RECLAMATION

Managing Water in the West

National Environmental Policy Act
FINDING OF NO SIGNIFCANT IMPACT

No.10-SCAO-003-FONSI

Groundwater Recovery Enhancement and Treatment (GREAT) Program
Ventura County, California

The Bureau of Reclamation (Reclamation) is providing American Recovery and Reinvestment Act (ARRA) funds to the City of Oxnard (City) to implement Phase 1 of the Groundwater Recovery Enhancement and Treatment (GREAT) Program in Ventura County, California. The project will install an Advanced Water Purification Facility and a Recycled Water Backbone system using an abandoned pipeline.

Based on our review and evaluation of a Program Environmental Impact Report (PEIR) certified by the City under the California Environmental Quality Act (CEQA) on September 14, 2004, and an Addendum dated November 21, 2006, we have determined that the proposed action does not constitute a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969. Accordingly, preparation of an environmental impact statement on the proposed action is not required.

Recommended: /s/ Date: 12/8/09
Doug McPherson, Environmental Protection Specialist

Reviewed By: /s/ Date: 12/8/09
Dennis Wolfe, Area Engineer

Approved: /s/ Date: 12/8/09
William J. Steele, Area Manager

U.S. Department of the Interior
Bureau of Reclamation
Lower Colorado Region
Southern California Area Office
Temecula, California

BACKGROUND

The GREAT Program is proposed on the Oxnard Plain in Ventura County, California, approximately 60 miles northwest of downtown Los Angeles and 35 miles south of Santa Barbara. The Oxnard Plain includes urban and suburban areas in the City of Oxnard and adjacent communities, as well as substantial agricultural areas. The primary sources of domestic water for the City are imported surface and groundwater from other water districts and groundwater wells.

Limitations on both local and imported water sources plus increasing cost of imported water prompted the City to study alternative water supply sources. The result was development of the Groundwater Recovery Enhancement and Treatment (GREAT) Program, a water resources project that combines wastewater recycling and reuse, groundwater injection, storage and recovery, and groundwater desalination.

The GREAT Program will be implemented in phases. Phase 1 includes an Advanced Water Purification Facility (AWPF) and a Recycled Water Backbone (RWB) system using an abandoned pipeline. The Phase 1 project will result in the capacity to recycle approximately 7,000 acre-feet of water annually for direct reuse and groundwater recharge. Ultimately, 28,000 acre-feet annually for will be produced for groundwater recharge as well as direct reuse.

Assistance Agreement No. R10AC35R12 provides Federal funding for Phase 1 of the GREAT Program. Elements to be funded include construction of the AWPF to produce recycled water and the RWB pipeline to transport the recycled water for use by the City. Identified environmental impacts were evaluated in a Program Environmental Impact Report (PEIR), SCH No. 2003011045, for the Oxnard GREAT Program certified under the California Environmental Quality Act (CEQA). The RWB pipeline was a minor modification addressed as an Addendum to the PEIR.

PURPOSE AND NEED

Existing water supply sources are insufficient to meet the City's growing demands and have limitations with respect to water costs and reliability. There is also a need to manage the water resources in the Oxnard Plain due to environmental impacts. Water users in the southern Oxnard Plain and Pleasant Valley areas rely on groundwater wells mainly for irrigation of crops. Groundwater recharge has not kept up with the rate of withdrawal resulting in a water imbalance condition.

The City currently discharges secondary treated effluent from the Oxnard Wastewater Treatment Plant (OWTP) directly to the City-permitted deep ocean outfall. This discharge currently does not contribute to the benefit of the region's water resources. Reclaiming this lost resource is the foundation of the GREAT Program. The AWPF will provide advanced treatment of the wastewater to allow reuse for municipal and industrial uses, groundwater injection to form a seawater intrusion barrier and agricultural irrigation.

AUTHORITY

Section 9113 of Public Law (PL) 111-11, the Omnibus Public Land Management Act of 2009, amended the Reclamation Wastewater and Groundwater Study and Facilities Act (Title XVI of PL 102-575) by adding Section 1654: Oxnard, California, Water Reclamation, Reuse and Treatment Project. The Secretary of the Interior in cooperation with the City of Oxnard, California, may participate in the design, planning and construction of Phase 1 permanent facilities for the GREAT project to reclaim, reuse and treat impaired water in the area of Oxnard California. This authority is delegated to Reclamation.

PROJECT DESCRIPTION

A map of the Phase 1 project is attached. The agreement covers construction of the AWPF and the RWB pipeline. The AWPF will have an initial capacity of 6.25 million gallons per day (mgd) of recycled water, capable of expansion to 25 mgd. The AWPF will produce recycled water that conforms to Title 22 recycled water standards established by the California Department of Public Health. The AWPF includes a multiple barrier treatment train consisting of microfiltration (MF), reverse osmosis (RO), and ultraviolet (UV)-light-based advanced oxidation (AOX) processes to purify the secondary effluent.

The Phase 1 project will also convert an abandoned sewer line to carry the Recycled Water Backbone Pipeline from the AWPF to the northwest portion of the City, serving municipal and industrial facilities along its route. The Recycled Water Backbone Pipeline includes approximately 22,000 feet of slip line, 6,000 feet of pipe burst and 21,100 feet of open cut with pipe sizes ranging from 8-inch to 32-inch.

ADOPTION OF EXISTING ENVIRONMENTAL DOCUMENT
The National Environmental Policy Act (NEPA) requires review of a proposed Federal action to determine its impact on the human environment. Council on Environmental Quality (CEQ) regulations direct Federal agencies to cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and State and local requirements (40 CFR 1506.2). Department of Interior regulations for implementing NEPA encourage tiering of environmental documents and provide for adoption of existing environmental documents if, upon evaluation by a responsible official, it is found to comply with relevant provisions of the CEQ regulations.

In accordance with CEQ regulations for implementing the procedural requirements of NEPA, Reclamation staff reviewed the GREAT PEIR and the Addendum to the PEIR and concluded that the documents adequately identify and disclose the reasonably foreseeable environmental effects of the proposed action. We adopt the documents as our Environmental Assessment in accordance with CEQ regulations (40 CFR 1506.3) and Department of the Interior regulations for implementing NEPA (43 CFR 46.320(a)).

ALTERNATIVES CONSIDERED
The PEIR assessed impacts to various alternatives, including Phase 1 of the GREAT Program, No Project, Purchase of Additional Groundwater or Surface Water, and Seawater Desalination.

Under the No Project Alternative, the goals of the GREAT Program would not be met and the beneficial impacts to groundwater recharge would not be realized.

Under the Purchase of Additional Groundwater or Surface Water Alternative, the City would purchase additional surface or groundwater to meet existing and projected future demands. Existing water supply sources are limited due to groundwater overdraft and pumping restrictions. This alternative would result in significant economic ramifications for the City and result in worsening of groundwater overdraft conditions in the Oxnard Plain aquifer. Imported surface water would be purchased at a premium cost and has the potential to contribute to adverse effects to northern California Bay-Delta ecosystems through increased cumulative demands on their water sources.

The Seawater Desalination Alternative includes economically infeasible costs on the scale necessary to meet the proposed GREAT Program objectives. Also, local water would not be recycled under this alternative.

The Preferred Action is to construct and implement Phase 1 of the GREAT Program. Reclamation's agreement with the City will provide partial funding for the AWPF and RWBS project.

SUMMARY OF CEQA FINDINGS AND OTHER FEDERAL REQUIREMENTS
The City prepared a PEIR and Addendum for the GREAT Program which determined that impacts to the environment are not significant. Mitigation measures will be implemented by the City to reduce potential impacts to less than significant in the areas of Land Use, Cultural Resources, Paleontological Resources, Water Resources, Air Quality, Traffic and Transportation, Noise, Visual Resources/Aesthetics, Public Services and Utilities, and Hazardous Materials and Waste. Construction impacts will be temporary. Refer to the attached PEIR Executive Summary for additional details.

Subsequent to PEIR certification, changes to the recycled water delivery system were proposed. The GREAT Program did not consider municipal and industrial use within the City for the recycled water. However, the City recently abandoned the Redwood Trunk sewer line that extended from the northwest portion of the City to the OWTP. This abandoned sewer line will be converted to carry a Recycled Water Backbone Pipeline from the AWPF to the northwest portion of the City, serving municipal and industrial facilities along its route. An addendum to the GREAT Program PEIR regarding the City of Oxnard Recycled Water Use Ordinance and Recycled Water Backbone System is attached.

<u>Geology Soils and Mineral Resources</u>
An unavoidable significant environmental impact in the area of Geology Soils and Mineral Resources is identified in the PEIR. The AWPF will be located within a tsunami hazard zone and may pose a risk to workers at the staffed facility during construction and operation. The existing tsunami warning system is effective for earthquakes generated beyond the Santa Barbara Channel. It is ineffective for tsunamis generated by earthquakes on local offshore faults. Geologic hazards associated with tsunamis are present with or without implementation of this project.

Land Use

The AWPF site is located in a designated industrial use area and will be compatible with existing and planned uses of the neighborhood. The RWBS pipeline is located almost entirely within existing paved roadways. The pipeline would be buried at a depth that will allow agricultural operations to continue, excavated soils would be stock piled and replaced, and the pipeline construction area would be returned to its preconstruction condition. No Prime or Unique Farmland will be removed from production by the pipeline facilities proposed as part of this project.

Cultural Resources

The proposed AWPF is located within the vicinity of the Oxnard Wastewater treatment facilities and other industrial facilities and will not have impacts on cultural resources. In general, the proposed RWBS pipelines will replace an existing abandoned pipeline and/or be placed within or adjacent to existing roadways. The existing roadways are already extensively disturbed from road construction, buried utilities, other industrial and urban development, and agricultural practices. The proposed project avoids historic properties. Reclamation will conduct consultations under the National Historic Preservation Act, including Native American consultations, as required.

Paleontological Resources

Construction activities for the AWPF and RWBS in previously disturbed areas and at depths less than a few feet below grade will have no impact on paleontological resources. No fossil site is recorded as being discovered in the younger alluvium of the Oxnard Plain within the proposed depth of excavation for the project in the immediate vicinity of the project site. Direct impacts may result from earth moving activities in previously undisturbed strata. The proposed project is not likely to have significant impacts on paleontological resources.

Water Resources

Construction and operation of the proposed project has the potential to impact surface water hydrology and water quality, surface drainage/flooding, ocean water quality, and groundwater hydrology and quality. The project will incorporate specific design features and construction measures, including best management practices, in compliance with applicable federal, state, and local regulations and standards, identified in more detail in the PEIR. This includes compliance with the Clean Water Act and any required permits under that act. Construction of the AWPF and RWBS will not result in significant water resources impacts with implementation of these measures.

Coastal Zone

The AWPF is located within the City, outside of the Coastal Zone boundary. Sections of the proposed pipelines are located within the Coastal Zone. The City of Oxnard Coastal Land Use Plan standards will apply to these pipeline sections. No significant impacts to coastal resources will result from the construction of the AWPF and RWBS.

Air Quality

Impacts to air quality will be temporary during construction activities. Fugitive dust will be controlled during grading, excavation, and construction activities, as described in the attached PEIR Executive Summary. This project will have no significant impacts on air quality. Emissions will not exceed Clean Air Act conformity applicability *de minimis* thresholds at 40 CFR 93.153(b) and will not be regionally significant.

Traffic and Transportation

Impacts to traffic and transportation will be temporary during construction activities. The City will require and approve a Transportation Management Plan for construction activities. This project will have no significant impacts on traffic and transportation.

Noise

Noise impacts will be temporary during construction activities and will be minimized following measures described in the attached PEIR Executive Summary. The project will have no significant noise impacts.

Visual Resources/Aesthetics

Above ground structures will be designed to be consistent with the Community Design Element of the City of Oxnard 2020 General Plan and finished with a non-reflective material to reduce glare. Lighting will be limited to areas required for safety and directed and shielded to reduce light scatter and glare. Following construction, pipeline corridors will be returned to pre-existing or better conditions. Construction will be conducted consistent with the Ventura County General Plan and City of Oxnard 2020 General Plan. This project will have no significant impacts on Visual Resources/Aesthetics.

Public Services and Utilities

Theft/vandalism deterrents such as fencing will be employed to protect construction and facility equipment. Prior to construction, underground utilities will be identified for avoidance. This project will have no significant impacts on Public Services and Utilities.

Hazardous Materials/Waste

The project will incorporate specific project design features and construction measures, including best management practices, in compliance with applicable federal, state, and local regulations and standards for hazardous materials, described in more detail in the PEIR. The City will employ general procedures, identified in more detail in the PEIR, to avoid potential significant effects associated with the handling and disposal of hazardous wastes. Construction of the AWPF and RWBS will not result in significant hazardous materials and waste impacts with implementation of these measures.

Socioeconomics/Environmental Justice

Socioeconomic effects of the proposed project are expected to be generally beneficial. No significant impacts to socioeconomic/environmental justice will result from this project.

Wetlands and Floodplain

No jurisdictional wetlands will be impacted by this project.

Endangered Species Act

The action will not affect Federally-listed species or designated critical habitat. Within the areas directly affected by the Project, there are no federally-listed species. In adjacent aquatic and terrestrial habitats, the EIR identified the following listed species: Ventura marsh milkvetch (*Astragalus pycnostachyus* var. *lanosissimus),* Salt marsh bird's beak (*Cordylanthus maritimus* ssp. *maritimus),* California brown pelican (*Pelecanus occidentalis californicus*), California least tern (*Sterna antillarum brownii*), Light-footed clapper rail (*Rallus longirostris levipes*), Western snowy plover (*Charadrius alexandrinus nivosus*), and tidewater goby (*Eucyclogobius newberry*). Federally protected marine mammals include northern elephant seal (*Mirounga angustirostris*), California sea lion (*Zalophus californianus*), and harbor seal (*Phoca vitulina*). The habitats where these species occur will not be disturbed.

Critical habitat has been designated for the western snowy plover (*Charadrius alexandrinus nivosus*) along Ormond Beach and a portion of the NBVC Point Mugu. Western snowy plover nests in depressions or scrapes on the open sandy beach, and forages along the shoreline. The project will not impact plover critical habitat. No other critical habitat has been designated in the area.

Sensitive Management Areas

Most of the affected Project area consists of agricultural lands, annual (ruderal) grasslands, and landscaped vegetation with little habitat value. Undisturbed open lands are present in the general vicinity, including coastal and inland marshes, and beach strand and coastal dune. Aquatic estuarine and marine habitats are also present in the vicinity. No significant impacts to natural aquatic or terrestrial habitats will occur from this project.

Mugu Lagoon National Wildlife Refuge, the Channel Islands National Marine Sanctuary, and the City of Oxnard General Plan Resource Protection Zone are all present in the general vicinity of the Project. The nearest management area, the City Resource Protection Zone, is at least 1500 feet away from all project elements. The other management areas are several miles at the closest point to any Project elements. None of these management areas will be impacted by the Project.

The Pacific Fishery Management Council has designated Essential Fish Habitat for Pacific Coast groundfish and northern anchovy/coastal pelagics within marine and estuarine areas within the general Project area. This project will not impact these habitats.

Indian Trust Assets

No known Indian Trust Assets will be impacted.

Wild and Scenic Rivers
No creeks in the region will be directly disturbed and none are designated Wild and Scenic Rivers.

AGENCY CONSULTATION AND COORDINATION

Fish and Wildlife Service
Consultant staff contacted the Ventura Fish and Wildlife Office during preparation of the PEIR. The United States Fish and Wildlife Service provided a letter documenting species concerns within the area.

California State Historic Preservation Officer (SHPO)
Reclamation will consult with the SHPO as required to comply with the National Historic Preservation Act.

California Coastal Commission
Coastal Zone Management Act consistency certification is not needed.

REFERENCES

Groundwater Recovery Enhancement and Treatment (GREAT) Program Final Environmental Impact Report, prepared for City of Oxnard by CH2M HILL, May 2004. State Clearinghouse Number 2003011045.

Addendum to the GREAT Program Environmental Impact Report, approved by the Oxnard City Council, November 21, 2006.

ATTACHMENTS

1) Map
2) Addendum to GREAT Program EIR
3) GREAT Program EIR Executive Summary

Groundwater Recovery Enhancement and Treatment (GREAT) Program

Final
Program Environmental Impact Report
SCH # 2003011045

Prepared for

City of Oxnard
251 South Hayes Avenue
Oxnard, California 93030

Prepared by

CH2MHILL
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May 2004

Groundwater Recovery Enhancement and Treatment (GREAT) Program

Final
Program Environmental Impact Report
SCH # 2003011045

City of Oxnard

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May 2004

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Contents

Appendix

Appendix A
Mitigation Monitoring and Reporting Plan

Mitigation Monitoring and Reporting Plan

The Draft PEIR indicates that with the exception of the small but finite safety risk associated with project elements located in the tsunami hazard zone (a safety risk which is present with or without implementation of the GREAT Program), no long-term significant impacts will result from Phase 1 of the proposed project with implementation of proposed mitigation measures. Specifics of Phase 2, most notably its particular components and the quantities of water that it will produce, cannot be determined with certainty at this time because they depend on several factors that cannot be quantified until after the implementation of Phase 1. The Draft PEIR provided analysis of potential Phase 2 facility and pipeline impacts and where applicable, proposed mitigation for these potential impacts, which are included in this MMRP. As Phase 2 is dependent upon the results of implementing Phase 1, Phase 2 mitigation measures identified in this MMRP will be re-evaluated following implementation of Phase 1 to further develop the details of these measures. Phase 2 mitigation measures will be further defined and addressed in future environmental documentation conducted for Phase 2.

The following illustrates the resource areas that have been determined to require mitigation measures.

Resource Area	Draft PEIR Section Where Impacts and Mitigation Measures are Identified	Are Mitigation Measures Required to Reduce Impacts to Less-Than-Significant?
Land Use	4.2	Yes
Geology, Soils, and Mineral Resources	4.3	Yes
Cultural Resources	4.4	Yes
Paleontological Resources	4.5	Yes
Water Resources	4.6	Yes
Biological Resources	4.7	Yes
Air Quality	4.8	Yes
Traffic and Transportation	4.9	Yes
Noise	4.10	Yes
Visual Resources/Aesthetics	4.11	Yes
Public Services and Utilities	4.12	Yes
Hazardous Materials and Waste	4.13	Yes
Socioeconomic/Environmental Justice	4.14	No

This MMRP is intended to facilitate the tracking of all mitigation measures, especially those monitoring actions that will continue through the life of the proposed project (Phase 1 and Phase 2).

The Plan contains information on potential impacts, both significant and otherwise during Phase 1 and Phase 2; measures that will be taken to mitigate those impacts; how monitoring will be accomplished; who will be the responsible party; and when implementation of the mitigation measures will occur. More detailed information on each issue can be found in the Draft PEIR section covering the specific resource area as outlined above.

The City of Oxnard will include this mitigation monitoring and reporting plan, and all related measures and conditions, as part of the construction contract specifications for the GREAT Program. Prior to construction activities commencing, a more detailed Mitigation Implementation Plan (MIP) will be developed for construction.

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
LU-1	A General Plan Amendment would be obtained for a land use designation change at the TTF site from Medium Residential to Industrial.	Project Applicant	City of Oxnard	City will confirm proposed development is consistent with land use designation prior to initiation of construction.	Preconstruction/N/A	
LU-2	The pipeline will be buried at a depth so as not to interfere with the use of the land for active agricultural activities, including tilling, planting, etc.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Plan Review /N/A Construction/Periodic	
LU-3	Soil excavated for placement of the pipeline will be stockpiled and replaced once the pipeline is installed.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	
LU-4	The pipeline construction area will be returned to preconstruction conditions and grade.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections to verify compliance.	Construction/At completion of pipeline construction	
GEO-1	Conduct a site-specific geotechnical analysis to support the design and construction of GREAT Program elements.	Project Applicant	Geotechnical Engineer/ Engineering Geologist	City engineers will monitor construction and excavation activities to verify compliance.	Project Design/N/A	
GEO-2	Conduct all grading and excavation operations in accordance with local erosion-control ordinances.	Project Applicant	Geotechnical Engineer/ Engineering Geologist	City engineers will monitor construction and excavation activities to verify compliance.	Construction/N/A	
GEO-3	Develop and implement a Storm Water Pollution Prevention Plan (SWPPP) using best management practices to reduce erosion and sedimentation.	Project Applicant	Geotechnical Engineer/ Engineering Geologist	City engineers will monitor construction and excavation activities to verify compliance.	Project Design/Periodic Construction/Periodic Operation/Periodic	
GEO-4	Limit soil erosion and dust generation by periodically applying water to graded areas, excavations, and soil stockpiles.	Project Applicant	Geotechnical Engineer/ Engineering Geologist	City will conduct periodic inspections and document construction activities to verify compliance.	Construction/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
CUL-1	The preferred mitigation measure under CEQA is avoidance. Sites that are avoided must also be protected from inadvertent impacts associated with construction. The standard mitigation measure for archaeological sites that cannot be avoided is usually data recovery through excavation, data analysis, and report preparation. Native American consultation would be undertaken as part of this mitigation measure. Impacts to historic standing structure resources that cannot be avoided can often be mitigated through documentation. In addition, relocation of the structure(s) may also be considered as a method of mitigation. Sites that are recommended for avoidance are as follows: • P-56-150013 • P-56-150014 • P-56-150020 • P-56-150023 • P-56-000000 (4550 Olds Road) • P-56-000000 (Historic Isolate) • P-56-000000 (3534 Etting Road) • P-56-000000 (3542 Etting Road) • P-56-150027 • P-56-150028 • P-56-150029 • P-56-000000 (4529 Hueneme Road) • P-56-000000 (4484 Naval Air Road #28) • P-56-000000 (4456 Naval Air Road #52) Based on the proposed location of GREAT Program elements, the recommended avoidance of potentially significant cultural resources will not result in any significant revisions to the proposed project.	Project Applicant	Cultural Resources Professional	City's archaeologist will monitor construction and excavation activities to verify compliance. City will consult with Native Americans for review. City will relocate unavoidable structure(s).	Preconstruction/As required Construction/As needed	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
CUL-2	The impact to cultural resources related directly or indirectly to the project-related destruction of archaeological resources shall be reduced to below the level of significance. This shall include the recovery or treatment of archaeological resources encountered during any archaeological site investigations or monitoring of ground-disturbing activities (construction) in areas with the potential to contain archaeological resources. It is known that monitoring will be required due to the possibility of encountering subsurface cultural materials on Fifth Street and Channel Island Boulevard. At Fifth Street, monitoring will be required along the pipeline alignment within an area about 200 meters north and south of the intersection of Rose Avenue and Fifth Street, continuing east on Fifth Street to Rice Avenue, then north on Rice Avenue to Sturgis Road. Monitoring also will be required along the pipeline alignment within an approximate 200-meter radius of the intersection of Rice Avenue and Channel Island Boulevard. Sites that are recommended for monitoring during construction are as follows: • CA-VEN-506 • CA-VEN-666 • CA-VEN-726 • CA-VEN-789 • CA-VEN-918 When investigations identify unique archaeological resources as defined in Section 21083.2 of the Public Resources Code, the site shall be subject to specified requirements for treatment. Any area where unique archaeological resources are not identified, but the materials recovered from shovel test pits indicate the potential presence of unique archaeological resources, shall be reported to the City of Oxnard.	Project Applicant	Cultural Resources Professional	City's archaeologist will recover and treat archaeological resources encountered during archaeological site investigations and/or monitoring. Materials recovered from shovel test pits shall be reported to the City of Oxnard. City's qualified archaeologist will implement a monitoring and recovery program in any area identified as having the potential to contain unique archaeological resources. City's qualified archaeologist shall monitor earth-moving activities in areas that are likely to contain unique archaeological resources. The project proponent shall provide the archaeologist with the necessary resources to identify and implement a program for the appropriate disposition as specified by Section 15064.5(e) of the CEQA Guidelines. City's qualified archaeologist will secure a written agreement with a recognized museum repository regarding the final disposition and permanent storage and maintenance of any unique archaeological resources recovered.	Construction/As needed	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
	Where any respective element of the project is expected to require earthmoving in soils at depths greater than 1 foot bgs, the City of Oxnard shall require that the following program be implemented and that the requirement be duly noted in project plans and specifications: • Retain a qualified archaeologist to implement a monitoring and recovery program in any area identified as having the potential to contain unique archaeological resources. • A qualified archaeologist shall monitor earth-moving activities in areas that are likely to contain unique archaeological resources. The archaeologist shall be authorized to halt construction, if necessary, in the immediate area where buried cultural remains are encountered. Prior to the resumption of grading activities in the immediate vicinity of the cultural remains, the project proponent shall provide the archaeologist with the necessary resources to identify and implement a program for the appropriate disposition as specified by Section 15064.5(e) of the CEQA Guidelines. • The selected archaeologist shall be required to secure a written agreement with a recognized museum repository regarding the final disposition and permanent storage and maintenance of any unique archaeological resources recovered as a result of the archaeological monitoring. This would also include corresponding geographic site data that might be recovered as a result of the specified monitoring program. The written agreement for the disposition of recovered artifacts shall specify the level of treatment (preparation, identification, curation, cataloging) required before the collection would be accepted for storage.			City's qualified archaeologist shall attend a preconstruction meeting to provide information regarding regulatory requirements for the protection of unique archaeological resources. City's qualified archeologist will train construction personnel on procedures to follow in the event that a unique archaeological resource is encountered during construction. City's qualified archaeologist will stop site disturbance until the specified conditions are met.		

