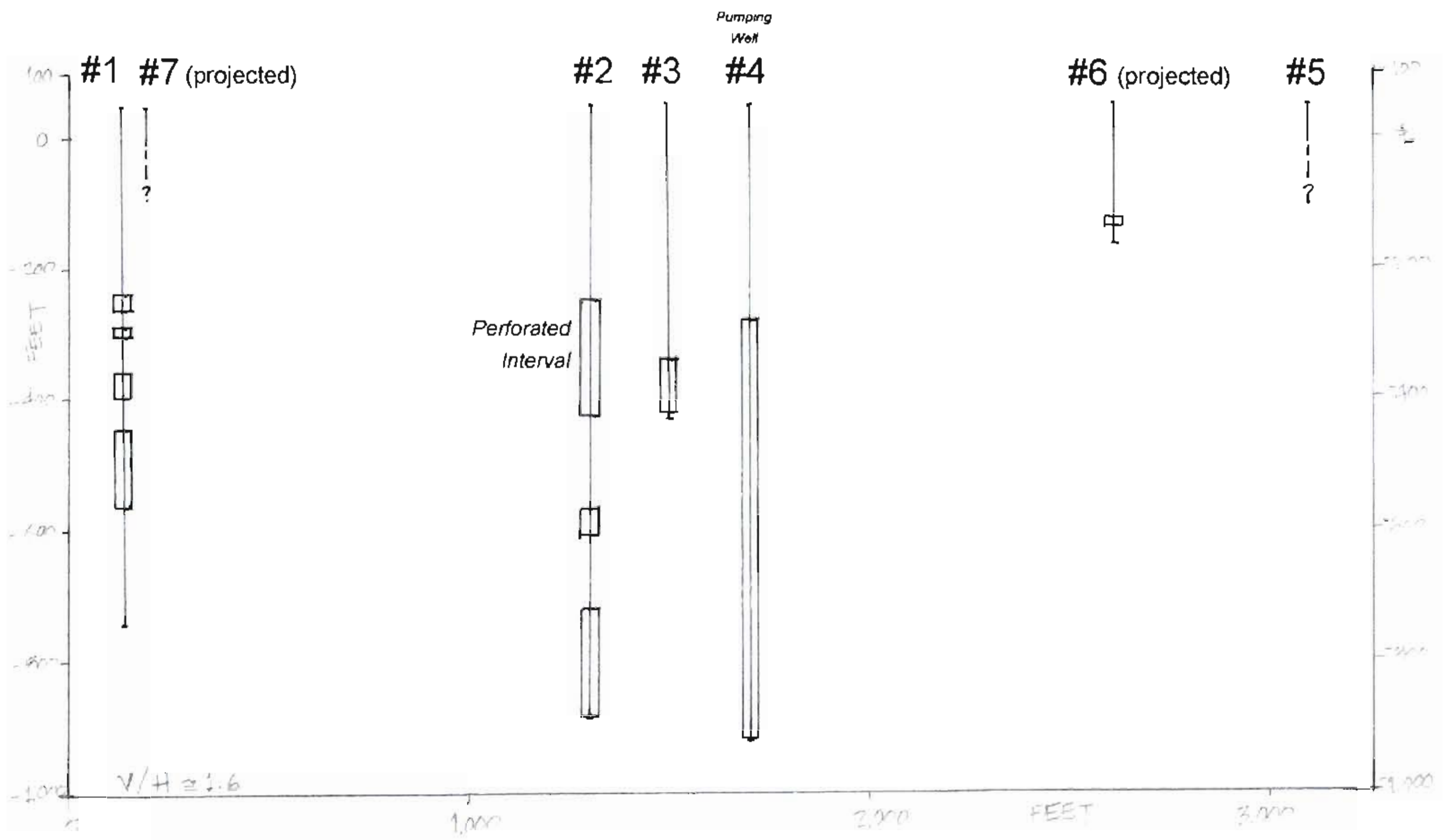


Figure 5. Water Levels and Temperatures recorded in all wells, step-drawdown test. The pumping well is #4.

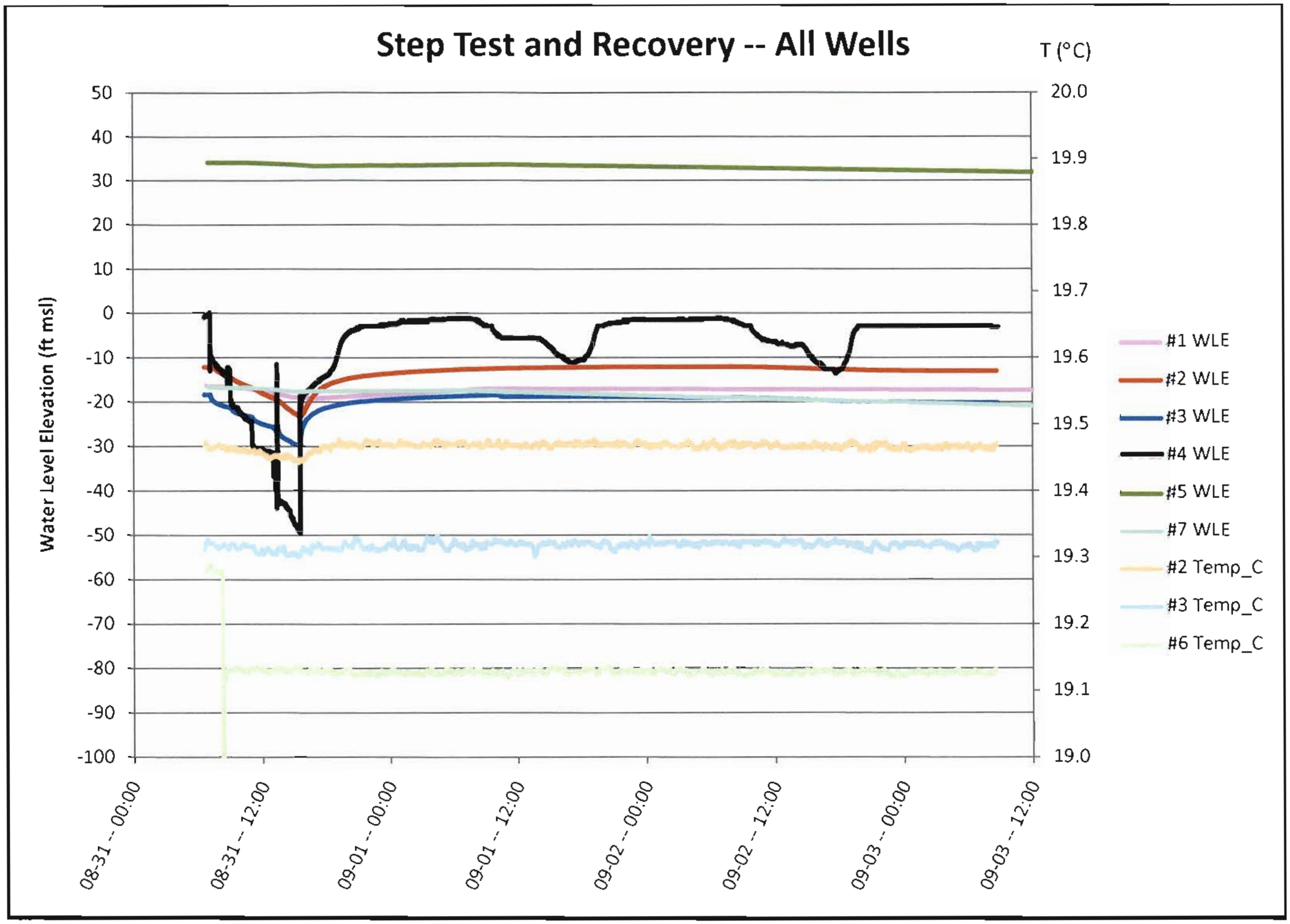


Figure 6. Pumping well water levels and meteorological conditions during the step-test.