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
	• The selected archaeologist shall attend a preconstruction meeting to provide information regarding regulatory requirements for the protection of unique archaeological resources. Construction personnel shall be trained on procedures to be followed in the event that a unique archaeological resource is encountered during construction. In addition, the archaeologist shall ensure that the preconstruction meeting participants are trained to notify the Ventura County Medical Examiner (coroner) within 24 hours of the discovery of human remains. Upon discovery of human remains, there shall be no further excavation or disturbance of the site or any reasonably nearby area suspected to overlie adjacent human remains until the following conditions are met: – The Ventura County Medical Examiner has been informed and has determined that no investigation of the cause of death is required, and if the remains are of Native American origin, the descendants of the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98.					

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
CUL-3	The City of Oxnard shall ensure that potential impacts to affected archaeological sites are minimized to below the level of significance. The City of Oxnard shall complete preconstruction site surveys to determine sites that would be potentially affected. Those sites that are determined to be eligible for listing in the CRHR shall be treated in accordance with one of the three feasible measures described in the "CEQA and Archaeological Resources," CEQA Technical Advice Series: • Capping (covering) the site with a level of soil prior to construction over the site • Incorporation into open space areas of the project site • Excavation where the first two measures are not feasible For eligible sites, the City of Oxnard shall, prior to construction, implement the applicable treatment plan.	Project Applicant	Cultural Resources Professional	City shall complete pre-construction site surveys to determine sites that would be potentially affected.	Preconstruction/As needed	
CUL-4	For routine maintenance and repair activities that occur during project operation, facility personnel shall take into consideration and avoid any cultural resources in the immediate vicinity. Measures shall include, but not be limited to, monitoring during excavation in previously unexcavated areas. Procedures shall be in accordance with those described in Measure CUL-2 for project construction. If necessary, Mitigation Measure CUL-3, shall be implemented.	Project Applicant	Cultural Resources Professional	City's Archeologist will conduct periodic monitoring to ensure compliance.	Project Operation/ Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
PALEO-1	Retention of Paleontologist. Prior to construction, the services of an approved paleontologist will be retained to implement mitigation measures during earth-moving activities and to verify the effectiveness of the measures.	Project Applicant	Paleontological Resources Professional	City will retain a qualified paleontologist.	Preconstruction/N/A	
PALEO-2	Museum Storage Agreement. The paleontologist will develop a formal agreement with a recognized museum repository, such as the Los Angeles County Museum of Natural History Vertebrate Paleontology Department (LACMVP), regarding final disposition and permanent storage and maintenance of any fossil remains and associated specimen data. This would also include corresponding geologic and geographic site data that might be recovered as a result of the mitigation program and the level of treatment (preparation, identification, curation, cataloguing) of the remains that would be required before the entire mitigation program fossil collection would be accepted for storage by the repository.	Project Applicant	Paleontological Resources Professional	City's paleontologist will develop a formal agreement with a recognized museum repository regarding final disposition and permanent storage and maintenance of any fossil remains and associated specimen data.	Preconstruction/N/A	
PALEO-3	Preconstruction Coordination. The paleontologist or monitor will coordinate with construction personnel to provide information regarding regulatory requirements for the protection of paleontologic resources. Construction personnel also will be briefed on procedures to be followed in the event that a fossil site or fossil occurrence is encountered during construction, particularly when the monitor is not onsite. The briefing will be presented to new construction personnel as necessary. Names and telephone numbers of the monitor and appropriate project contact will be provided to the construction manager.	Project Applicant	Paleontological Resources Professional	City's paleontologist or monitor will coordinate with construction personnel to ensure compliance.	Preconstruction/As needed	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
PALEO-4	Paleontologic Monitoring and Fossil/Sample Recovery. Earth-moving activities will be monitored only in those areas where these activities will disturb previously undisturbed strata (monitoring will not be conducted in areas underlain by artificial fill, except to ensure that a monitor is present when the underlying younger alluvium is encountered by these activities). Monitoring will be conducted on a half-time basis in areas underlain by the younger alluvium once these activities have reached a depth 5 feet belowgrade. This depth is the monitoring threshold most widely accepted by other CEQA agencies for areas underlain by younger alluvium because it is considered the shallowest depth at which remains old enough to be considered fossilized might be encountered. Monitoring will not be conducted in areas where earth-moving activities do not reach this depth. Following the discovery of fossil remains, monitoring will occur full time in the vicinity of the fossil site. On the other hand, if no fossil remains are found once 50 percent of earth-moving activities have been completed in a particular portion of the project site, monitoring can be reduced or suspended in that area. Monitoring will consist of visually inspecting debris piles and freshly exposed strata for larger fossil remains, and periodically dry test screening sediment, rock, and debris for smaller fossil remains. As soon as practical, the monitor will recover all vertebrate fossil specimens, a representative sample of invertebrate or plant fossils, or any fossiliferous rock sample that can be recovered easily. If recovery of a large or unusually productive fossil occurrence is warranted, earth-moving activities will be diverted temporarily around the fossil site; and a recovery crew will be mobilized as necessary to remove the occurrence as quickly as possible. If the paleontological monitor is not onsite when a fossil occurrence is uncovered, earth-moving activities will be diverted temporarily around the fossil site; and the monitor called to evaluate and, if warranted, remove the occurrence.	Project Applicant	Paleontological Resources Professional	City's paleontologist will monitor construction and excavation activities to verify compliance. City's paleontologist monitor will recover all qualifying fossil samples that can be recovered easily. City's paleontologist monitor will document the proper geologic context of any fossil occurrence as appropriate. City may temporarily divert earth-moving activities around fossil sites to ensure compliance.	Construction/As needed	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
	If the fossil site is determined too unproductive or the fossil remains not worthy of recovery, no further action will be taken; and earth-moving activities will be allowed to proceed immediately. The proper geologic context of any fossil occurrence will be documented as appropriate. Any recovered rock sample will be processed to allow for the recovery of smaller fossil remains.					
PALEO-5	Final Laboratory Tasks. Fossil specimens recovered from the project site as a result of the mitigation program, including those recovered as the result of processing fossiliferous rock samples, will be treated (prepared, identified, curated, catalogued) in accordance with designated museum repository requirements. Samples will be submitted to laboratories for microfossil, pollen, or carbon-14 dating analysis.	Project Applicant	Paleontological Resources Professional	City's paleontologist will submit fossil samples recovered from the project site to laboratories for analysis.	Postconstruction/As needed	
PALEO-6	Reporting. The monitor will maintain daily monitoring logs that will include the particular tasks accomplished, the earth-moving activity monitored, the location where monitoring was conducted, the rock unit encountered, fossil specimens recovered (if applicable), and associated specimen data and corresponding geologic and geographic site data. A final technical report of results and findings will be prepared by the paleontologist and submitted to the City of Oxnard.	Project Applicant	Paleontological Resources Professional	City's paleontologist monitor will maintain daily monitoring logs and submit a final technical report to the City of Oxnard.	Construction/Daily Postconstruction/N/A	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
WR-1	The project will incorporate specific project design features and project construction measures, including best management practices, in compliance with the following applicable federal, state, and local regulations and standards: Federal Standards • Clean Water Act – NPDES Program – Total Maximum Daily Loads • Underground Injection Control Program State Standards • State Water Resources Control Board – Porter-Cologne Water Quality Control Act – State Antidegradation Policy – State Water Reclamation Policy – Ocean Plan • Regional Water Quality Control Board (Region 4) Water Quality Control Plan – State Waste Discharge Requirements – Water Reclamation Requirements – NPDES Program – General WDRs and NPDES Permit for Discharges of Groundwater – General NPDES Permit for Discharges of Stormwater – Total Maximum Daily Loads • Regional Water Quality Control Board Section 401 Certification • DHS Domestic Water Supply System for Potable Use • DHS Recycled Water for Nonpotable Use • DHS Recycled Water for Indirect Potable Use	Project Applicant	City of Oxnard Water Division	City will review project construction plans and specifications to verify compliance with applicable regulations and standards.	Project Design/N/A	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
	Local Standards • Fox Canyon Groundwater Management Agency Ordinances • Ventura County Well Permit Ordinance • Ventura County Watercourse Encroachment Permit • Countywide NPDES Municipal Stormwater Permit					
BIO-1	Impacts to vegetation, including annual grassland, landscaped, and agricultural, are anticipated to be less than significant, so no mitigation is proposed. However, to reduce the potential for erosion, standard BMPs will be implemented during construction; they will include the following: • Use of silt fencing, sandbagging, or certified weed-free hay bales to contain runoff and trap sediment • Use of biodegradable slope protection fabrics on exposed slopes steeper than 3:1 (3 feet vertical: 1 foot horizontal) • Minimizing construction in the rainy season as feasible • Hydroseeding areas of exposed earth with a native hydroseed mix once construction is complete	Project Applicant's Construction Contractor	Qualified Biological Professional	City will verify that standard BMPs are implemented during each phase of construction.	Construction/As needed Postconstruction/As needed	
BIO-2	Drainage channels within the project area are anticipated to be under jurisdiction of the federal Clean Water Act of 1972, as well as Section 1600 of the California Fish and Game Code. As such, project activities potentially affecting drainage channels will require permitting and agreements by the USACE, CDFG, and the RWQCB. Impacts to the channels will be mitigated through compliance with permits and agreements; this will include implementation of mitigation measures that may include on- or offsite habitat restoration and construction BMPs.	Project Applicant	Qualified Biological Professional	City will verify the permitting agreements with USACE, CDFG, and RWQCB are approved and mitigation is implemented in compliance with these agreements.	Preconstruction/N/A Construction/As required	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
BIO-3	To ensure that no impacts will occur to sensitive plants, preconstruction surveys for special-status plants will be conducted prior to ground-disturbing activities at undeveloped/vacant sites. If identified during surveys, mitigation will be developed in coordination with resource agencies. It may include relocation of affected plants, seed collection and replanting, and/or topsoil collection and replacement after construction is complete.	Project Applicant	Qualified Biological Professional	City will verify that preconstruction surveys for special-status plants are conducted and if required, that mitigation measures are developed and implemented.	Preconstruction/As required Postconstruction/As required	
BIO-4	Thirty days prior to construction activities, a qualified biologist shall conduct a survey to determine if the burrowing owl is present at the site, and the nesting status of the individuals at the site. If nesting is not occurring, construction work can proceed after any owls have been evacuated from the site using CDFG-approved burrow closure procedures. If nesting is occurring, construction work shall be delayed until fledglings have left the nest.	Project Applicant	Qualified Biological Professional	City will verify that preconstruction surveys for burrowing owl are conducted by a qualified biologist and if required, that mitigation measures are developed and implemented in compliance with CDFG's burrowing owl procedures. City may delay construction work to ensure compliance.	Preconstruction (30 days prior to construction activities)/As required	
BIO-5	Mitigation to reduce impacts to nesting raptors will include preconstruction surveys 30 days prior to construction activities within 500 feet of the proposed construction area. A qualified biologist shall conduct a survey to determine if any raptors are nesting in large trees or in adjacent (ruderal) grasslands. If nesting is not occurring, construction work can proceed. If an active nest is present, construction work shall be delayed until fledglings have left the nest. With mitigation, the potential impacts would be reduced to less than significant.	Project Applicant	Qualified Biological Professional	City will verify that preconstruction surveys for raptors are conducted by a qualified biologist and if required, that mitigation measures are developed and implemented. City may delay construction work to ensure compliance.	Preconstruction (30 days prior to construction activities)	
AQ-1	The area disturbed by clearing, grading, earth moving, or excavation operations shall be as small as feasible to prevent excessive dust.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
AQ-2	Pregrading/excavation activities shall include watering the area to be graded or excavated before commencement of grading or excavation. Application of water (reclaimed, if available) shall penetrate sufficiently to minimize fugitive dust during grading activities. This measure would reduce unmitigated PM_{10} emissions from grading and excavation by approximately 34 to 68 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	
AQ-3	Trucks shall be required to cover their loads as required by California Vehicle Code 23114. This measure would reduce unmitigated PM_{10} emissions from truck hauling by approximately 7 to 14 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	
AQ-4	Graded and excavated material, exposed soil areas, and active portions of the construction site, including unpaved onsite roadways, shall be treated to prevent fugitive dust. Treatment shall include, but not be limited to, periodic watering, application of environmentally safe soil stabilization materials, and/or roll compaction as appropriate. Watering shall be done as often as necessary, and reclaimed water shall be used whenever possible. This measure would reduce unmitigated wind-blown PM_{10} emissions from active areas by approximately 30 to 74 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance. City will ensure that Construction Contractor implements preventative fugitive dust treatment as appropriate.	Construction/Periodic – As appropriate	
AQ-5	Inactive graded and/or excavated areas shall be monitored at least weekly for dust stabilization. Soil stabilization methods, such as water and roll-compaction, and application of environmentally safe dust control materials, shall be periodically implemented to portions of the construction site that are inactive for over 4 days. If no further grading or excavation operations are planned for the area, the area shall be seeded and watered until grass growth is evident, or the area would be periodically treated with environmentally safe dust suppressants to prevent excessive fugitive dust. This measure would reduce unmitigated wind-blown PM_{10} emissions from inactive previously disturbed areas by approximately 30 to 65 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections to ensure Construction Contractor is monitoring inactive graded and/or excavated areas at least weekly for dust stabilization. City will conduct periodic inspections to ensure Construction Contractor is implementing soil stabilization methods to portions of the construction site that are inactive for over 4 days.	Construction/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
				City will conduct periodic inspections to ensure Construction Contractor is treating areas, which will no longer be graded or excavated, with environmentally safe dust suppressants to prevent excessive fugitive dust.		
AQ-6	Signs shall be posted onsite limiting traffic to 15 miles per hour or less. This measure would reduce unmitigated PM_{10} emissions from unpaved roads by approximately 40 to 70 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections of activities to verify compliance.	Construction/Periodic	
AQ-7	During period of high winds (i.e., wind speed sufficient to cause fugitive dust to impact adjacent properties), clearing, grading, earth moving, and excavation operations shall be curtailed to the degree necessary to prevent fugitive dust created by onsite activities and operations from being a nuisance or hazard, to offsite properties. The site superintendent/supervisor shall use discretion in conjunction with the APCD in determining when winds are excessive.	Project Applicant's Construction Contractor	City of Oxnard	City will verify that clearing, grading, earth moving, and excavation operations are curtailed as appropriate during periods of high winds.	Construction/As appropriate	
AQ-8	Adjacent streets and roads shall be swept at least once per day, preferably at the end of the day, if visible soil material is carried over to adjacent streets and roads. This measure would reduce unmitigated PM_{10} emissions from adjacent paved roads by approximately 25 to 60 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will verify that adjacent streets and roads are swept once per day if visible soil material is carried over from construction activities.	Construction/As needed	
AQ-9	Personnel involved in grading operations, including contractors and subcontractors, shall be advised to wear respiratory protection in accordance with California Division of Occupational Safety and Health Administration (OSHA) regulations.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
AQ-10	Crews from local populations shall be hired where possible because it is more likely that they have been previously exposed to the fungus and are, therefore, immune.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-11	Crews shall be required to use respirators during project clearing, grading, and excavation operations in accordance with California Division of OSHA regulations.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	
AQ-12	Cabs of grading and construction equipment shall be air conditioned.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-13	Work crews shall be required to work upwind from the excavation sites.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-14	Construction roads shall be paved or treated with an environmentally safe dust suppressant. This measure would reduce unmitigated PM_{10} emissions from construction roads by approximately 92 percent if paved, or 45 to 85 percent if a dust suppressant is applied.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-15	Where acceptable to the fire department, weed growth shall be controlled by mowing instead of disking, thereby leaving the ground undisturbed and with a mulch.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-16	During rough grading and site development, the primary access roads into the Specific Plan Area from adjoining paved roadways shall be treated with environmentally safe dust control agents.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-17	Equipment idling time shall be minimized.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
AQ-18	Equipment engines shall be maintained in good condition and in proper tune in accordance with manufacturers' specifications.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
AQ-19	Use alternatively fueled construction equipment, such as compressed natural gas (CNG), liquefied natural gas (LNG), or electric, if feasible. This measure would reduce ROG emissions from construction equipment by approximately 54 percent, but would increase NO_x emissions by approximately 29 percent.	Project Applicant's Construction Contractor	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
TRANS-1	To address lane closure impacts to study area roadways due to construction of Phase 1, the GREAT construction contractor will be required prepare a construction TMP that would be approved by the City of Oxnard and County of Ventura that addresses, at a minimum, the following: • Detours for lane closures • Timing of lane closures on adjacent routes (to provide for effective detours) • Timing of heavy equipment and building material deliveries • Signing, lighting, and traffic control device placement • Establishing work hours outside the peak traffic periods, or suggesting alternate travel routes for construction traffic The following elements shall also be addressed in the TMP: 1. The Contractor will maintain the maximum amount of travel lane capacity possible during nonconstruction periods and will provide flagger-control at all construction sites to manage traffic control and flows. 2. During construction, the Contractor will limit the work zone to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone. Alternatively, the Contractor will use detour signing, where available, on alternate access streets in the event that complete temporary street closures are required. Detour plans would be submitted to the City of Oxnard, Ventura County, and Caltrans as part of the permit requirements.	Project Applicant's Construction Contractor	City of Oxnard	City will verify the TMP is approved and implemented during each phase of construction.	Preconstruction/N/A Construction/NA	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
	3. All property owners and residents of streets affected by construction will be notified prior to the start of construction. Advance public notification will include postings of notices and appropriate signage of construction activity. 4. All construction activities will be coordinated with local law enforcement and fire protection agencies. Emergency service providers will be notified of the timing, location, and duration of construction activities. 5. As part of the TMP, the Contractor will identify all access restrictions expected to occur during construction. The Contractor will develop a plan for notifying the affected businesses, homes, and other facilities, and prepare a plan to ensure adequate access at all times. This plan may involve alternate access, detours, or other temporary mitigations. 6. The Contractor will develop a plan for addressing temporary parking impacts due to construction. The parking plan should minimize the length of any temporary parking restrictions, identify alternative parking areas and appropriate signing, and specify the process for communicating with the affected residents. This strategy should be discussed with the jurisdictions and included as part of the project TMP. 7. Where construction will result in temporary closures of sidewalks and other pedestrian facilities, the Contractor will provide temporary pedestrian access, through detours or safe areas along side the construction zone. Any affected pedestrian facilities and the alternative facilities or detours that will be provided will be identified in the TMP. Where construction activity will result in a bike lane closure, appropriate detours and signing will be developed. Where trenching will affect bicycle travel on streets without bicycle facilities, requirements for plates to cover trenches will be in accordance with the permit requirements of the local jurisdiction.					

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
TRANS-2	To address the implementation of Phase 1 of the GREAT Program (construction and operation) when considered with the implementation of all other approved or anticipated projects in the County, the applicant shall pay a Traffic Impact Mitigation Fee (TIMF). The TIMF is based on a reciprocal agreement between the City of Oxnard and the County of Ventura. Per the County, the TIMF is calculated as follows: Project ADT X $30.58 per ADT = TIMF. For projects where the construction traffic would have a greater traffic impact than operational traffic, construction-related trips may be pro-rated over the life of the Traffic Mitigation Fee Program. Per the County of Ventura, the TIMF estimated for Phase 1 is approximately $1,040 (Nazir Lalani, Transportation Department, April 2004).	Project Applicant	City of Oxnard	City will verify that TIMF is paid to the County of Ventura.	Preconstruction/N/A	
N-1	Drill rigs, air compressors and blowers, pumps, and other associated equipment will be outfitted to meet local noise requirements. Possible options for controlling noise from such equipment include steel-framed, fiberglass-filled panels, acoustical skirts for drill rigs, and high-performance mufflers for engines.	Project Applicant	City of Oxnard	City will conduct periodic inspections during construction to verify compliance.	Construction/Periodic	
N-2	Temporary noise barriers consisting of acoustical curtains would be used around the perimeter of the work areas located near sensitive receivers (i.e., residential areas, schools, day care centers, and nursing homes).	Project Applicant	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	
N-3	Nighttime construction activities shall be confined to areas located at least 0.25-mile or greater from residential areas. Confining construction in residential areas to daytime hours will safeguard residents against sleep disruption due to construction noise. Because the effects of construction on traffic circulation and road capacities has been determined to be a less than significant impact, limiting construction in residential areas to daytime hours would be feasible.	Project Applicant	City of Oxnard	City will monitor activities to verify compliance.	Construction/As appropriate	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
VIS-1	Following construction, pipeline corridors will be returned to existing or better condition.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance.	Postconstruction/N/A	
VIS-2	Construction will be conducted consistent with the scenic and aesthetic resource and development goals, objectives, policies, and programs included in the Ventura County General Plan and City of Oxnard 2020 General Plan.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance.	Construction/N/A	
VIS-3	Aboveground structures will be designed to be consistent with the development goals, objectives, and policies included in the Community Design Element of the City of Oxnard 2020 General Plan, including landscaping or other suitable screening.	Project Applicant	City of Oxnard	City will verify compliance.	Project Design/N/A	
VIS-4	Aboveground structures will be finished with a nonreflective material to reduce glare.	Project Applicant	City of Oxnard	City will verify compliance.	Project Design/N/A	
VIS-5	Lighting will be limited to areas required for safety, and will be directed and shielded to reduce light scatter and glare.	Project Applicant	City of Oxnard	City will verify compliance.	Project Design/N/A	
PUB-1	Theft/vandalism deterrents such as fencing will be employed at pipeline and ASR installation sites to protect construction and facility equipment.	Project Applicant	City of Oxnard	City will verify compliance.	Construction/N/A	
PUB-2	As part of standard construction practices and requirements, USA would be notified of the project prior to construction to identify underground utilities that need to be avoided.	Project Applicant	City of Oxnard	City will verify compliance.	Preconstruction	
PUB-3	Construction and placement of buried pipelines would be conducted to avoid existing buried utilities.	Project Applicant	City of Oxnard	City will conduct periodic inspections during construction and excavation activities to verify compliance.	Construction/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
HAZ-1	The project will incorporate specific project design features and project construction measures, including best management practices, in compliance with the following applicable federal, state, and local regulations and standards for hazardous materials: Federal Standards • CERCLA – Section 302 – Section 304 – Section 311 – Section 313 • Clean Air Act • Clean Water Act • Department of Transportation Act State Standards • Health and Safety Code – Section 25500 (Waters Bill) – Section 25531 (La Follette Bill) • Aboveground Petroleum Storage Act • Safe Drinking Water and Toxics Enforcement Act (Proposition 65) Local Standards • California Vehicle Code • Uniform Fire Code • State of California Building Standards • NFPA 5000 Building Code	Project Applicant	City of Oxnard	City will verify compliance during review of plans and specifications and verify compliance during each phase of construction.	Project Design Preconstruction/N/A Construction/N/A	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
HAZ-2	The project will incorporate specific project design features and project construction measures, including best management practices, in compliance with the following applicable federal, state, and local regulations and standards for waste, which are more completely described in Section 4.13.2 Applicable Standards: Federal Standards • RCRA – Subtitle C – Subtitle D • Clean Water Act State Standards • California Public Resource Code – Section 40000 et. seq • Porter-Cologne Water Quality Control Act • California Hazardous Waste Control Law Local Standards • Uniform Fire Code • Uniform Building Code • National Fire Protection Association • Uniform Plumbing Code	Project Applicant	City of Oxnard	City will verify compliance during review of plans and specifications and verify compliance during each phase of construction.	Project Design/N/A Preconstruction/N/A Construction/N/A	
HAZ-3	GREAT Program facilities will be classified as a hazardous waste generator. Currently, the City of Oxnard has an active EPA identification number. This number will be used by the Great Program facilities when disposing of hazardous waste.	Project Applicant	City of Oxnard	City will verify compliance.	Operation/N/A	
HAZ-4	Hazardous wastes will not be stored onsite for more than 90 days and will be accumulated according to CCR Title 22.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance	Operation/Periodic	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 1						
HAZ-5	Hazardous wastes will be stored in appropriately segregated storage areas surrounded by berms to contain leaks and spills. The bermed areas will be sized to hold the full contents of the largest single container and, if not roofed, sized for an additional 20 percent to allow for rainfall. These areas will be inspected weekly.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance	Operation/Weekly	
HAZ-6	Hazardous wastes will be collected by a licensed hazardous waste hauler using a hazardous waste manifest and managed only at an authorized hazardous waste management facility. Biannual hazardous waste generator reports will be prepared and submitted to the DTSC. Copies of manifests, reports, waste analyses, and other documents will be kept onsite and remain accessible for inspection for at least 3 years.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance	Operation/Periodic	
HAZ-7	Employees will be trained in hazardous waste procedures, spill contingencies, and waste minimization.	Project Applicant	City of Oxnard	City will verify compliance.	Operation/As needed	
HAZ-8	Procedures will be developed to reduce the quantity of hazardous waste generated. Nonhazardous materials will be used instead of hazardous materials whenever possible, and wastes will be recycled whenever possible.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance	Operation/As needed	
HAZ-9	Waste lubricating oil will be recovered and recycled by a waste-oil recycling contractor. Spent lubrication oil filters will be disposed of in a Class I landfill. Handling of hazardous wastes in this way will minimize the quantity of waste deposited to landfills.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance	Operation/As needed	
HAZ-10	Chemical cleaning wastes will consist of alkaline and acid cleaning solutions used during chemical cleaning of various types of water treatment equipment. These wastes will be stored temporarily onsite in either 55-gallon containers or portable tanks and disposed of offsite in accordance with applicable regulatory requirements. Disposal may consist of treatment and/or landfilling.	Project Applicant	City of Oxnard	City will conduct periodic inspections to verify compliance	Operation/As needed	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 2						
WR-2	The project will incorporate specific project design features and project construction measures, including best management practices, in compliance with the following applicable federal, state, and local regulations and standards: Federal Standards • Clean Water Act – NPDES Program – Total Maximum Daily Loads • Underground Injection Control Program State Standards • State Water Resources Control Board – Porter-Cologne Water Quality Control Act – State Antidegradation Policy – State Water Reclamation Policy – Ocean Plan • Regional Water Quality Control Board (Region 4) Water Quality Control Plan – State Waste Discharge Requirements – Water Reclamation Requirements – NPDES Program – General WDRs and NPDES Permit for Discharges of Groundwater – General NPDES Permit for Discharges of Stormwater – Total Maximum Daily Loads • Regional Water Quality Control Board Section 401 Certification	Project Applicant	City of Oxnard Water Division	City will review project construction plans and specifications to verify compliance with applicable regulations and standards.	Project Design/N/A Preconstruction/N/A	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 2						
	• DHS Domestic Water Supply System for Potable Use • DHS Recycled Water for Nonpotable Use • DHS Recycled Water for Indirect Potable Use Local Standards • Fox Canyon Groundwater Management Agency Ordinances • Ventura County Well Permit Ordinance • Ventura County Watercourse Encroachment Permit • Countywide NPDES Municipal Stormwater Permit					
WR-3	The City will implement BMPs to reduce the potential for coastal landward flow in the UAS. In general, groundwater will be recovered further inland to minimize water level declines at the coastline. This will include recovering a higher percentage of water at Blending Station No. 3 and a lower percentage of water at the City Water Yard and the El Rio Wellfield.	Project Applicant	City of Oxnard Water Division	City will verify that appropriate BMPs are implemented to reduce the potential for coastal landward flow in the UAS.	Operation/As needed	
WR-4	The City will implement BMPs to reduce the potential for coastal landward flow in the LAS. In general, groundwater will be recovered form the UAS when possible to minimize this potential. This will include pumping a lower percentage of water from the two LAS wells at the City Water Yard (Nos. 20 and 21).	Project Applicant	City of Oxnard Water Division	City will verify that appropriate BMPs are implemented to reduce the potential for coastal landward flow in the LAS.	Operation/As needed	
WR-5	The City will implement BMPs to reduce the interference with operations at the Forebay spreading grounds. In general, groundwater recovery will be limited to quantities allowable by UWCD.	Project Applicant	City of Oxnard Water Division	City will verify that appropriate BMPs are implemented to reduce interference with operations at the Forebay spreading grounds.	Operation/As needed	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 2						
WR-6	The City will prepare an implementation plan for Phase 2 recovery of the groundwater that is recharged on the southern Oxnard Plain and Pleasant Valley areas. This plan will provide the details of how groundwater will be recovered and the best management practices that will be implemented. This implementation plan will be submitted to UWCD, FCGMA, and other interested stakeholders involved with water resources management in the Oxnard Plain and Pleasant Valley areas for comment.	Project Applicant	City of Oxnard Water Division	City will verify that an implementation plan is prepared for Phase 2 recovery of groundwater that is recharged on the southern Oxnard Plain and Pleasant Valley areas. City will verify that the implementation plan is submitted to UWCD, FCGMA, and other interested stakeholders for comment.	Project Design/N/A	
WR-7	The City will contribute to the UWCD ongoing basinwide groundwater monitoring program for the Oxnard Plain and Pleasant Valley areas program to assist with the collection of data that are necessary to monitor and evaluate the effects from Phase 2 recovery of groundwater that is recharged by in-lieu delivery methods and by direct injection methods on the southern Oxnard Plain and Pleasant Valley. It is assumed that the City will have full access to the UWCD groundwater monitoring database to assist the City with performing the routine annual evaluation.	Project Applicant	City of Oxnard Water Division	City will verify contribution to the UWCD ongoing basinwide groundwater monitoring program for the Oxnard Plain and Pleasant Valley areas program.	Operation/N/A	
WR-8	The City will perform annual hydrogeologic evaluations and prepare annual evaluation reports to document the hydrogeologic conditions and effects from implementation of the GREAT Program. These reports will be submitted to UWCD, FCGMA, and other interested stakeholders involved with water resources management in the Oxnard Plain and Pleasant Valley areas.	Project Applicant	City of Oxnard Water Division	City will verify that annual hydrogeologic evaluations are conducted and annual evaluation reports are prepared to document the hydrogeologic conditions and effects from implementation of the GREAT Program. City will verify that these reports are submitted to UWCD, FCGMA, and other interested stakeholders.	Operation/Annually	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 2						
WR-9	As necessary, the City will adjust Phase 2 recovery of the groundwater that is recharged on the southern Oxnard Plain and Pleasant Valley areas. These adjustments, in part, will be based on comments received by UWCD, FCGMA, and other interested stakeholders involved with water resources management in the Oxnard Plain and Pleasant Valley areas.	Project Applicant	City of Oxnard Water Division	City will verify that Phase 2 recovery of groundwater is adjusted as necessary, based on comments received by UWCD, FCGMA, and other interested stakeholders.	Operation/N/A	
WR-10	The City will implement BMPs WR-10a, b, and c to adjust Phase 2 recovery of the groundwater that is recharged on the southern Oxnard and Pleasant Valley areas to minimize drawdown in the northern Oxnard Plain and Oxnard Forebay areas and the potential for adverse impacts, which could include the following: • In the UAS, water level declines could increase the potential to induce brief periods of coastal landward flow during extended, drier climatic periods. • In the LAS, water level declines could increase the moderate potential for landward flow that exists, particularly during drier years and in the fall when water levels are seasonally low. • In the UAS, water level declines could potentially interfere with pumping operations at the Forebay spreading grounds. These BMPs are based on the potential groundwater level declines as evaluated using the groundwater flow model for the four Phase 2 scenarios (2a, 2b, 2c, and 2c2), which included groundwater recovered at the following locations: the UWCD El Rio wellfield (several UAS wells), the City Water Yard (two LAS wells and five UAS wells), and at the City Blending Station No. 3 (three UAS wells).	Project Applicant	City of Oxnard Water Division	City will verify that appropriate BMPs are implemented to minimize drawdown in the northern Oxnard Plain and Oxnard Forebay areas.	Operation/N/A	

CONDITION NUMBER	MITIGATION REQUIREMENT	RESPONSIBLE ENTITY	MONITOR	ACTION BY MONITOR	TIMING/FREQUENCY	COMPLIANCE (YES or NO)
PHASE 2						
	BMPs WR-10a, b, c consist of the following: • WR-10a – Reducing the Potential for Coastal Landward Flow in the UAS. In general, groundwater should be recovered further inland to minimize water level declines at the coastline. This would include extracting more water at City Blending Station No. 3, which is further inland than the UWCD El Rio Wellfield and the City Water Yard. • WR-10b – Reducing the Potential for Coastal Landward Flow in the LAS. In general, groundwater should be recovered from the UAS when possible to minimize this potential. This would include minimizing extractions from the two LAS wells at the City Water Yard (Nos. 20 and 21). • WR-10c – Reducing the Interference with Operations at the Forebay Spreading Grounds. In general, groundwater recovery from the El Rio wellfield should be limited where practicable. This would include shifting pumping to City Water Yard wells and/or City Blending Station No. 3 wells. Implementation of these BMPs should include consideration of the results of the groundwater flow modeling used in their development, which are provided in the Water Resources Technical Report. As Phase 2 is dependent upon the results of implementing Phase 1, mitigation measure WR-10 will be re-evaluated following implementation of Phase 1 to further develop the details of this measure. Mitigation measure WR-10 will be further defined and addressed in future environmental documentation conducted for Phase 2.					

EMERGENCY ORDINANCE – E

AN EMERGENCY ORDINANCE LIMITING EXTRACTIONS FROM GROUNDWATER EXTRACTION FACILITIES, SUSPENDING USE OF CREDITS AND PROHIBITING CONSTRUCTION OF ANY GROUNDWATER EXTRACTION FACILITY AND/OR THE ISSUANCE OF ANY PERMIT THEREFOR

The Board of Directors of the Fox Canyon Groundwater Management Agency, State of California, ordains as follows:

ARTICLE 1. Findings

The Board of Directors hereby finds that:

A. On January 17, 2014, the Governor of the State of California proclaimed a state of emergency due to current drought conditions and called on Californians to reduce their water usage by 20 percent. On March 1, 2014, the Governor signed into law emergency drought legislation that finds and declares that California is experiencing an unprecedented dry period and shortage of water for its citizens, local governments, agriculture, environment, and other uses.

B. The U.S. Drought Monitor has designated the territory of the Agency to be currently in a condition of exceptional drought.

C. The United Water Conservation District has reported that groundwater storage in the Oxnard Plain Basin Forebay dropped by 32,200 acre feet in the past year and groundwater levels are currently below sea level. Continued dry conditions and regulatory restrictions on diversions from the Vern Freeman Diversion will result in less water available for recharge of the Forebay.

D. On February 25, 2009, the Fox Canyon Groundwater Management Agency Board of Directors in response to a serious water resource problem constituting a very real and immediate threat to groundwater quality and quantity to the West, East, and South Las Posas Basins and any and all basins tributary thereto adopted Emergency Ordinance D, entitled An Emergency Ordinance to Impose a Temporary Moratorium on Construction of New Wells and to Provide an Upper Limitation to Efficiency Extraction Allocation Within the West, East, and South Las Posas Groundwater Basins Pending Development of a Basin-Specific Management Plan.

E. Emergency Ordinance D was replaced by Ordinance 8.6 which presumed the development of a Basin-Specific Management Plan. However, the threats to groundwater quality and quantity in the Las Posas Basins remain and have increased due to persistent drought conditions, and the lack of a Basin-Specific Management Plan.

F. The Agency's 2007 Update to its Groundwater Management Plan established basin yield at 100,000 acre-feet per year; however, average annual total extractions within the Agency for Calendar Years 2003 through 2012 were 124,586 acre-feet.

G. Due to persistent dry conditions, the Department of Water Resources on January 31, 2014, announced a 2014 State Water Project Allocation of zero percent.

H. The cumulative use of conservation credits has reduced the benefit of previous reductions in historical allocations, and could limit any benefit derived through this Emergency Ordinance.

I. The Board may adopt ordinances for the purpose of regulating, conserving, managing, and controlling the use and extraction of groundwater within the territory of the Agency.

J. The measures adopted in this emergency ordinance are necessary in order to improve and protect the quantity and quality of groundwater supplies within the territory of the Agency, to prevent a worsening of existing conditions, to allow time to implement a definite and long-term solution to improve groundwater conditions in the Agency and to bring groundwater extractions into balance with recharge.

K. This emergency ordinance is exempt from the California Environmental Quality Act pursuant to CEQA Guidelines Sections 15307 and 15308 as an action taken "to ensure the maintenance, restoration, or enhancement of natural resources or the environment."

ARTICLE 2. Reduction of Groundwater Extractions

A. For the duration of this emergency ordinance, all Municipal and Industrial Operators' extraction allocations, regardless of type, shall be replaced with a Temporary Extraction Allocation (TEA) based on an operator's average annual reported extractions, not including any extractions that incurred surcharges, for Calendar Years 2003 through 2012.

B. For the Port Hueneme Water Agency (PHWA), their TEA shall be established according to the Agency's approved July 24, 1996 agreement and allocations contained within.

C. Temporary Extraction Allocations (TEA) shall be reduced in order to eliminate overdraft from the aquifer systems within the boundaries of the Agency for municipal and industrial uses. The reductions shall be as follows:

1. Beginning July 1, 2014	10% (TEA x 0.90/2)
2. Beginning January 1, 2015	15% (TEA x 0.85/2)
3. Beginning July 1, 2015	20% (TEA x 0.80/2)
4. Beginning January 1, 2016	20% (TEA x 0.80)

D. For reported extractions starting on August 1, 2014, all Agricultural Operators' extraction allocations, regardless of type, shall be replaced with an Annual Efficiency Allocation as provided in Section 5.6.1.2. of the Agency Ordinance Code, except that the annual irrigation allowances used to calculate the Irrigation Allowance Index shall be adjusted downward 25% from the allowances set forth in Resolution No. 2011-04 (Exhibit No. 1). For computing the irrigation allowance, the definition of Planted Acre may include designated areas that grew irrigated crops in the twelve months prior to August 1, 2014, but have subsequently been fallowed or are growing a non-irrigated crop.

E. On February 1, 2015, the Board may by Resolution undertake an additional adjustment to the annual irrigation allowances used to calculate the Irrigation Allowance Index, or other pumping restrictions in order to achieve a cumulative 10% reduction in pumping by Agricultural Operators.

F. On August 1, 2015, the Board may by Resolution undertake an additional adjustment to the annual irrigation allowances used to calculate the Irrigation Allowance Index, or other pumping restrictions in order to achieve a cumulative 20% reduction in pumping by Agricultural Operators.

G. Notwithstanding the extraction allocations established pursuant to Chapter 5.0 of the Agency Ordinance Code, all extractions in excess of the allocations established and adjusted by this emergency ordinance shall be subject to extraction surcharges.

H. The Executive Officer may, on written request from a land owner or operator, grant a variance from the requirements of this article based on a showing:

   1. That there are special circumstances or exceptional characteristics of the owner or operator which do not apply generally to comparable owners or operators in the same vicinity; or
   2. That strict application of the reductions as they apply to the owner or operator will result in practical difficulties or unnecessary hardships inconsistent with the general purpose of this emergency ordinance; or
   3. That the granting of such variance will result in no net detriment to the aquifer systems.

ARTICLE 3. Limitation on Accrual and Use of Credits

Notwithstanding Section 5.7 of the Agency Ordinance Code, conservation credits shall not be obtained and may not be used to avoid paying surcharges for extractions while this emergency ordinance is in effect.

ARTICLE 4. Prohibition on New Extraction Facilities

The Board prohibits the issuance of any permit for construction of a groundwater extraction facility, other than a replacement, backup or standby facility which does not allow the initiation of any new or increased use of groundwater, within the territory of the Agency. The prohibition set forth shall not apply to any permit for which a completed application is on file with the Agency on or before February 26, 2014, or for any permit in furtherance of a pumping program approved by the Board. For the purpose of this Article 4, a new or increased use is one that did not exist or occur before the effective date of this emergency ordinance. The Board may grant exceptions to the prohibition set forth in this Article 4 on a case-by-case basis. Applications for exceptions shall conform to the requirements of Section 5.2.2.3. of the Agency Ordinance Code and will be approved only if the Board makes the findings set forth in Section 5.2.2.4. of the Agency Ordinance Code.

ARTICLE 5. Duration

This emergency ordinance shall remain in effect from the date of adoption and reviewed every eighteen months, unless superseded or rescinded by action of the Board or a finding by the Board that the drought or emergency condition no longer exists.

ARTICLE 6. Effective Date

This ordinance shall become effective immediately upon adoption by the vote of at least four members of the Board; otherwise it shall become effective on the thirty-first day after adoption.

PASSED AND ADOPTED this 11th day of April 2014 by the following vote:

AYES: 5
NOES: 0
ABSENT: 0

By: ______________________
Lynn Maulhardt, Chair, Board of Directors
Fox Canyon Groundwater Management Agency

ATTEST: I hereby certify that the above is a true and correct copy of Emergency Ordinance E.

By: ______________________
Jessica Kam, Clerk of the Board

Exhibit No. 1 – Current Irrigation Allowance Index and - Proposed Allowance Index Values (Adjusted 25%)

Irrigation Allowance Index Values (Adjusted 25%)*

Acre-Feet/Acre

Includes leaching and DU = 0.8	**# of Crops**	**Oxnard (Z1)**			**Camarillo (Z2)**			**Santa Paula (Z3)**		
		Typical	**Dry**	**Wet**	**Typical**	**Dry**	**Wet**	**Typical**	**Dry**	**Wet**
		Total AF/A	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***
Spring Veg./Fall Celery	2	2.7	2.8	2.5	3.0	3.2	2.8	3.3	3.4	3.0
Summer Veg./Fall Veg	2	2.5	2.7	2.4	2.8	3.0	2.7	3.0	3.2	2.9
Spring Veg./Late Summer Veg./+part Late Fall Veg*	**2+plus**	2.9	3.1	2.8	3.3	3.5	3.1	3.6	3.8	3.4

Crop		**Oxnard (Z1)**			**Camarillo (Z2)**			**Santa Paula (Z3)**		
		Typical	**Dry**	**Wet**	**Typical**	**Dry**	**Wet**	**Typical**	**Dry**	**Wet**
		Total AF/A	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***	***Total AF/A***
Avocado - 20% Ground Shading	**1**	1.4	1.5	1.3	1.6	1.7	1.5	1.7	1.9	1.6
Avocado - 50% Ground Shading	**1**	2.0	2.2	1.9	2.3	2.5	2.1	2.5	2.8	2.3
Avocado - 70% Ground Shading	**1**	2.7	3.1	2.6	3.1	3.5	3.0	3.4	3.8	3.2
Blueberries 20% Ground Shading	**1**	1.4	1.4	1.3	1.5	1.8	1.5	1.8	1.9	1.7
Blueberries 50% Ground Shading	**1**	2.0	2.1	1.9	2.2	2.3	2.2	2.4	2.5	2.4
Blueberries 70% Ground Shading	**1**	2.7	2.9	2.6	3.1	3.3	3.0	3.4	3.6	3.2
Celery - Single Crop	**1**	1.5	1.6	1.4	1.7	1.8	1.5	1.8	1.9	1.6
Citrus - 20% Ground Shading	**1**	1.4	1.6	1.3	1.6	1.8	1.5	1.8	1.9	1.6
Citrus - 50% Ground Shading	**1**	1.9	2.0	1.8	2.2	2.3	2.0	2.4	2.5	2.2
Citrus - 70% Ground Shading	**1**	2.6	2.7	2.4	2.9	3.0	2.7	3.2	3.3	2.9
Lima Beans	**1**	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	0.9
Misc. Veg Greenhouse - Fall	**1**	0.9	0.9	0.8	1.0	1.0	0.9	1.0	1.1	1.0
Misc. Veg Greenhouse - Spr	**1**	1.0	1.1	0.9	1.1	1.2	1.1	1.2	1.3	1.2
Misc. Veg Greenhouse - Summer	**1**	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4
Misc. Veg Single Crop - Fall	**1**	1.0	1.1	1.0	1.1	1.2	1.0	1.2	1.3	1.1
Misc. Veg Single Crop - Spr	**1**	1.2	1.3	1.1	1.3	1.4	1.2	1.5	1.6	1.4
Misc. Veg Single Crop - Summer	**1**	1.5	1.5	1.5	1.7	1.7	1.6	1.8	1.9	1.8
Nursery (Non-Greenhouse)	**1**	3.2	3.4	3.1	3.6	3.8	3.5	4.0	4.2	3.8
Nursery (Greenhouse)	**1**	3.4	3.5	3.3	3.8	3.9	3.7	4.2	4.3	4.0
Raspberries - Tunnel	**1**	3.2	3.4	3.1	3.7	3.8	3.6	4.0	4.2	3.9
Sod	**1**	3.0	3.2	2.9	3.4	3.6	3.3	3.7	3.9	3.6
Strawberries-Main Season	**1**	2.3	2.5	2.2	2.6	2.7	2.4	2.8	2.9	2.6
Strawberries-Summer	**1**	1.4	1.4	1.3	1.5	1.6	1.4	1.6	1.7	1.5
Tomatoes - Peppers	**1**	1.7	1.7	1.6	1.9	1.9	1.8	2.1	2.1	2.0

*Adopted by FCGMA Board on April 11, 2014

FOX CANYON GROUNDWATER MANAGEMENT AGENCY

A STATE OF CALIFORNIA WATER AGENCY

July 24, 2013

Board of Directors
Fox Canyon Groundwater Management Agency
800 South Victoria Avenue
Ventura, CA 93009-1600

SUBJECT: ANNUAL BASIN MANAGEMENT OBJECTIVES PROGRESS REPORT – *(New Item)*

RECOMMENDATION: Receive and file a report regarding the status of groundwater conditions relative to the Agency's Basin Management Objectives.

EXECUTIVE SUMMARY:
The Agency's Basin Management Objectives (BMOs) "Report Cards" have been updated with data collected during calendar year 2012. The Report Cards are used to communicate status of groundwater conditions and progress toward meeting the Agency's goals. This is accomplished by comparing groundwater levels and/or quality to the BMOs. This comparison of data collected in 2012 to the BMOs indicates that 20 BMOs were met, and 25 were not met. There was no data available for evaluating seven BMOs. For comparison, in 2011 25 BMOs were met, and 22 were not met, and no data was available for evaluating five BMOs.

Among the greatest exceedances of BMOs in 2012 are:

- Water levels below the BMO by 71 feet (average value) at PTP-1 (inland, Oxnard Plain Basin, lower aquifer system), 66 feet (average value) at PV No.10 (Pleasant Valley Basin);
- Chloride concentrations exceeding the BMO by 16,800 mg/L at CM1A-220 (Pt Mugu–Oxnard Plain, upper aquifer system), 11,650 mg/L at CM2-760 (Port Hueneme, Oxnard Plain Basin, lower aquifer system);
- Nitrate concentrations above the BMO by 19 mg/L at 25C05 (Arroyo Santa Rosa Basin); and
- TDS concentration above the BMO by 1,040 mg/L at 09F01 (East Las Posas Basin).