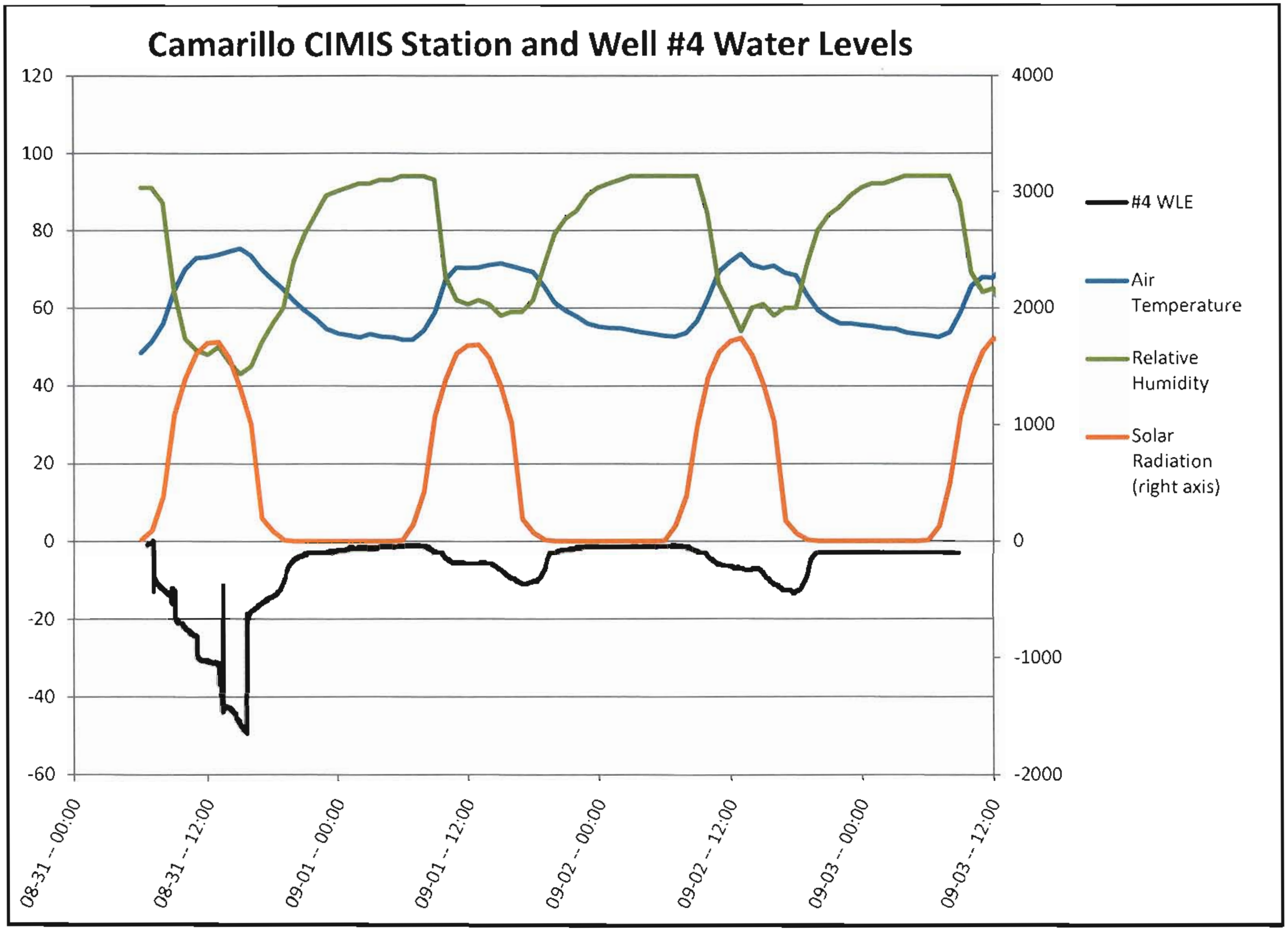


Figure 7. Step-test water level and temperature data for wells #2, #3 and #4.

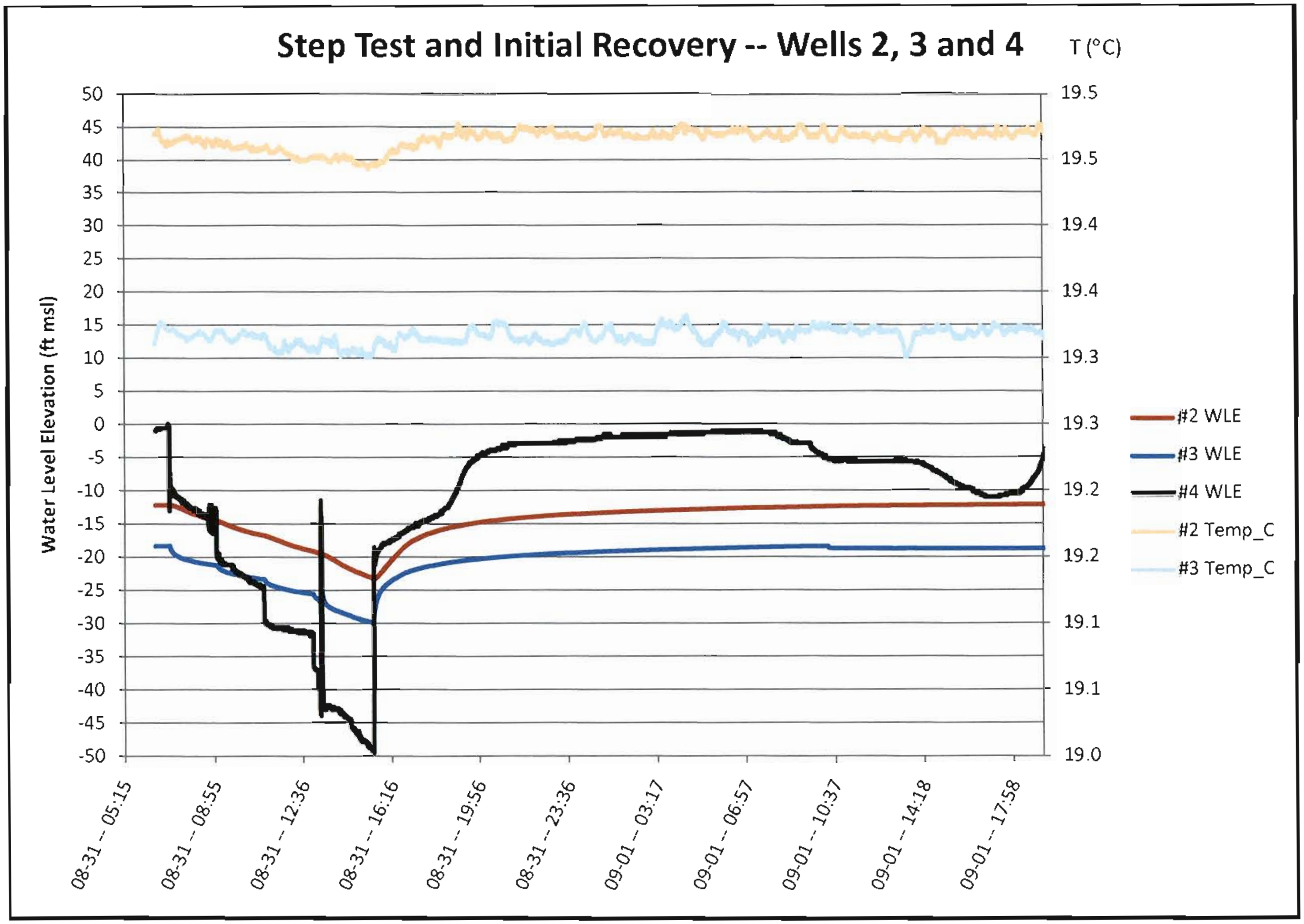
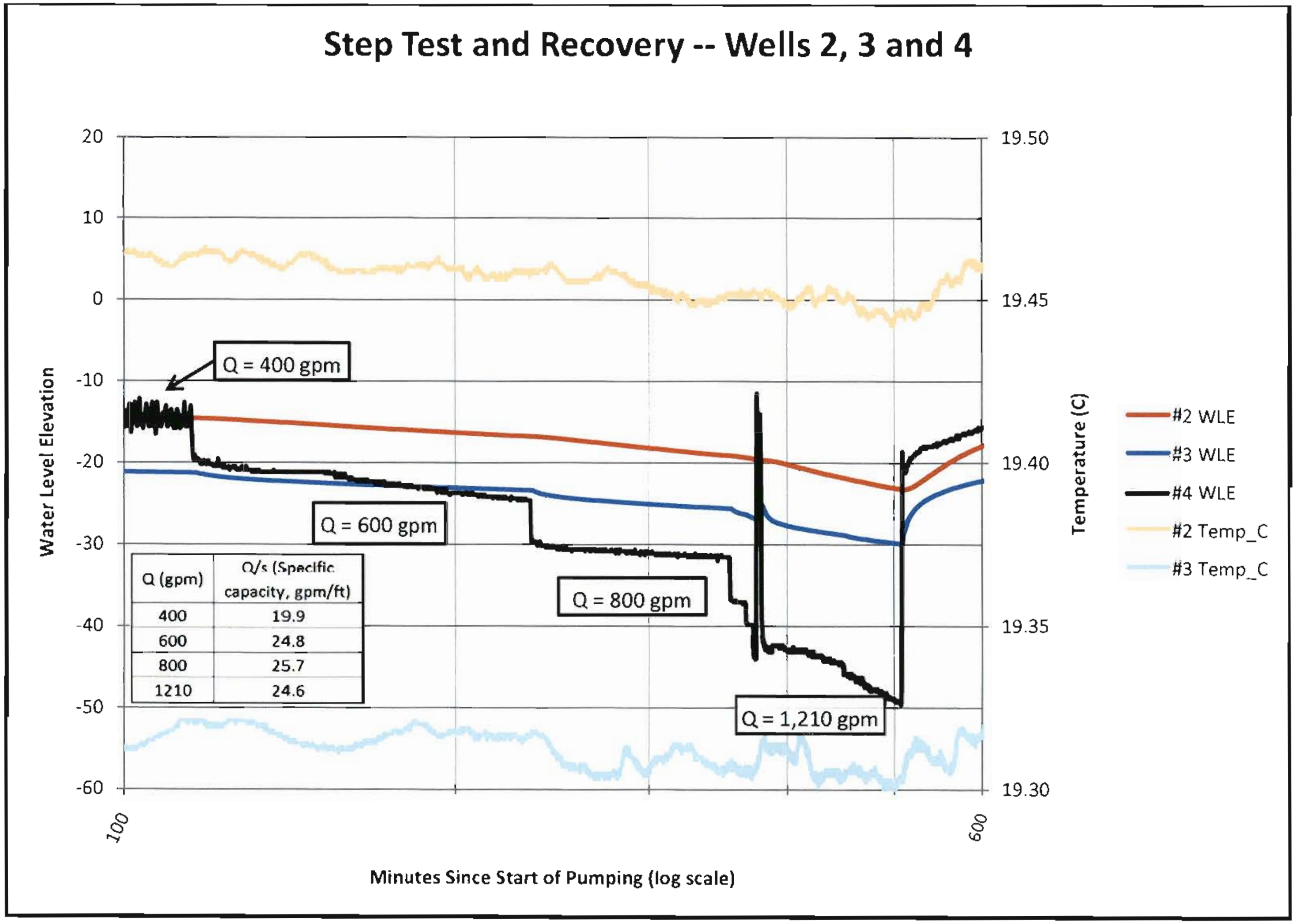


Figure 9. Step-test detail plot. Specific capacity calculations are based on maximum drawdown for each pumping interval; see text for discussion.



Q (gpm)	Q/s (Specific capacity, gpm/ft)
400	19.9
600	24.8
800	25.7
1210	24.6

Figure 10. Drawdown in monitoring wells #2 and #3 during step-test production.