Based on the historical water level and water quality data, presented in the BMO Report Cards, conditions in late 2012 were similar to those in late 2009. In 2012, rainfall was below average and groundwater extractions were above average (FCGMA Calendar Year 2012 Annual Report). Thus far 2013 has below average rainfall, and as such it is anticipated that groundwater levels and water quality will likely decline further.

The primary areas of concern remain:

1. Oxnard Plain Basin and Pleasant Valley Basins: Depressed water levels continue to allow conditions under which salts from the ocean and/or other geologic sources can potentially migrate into the aquifers. Areas of greatest concern are the coastal portions of the Oxnard Plain Basin near Port Hueneme (especially the Lower Aquifer System) and Pt. Mugu (both Upper and Lower

Aquifer Systems) and the Pleasant Valley Basin where intrusion has been previously documented. Salt migration would be expected to increase during an extended drought.

2. Las Posas Basins: Poor quality water continues to migrate northward into East Las Posas Basin from sources in the South Las Posas Basin, although the current set of BMO locations is not situated so as to illustrate this movement. Additional detail will be available in the Las Posas Basin-Specific Groundwater Management Plan currently under development.

3. Arroyo Santa Rosa Basin: Nitrate and chloride concentrations remain a concern in the Arroyo Santa Rosa Basin, although there are limited data available for evaluation in this basin.

BACKGROUND:
The 2007 Update to the FCGMA Groundwater Management Plan (GMP) established BMOs for the basins within the Agency. BMOs are groundwater levels or water quality measurements (concentrations) defined at specific locations that serve as quantitative performance metrics for evaluating the effectiveness of the Agency's groundwater management strategies toward meeting its GMP goals.

The current set of 52 BMOs provide performance metrics for the GMP plan goals, which are designed to address the varying water quality concerns in the groundwater basins within the Agency. The primary water quality concerns include:

- Nitrate impact to potable beneficial groundwater uses in the Oxnard Plain Forebay;
- Saline intrusion in coastal areas of the Oxnard Plain Basin;
- Migration of saline water from surrounding geologic sources in the Pleasant Valley Basin;
- Elevated nitrate and chloride in the Arroyo Santa Rosa Basins; and
- Chloride impact to agricultural beneficial groundwater uses in Las Posas Basins.

The water quality and water level data are collected by others and provided to the Agency. The data collected in 2012, and used for this update report, was provided by United Water Conservation District.

DISCUSSION:
The purpose of today's report is to provide an update on the status of groundwater conditions and progress toward meeting the Agency's BMOs. Staff believes reviewing BMO status periodically helps keep the Agency's goals and progress toward meeting those goals front and center. Agency staff provided a similar report in 2010 and 2011.

The approach is to compare measured water levels and groundwater quality to the Agency's current set of BMOs. The primary tool used to communicate status is the attached suite of BMO "Report Cards" (Item 4A). The report cards summarize current groundwater levels and/or quality relative to the BMOs for a particular basin.

GROUNDWATER CONDITIONS AND BMO STATUS BY BASIN:
The status of the BMOs for each basin is summarized below and on the respective report card (Item 4A). Further details are provided in the "Status Summary Table" located on each report card, where the status of each BMO is displayed quantitatively and visually. The geographic location of each BMO well can be found on the map located below the table on each report card. Time-series plots of groundwater levels and constituent concentrations are available upon request, for individuals who are interested in reviewing historical trends. It should be noted that of the 52 BMOs, 2012 data was not available for seven of the BMOs (two in the East Las Posas Basin, two in the West Las Posas Basin, two in the South Las Posas Basin, and one in the Arroyo Santa Rosa Basin). The Agency BMO program relies on data collected and

provided by others. Where data was not collected in 2012, staff is working towards getting the wells back on the monitoring and sampling lists.

Oxnard Plain Forebay Basin (Forebay)

- BMOs: The Forebay has BMOs for nitrate and total dissolved solids (TDS) to protect groundwater quality for potable and irrigation uses. There are no groundwater level BMOs for the Forebay.

- Status: Average nitrate and TDS concentrations were well below their respective BMOs in 2012. The average TDS concentrations at El Rio No.5 and El Rio No.15 increased 186 and 177 mg/L respectively during 2012.

- Trends: Nitrate concentrations vary annually but have remained in the same general range since 2008. The average TDS concentration of samples collected from well El Rio No.5 is higher than the average concentration for samples collected in 2008; however, for well El Rio No.15, the average TDS concentration is approximately the same as in 2008.

Oxnard Plain Basin – Upper Aquifer System

- BMOs: The Oxnard Plain Basin – Upper Aquifer System has BMOs for groundwater levels and chloride concentrations along the coast and at one inland location. These BMOs work together to protect against saline intrusion (sufficiently high water levels guard against intrusion, while chloride is a direct indicator of intrusion).

- Status: In 2012, water levels BMOs were met in all wells except those located near Pt. Mugu. The Pt. Mugu area is challenging because it lies furthest from the primary groundwater recharge area for the basin (e.g. the Forebay). As long as water levels remain consistently below BMOs, the risk for additional intrusion persists. Consistent with past results, chloride BMOs were not met near Port Hueneme (BMO wells A1-195 and CM4-275) and Pt. Mugu (BMO wells CM1A and CM6).

- Trends: In general, the average annual water levels declined approximately 1 foot during 2012. With regard to the 5-year trend, water levels are generally the same as those of 2008. The exceptions are inland and near Pt. Mugu, where water levels have risen slightly (approximately 5 and 2 feet respectively) during the last five years. Chloride concentrations have been stable at all BMO locations except CM4-275 and CM6. Chloride concentrations have declined at BMO location CM4-275, increased at CM6 in the Mugu Aquifer. CM6 is located in an area of documented saline intrusion.

Oxnard Plain Basin – Lower Aquifer System

- BMOs: The Oxnard Plain Basin – Lower Aquifer System has BMOs for groundwater levels and chloride concentrations along the coast and at one inland location. These BMOs work together to protect against saline intrusion (sufficiently high water levels guard against intrusion, while chloride is a direct indicator of intrusion).

- Status: In 2012, water level BMOs were not met. Average water levels at the five locations were significantly below their respective BMOs (4 feet below near the north west corner of the basin and 71 feet below near the shared basin boundary with the Pleasant Valley Basin). As long as water levels remain consistently below BMOs, the risk for additional intrusion persists. Consistent with past results, chloride BMOs were not met near Port Hueneme (CM2) and Pt. Mugu (CM1A).

- Trends: In general, water levels have remained steady within a range of annual fluctuations to rising slightly with the exception of the water level at Pt. Mugu. Chloride concentrations have been stable or declining during the past five years in the Fox Canyon Aquifer except at Pt. Mugu (CM1A), a location in an area of documented saline intrusion.

Pleasant Valley Basin

- BMOs: The Pleasant Valley Basin has BMOs for groundwater levels and chloride concentrations. These BMOs work together to protect against saline intrusion (sufficiently high water levels guard against intrusion, while chloride is a direct indicator of intrusion).
- Status: In 2012, water levels BMOs were not met at either BMO location. Average water levels remain significantly below the respective BMOs (38 to 66 feet below). Chloride BMO was met at the southern location (100 mg/L) but exceeded at the northern location (175 mg/L).
- Trends: In general, water levels at both locations rose during the last approximately five years. Chloride concentrations at both locations have been increasing over the past seven to ten years. Over the past 20 years chloride concentrations at the southern location have remained below the BMO while concentrations at the northern location have fluctuated above and below the BMO of 150 mg/L. Sometime between the sampling event in 2011 and sampling in 2012, the chloride concentration increased to above the BMO. As long as water levels remain consistently below the water level BMO (20 feet above mean sea level), the risk of increasing chloride (and other salt) concentrations remains. Chloride concentrations would be expected to increase significantly and more rapidly if water levels were to drop again to levels experienced in the late 1980s and early 1990s.

Arroyo Santa Rosa Basin

- BMOs: The Arroyo Santa Rosa Basin has BMOs for nitrate and chloride to protect groundwater quality for potable and irrigation uses. There are no groundwater level BMOs for this basin.
- Status: In 2012, the nitrate concentration BMO was not met at either BMO location. Average nitrate concentrations remain above the respective BMO (64 and 52 vs. 45 mg/L). Chloride concentration data for 2012 was available at only the western (25D01) BMO location. The chloride concentration was below its BMO (137 vs. 150 mg/L).
- Trends: Available data are sparse to not adequate for determining trends during the last five years. Nitrate concentrations are estimated to be about the same as they were in about 2008. Chloride concentration at the western location has generally been increasing since 1999.
- Other Comments: Given the limited and sporadic availability of data at the BMO locations, it is recommended that Agency staff investigate potential alternative BMO locations for this basin.

Las Posas Basins

- BMOs: The Las Posas Basins have BMOs for chloride and TDS to protect groundwater quality for potable and irrigation uses. There are currently no groundwater level BMOs for this basin.

- Status: No data was available for three of the six BMO monitoring locations for 2012. Chloride and TDS BMOs were not met in the East Las Posas Basin, which are located within the expanding plume of poor quality water. Chloride and TDS BMOs were met in the West Las Posas Basin (08F01). No monitoring data was available for the South Las Posas Basin.

- Trends: In the East Las Posas Basin, chloride and TDS concentrations over the last five years have been gradually increasing. The available data for the West Las Posas Basin indicate that chloride and TDS concentrations over the last five years were stable to decreasing at the BMO locations.

- Other Comments: If adopted, BMOs recommended in the Draft Las Posas Basin-Specific Groundwater Management Plan will replace the current set of BMOs.

This letter has been reviewed by Agency Counsel. If you have any questions, please call Kathleen Riedel at (805) 654-2954, or me at (805) 654-2073.

Sincerely,

Jeff Pratt, P.E.
FCGMA Executive Officer

Attachment: Basin Management Objectives Report Cards (Item 4A)

FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
OXNARD PLAIN FOREBAY
2012

Goal: Protect water quality at public drinking water wells (nitrate and TDS) and irrigation suitability (TDS). (Note TDS = total dissolved solids)

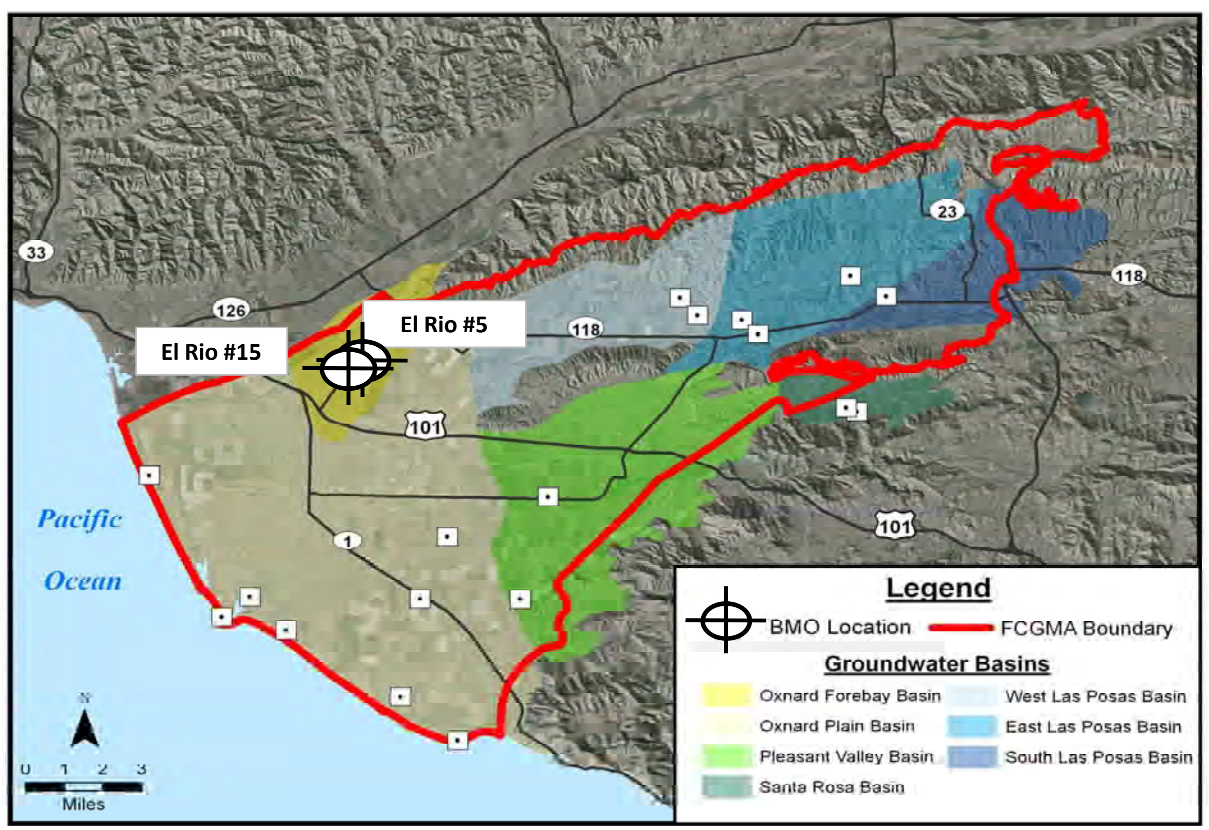
BMOs: Nitrate Concentration: 22.5 mg/L-NO_3 (50% of State of California MCL)

TDS Concentration: 1,200 mg/L (LARWQCB Basin Plan Objective)

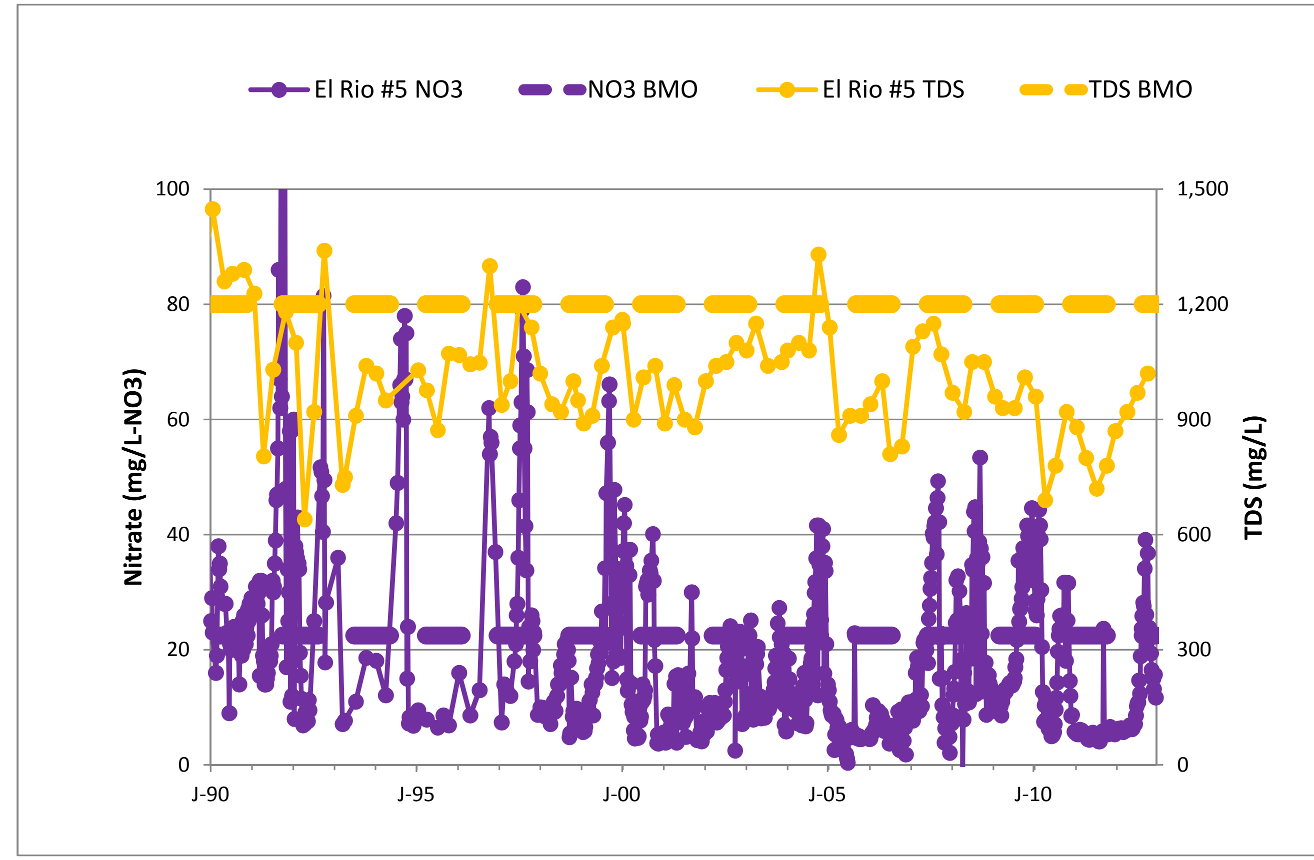
Status Summary: Average nitrate and TDS concentrations were well below the BMOs in 2012. Short term nitrate exceedances are managed by blending with other water sources. Declining water levels during 2012 have contributed to increasing nitrate and TDS concentrations, compared to those in 2011.

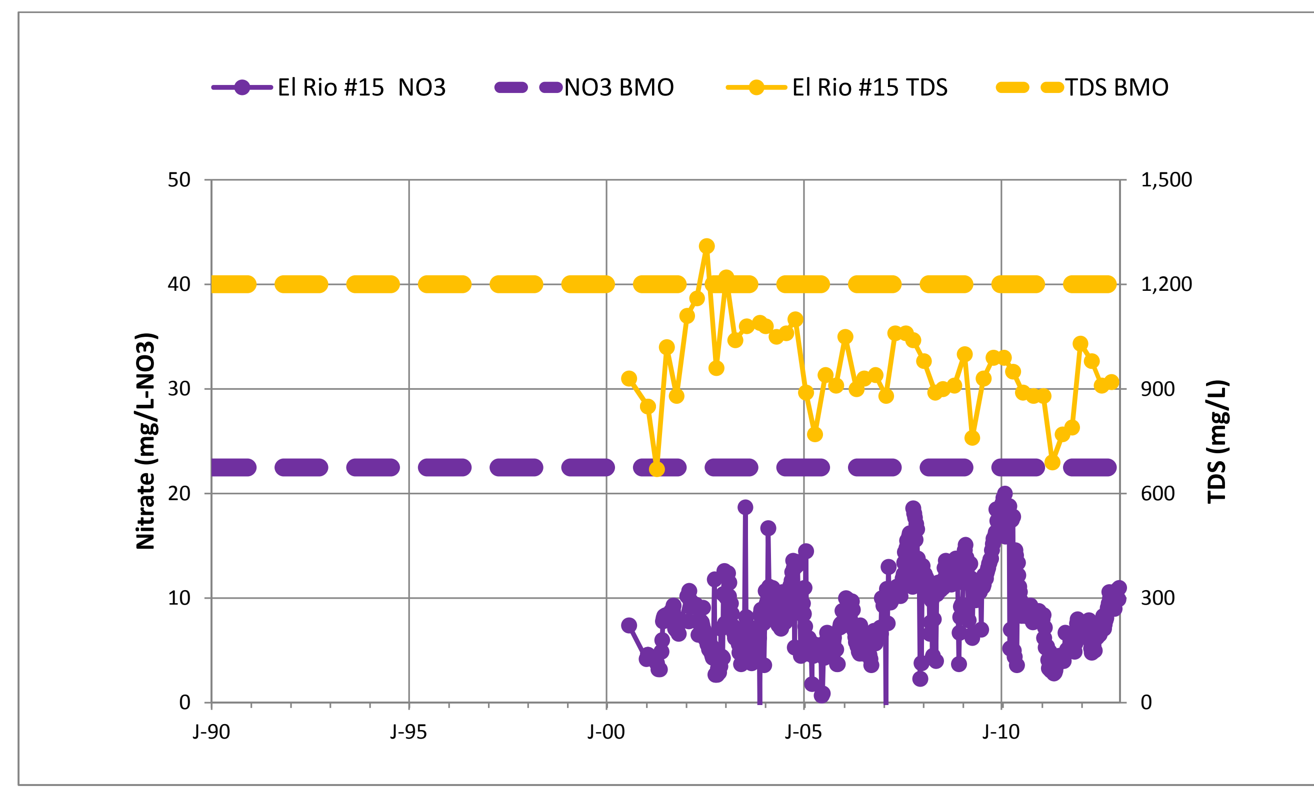
Status Summary Table

State Well Number (name)	Depth (ft)	Nitrate (mg/L) BMO	Nitrate (mg/L) 2012 Ave	TDS (mg/L) BMO	TDS (mg/L) 2012 Ave	5-yr Trend Nitrate	5-yr Trend TDS
02N22W23B02S (El Rio #5)	135-277	22.5	13	1,200	945	→	↑
02N22W23C05S (El Rio #15)	140-310	22.5	8	1,200	960	→	→



FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
OXNARD PLAIN FOREBAY
2012





FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
OXNARD PLAIN - UPPER AQUIFER SYSTEM
2012

Goal: Prevent saline intrusion in the Oxnard and Mugu Aquifers. Primary source is seawater inflow via aquifer outcrops in submarine canyons near Port Hueneme and Pt. Mugu.

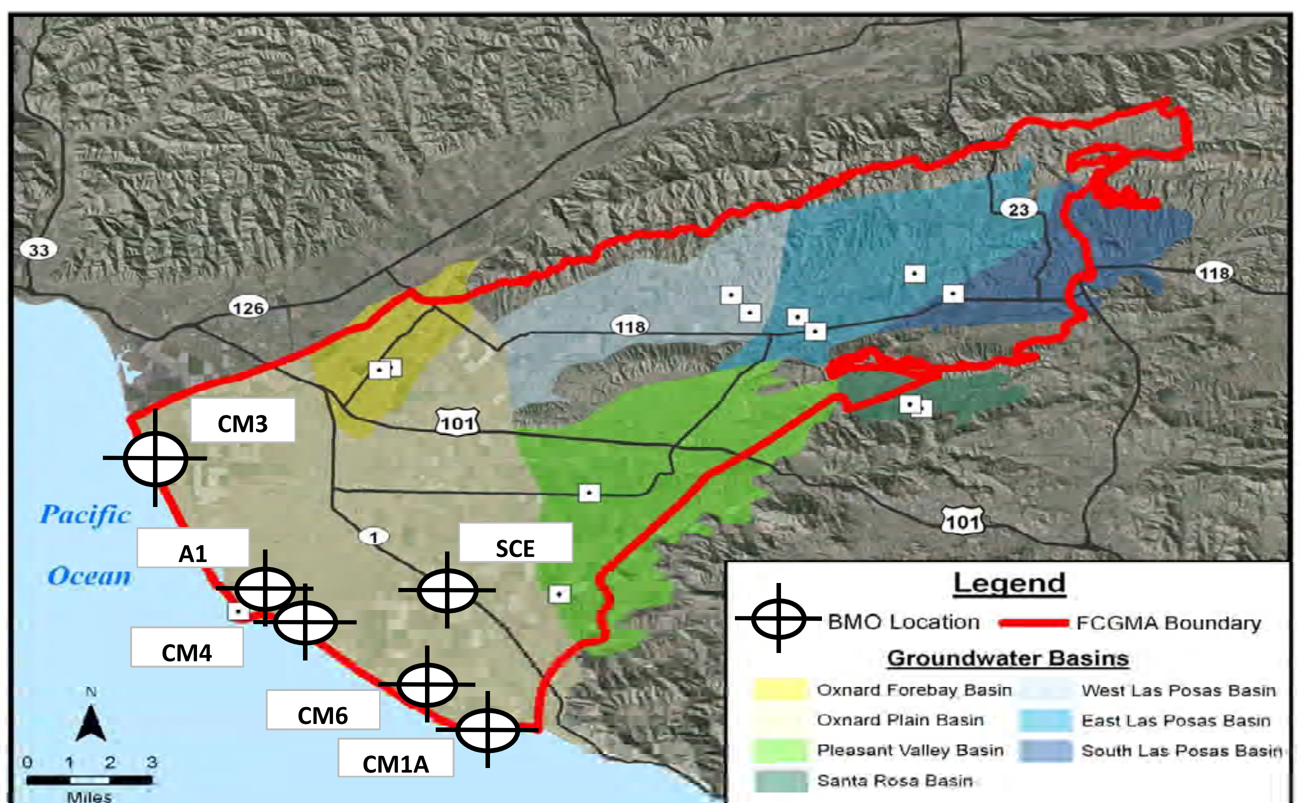
BMOs: Water Levels: Average groundwater elevations suffient to maintain slight seaward groundwater gradient. Elevation varies with location.

Chloride Concentration: 150 mg/L Chloride (LARWQCB Basin Plan Objective).

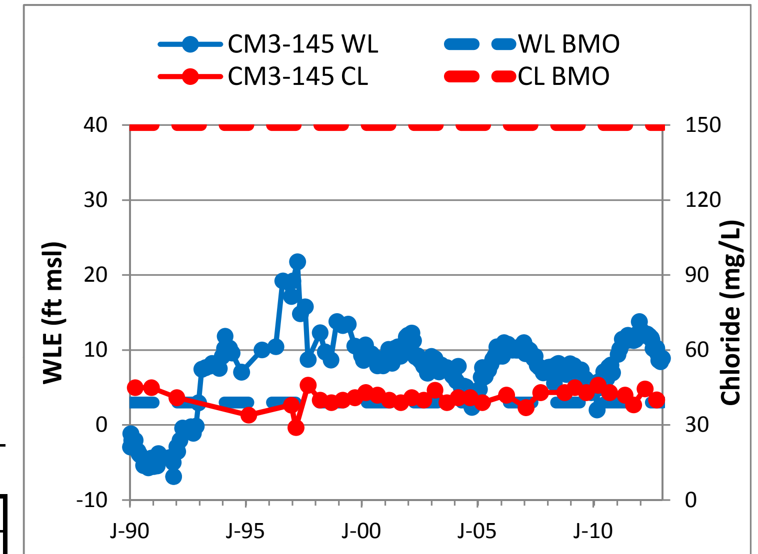
Status Summary: Water level BMOs were met at two thirds of the monitoring locations in 2012. December water levels were generally the same as those in January 2008 and January 2011. Chloride BMOs were met at less than half of the monitoring locations. Consistent with past results, chloride BMOs were not met near Port Hueneme and Pt. Mugu (these are areas of documented saline intrusion).

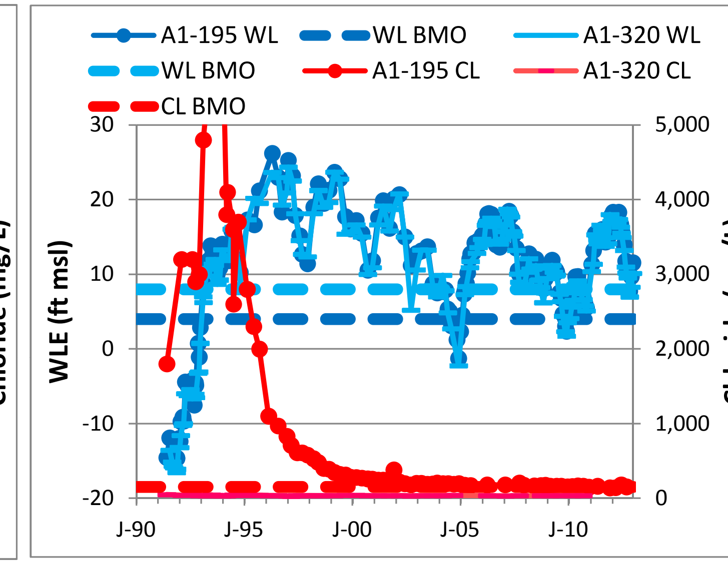
Status Summary Table

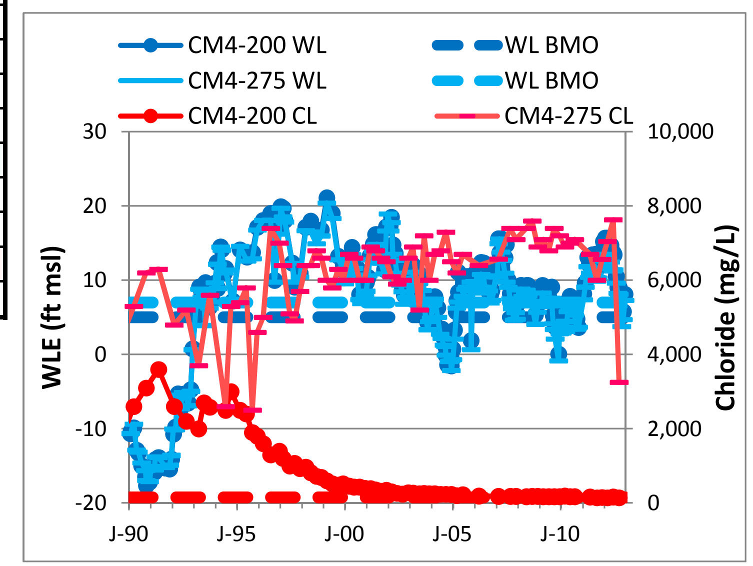
State Well Number (name)	Depth (ft)	Water Level (ft msl)		Chloride (mg/L)		5-yr Trend	
		BMO	2012 Ave	BMO	2012 Ave	Water Level	Chloride
01N23W01C05S (**CM3**-145)	120-145	3	11	150	42	→	→
01N22W20J08S (**A1**-195)	155-195	4	14	150	159	→	→
01N22W20J07S (**A1**-320)	280-320	8	13	150	34	→	→
01N22W28G05S (**CM4**-200)	180-200	5	12	150	149	→	→
01N22W28G04S (**CM4**-275)	255-275	8	10	150	5,977	→	↓
01N21W19L12S (**SCE**-220)	200-220	5	8	150	61	↑	→
01S22W01H04S (**CM6**-200)	180-200	5	-1	150	3,250	→	→
01S22W01H03S (**CM6**-330)	310-330	8	-14	150	2,237	→	↑
01S21W08L04S (**CM1A**-220)	200-220	5	-4	150	16,950	↑	→

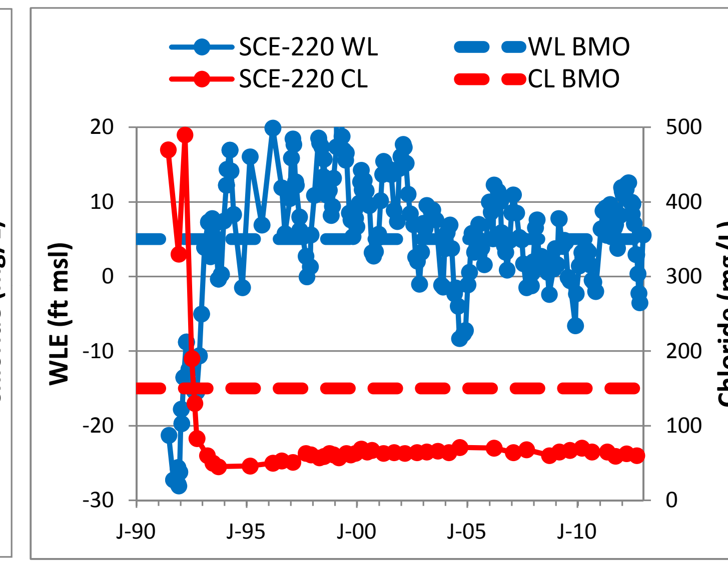


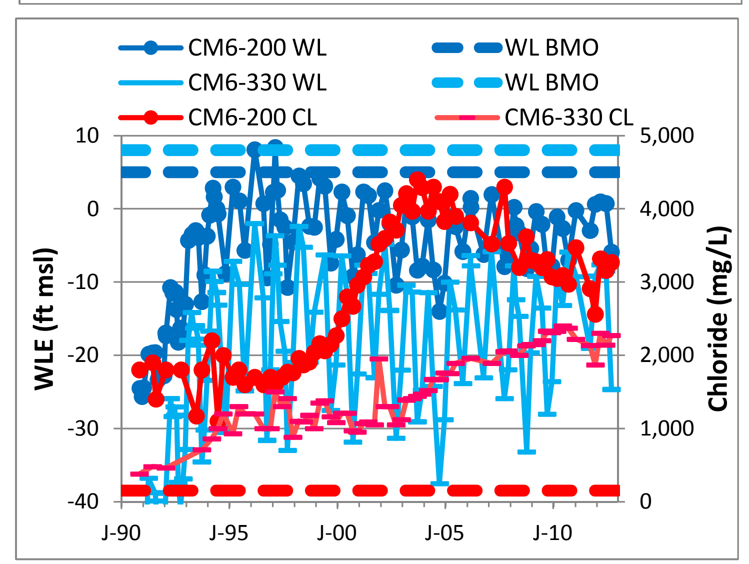
FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
OXNARD PLAIN - UPPER AQUIFER SYSTEM
2012

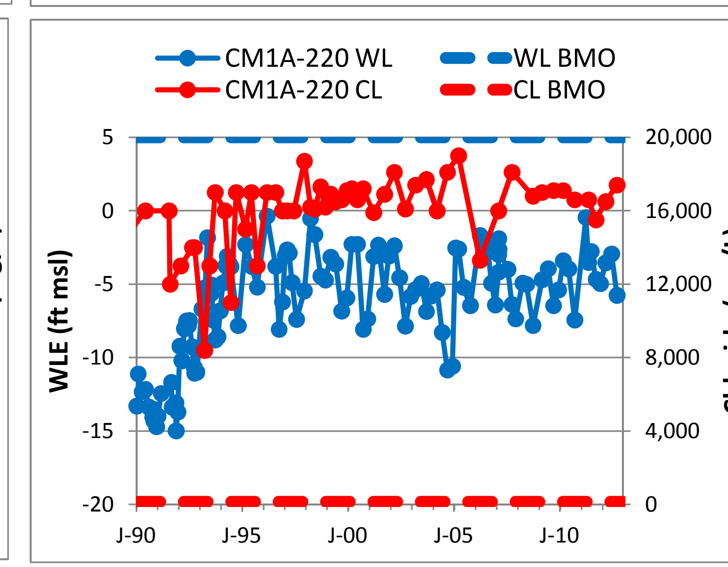












FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
OXNARD PLAIN - LOWER AQUIFER SYSTEM
2012

Goal: Prevent saline intrusion in the LAS. Sources are seawater inflow via aquifer outcrops in submarine canyons near Port Hueneme and Pt. Mugu and and marine sediments.

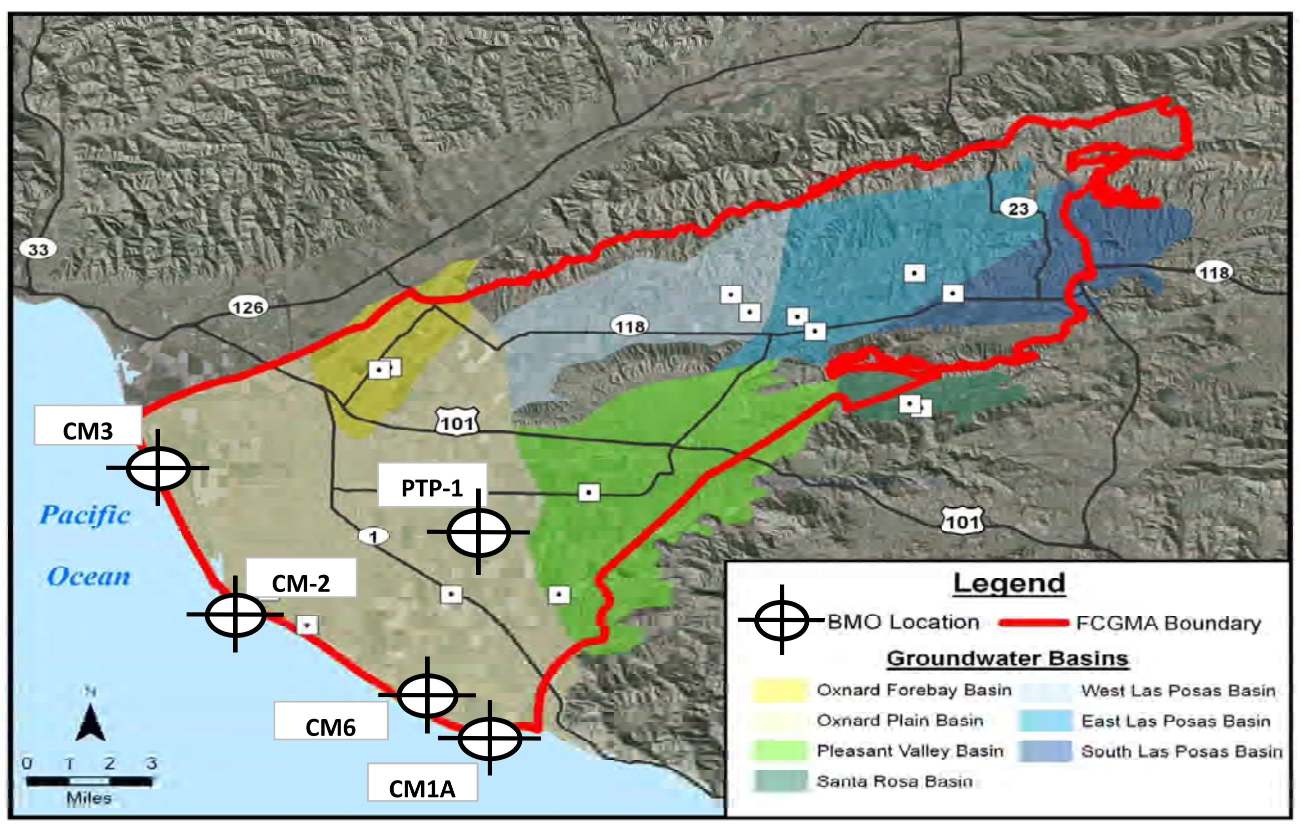
BMOs: Water Levels: Average groundwater elevations suffient to maintain slight seaward groundwater gradient. Elevation varies with location.

Chloride Concentration: 150 mg/L Chloride (LARWQCB Basin Plan Objective).

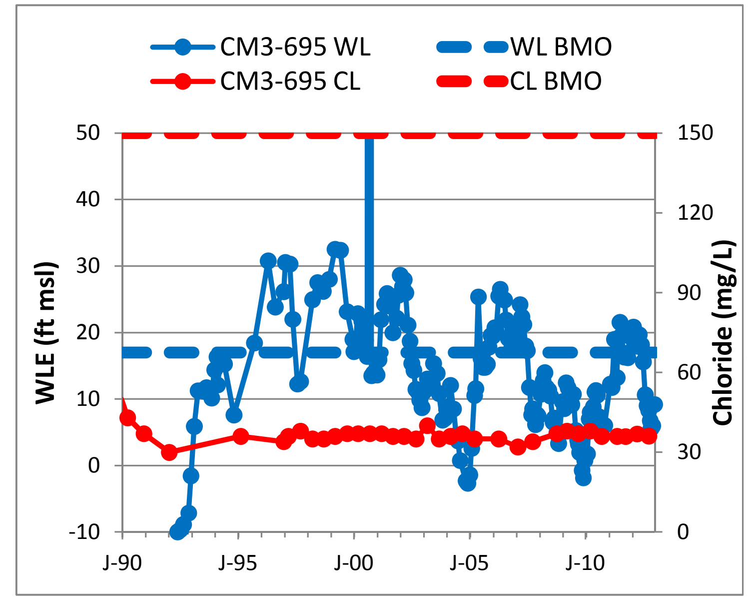
Status Summary: In 2012, water level BMOs were not met . Water levels are below their respective BMO by up to 71 feet (at the inland location). As long as water levels remain depressed, the potential for saline intrusion remains. Consistent with past results, chloride BMOs were not met near Port Hueneme (CM2) and Pt. Mugu (CM1A). These are areas of documented seawater intrusion.

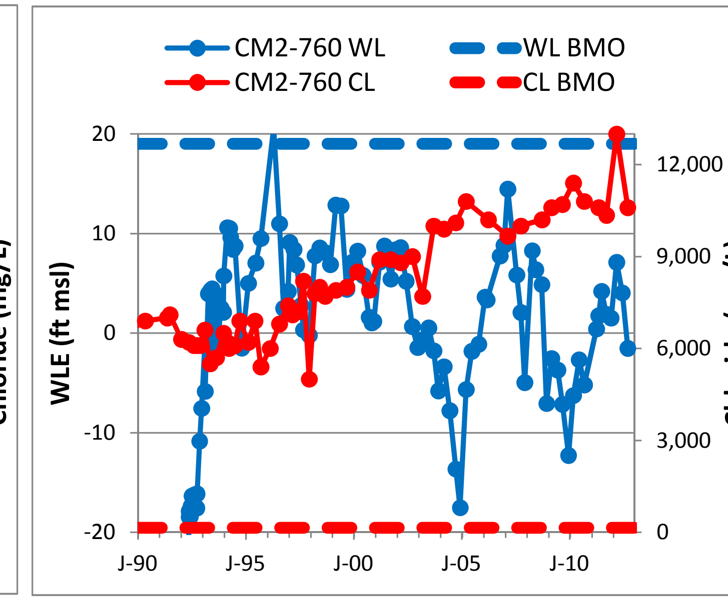
Status Summary Table

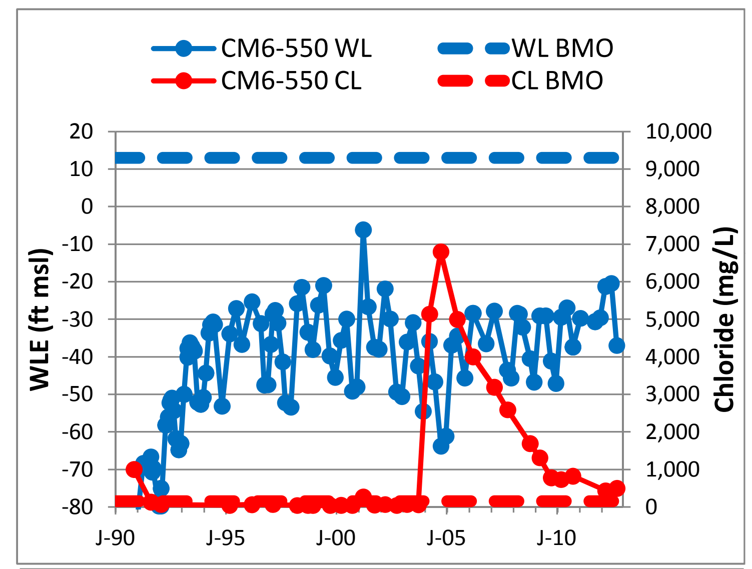
State Well Number (name)	Depth (ft)	Water Level (ft msl)		Chloride (mg/L)		5-yr Trend	
		BMO	2012 Ave	BMO	2012 Ave	Water Level	Chloride
01N23W01C04S (**CM3**-695)	630-695	17	13	150	37	→	→
01N22W29D02S (**CM2**-760)	720-760	19	3	150	11,800	→	→
01S22W01H01S (**CM6**-550)	490-550	13	-26	150	465	↑	↓
01S21W08L03S (**CM1A**-565)	525-565	14	-40	150	5,260	↓	↑
01N21W07J02S (**PTP #1**)	590-1280	20	-51	150	41	→	→

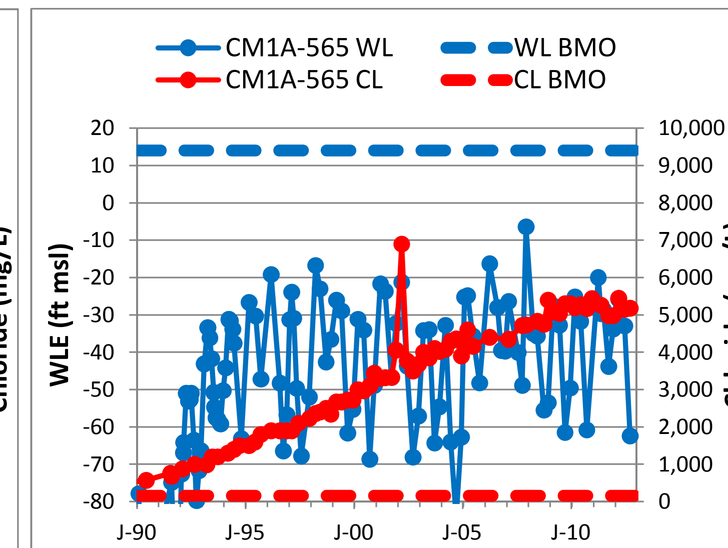


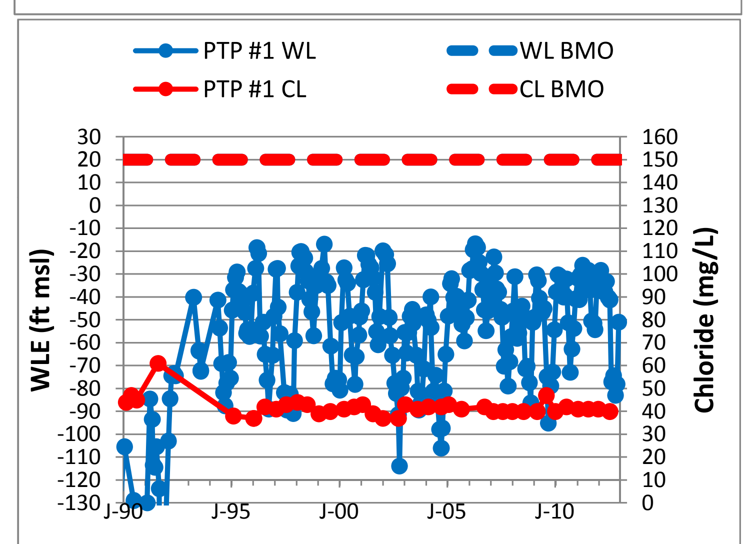
FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
OXNARD PLAIN - LOWER AQUIFER SYSTEM
2012











FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
PLEASANT VALLEY BASIN
2012

FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
PLEASANT VALLEY BASIN
2012

Goal: Prevent inland migration of saline groundwater from coastal areas, underlying sources, and fine-grained interbeds.

BMOs: Water Levels: Average groundwater elevations suffient to prevent landward migration from coastal areas and minimize vertical gradients.