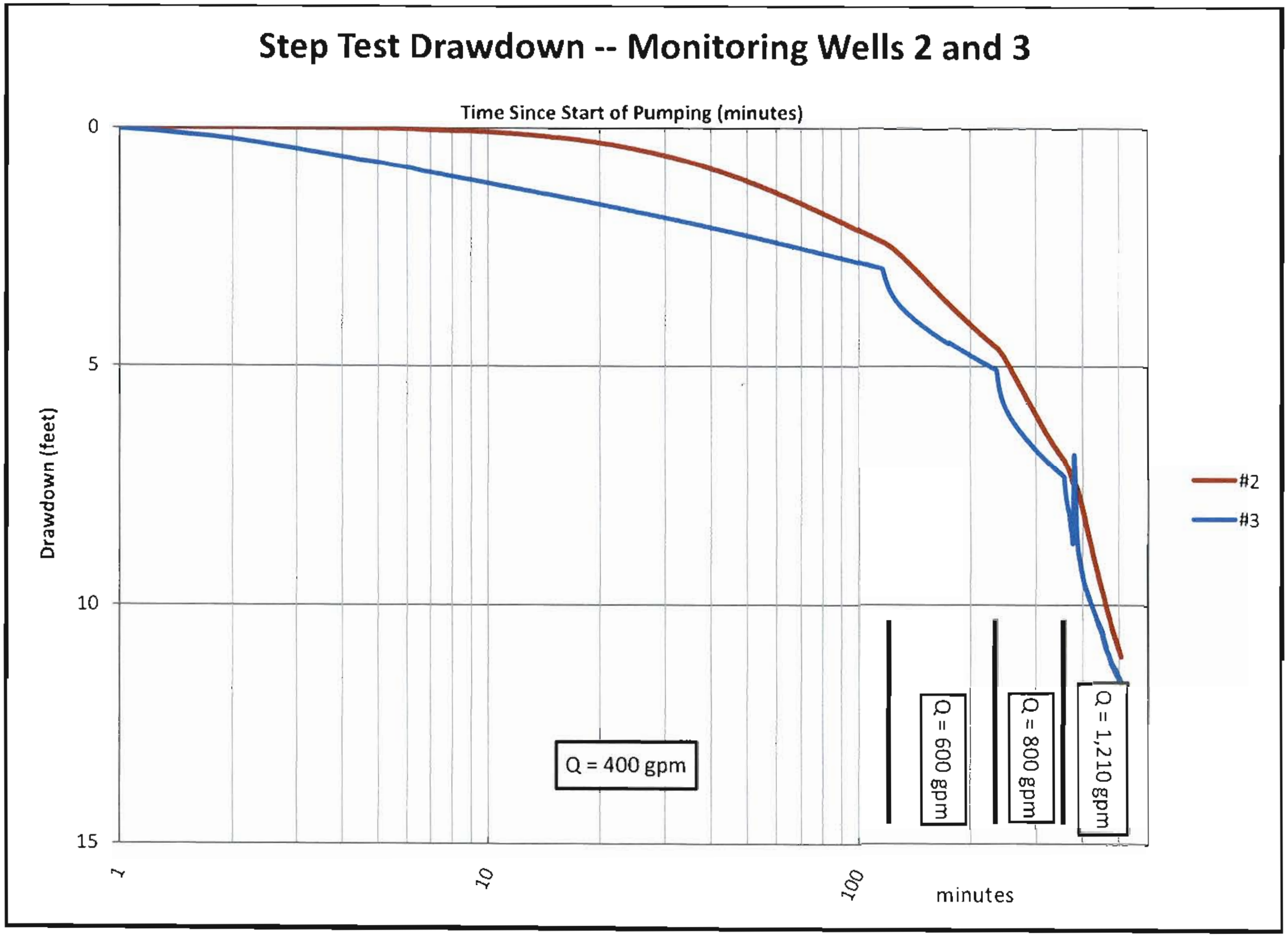


Figure 11. Water level recovery in monitoring wells #2 and #3 (step-test).

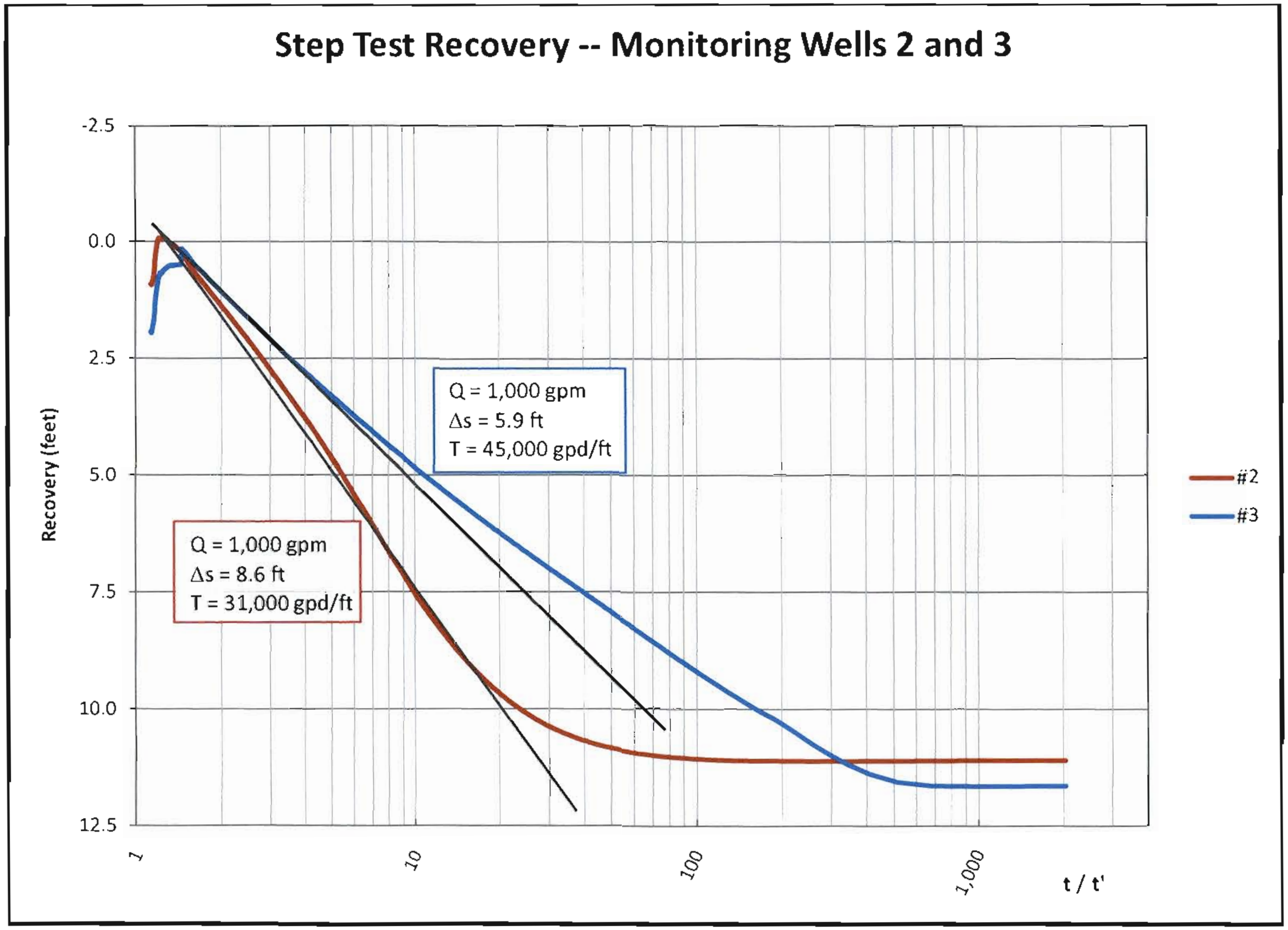


Figure 12. Constant-rate production test and recovery, all water level data. Grey vertical bars correspond with initiation and cessation of pumping during the test.

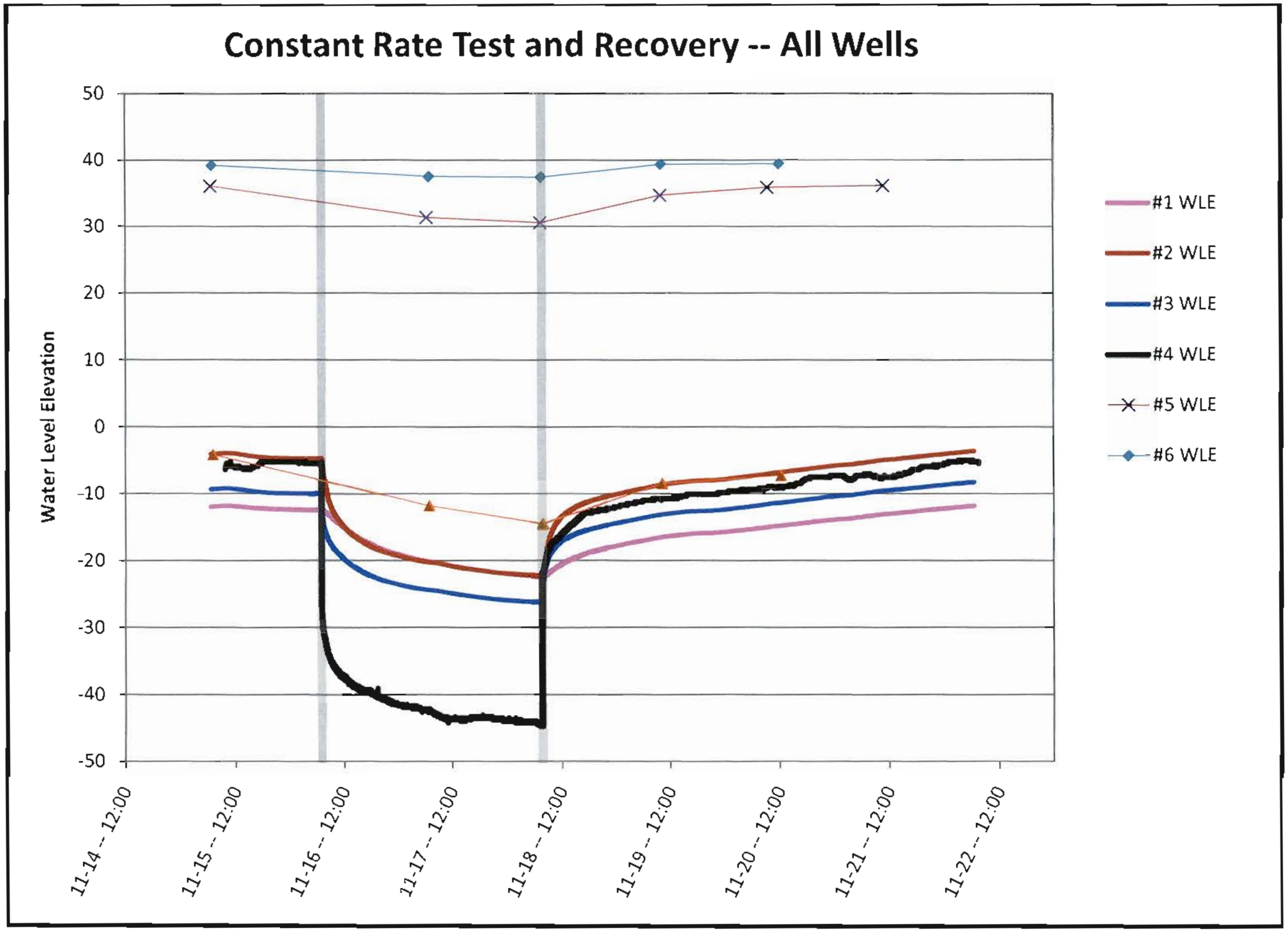


Figure 13. Detailed view of continuous-record data from the constant-rate production test and recovery period.

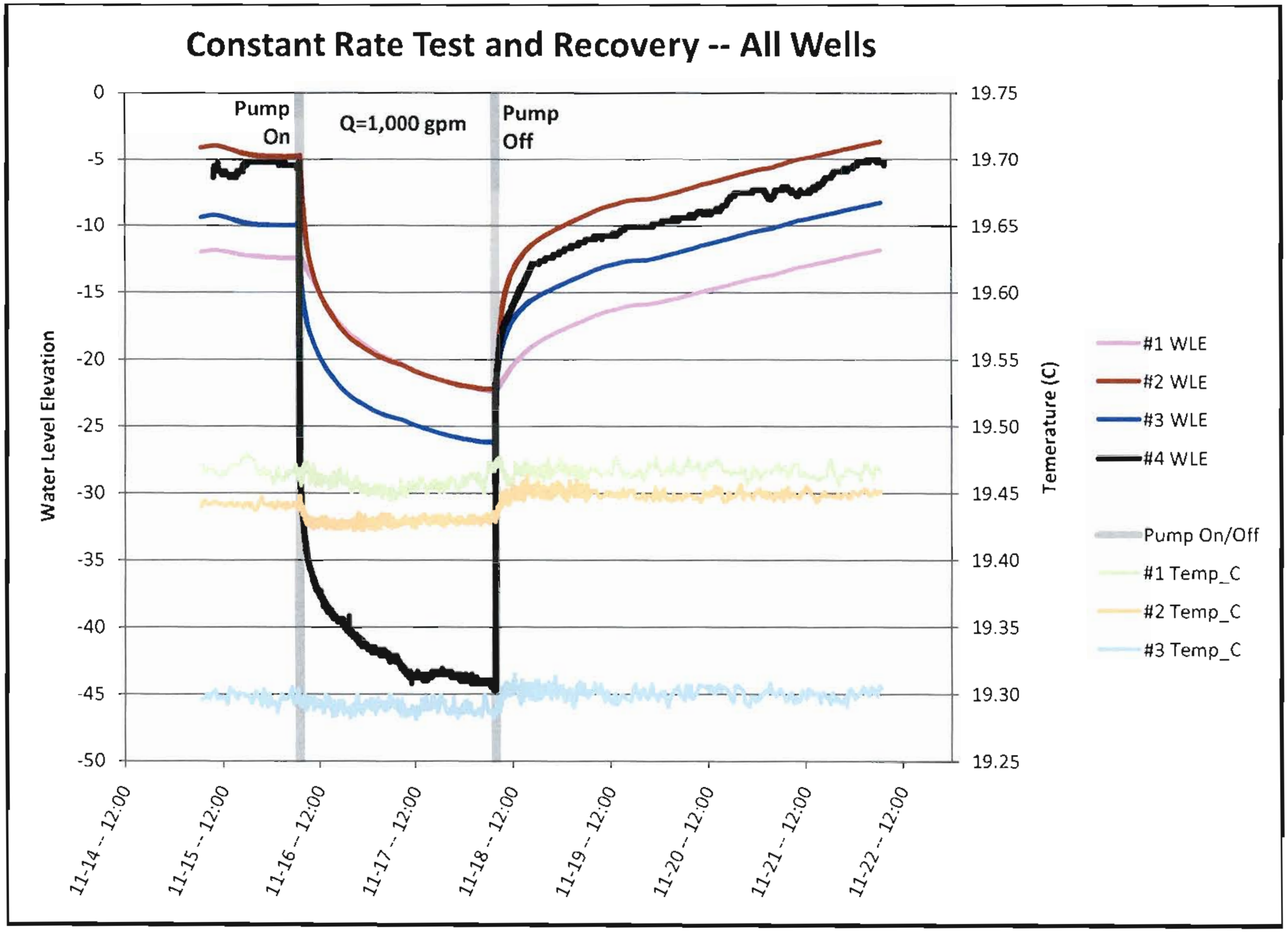


Figure 14. Drawdown in pumping well #4 during constant-rate test production.

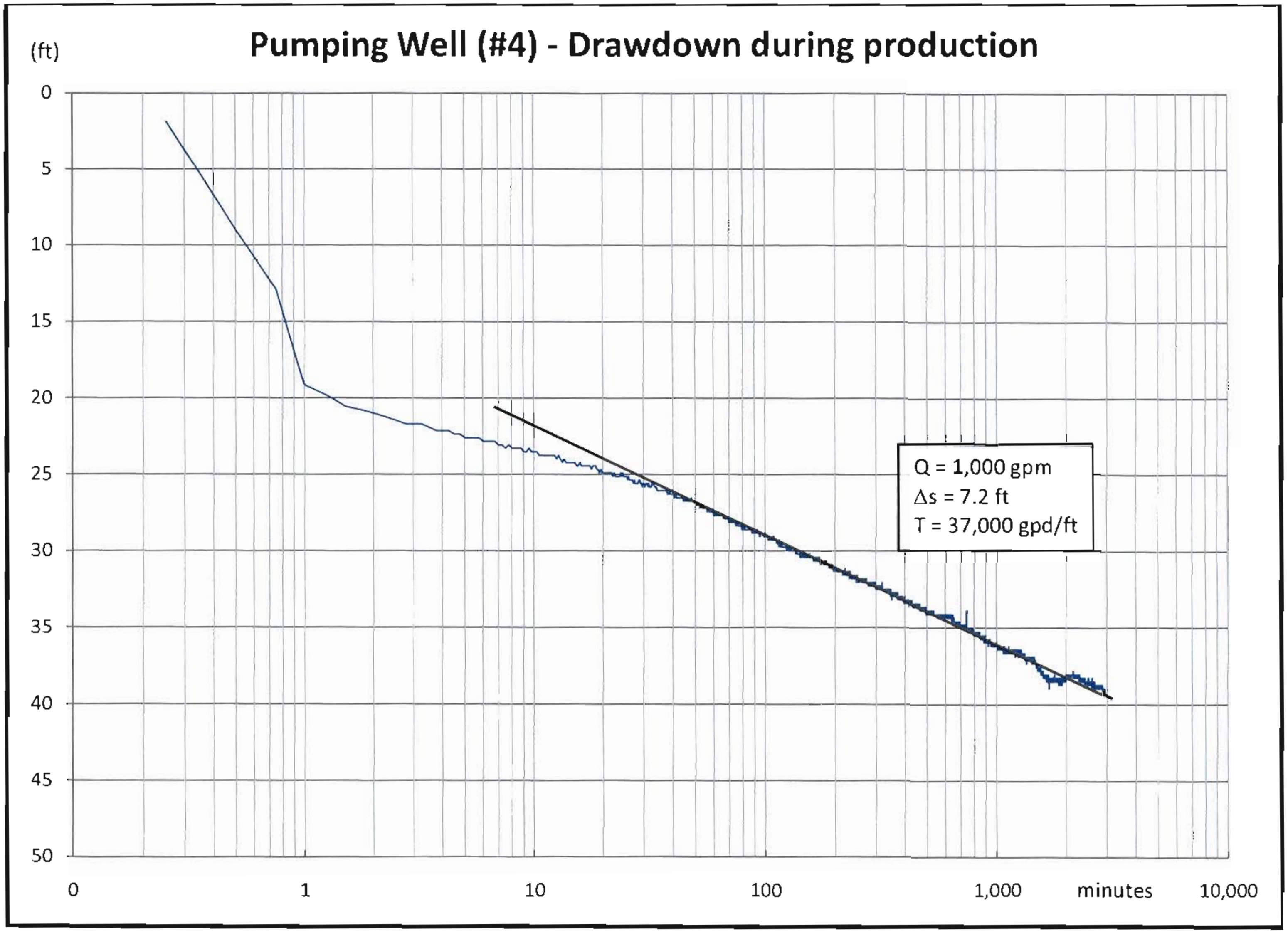


Figure 15. Water level recovery in production well #4 (constant-rate test).