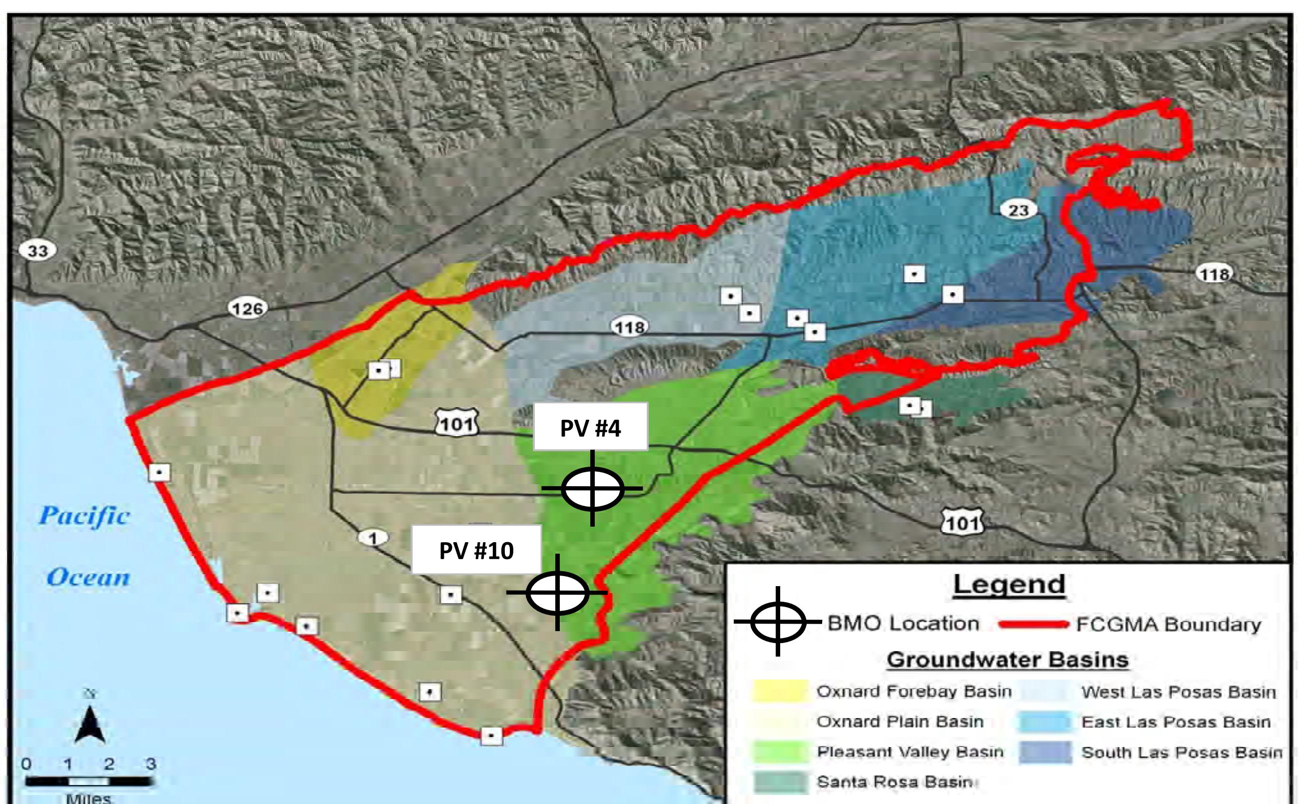
Chloride Concentration: 150 mg/L Chloride (LARWQCB Basin Plan Objective).

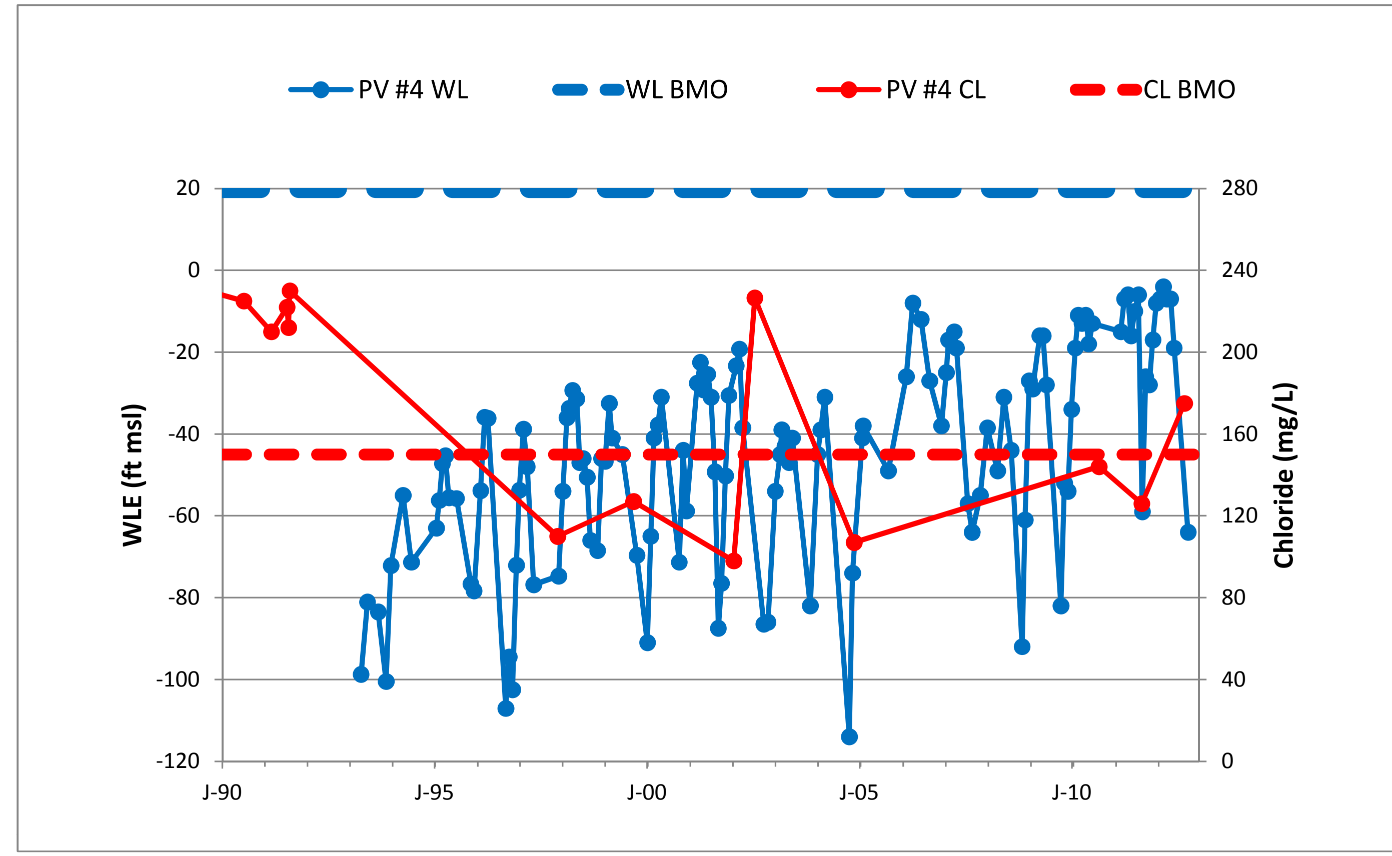
Status Summary: In 2012, water level BMOs were not met at either location. Despite the general trend of rising water levels during the past five years, water levels remain significantly below the BMOs. The chloride BMO is met at the southern of the two monitoring locations. The chloride concentration at the northeastern monitoring location has been rising since January 2005. With depressed water levels, the risk of increasing chloride concentrations remains.

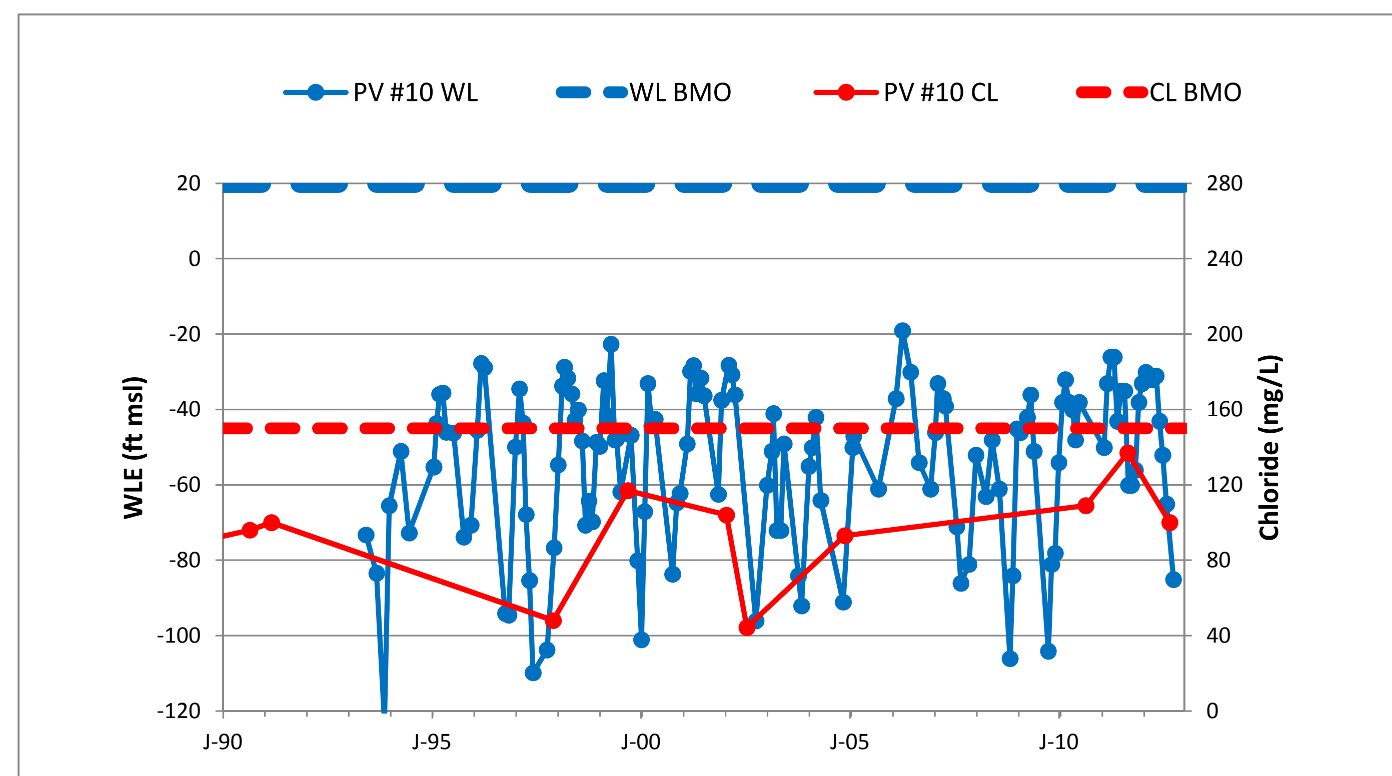
Status Summary Table

State Well Number (name)	Depth (ft)	Water Level (ft msl)		Chloride (mg/L)		5-yr Trend	
		BMO	2012 Ave	BMO	2012 Ave	Water Level	Chloride*
01N21W03K01S (**PV #4**)	403-1433	20	-18	150	175	↑	↑
01N21W21H02S (**PV #10**)	503-863	20	-46	150	100	↑	→

Note: * = Trend evaluation is inconclusive; no chloride data between 2004 and 2010.







FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
ARROYO SANTA ROSA BASIN
2012

Goal: Meet LARWQCB Basin Plan Objectives for nitrate and chloride.

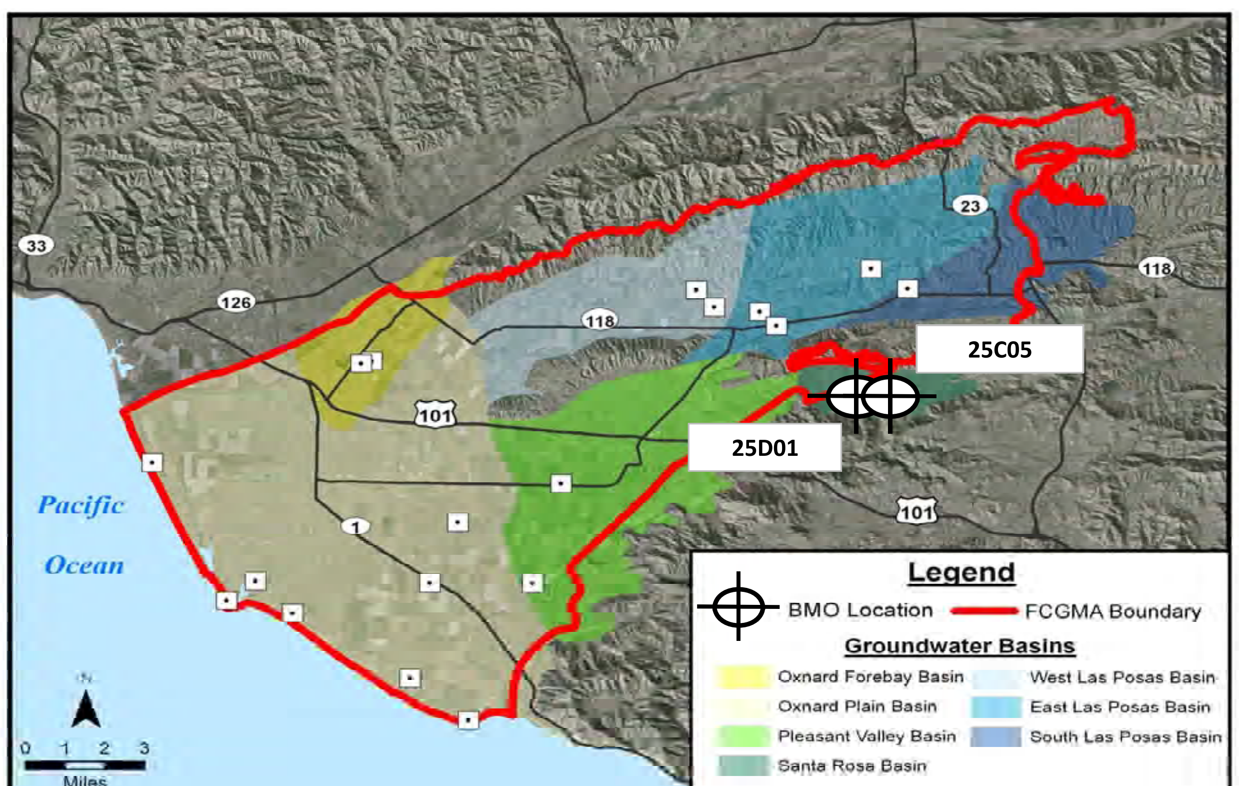
BMOs: Nitrate Concentration: 45 mg/L-NO_3 (LARWQCB Basin Plan Objective & State of CA MCL)

Chloride Concentration: 150 mg/L (LARWQCB Basin Plan Objective)

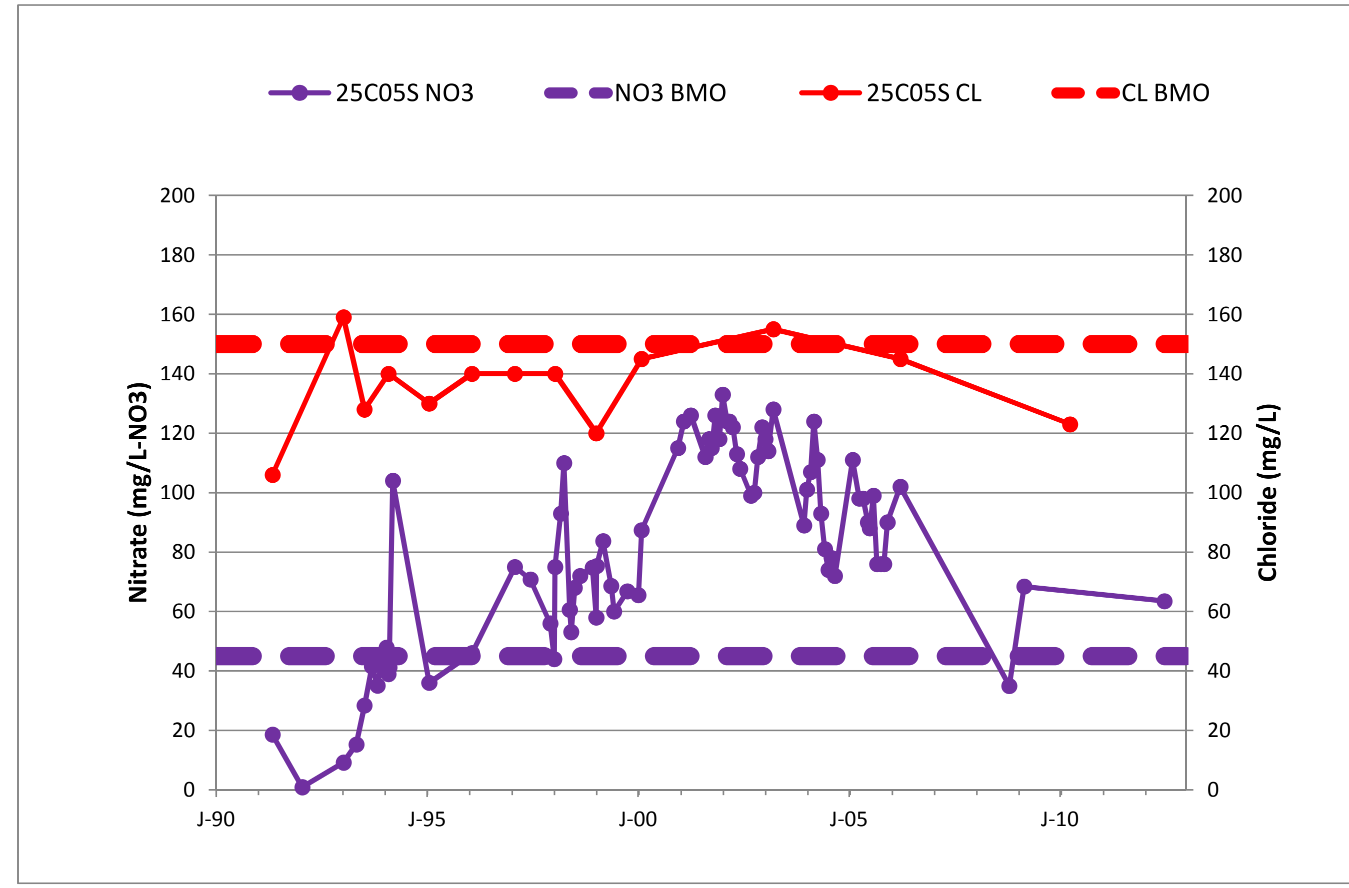
Status Summary: Nitrate exceeded its BMO (64 and 52 vs. 45 mg/L) at both monitoring locations. Nitrate concentrations were about the same as those in 2008. Chloride data was not available for one of the two BMO locations (25C05) for 2012. Chloride concentration at 25D01 was slightly below the BMO (137 vs. 150 mg/L). Chloride data at 25C05 has not been available for the past 2 years, therefore the 5 year trend could not be determined. Based on the available data, chloride concentrations have risen at 25D01 since about mid-1999.

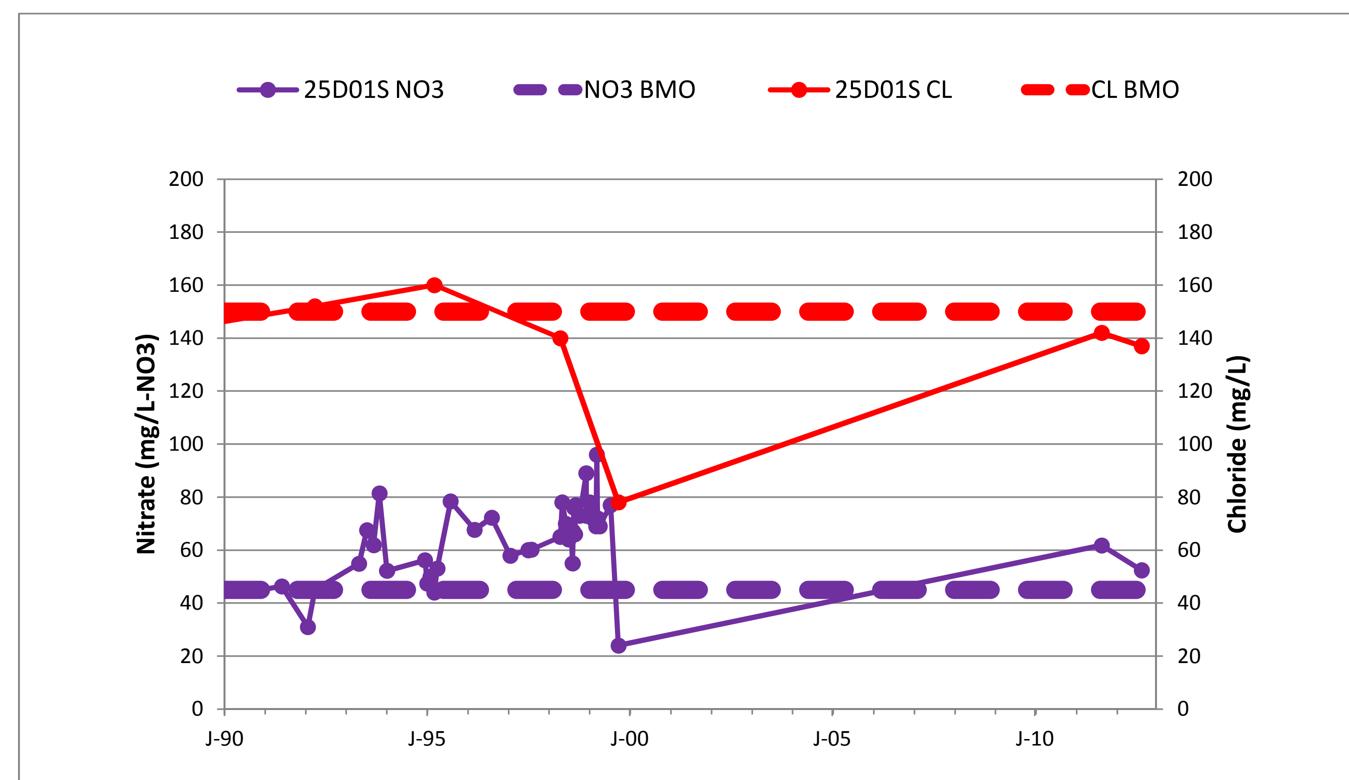
Status Summary Table

State Well Number (name)	Depth (ft)	Nitrate (mg/L)		Chloride (mg/L)		5-yr Trend	
		BMO	2012 Ave	BMO	2012 Ave	Nitrate	Chloride
02N20W25C05S	160-260	45	64	150	No Data	→	
02N20W25D01S	Unknown	45	52	150	137	→	↑



FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
ARROYO SANTA ROSA BASIN
2012





FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
LAS POSAS BASINS
2012

Goal: Maintain chloride and TDS concentrations suitable for irrigation of salt-sensitive crops, particulary avocados and berries. BMOs for SLP are equal to the concentrations observed in surface water in Arroyo Las Posas.

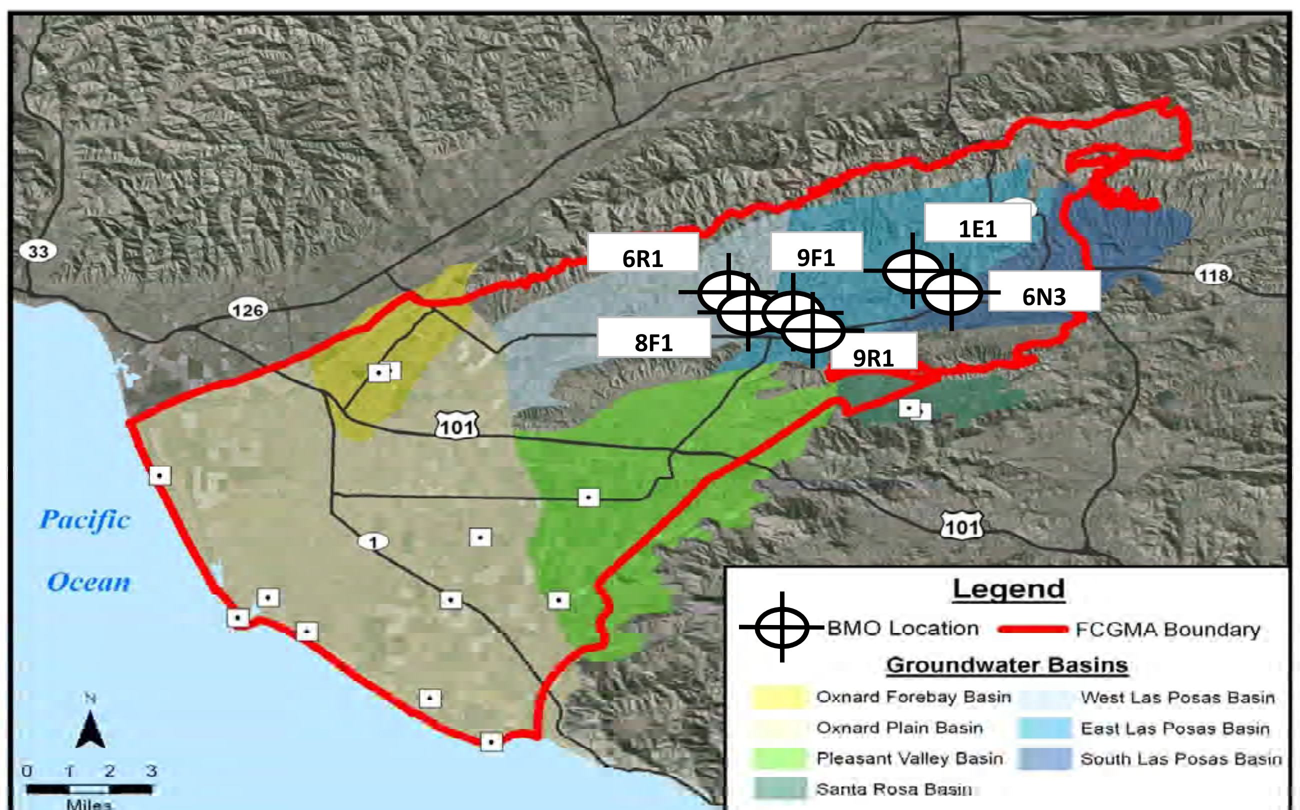
BMOs: Chloride Concentration: WLP & ELP: 100 mg/L; SLP: 160 mg/L.