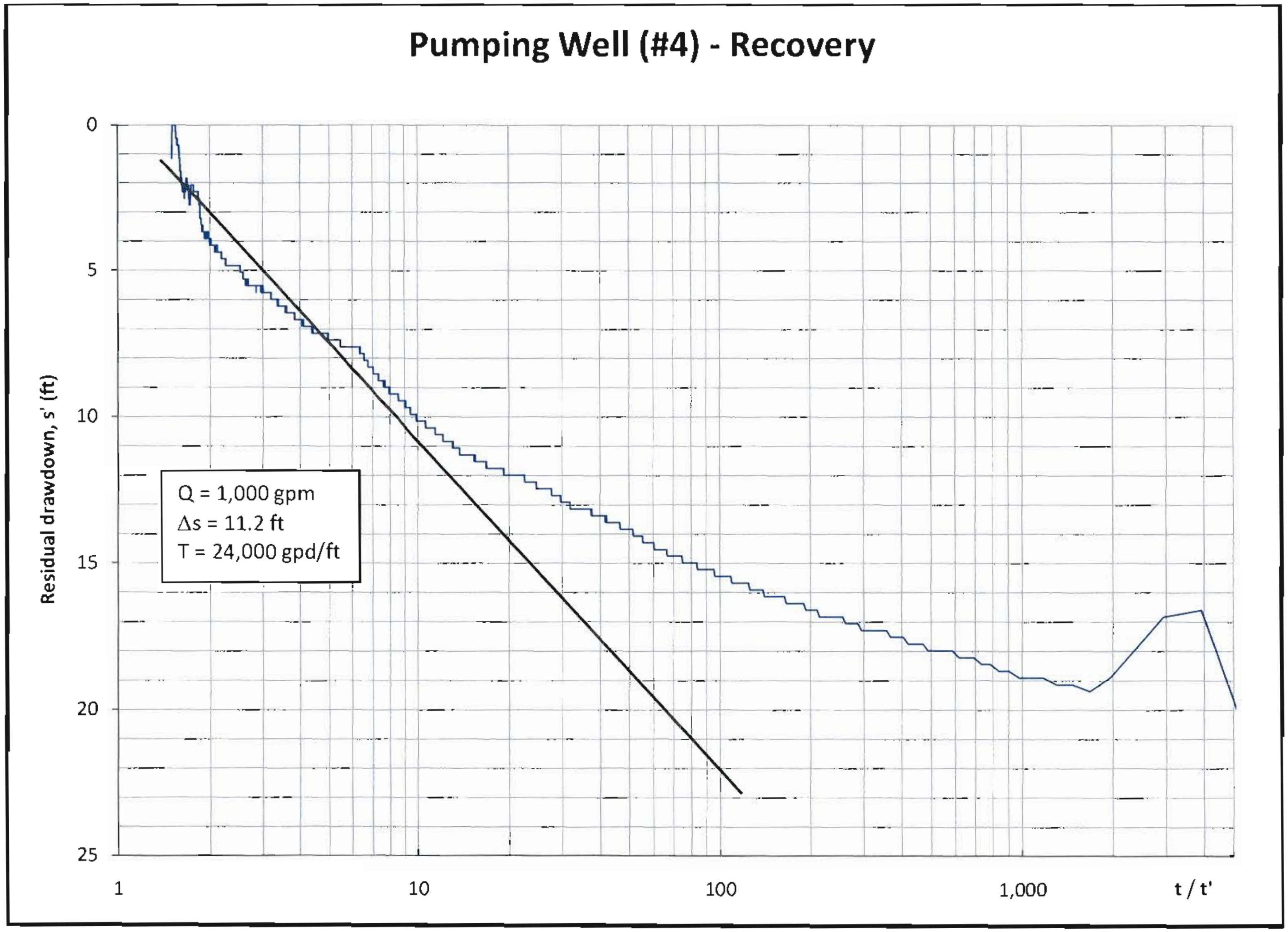


Figure 16. Drawdown during production in observation wells #1, #2 and #3; constant-rate test.

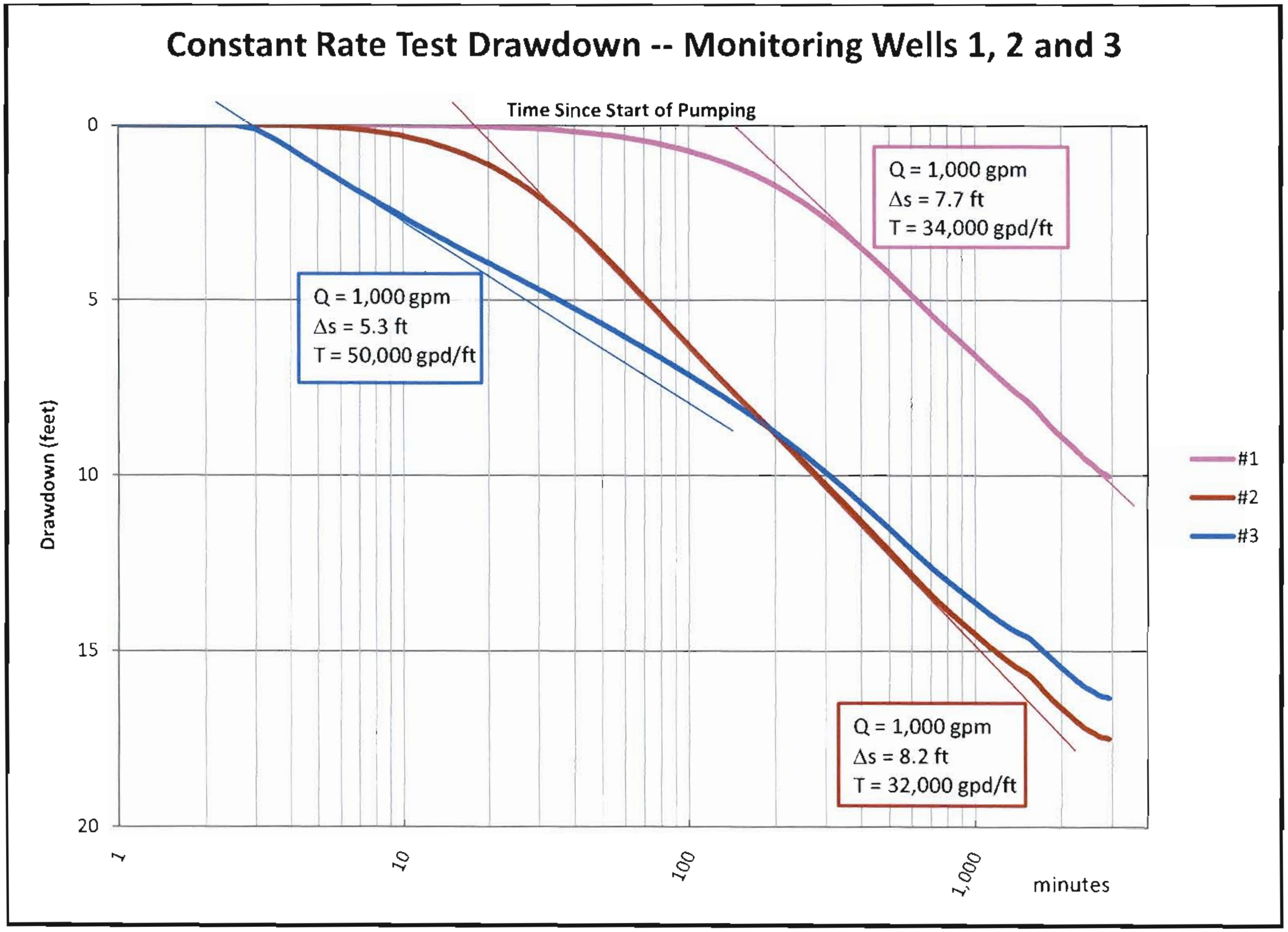


Figure 17. Water level recovery during production in observation wells #1, #2 and #3; constant-rate test. Horizontal axis is time elapsed since cessation of pumping (minutes, log scale).

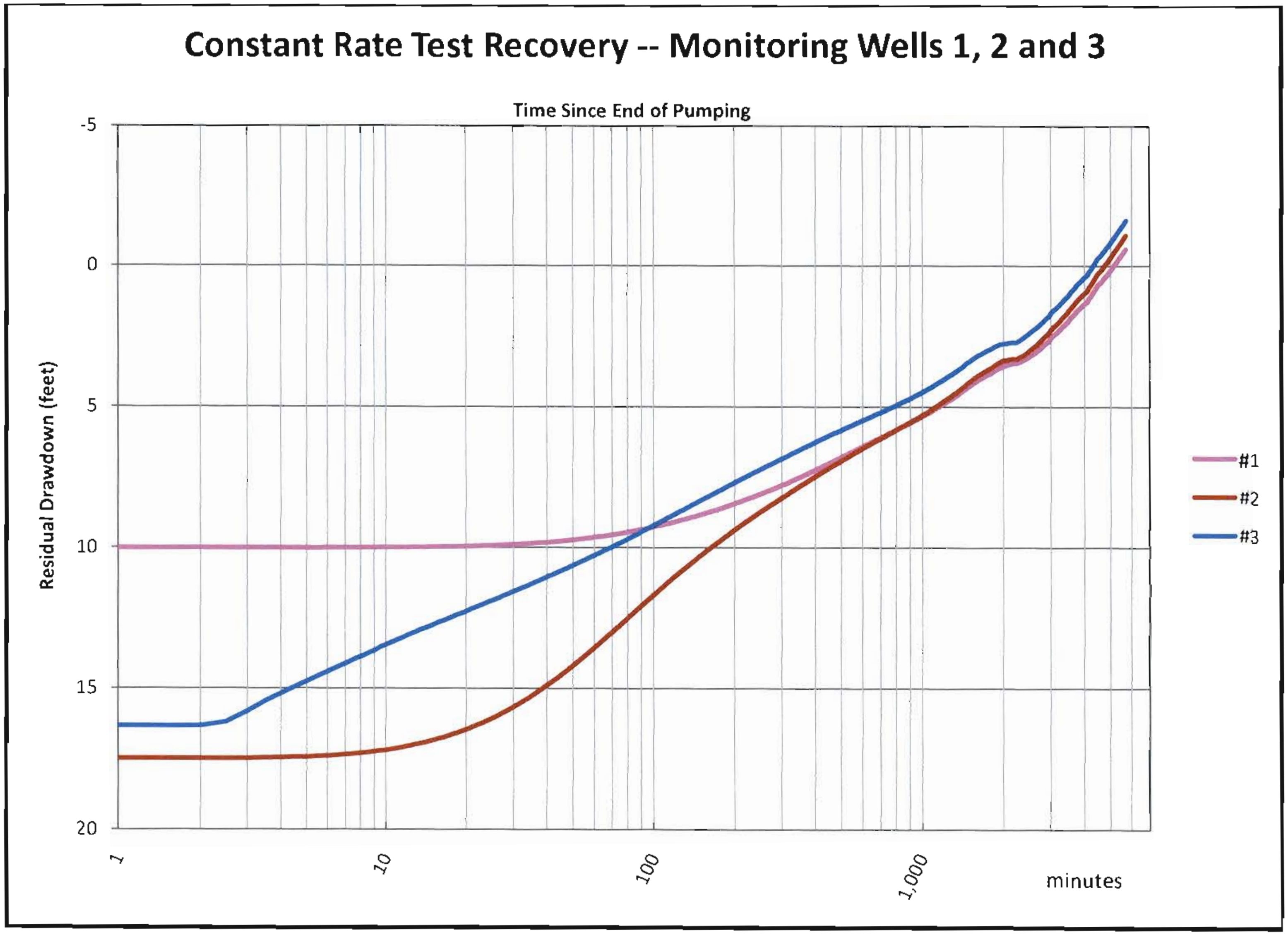


Figure 18. Water level recovery in observation wells #1, #2 and #3; constant-rate test. Horizontal axis is t/t' (unitless; total time since initiation of pumping, divided by time since start of recovery).