TDS Concentration: ELP: 500 mg/L; WLP: 600 mg/L; and SLP: 1,500 mg/L.

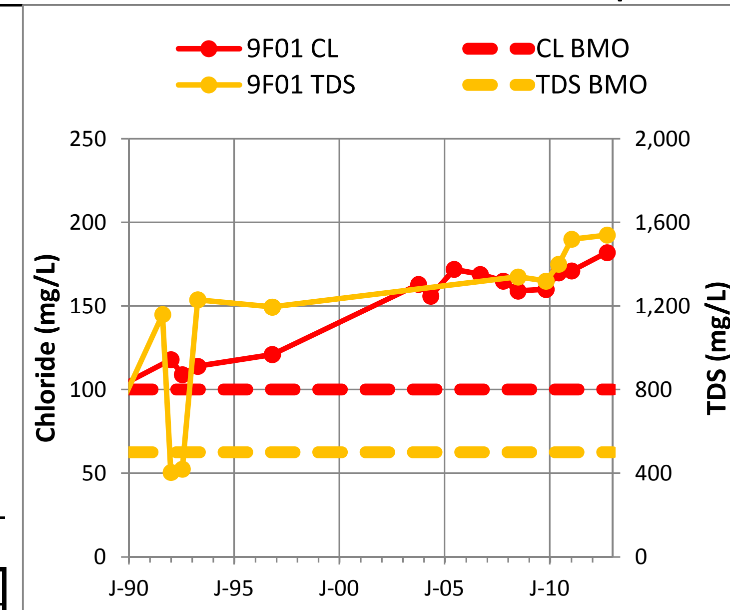
Status Summary: No data is availble for three of the six BMO monitoring locations for 2012. Chloride and TDS BMOs were exceeded in the ELP Basin, in the area of the expanding plume of poor quality water. Chloride and TDS BMOs were met at 08F01 in the West Las Posas Basin. Data are insufficient to determine the five-year trend at three monitoring locations. For the past five years, chloride and TDS concentration trends are slightly rising in the ELP. Chloride and TDS concentrations decreased at the BMO location in the WLP Basin. New BMOs are proposed in the draft basin-specific plan.

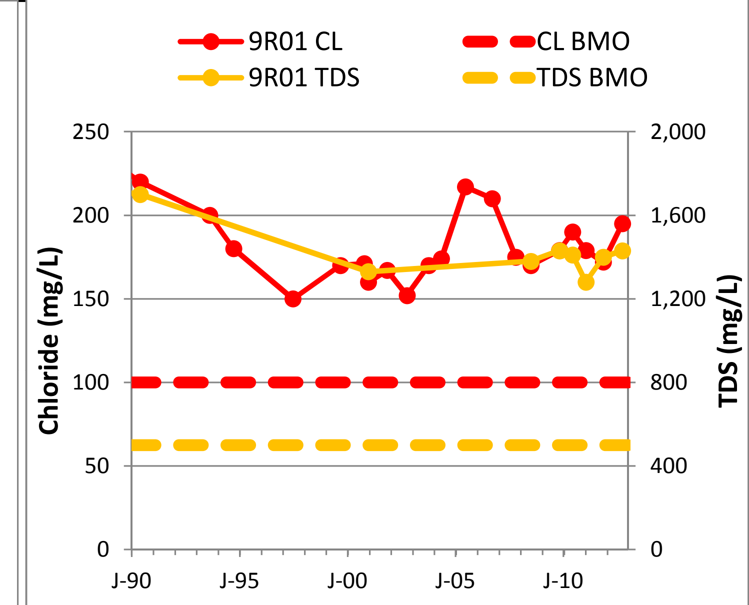
Status Summary Table

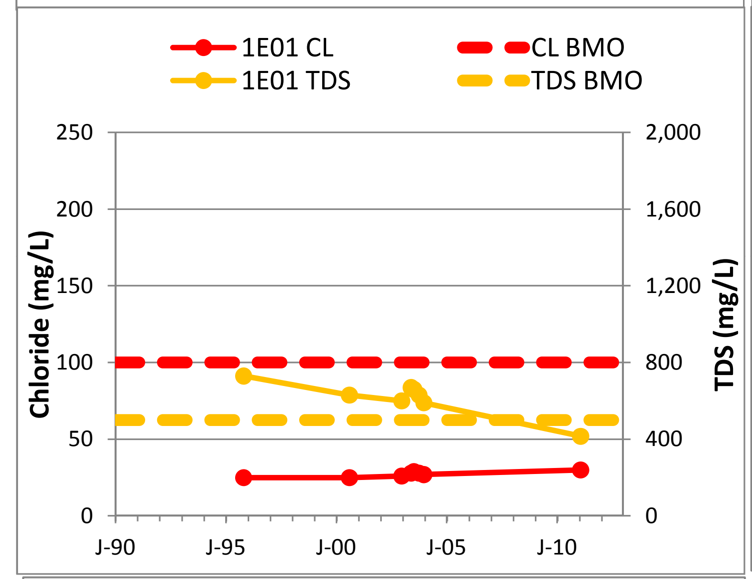
State Well Number (name)	Depth (ft)	Chloride (mg/L)		TDS (mg/L)		5-yr Trend	
		BMO	2012 Ave	BMO	2012 Ave	Chloride	TDS
02N20W09F01S (ELP)	906-1,290	100	182	500	1,540	↑	↑
02N20W09R01S (ELP)	456-724	100	195	500	1,430	↑	↑
02N20W01E01S (ELP)	567-907	100	*No Data*	500	*No Data*	*Insufficient Data*	
02N20W06R01S (WLP)	1,090-1,512	100	*No Data*	600	*No Data*	*Insufficient Data*	
02N20W08F01S (WLP)	752-1,406	100	13	600	369	↓	↓
02N19W06N03S (SLP)	101-121	160	*No Data*	1500	*No Data*	*No Data*	

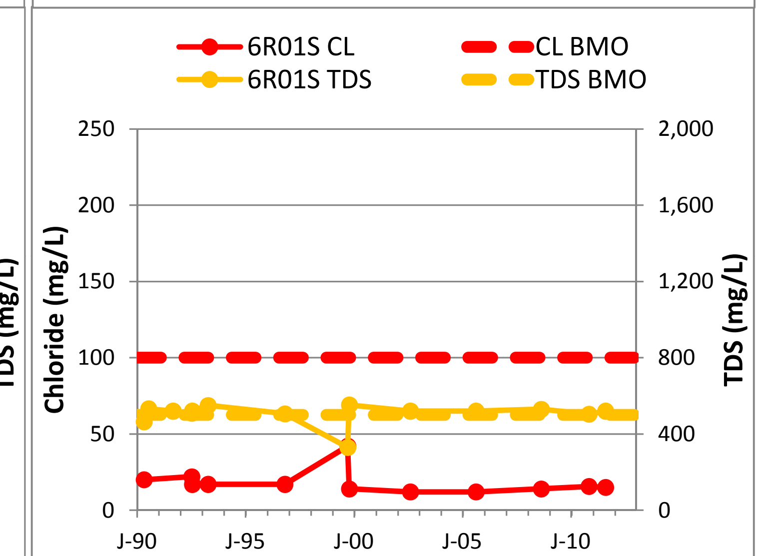


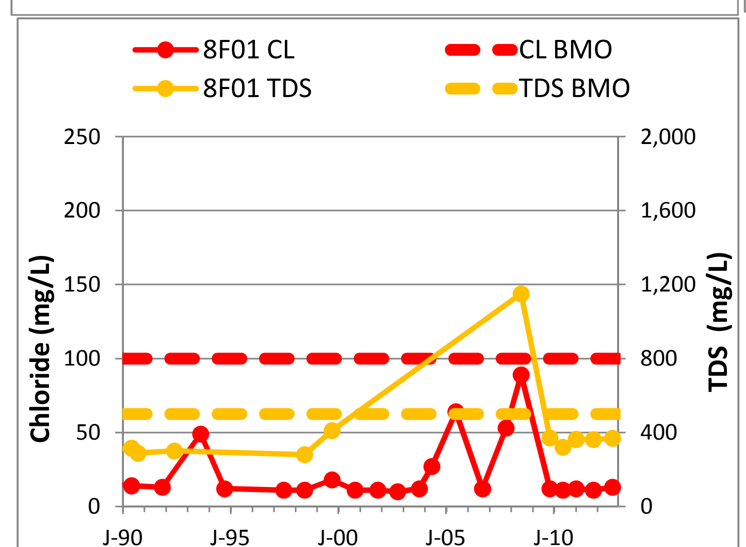
FOX CANYON GMA BASIN MANAGEMENT OBJECTIVES REPORT CARD
LAS POSAS BASINS
Updated January 2012

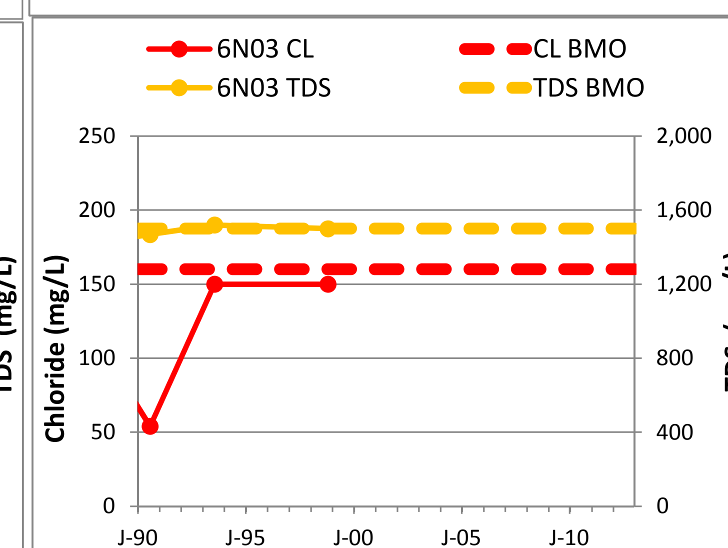












Resolution No. 2013-02
of the
Fox Canyon Groundwater Management Agency

A RESOLUTION CONCERNING THE IMPLEMENTATION OF FIRST PHASE OF THE CITY OF OXNARD'S GREAT PROGRAM AND THE ASSOCIATED RECYCLED WATER MANAGEMENT PLAN

WHEREAS, the Fox Canyon Groundwater Management Agency ("Agency") was established to preserve the integrity of the quality and quantity of groundwater resources within its boundaries; and

WHEREAS, the Agency exercises its regulatory authority through ordinances, resolutions, and implementation of its adopted groundwater management plan; and

WHEREAS, the current Agency groundwater management plan ("GMA Management Plan") was updated and adopted in May 2007; and

WHEREAS, the GMA Management Plan provides an extensive evaluation of the varying conditions in aquifers within the Agency, and an assessment of the water management strategies that various entities propose for implementation within the Agency; and

WHEREAS, the City of Oxnard ("City") is in the final stages of constructing the first phase of its Groundwater Recovery Enhancement and Treatment Program ("GREAT Program"), through which the City will make available approximately 7,000 acre-feet per year ("AFY") of advanced treated recycled water ("RW") for use within the City, the Oxnard Plain and Pleasant Valley area; and

WHEREAS, the GMA Management Plan describes the use of RW generated from the GREAT Program as an important management strategy that will result in improvements to water supply reliability and water quality conditions within the Agency; and

WHEREAS, the primary benefits of the GREAT Program include: (a) generation of approximately 7,000 AFY of new water supplies for the region; (b) increased use of supplemental water supplies and the concomitant reduced groundwater pumping in the areas of the Oxnard Plain and Pleasant Valley subbasins; (c) introduction of RW into the Pumping Trough Pipeline ("PTP") and Pleasant Valley County Water District ("PVCWD") systems which will increase United Water Conservation District's ("UWCD") ability to recharge surface water to the Forebay under certain conditions; (d) shifting groundwater pumping from the coastal and Pleasant Valley areas that are most difficult to recharge, to the Forebay/Near Forebay, which is easily recharged; (e) overall increase in groundwater recharge; and (f) the removal of tons of salts from the Oxnard Plain and Forebay groundwater; and

WHEREAS, the Agency adopted Resolutions Nos. 2003-4, and 2003-5 in support of the implementation of the GREAT Program; and

WHEREAS, UWCD's mission is to manage, protect, conserve and enhance the water resources of the Santa Clara River, its tributaries, and associated aquifers; and

WHEREAS, UWCD has and continues to serve an integral role in evaluating groundwater conditions within the Agency jurisdiction and developing strategies to optimize the management and use of water resources within the region. United's efforts in this regard are documented in the GMA Management Plan and its ongoing responsibilities in monitoring aquifer conditions and regularly operating and updating Ventura Regional Groundwater Model; and

WHEREAS, UWCD, PVCWD and the City have developed a plan to utilize RW within the UWCD PTP and PVCWD ("PV") distribution systems, along with direct delivery of RW to agricultural users along the pipeline alignment (collectively, "RW users"). Certain RW users have documented this plan to use RW through an agreement titled, "Full Advanced Treatment Recycled Water Management and Use Agreement" entered into by and between the City, PVCWD, UWCD, Houweling Nurseries, Reiter Affiliated Companies and Southland Sod ("RW Agreement"). The RW Agreement is an attachment to the Agency staff report accompanying this Resolution; and

WHEREAS, the City, UWCD and PVCWD will oversee and coordinate the ongoing delivery of RW to agricultural users in the Pleasant Valley and Oxnard Plain subbasins; and

WHEREAS, as a component of the RW Agreement, the City, UWCD and PVCWD have developed a "Recycled Water Management Impact Analysis Plan" ("RWIA Plan") pursuant to which basin conditions will be monitored and analyzed, and criteria set under which the City will be able to pump groundwater from City owned wells and the UWCD Oxnard-Hueneme system ("OH System"). The RWIA Plan is set forth in this Resolution and its attachments; and

WHEREAS, the use of RW and the implementation of the RWIA Plan will contribute to the improvement of groundwater supply and quality issues within the Agency; and

WHEREAS, from 2006 to present the City, UWCD and PVCWD collaborated on the implementation of the Conejo Creek – Supplemental M&I Water Program. This program provided PVCWD approximately 6,000 AFY of additional surface water supplies. All or some portion of the groundwater pumping by PVCWD displaced by this additional surface water was then transferred to the Forebay through groundwater delivered to UWCD's Oxnard-Hueneme Pipeline customers, including the City. The intent of this program was to shift groundwater pumping from the Pleasant Valley subbasin to the Forebay; and

WHEREAS, the data obtained from the implementation of the Supplemental M&I Water Program is valuable in assessing the capabilities and impacts of shifting additional pumping to the Forebay as documented in the RWIA Plan (Attachment A); and

WHEREAS, the GREAT Program Final Environmental Impact Report (SCH #2003011045) assessed the potential environmental impacts associated with Phase 1 of the GREAT Program and this RWIA Plan, and was certified in September, 2004, concurrent with the City's approval of the construction of Phase 1 of the GREAT Program; and

WHEREAS, the Agency Ordinance Code provides for adjustments to extraction allocations; and

WHEREAS, the Agency has considered the environmental effects of the RWIA Plan as shown in the GREAT Program Final Environmental Impact Report and made the findings required by California Environmental Quality Act Guidelines section 15091.

NOW, THEREFORE, IT IS HEREBY PROCLAIMED AND RESOLVED AS FOLLOWS: The Agency grants its approval of the RWIA Plan subject to the following conditions:

1. This Resolution supersedes and restates in its entirety Resolution No. 2003-5.

2. The UWCD has provided the RWIA Plan and Monitoring Plan for the proposed groundwater pumping allowed pursuant to this Resolution. This Resolution and the RWIA Plan contain the following (the RWIA and Monitoring Plan are included as Attachment A and B to this Resolution):

    a. A description of groundwater monitoring program consisting of water level and water quality monitoring that is designed to detect ongoing conditions within the West Las Posas Basin, Pleasant Valley subbasin, the Oxnard Plain subbasin, and the Forebay. Water level and quality data shall be collected on an ongoing basis for use to assess basin conditions and provide for the ongoing use of the Ventura Regional Groundwater Model in evaluating basin conditions.
    b. An assessment of historic and current conditions in the Forebay, Oxnard Plain and Pleasant Valley subbasins and anticipated impacts to those subbasins associated with the implementation of the RWIA Plan.
    c. Limitations or restrictions on Forebay pumping based upon groundwater level triggers and hydrologic conditions.
    d. Annual, or more frequent, coordination meetings and reporting between the City, UWCD, PVCWD and the Agency regarding the annual report and implementation of the RWIA.
    e. All monitoring and reporting shall be overseen and approved by a State of California Licensed Professional Geologist or Engineer.

3. The City shall accrue a Recycled Water Pumping Allocation ("RWPA") (up to 5,200 AFY per year), which allows the City to obtain groundwater in a volume and subject to the conditions provided in this Resolution.

4. The City will receive 1 acre-foot of RWPA for each acre-foot of RW use that results in 1 acre-foot decrease in groundwater pumping by RW users. Further, the City will receive RWPA only in the instance that the reduced groundwater pumping by RW users was

groundwater that would have been pumped based upon a Historical Allocation or Irrigation Efficiency/Allowance Allocation.

5. To the extent practical, PVCWD shall prioritize its water use as follows, from highest to lowest priority: (a) Conejo Creek Project supplemental water: (b) RW; (c) surface water from UWCD; and (d) groundwater. However, the Agency acknowledges that Camrosa Water District and PVCWD are currently reevaluating the future availability of water from the Conejo Creek Project. This Resolution creates no obligation for PVCWD to continue purchasing water through the Conejo Creek Project; provided however, if PVCWD does continue to have access to that supply, it should rely on it as a first priority. Further, the Agency recognizes that Camrosa Water District has relied and may continue to rely on the Conejo Creek Project supplies for use within its district. The volume of water available to PVCWD has been and may continue to be reduced as Camrosa uses more and more of that supply within the Camrosa service area. This prioritization of use under this provision shall be documented through the Annual Report required under Section 13.

6. No RWPA will accrue to the City for RW use that displaces groundwater pumping that would have been subject to Agency surcharges.

7. No RWPA shall accrue to the City for RW use that displaces UWCD surface water deliveries to those same users, when and if UWCD is concurrently physically not capable of diverting that volume of surface water to UWCD recharge basins because the recharge basins and the Forebay are full.

8. RW users shall not earn conservation credits on unused Historical Allocation associated with reduced groundwater pumping resulting from use of RW.

9. The City will report annually to the Agency and UWCD the quantity of RW delivered to each RW user. Prior to receipt of any RW, each RW user shall develop a protocol and format acceptable to the RW user, the Agency and the City, to account for the RW user's annual water use, including RW.

10. The City and RW users will report their water use to the Agency on semi-annual extraction reports as required under Agency rules and procedures, and otherwise consistent with the requirements provided in Section 9 above.

11. City shall pump the RWPA from City owned wells and UWCD's O-H system.

12. The Agency, the City, UWCD, and PVCWD shall meet during the first week of May of each year ("Coordination Meeting"), and more frequently as necessary, to discuss any needed refinements to the implementation of the RWIA Plan, the current accounting of RWPA, and any expected limitations on the City's use of RWPA because of Forebay water levels and then existing hydrologic conditions. As a result of these annual meetings, the Agency, the City and UWCD shall establish the locations and volume of

RWPA that shall be available to the City for pumping through the following year, subject to the following conditions:

a. The volume of RWPA that the City is allowed to extract shall be set between 0 and 8,000 AFY (this volume limitation shall include the volume of M&I Supplemental Program water UWCD will pump during the same period as provided in Section 20, below); and
b. To the extent the City is not allowed to pump the cumulative RWPA it has earned, all accrued RWPA shall carry forward until the City is allowed to use the RWPA in its entirety, subject to the conditions of this Resolution; and
c. To the extent the Agency, the City and UWCD do not agree on restrictions on the use of RWPA for any given year, based on the then existing and anticipated hydrologic circumstances, the City shall use the RWPA consistently with UWCD Board of Directors' determination in consultation with the Agency.
d. This provision shall not prevent the parties from meeting more frequently to consider alterations to the implementation of the RWIA Plan given changing hydrologic conditions.

13. In preparation for the Coordination Meeting, the City, UWCD and PVCWD will provide the Agency with an Annual Report by April 1st. The report shall include an assessment of conditions, including water level/water quality data and analysis in the Forebay, Oxnard Plain and Pleasant Valley subbasins and an evaluation of any impacts directly associated with the pumping approved under this Resolution. GMA staff will annually review and report to the Agency Board on compliance and effectiveness of this Resolution.

14. Unless otherwise authorized pursuant to the Coordination Meetings, the City shall not pump its RWPA from the Forebay when evacuated groundwater from storage in the Forebay reaches 80,000 acre-feet (as regularly determined by UWCD), or groundwater levels in the Forebay reach 19 feet above mean sea level. Resumption of pumping of RWPA from the Forebay shall occur as authorized pursuant to the Coordination Meetings as provided in Section 12.

15. City shall be deemed to pump its RWPA before its Historical Allocation.

16. The City may not transfer or assign all or any portion of its RWPA, except to facilitate its use of the RWPA in coordination with UWCD so that RWPA may be pumped from either City owned wells or UWCD's O-H Pipeline facilities.

17. Except as expressly provided in this Resolution, the RWPA does not create a new Agency allocation or credit.

18. Only RW delivered to RW users who have filed all required extraction reports with and have paid all required fees, charges and penalties due and payable to the Agency and UWCD shall be eligible to generate a RWPA for the benefit of the City.

19. The Agency Board may reconsider and modify any provision of this Resolution under the following circumstances: (a) concurrently with the expiration of the "Performance Test" (no later than 2 years after 1st RW Delivery) as provided and as defined in the RW Agreement; (b) a material modification in the terms and conditions set forth in the RW Agreement; (c) to make this Resolution consistent with provisions of any update to the GMA Management Plan that has been approved by the Agency Board; or (d) a finding by the Agency Board that the implementation of this Resolution is having a detrimental impact on the water resources in either the Forebay, Oxnard Plain or Pleasant Valley subbasins. The Agency shall provide a minimum of six months advance notice to the RW users before implementing any material change to this Resolution.

20. Based upon the RWIA provided in Attachment A, 8,000 AFY of RW and M&I Supplemental Program groundwater extraction can be accommodated in the Forebay with little, if any effect on Forebay depletion. 5,200 AFY of RW pumping is proposed as a substitute to the M&I Supplemental Program as part of this Resolution. Therefore, to remain below this impact threshold, no more than 2,800 AFY of groundwater pumping in any one year can be utilized by UWCD from the M&I Supplemental Program account.

21. The City shall cease accruing RWPA on the date in which the first 10-year term of the RW Agreement terminates. Subsequent to the termination of the RW Agreement, the City shall pump its remaining RWPA pursuant to the terms and conditions of this Resolution.

On motion by Director Naumann, seconded by Director Kelley, the foregoing resolution was passed and adopted on this 26th day of June 2013.

By: Charlotte Crave

Charlotte Crave, Vice-Chair, Board of Directors
Fox Canyon Groundwater Management Agency

ATTEST: I hereby certify that the above is a true and correct copy of Resolution 2013-02.