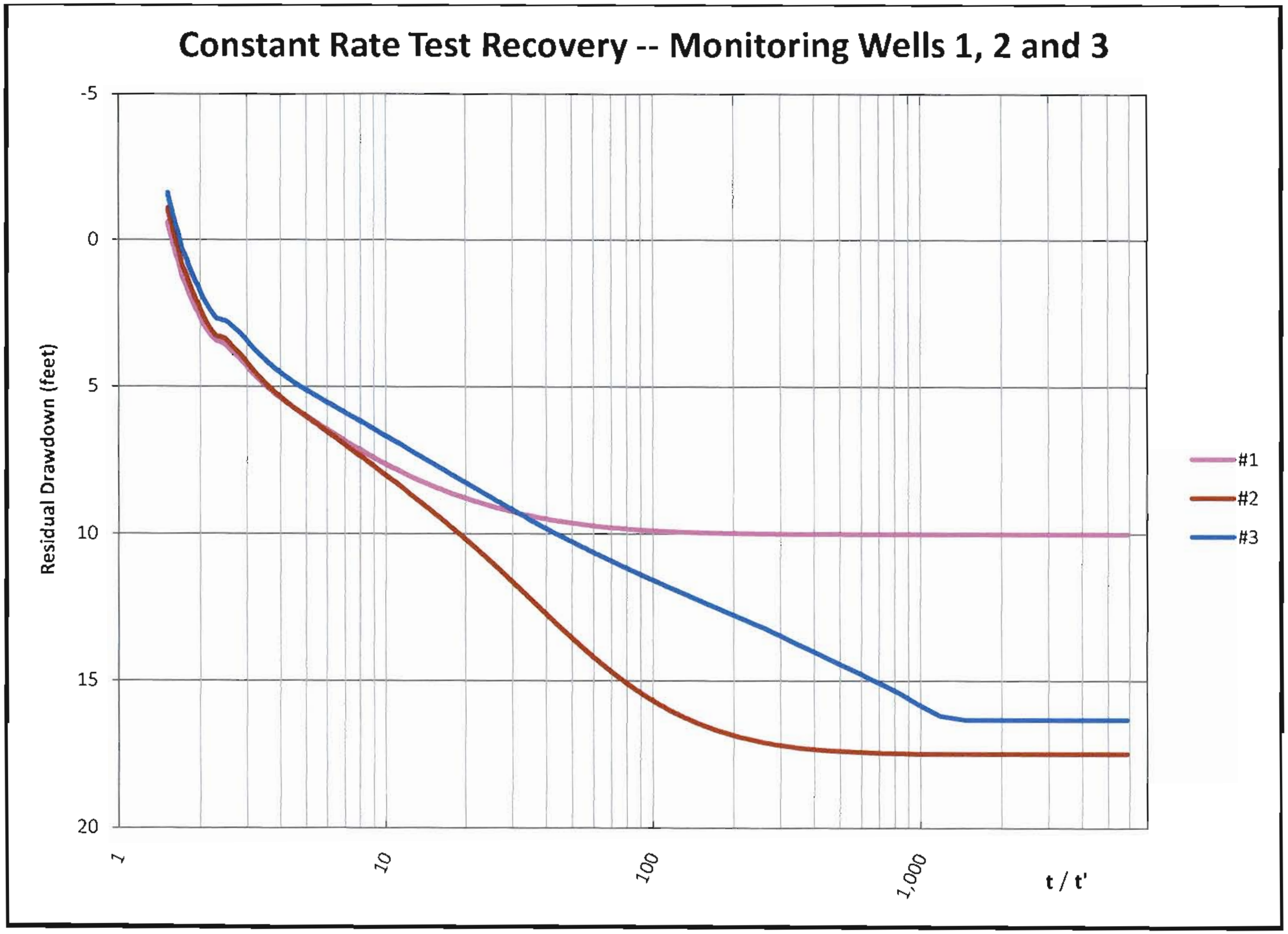


Figure 19. Schematic changes to aquifer response during constant-rate production period. The curve is observed water level data from well #4, with different components of possible aquifer contributions.

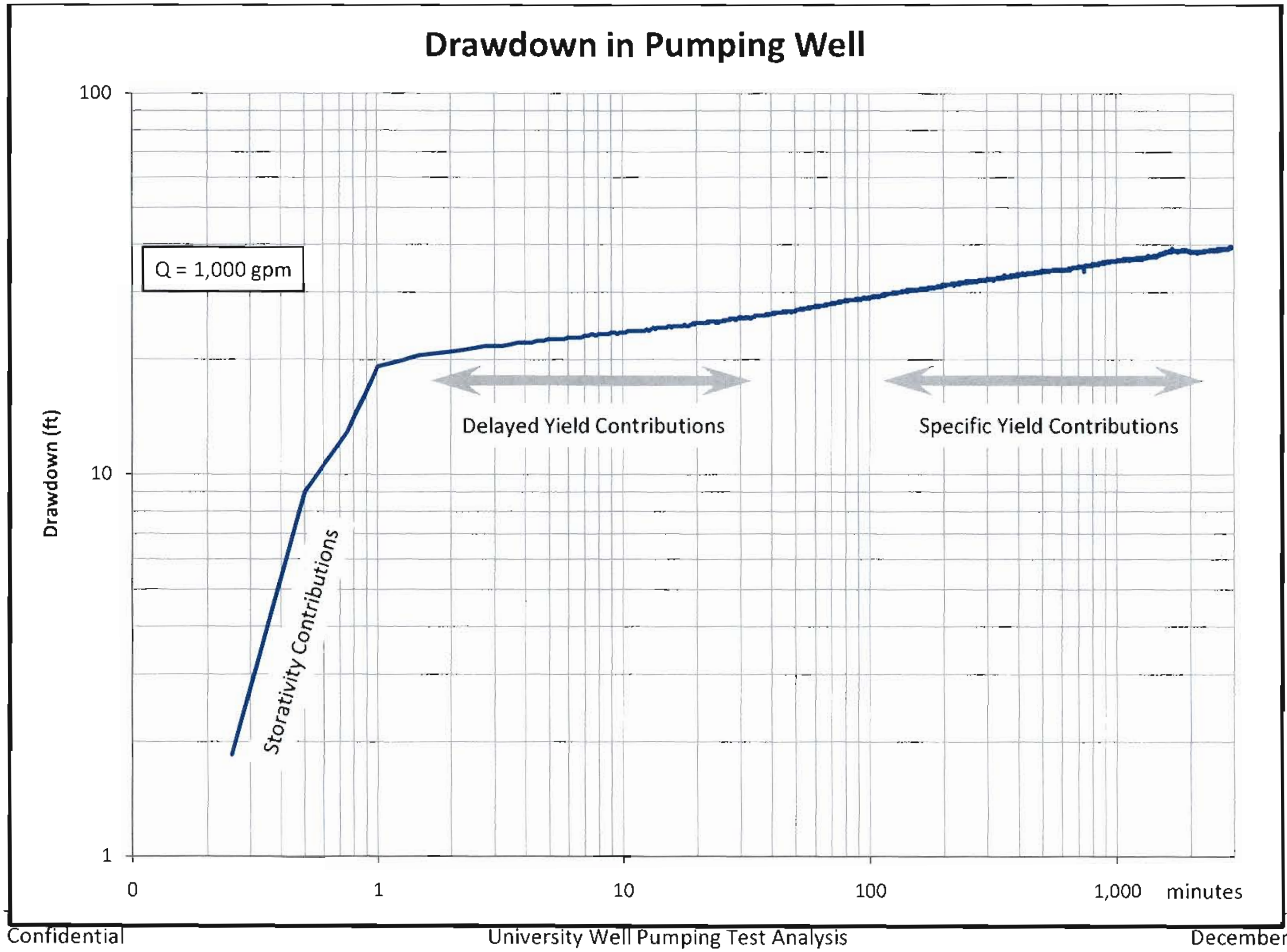


Figure 20. Distance-drawdown plot of all observation wells (constant-rate test). Shallow aquifer observation wells #5 and #6 are shown in lighter blue and were not considered in the trendline analysis.

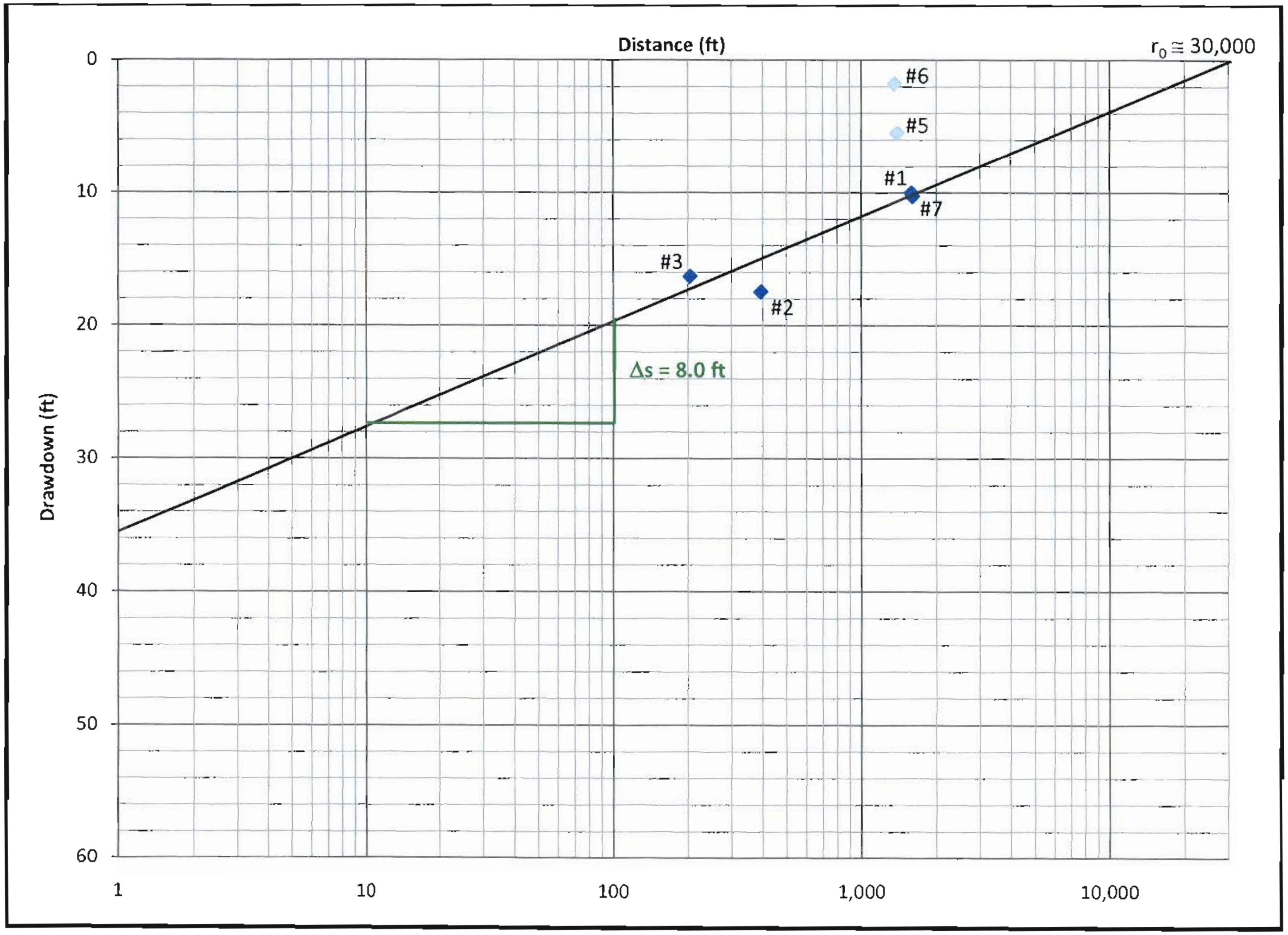
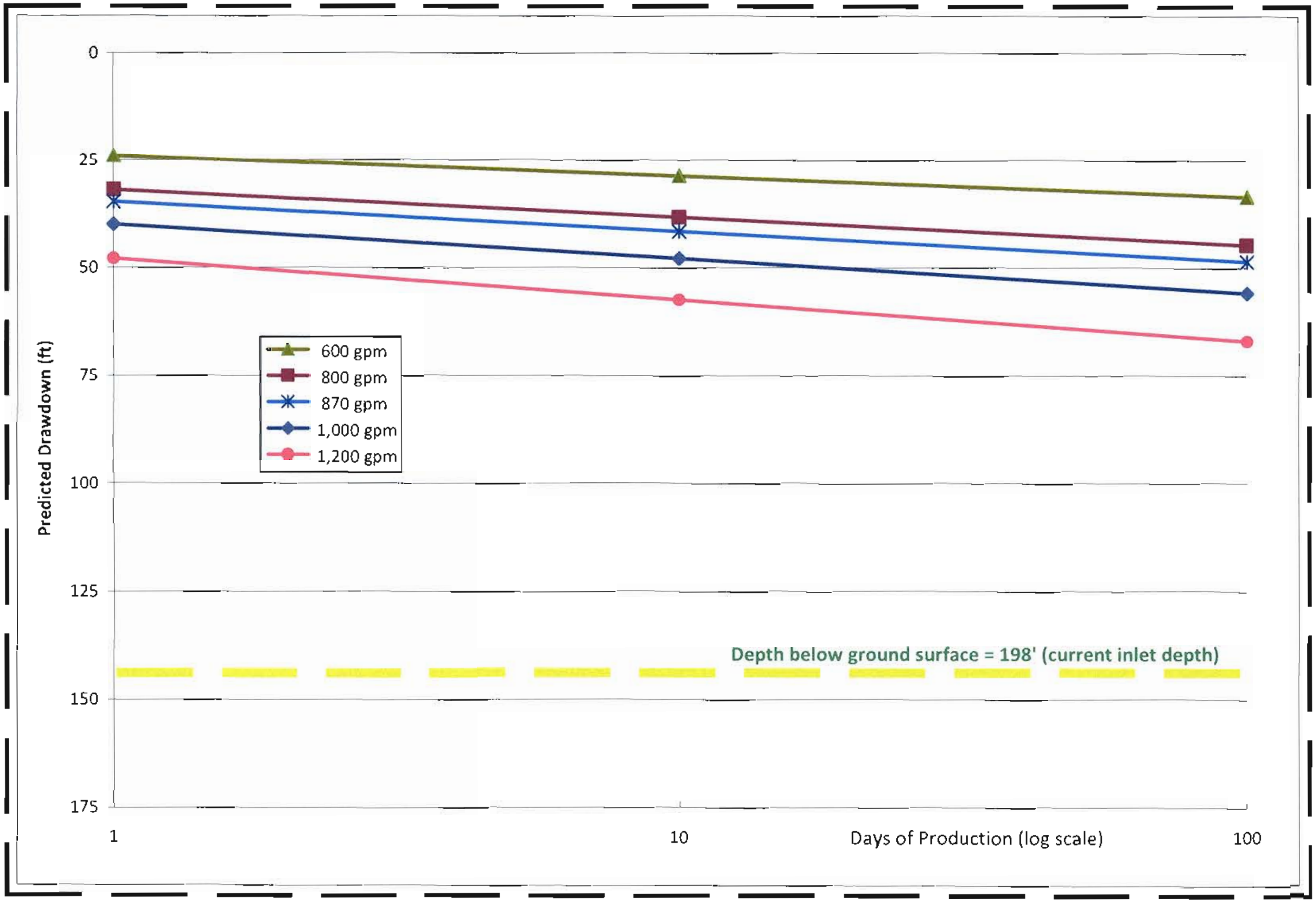


Figure 21. Predicted drawdown curves for University well; see text for discussion.



APPENDIX L: AWWA WATER LOSS AUDIT REPORTING WORKSHEETS

Water Loss Audits for:

FY16-17

FY17-18

FY18-19

FY19-20

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Camrosa Water District (CA5610063)
Reporting Year: 2019-20 | 7/2019 - 6/2020

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

WATER SUPPLIED

Master Meter and Supply Error Adjustments

			Grade	Value	Unit			Grade	Pcnt:		Value:	Unit
Volume from own sources:	+	?	9	2,391.700	acre-ft/yr	+	?	3		○ ●	17.180	acre-ft/yr
Water imported:	+	?	7	5,182.770	acre-ft/yr	+	?	9		● ○		acre-ft/yr
Water exported:	+	?	n/a	0.000	acre-ft/yr	+	?			● ○		acre-ft/yr
WATER SUPPLIED:				**7,557.290**	acre-ft/yr							

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ? for help using option

			Grade	Value	Unit	Pcnt:		Value:	Unit
Billed metered:	+	?	5	6,900.000	acre-ft/yr				
Billed unmetered:	+	?	n/a		acre-ft/yr				
Unbilled metered:	+	?	n/a		acre-ft/yr				
Unbilled unmetered:	+	?	5	18.893	acre-ft/yr		○ ●	18.893	acre-ft/yr
AUTHORIZED CONSUMPTION:		?		**6,918.893**	acre-ft/yr				

Use buttons to select percentage of water supplied
OR
value

WATER LOSSES (Water Supplied - Authorized Consumption) **638.397** acre-ft/yr

Apparent Losses

			Grade	Value	Unit	Pcnt:		Value:	Unit
Unauthorized consumption:	+	?		18.893	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

			Grade	Value	Unit	Pcnt:		Value:	Unit
Customer metering inaccuracies:	+	?	3	140.816	acre-ft/yr	2.00%	● ○		acre-ft/yr
Systematic data handling errors:	+	?	5	17.250	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? **176.960** acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? **461.437** acre-ft/yr

WATER LOSSES: **638.397** acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: ? **657.290** acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

			Grade	Value	Unit
Length of mains:	+	?	7	211.1	miles
Number of active AND inactive service connections:	+	?	10	8,761	
Service connection density:		?		42	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 3 65.0 psi

COST DATA

			Grade	Value	Unit
Total annual cost of operating water system:	+	?	10	$12,324,926	$/Year
Customer retail unit cost (applied to Apparent Losses):	+	?	9	$3.65	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	+	?	5	$1,145.26	$/acre-ft

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 67 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Water imported
2: Customer metering inaccuracies
3: Billed metered

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Camrosa Water District (CA5610063)
Reporting Year: 2019 7/2018 - 6/2019

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

	Grade	Value	Unit	Grade	Pcnt:		Value:	Unit
Volume from own sources:	5	2,884.400	acre-ft/yr	3	1.54%	● ○		acre-ft/yr
Water imported:	9	4,406.970	acre-ft/yr	4	0.34%	● ○		acre-ft/yr
Water exported:	n/a		acre-ft/yr			● ○		acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 7,232.691 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

	Grade	Value	Unit	Pcnt:		Value:	Unit
Billed metered:	7	6,656.928	acre-ft/yr				
Billed unmetered:	n/a		acre-ft/yr				
Unbilled metered:	n/a	0.000	acre-ft/yr				
Unbilled unmetered:		90.409	acre-ft/yr	1.25%	● ○		acre-ft/yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: 6,747.337 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption) 485.354 acre-ft/yr

Apparent Losses

	Grade	Value	Unit	Pcnt:		Value:	Unit
Unauthorized consumption:		18.082	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

	Grade	Value	Unit	Pcnt:		Value:	Unit
Customer metering inaccuracies:	3	100.688	acre-ft/yr	1.49%	● ○		acre-ft/yr
Systematic data handling errors:		16.642	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 135.413 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)
Real Losses = Water Losses - Apparent Losses: 349.942 acre-ft/yr

WATER LOSSES: 485.354 acre-ft/yr

NON-REVENUE WATER
NON-REVENUE WATER: 575.763 acre-ft/yr
= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grade	Value	Unit
Length of mains:	10	211.1	miles
Number of active AND inactive service connections:	10	8,664	
Service connection density:		41	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes
Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 5 65.0 psi

COST DATA

	Grade	Value	Unit
Total annual cost of operating water system:	10	$7,055,094	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$3.26	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	5	$ 1,059.81	$/acre-ft

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 69 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Customer metering inaccuracies
3: Variable production cost (applied to Real Losses)

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Camrosa Water District (CA5610063)
Reporting Year: 2018 7/2017 - 6/2018

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

	Grade	Value	Unit	Grade	Pcnt:		Value:	Unit
Volume from own sources: + ?	5	4,246.870	acre-ft/yr	+ ? 3	-1.04%	● ○		acre-ft/yr
Water imported: + ?	5	3,984.100	acre-ft/yr	+ ? 9	0.48%	● ○		acre-ft/yr
Water exported: + ?	n/a		acre-ft/yr	+ ?		● ○		acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 8,256.569 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

	Grade	Value	Unit
Billed metered: + ?	7	7,546.243	acre-ft/yr
Billed unmetered: + ?	n/a		acre-ft/yr
Unbilled metered: + ?	n/a	0.000	acre-ft/yr
Unbilled unmetered: + ?		103.207	acre-ft/yr

Pcnt: 1.25% ● ○ Value: acre-ft/yr

Use buttons to select percentage of water supplied
OR
value

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

AUTHORIZED CONSUMPTION: ? 7,649.450 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption) 607.119 acre-ft/yr

Apparent Losses

	Grade	Value	Unit	Pcnt:		Value:	Unit
Unauthorized consumption: + ?		20.641	acre-ft/yr	0.25%	● ○		acre-ft/yr
Customer metering inaccuracies: + ?	4	114.140	acre-ft/yr	1.49%	● ○		acre-ft/yr
Systematic data handling errors: + ?		18.866	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 153.647 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 453.472 acre-ft/yr

WATER LOSSES: 607.119 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 710.326 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grade	Value	Unit
Length of mains: + ?	10	211.1	miles
Number of active AND inactive service connections: + ?	10	8,450	
Service connection density: ?		40	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 5 65.0 psi

COST DATA

	Grade	Value	Unit
Total annual cost of operating water system: + ?	10	$10,422,217	$/Year
Customer retail unit cost (applied to Apparent Losses): + ?	9	$3.27	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses): + ?	5	$880.89	$/acre-ft

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 61 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Water imported
3: Customer metering inaccuracies

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
+ Click to add a comment

Water Audit Report for: Camrosa Water District (CA5610063)
Reporting Year: 2017 | 7/2016 - 6/2017

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

WATER SUPPLIED

Master Meter and Supply Error Adjustments

							Pcnt:		Value:	
Volume from own sources:	+ ?	5	3,728.310	acre-ft/yr	+ ?	3		○ ●	-19.570	acre-ft/yr
Water imported:	+ ?	5	3,612.000	acre-ft/yr	+ ?	9		○ ●	-50.000	acre-ft/yr
Water exported:	+ ?	n/a		acre-ft/yr	+ ?			● ○		acre-ft/yr

WATER SUPPLIED: 7,409.880 acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ?
for help using option buttons below

					Pcnt:		Value:	
Billed metered:	+ ?	7	7,062.653	acre-ft/yr				
Billed unmetered:	+ ?	n/a		acre-ft/yr				
Unbilled metered:	+ ?	n/a		acre-ft/yr				
Unbilled unmetered:	+ ?	5	18.525	acre-ft/yr		○ ●	18.525	acre-ft/yr

Use buttons to select percentage of water supplied
OR
value

AUTHORIZED CONSUMPTION: ? 7,081.178 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption)

328.702 acre-ft/yr

Apparent Losses

					Pcnt:		Value:	
Unauthorized consumption:	+ ?		18.525	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	+ ?	7	106.825	acre-ft/yr	1.49%	● ○		acre-ft/yr
Systematic data handling errors:	+ ?		17.657	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 143.007 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 185.696 acre-ft/yr

WATER LOSSES: 328.702 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 347.227 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	+ ?	10	211.1	miles
Number of active AND inactive service connections:	+ ?	10	7,500	
Service connection density:	?		36	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 5 65.0 psi

COST DATA

Total annual cost of operating water system:	+ ?	10	$9,246,406	$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	9	$3.11	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	+ ?	5	$753.39	$/acre-ft

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 64 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Water imported
3: Variable production cost (applied to Real Losses)

APPENDIX N: SWRCB RESOLUTION No. 2020-0009

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2020-0009

REGULATION ON MONTHLY URBAN WATER CONSERVATION REPORTING

WHEREAS:

1. Climate change is increasing drought frequency and severity, reducing snowpack, and drying soils, making California’s water supplies more vulnerable;

2. Transparent and accessible monthly water use data help Californians prepare for and respond to drought, as data allow for informed and contemporaneous analysis and action;

3. Transparent and accessible monthly water use data are valuable to the public and institutions, including the media, universities, research centers, local and regional governments, non-governmental organizations, and water suppliers;

4. On July 15, 2014, the State Water Board adopted an emergency regulation to support water conservation (Resolution No. 2014-0038) that required urban water suppliers to report monthly on their water production, conservation-related implementation measures, and local enforcement actions starting with the June 2014 reporting period;

5. On March 17, 2015, the State Water Board amended and readopted the previous emergency regulation to further support water conservation (Resolution No. 2015-0013) and require urban water suppliers to continue monthly reporting per California Code of Regulations, title 23, section 865, subdivision (b)(2);

6. On May 5, 2015, the State Water Board amended and readopted the previous emergency regulation to further support water conservation (Resolution No. 2015-0032) and require urban water suppliers to continue monthly reporting per California Code of Regulations, title 23, section 865, subdivision (b)(2);

7. On February 2, 2016, the State Water Board amended and readopted the previous emergency regulation to further support water conservation (Resolution No. 2016-0007) and require urban water suppliers to continue monthly reporting per California Code of Regulations, title 23, section 865, subdivision (b)(2);

8. On May 18, 2016, the State Water Board amended and readopted the previous emergency regulation to further support water conservation (Resolution No. 2016-0029) and require urban water suppliers to continue monthly reporting per California Code of Regulations, title 23, section 865, subdivision (b)(2);

9. On February 8, 2017, the State Water Board amended and readopted the previous emergency regulation to further support water conservation (Resolution No. 2017-0004) and require urban water suppliers to continue monthly reporting per California Code of Regulations, title 23, section 865, subdivision (b)(2);

10. On May 9, 2016, the Governor issued Executive Order B-37-16 to make water conservation a way of life in California and directed the State Water Board to establish permanent reporting and data collection by urban water suppliers;

11. On April 7, 2017, the Governor issued Executive Order B-40-17, directing the State Water Board to continue development of permanent requirements for reporting water use by urban water agencies and require water use reporting until permanent requirements are in place;

12. On May 31, 2018, the Governor signed into law Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman) to improve water conservation and drought planning to help prepare California for longer, more intense droughts caused by climate change; this law authorizes the board, per Water Code section 10609.28, to issue a regulation requiring a wholesale water supplier, an urban retail water supplier, or a distributor of a public water supply, as that term is used in Section 350, to provide a monthly report relating to water production, water use, or water conservation;

13. Most urban water suppliers continue to provide monthly water production and conservation reports to the Board, however, the number of suppliers reporting has fallen, which reduces the value of data on water conservation;

14. In other reports, such as the Electric Annual Report, urban water suppliers indicate monthly production and delivery volumes on an annual basis; however, these reports have a significant lag time that can extend well over one year and so do not indicate changes in water use and conservation and enforcement actions, especially when shortages exist;

15. The proposed regulation will establish in California Code of Regulations, title 23, division 3, a new Chapter 3.5 on Urban Water Use Efficiency and Conservation, and within Chapter 3.5, a new Article 1 on Reporting that includes sections pertaining to conservation and use reporting by urban water suppliers;

16. The State Water Board is adopting the regulation as directed by former Governor Brown in Executive Order B-37-16 and B-40-17 to support water conservation and provide state agencies, water agencies, academia, and the public with near-real-time, machine-readable information on water consumption, conservation and enforcement actions that conforms to the requirements of the Open Data and Transparency Data Management Act in Water Code section 12400;

17. The data collected pursuant to the regulation will add to data collected pursuant to the expired emergency regulation (California Code of Regulations, title 23, sections 865 and 866). As was the case with the emergency regulations, any cautions, caveats and data limitations shall be clearly identified and noted;

18. Nothing in the regulation or in the enforcement provisions of the regulation precludes a local agency from exercising its authority to adopt more stringent conservation measures;

19. The Water Code does not impose a mandatory penalty for violations of the regulation adopted by this resolution, and local agencies retain the enforcement discretion in enforcing the regulation to the extent authorized;

20. Local agencies are encouraged to develop their own progressive enforcement practices to promote conservation, which may include the use of water budget-based rate structures.

THEREFORE BE IT RESOLVED THAT:

1. The State Water Board adopts California Code of Regulations, title 23, division 3, chapter 3.5 on Urban Water and Use Efficiency and Conservation and within this chapter, article 1, on Reporting, hereto attached; State Water Board staff will submit the regulation to Office of Administrative Law for final approval;

2. If, during the approval process, State Water Board staff, the State Water Board, or Office of Administrative Law determines that minor corrections to the language of the regulation or supporting documentation are needed for clarity or consistency, the State Water Board Executive Director or the Executive Director's designee may make such changes;

3. The State Water Board directs staff to provide the Board with regular updates on urban potable water usage and other information gleaned from the monthly reports and to report back to the Board periodically as to whether the reporting frequency required by this regulation should be changed;

4. The State Water Board directs staff to work with water suppliers to ensure data are reasonably accurate when reported and updated as needed;

5. The State Water Board directs staff to continue assessments of urban water data reporting needs and processes and to develop recommendations to streamline reporting and to make data more accessible and useful, per the requirements of Water Code section 10609.15, by April 1, 2021, recognizing that sound data management requires continuous improvement.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on April 21, 2020.

AYE: Chair E. Joaquin Esquivel
Vice Chair Dorene D'Adamo
Board Member Tam M. Doduc
Board Member Sean Maguire
Board Member Laurel Firestone

NAY: None

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board