By: Miranda Nobriga

Miranda Nobriga, Clerk of the Board

Attachment A – Recycled Water Management Plan Impact Analysis (RWIA) Plan
Attachment B – Monitoring Plan for GREAT Program Forebay and Oxnard Plain Extractions, dated May 2013

Recycled Water Management Impact Analysis (RWIA) Plan

Prepared by UWCD – Dr. Steve Bachman
April 2013

Proposed Extraction Locations and Pumping Schedules: The pumping is proposed to be shared between three sites - UWCD's El Rio facility, Oxnard's Water Yard, and Oxnard's Rice Avenue facility. The El Rio facility is in the Forebay basin and pumps largely from the Upper Aquifer. The Water Yard and Rice Ave facilities are located in the Oxnard Plain basin, near the boundary with the Forebay basin. The Oxnard facilities pump largely from the Upper Aquifer.

Potential Impacts from Pumping: Although the Forebay basin can tolerate significant pumping because it is easily recharged during wet periods, decreased water levels in the Forebay basin and adjacent portions of the Oxnard Plain basin can create temporary impacts. Because Oxnard's facilities are between the Forebay and the coast, there could be potential impacts at the coastline. These impacts can be divided into local and regional effects. Local effects include lowered groundwater levels and/or water quality changes in nearby wells. For instance, nitrates commonly increase at El Rio during dry periods when there is less recharge and groundwater elevations drop in the Forebay. Regional effects include overall lowered groundwater levels that could extend to the coastline and affect seawater intrusion, which is most likely during successive dry years, when Forebay recharge is significantly reduced while pumping continues. In particular, care must be taken not to pull the Hueneme plume of salty groundwater further inland.

The Fox Canyon Groundwater Management Agency ("FCGMA") has previously approved two programs which authorized increased reliance on Forebay pumping. The results of these programs – the Conejo Creek / Supplemental M&I Program and the Ferro Pit recharge basin acquisition program (FCGMA Resolution No. 2010-08) – have demonstrated that increased pumping from the Forebay can be managed successfully and without any negative consequences.

It is important to note that Oxnard has eliminated its use of the Conejo Creek / Supplemental M&I Program, so much of the pumping in the Forebay that is part of that program will be eliminated. Whereas PVCWD may continue to receive some water from the Conejo Creek project, the transfer of pumping to the Forebay will be significantly decreased. Historically, the Conejo Creek project has produced approximately 6,000 AFY of yield with that groundwater pumping shifted to the Forebay. This program has demonstrated that the Forebay can accommodate this level of increased pumping without negative consequences.

It is also important to note that whereas the GREAT Program will deliver approximately 5,200 AFY of advanced treated recycled water ("RW") which will be eligible for a Recycled Water Pumping Allocation ("RWPA"), the availability of RW for use within PVCWD and the PTP system will enable UWCD to retain some additional surface water to recharge the Forebay. Hence, the impact of pumping the RWPA from the Forebay and the adjacent areas of the Oxnard Plain basin will be mitigated to some extent by the enhanced recharge of the Forebay.

Analysis of Potential Impacts: UWCD has evaluated various pumping scenarios based on historic water uses. In particular, the implementation of the Conejo Creek / Supplemental M&I Program and the Ferro Pit recharge basin acquisition program provide very recent data regarding the Forebay's ability to accommodate various pumping stresses. Attachment A indicates that as much as 8,000 AFY of additional Forebay pumping under these programs has had minimal effect on the strong correlation between river flow/diversions and groundwater elevations. The Forebay has historically accommodated cycles of lowering water levels during drier years and recharge and rebound of water levels during wetter years.

Thus, the Forebay appears to be able to accommodate RWPA pumping of the magnitude of the supplemental water programs.

Despite the historical accommodation of the Forebay to dry periods, groundwater elevations reach sea level during these periods. Thus, potential impacts of low groundwater elevations during dry periods must be monitored carefully. For instance, if groundwater elevations in the Forebay reach critical depletion levels (80,000 AFY of available storage or 19 feet above sea level), the low groundwater elevations could potentially create a landward gradient that pulls seawater further into the aquifers. It would be prudent to reduce pumping of RWPA water during this time of low water levels.

The regional groundwater gradient in the vicinity of the Forebay is towards the west, parallel to the Santa Clara River. Data evaluation does not indicate discernable changes in this gradient caused by any increase in Forebay pumping. The Forebay and adjacent areas already have significant pumping as a background. The added anticipated pumping associated with this project should impose only a relatively small incremental change.

Material local effects, including lowered groundwater levels and/or water quality changes in nearby wells, are not expected to result from the proposed pumping. UWCD has a long history of operations at the El Rio facility which has been accommodated by other pumpers in the area. The high transmissivity of the aquifers in the Forebay tends to mute cones of depression, with the effects of current pumping in the El Rio wellfield only evident during very dry periods. The other mitigating factor is that surface water is spread at El Rio, creating a recharge mound that at times overwhelms and completely masks any cone of depression from the El Rio wells. As described below, UWCD carefully monitors groundwater conditions near the El Rio facility and will be able to detect unexpected effects before causing undesirable consequences. Localized effects would occur in the aquifer due to the increased pumping at the Water Yard and Rice Avenue facilities, but those effects are not likely to impact other currently active production wells that are located over 4,000 feet and over 1,600 feet away.

Monitoring: UWCD currently monitors dozens of wells in the Forebay, Pleasant Valley, and Oxnard Plain subbasins. The monitoring points are a combination of production wells and dedicated monitoring wells, which are generally monitored on a quarterly schedule for groundwater elevations. A portion of these monitoring points also have recording transducers in the wells to measure groundwater levels, with sampling intervals varying from several minutes to several hours. In some producing wells with transducers, real-time data transfer is accomplished through a SCADA system, whereas data from the other transducers are manually downloaded regularly. The groundwater elevation data are regularly entered into UWCD's groundwater elevation database for analysis.

Groundwater quality is sampled from a subset of these wells, generally on a quarterly basis, and entered into UWCD's water quality database for analysis. In addition, the results of water quality sampling from other public water supply wells are downloaded regularly from California Department of Public Health digital records into UWCD's water quality database. UWCD regularly adjusts its monitoring program to address differing conditions, and will continue to do so with this project.

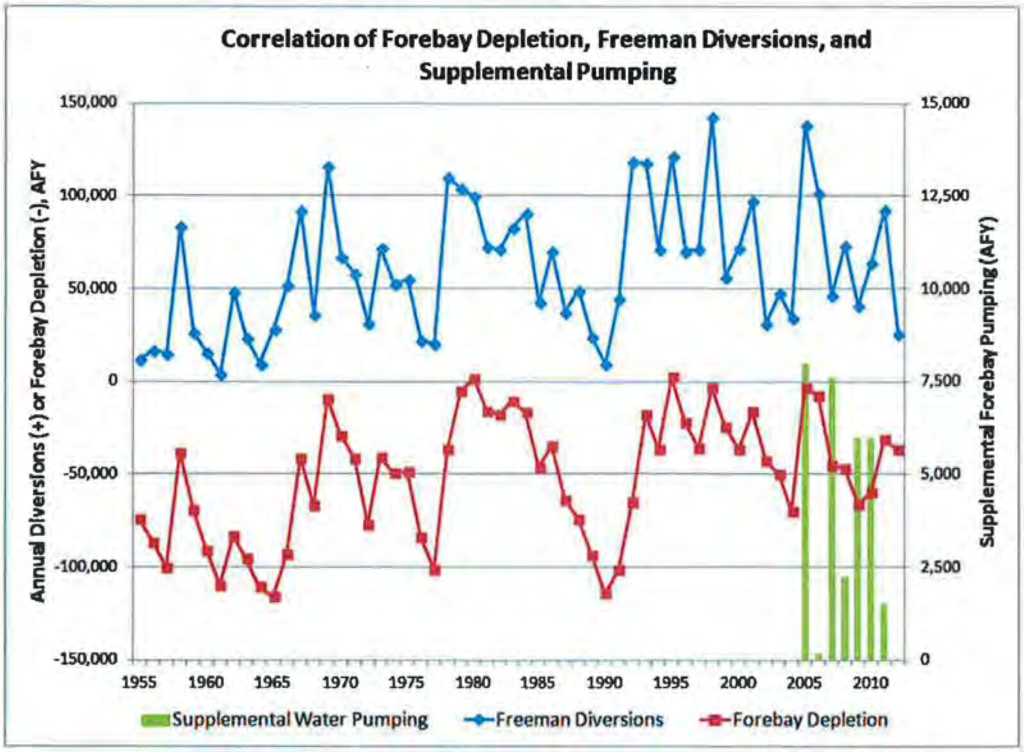
Mitigation of Potential Effects: Given that the reduction in the pumping resulting from the decrease in the Supplemental M&I Program may partially or fully offset anticipated RWPA pumping, aquifer conditions may not change as a result of this project. Forebay groundwater elevations will likely continue to cycle through wet and dry conditions, with full recovery coming when wet-period recharge fills the Forebay subbasin. An uncertainty, however, is the effect of reduced diversions during some years because of future fish flow requirements. The increased recharge to the Forebay from flows diverted from the PV and PTP pipelines to Forebay spreading basins may partially or wholly mitigate this loss to fish flows.

UWCD will continue to pump the Forebay consistent with its historical operations in the Forebay. That is, when Forebay levels are materially depressed and it appears that dry conditions will persist such that Forebay water levels may decline below UWCD's threshold low water level trigger, pumping of supplemental water such as RWPA may be reduced or suspended until UWCD determines the low water level conditions are or will be ameliorated. As with the M&I Supplemental Water program, UWCD will determine in April-May of each year the amount of RWPA that can be pumped in the following water year (October 1 to September 30) at the three extraction locations. This decision will be based on trends of groundwater elevations and other factors that could influence groundwater elevations, in consultation with FCGMA and the City of Oxnard. Of prime concern in this determination is whether RWPA pumping in the following year could lower groundwater elevations below those that correspond to 80,000 AF of available storage or 19 feet above sea level (measured as an average at two wells - Well Nos. 02N22W12R01S and 02N22W22RO2S). However, if groundwater elevations drop further than expected during the year and threaten to go below the 80,000 AF depletion level or 19 feet above sea level, then mid water-year meeting(s) among parties will be held to determine whether the RWPA pumping schedule should be modified.

To monitor and potentially mitigate any impact of pumping RWPA water from the facilities outside the Forebay (Water Yard and Rice Ave) during a dry period that could pull salty water inland from the Hueneme seawater plume, the Upper Aquifer groundwater gradient between these facilities and the coast will be calculated after each monitoring event of the coastal monitoring wells, but not less than semiannually. If it is established that there is a landward gradient that could pull the Hueneme plume further landward, then UWCD, FCGMA, and Oxnard will meet to discuss altering pumping locations and/or pumping amounts until a seaward gradient is re-established.

Groundwater elevations and water quality will continue to be monitored on the existing schedules by UWCD and the County of Ventura. The monitoring results will be analyzed by UWCD at least twice a year for unexpected effects of the pumping. If unexpected effects are detected that could produce undesirable consequences in the basin, UWCD, FCGMA, and Oxnard will meet to discuss how pumping patterns/amounts will be adjusted to prevent the potential undesirable consequences. Because the pumping will be distributed among several wells within three separate locations, there is significant ability to alter pumping patterns. Undesirable consequences are considered to include drawdown below historical low groundwater elevations at the pumping location, interference with other pumping wells that exceeds normal levels and could cause nearby well owners to lower pump bowls in their well(s), and unexpected water quality changes that impact beneficial uses of the groundwater.

Monitoring Results and Reporting: The results of the project monitoring will be summarized following the end of each calendar year by UWCD. Water level and water quality results will be graphed and mapped for ease of examination. The results will be summarized in the Annual Report and circulated to FCGMA and Oxnard by April 1st.



There is a strong correlation between Forebay depletion (available storage) and diversion of surface water at the Freeman Diversion. Thus, Forebay groundwater elevations are largely driven by climatic factors. When as much as 8,000 AFY of pumping was added to the Forebay as part of the M&I Supplemental and Ferro programs (shown as columns), there was little if any effect on Forebay depletion.

Monitoring Plan for
GREAT Project Forebay and Oxnard Plain Extractions

May 2013

Proposed Extraction Locations and Pumping Schedules: The pumping is proposed to be shared between three sites – UWCD's El Rio facility, Oxnard's Water Yard, and Oxnard's Rice Ave. facility. The combined Program is limited to pumping amounts up to 8,000 AFY.

Monitoring: United Water currently monitors scores of wells in the Forebay (45 wells for water quality, and 46 wells for water level) and Oxnard Plain (70 wells for water quality and 110 wells for water level) basins (Figures 1 and 2). The monitoring points are a combination of production wells and dedicated monitoring wells. The frequency of monitoring depends upon the location of the well and the aquifer penetrated. The maps indicate the current frequency of monitoring. In addition, the maps also indicate the wells in which transducers are installed. These transducers are generally set to monitor water levels about every four hours. In the producing wells with transducers, real-time data transfer is accomplished through a SCADA system, whereas data from the other transducers are stored and manually downloaded regularly. The groundwater elevation data and water quality analyses are regularly entered into United Water's groundwater elevation and water quality databases for analysis. In addition, the results of water quality sampling from other public water supply wells are downloaded regularly from California Department of Public Health digital records into United's water quality database. United Water regularly adjusts its monitoring program to address differing conditions, and will continue to do so during this project. The trigger of 19 feet above sea level in the Forebay will be measured as an average of two wells (Well Nos. 02N22W12R01S and 02N22W22RO2S). Water levels in the western portion of the West Las Posas Basin will be monitored. In addition, when nearby monitoring wells are available, water levels and extractions from individual RW Agreement operators on the Oxnard Plain and Pleasant Valley Basins will be measured.

Monitoring Results and Reporting: The results of the project monitoring will be summarized at the end of each calendar year by United Water, and submitted by April 1st to the Agency as part of the Annual Report. Water level and water quality results will be graphed and mapped for ease of examination. This analysis will be an integral part of the Annual Report required for the GREAT project.

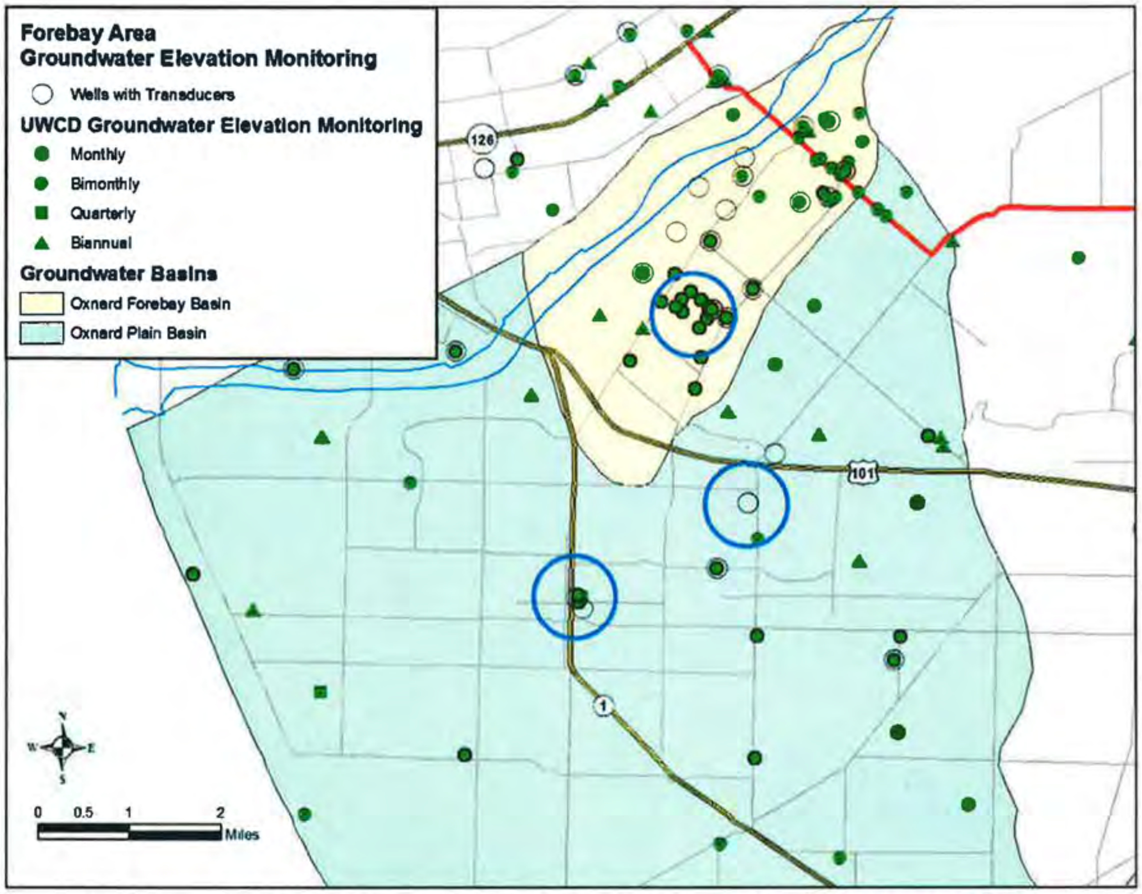


Figure 1. Current United Water groundwater elevation monitoring program. Blue circles indicate locations of pumping for the GREAT project.

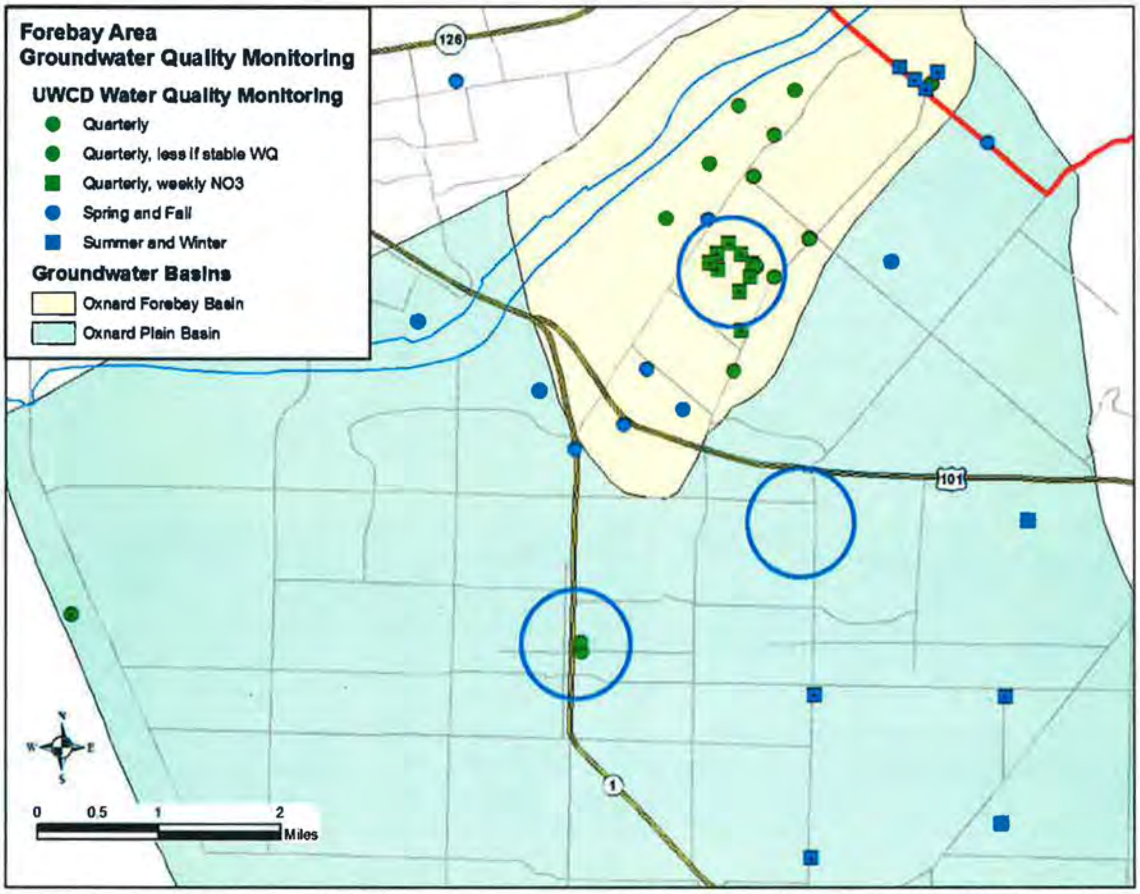


Figure 2. Current United Water groundwater quality monitoring program. Additional data are obtained regularly from California Department Public Health for public drinking water wells in the area. Blue circles indicate locations of pumping for the GREAT project.

White Paper Prepared for Carollo Engineers on:

Water Use From The Advanced Water Purification Facility in Agricultural Operations on the Oxnard Plain.

June 14, 2014

Prepared by:

GreenSource Inc.
1187 Ojai Street
Fillmore, California 93015

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INTRODUCTION TO HISTORICAL AGRICULTURAL WATER USE AND DEVELOPMENT ON THE OXNARD PLAIN

Development of water harvest, supply trunks and delivery systems is a process. It is a process that, much as moving in size from a small backyard garden to community garden to commercial farming like tomatoes, takes the creation of systems of many facets. Those include land availability, land preparation, a conducive climate for crop propagation, an adequate quantity and quality water source, a set of motivated growers, and an efficient distribution channel to the end user. The process of developing a "new" water source in California is not new and will create a business development model that brings together interests from farming, land development, water, and consumers. All of these factors join together as part of the profit and loss equation.

In the late 1800's, many new water supply systems were developed by groups of recent transplants to Ventura County. These water supply systems were seeking to increase land value by the intensification of cropping patterns. The methods included development of water sources through diversion and gravity. This focused on diverting water from surface flows of local streams into open ditches, and then flowing that water through gravity systems to flat areas of land subdivided into fields. This was then sold to farmers for use in those fields. The financing mechanism for the development of these new water sources and distribution systems was accomplished by the creation of "whole" systems. A point of collection, a delivery system, a distribution system and finally a growing set of users who, over time, could both create a value-added product to pay for the new water. Through the development of additional user units, reduction of the unit cost, or individual expense, occurred.

Initially, it was the holders of large tracts of land who created these water supply systems. Senator Thomas Bard, of the Oxnard area, was one such holder. The mutual water company that he and his investor partners created, required large amounts of capital to create a sustainable system. The system needed to be high enough above the new tract to allow the diverted water to flow, utilizing gravity to flow down a ditch at a sedate speed, and be cut out to individual fields by the use of weirs. Each field was a "unit" of use.

Some units of use compensated the water developers by allowing easements on their land in exchange for a certain amount of annual water. Others gained rights for use by investing in shares of the company, which allowed the investor the right to take delivery of water from a delivery point on their land.

Over time, the delivery systems increased in size and complexity in order to accommodate the increase in land served by this water. As the number of user units increased (greater numbers of units mean more individual units to pay for the whole system), and the cost of the system remained a predictable number, the cost to each unit lowered in terms of the amount of money demanded from each unit to support or pay for the system.

Today, we see an opportunity to develop a new system to new buyers that maximizes the complexity and skill of the partners, while decreasing the unit cost for the delivery and use system.

This White Paper is developed to attempt to clarify some of these issues and in response to three questions posed by the City of Oxnard.

The three questions are:

1. How will the Advanced Water Purification Facility ("AWPF") water increase the yield of crops and reduce the water consumption?

ISSUE: The agricultural community in the Oxnard Plain is utilizing the current water supplies and obtaining the highest yield available at this time. Because of the current declaration of a drought emergency, and emergency regulations, reliability of quality water is at risk. Therefore, the crop yields are also at risk.

FACTS: “The average salinity of well water in the Oxnard area that includes the proposed users of the AWPF water is 1,720 mg/L as total dissolved solids (TDS), this is in comparison to the the basin plan objective of 1,200 mg/l TDS, with corresponding electrical conductivity of 3.1 dS/m. The AWPF will provide water with much lower salt content than the well waters currently used by the farmers for irrigation. Salinity in the AWPF recycled water is estimated to be 230 mg/L as TDS with EC of 0.36dS/m. Therefore, the yield reduction currently suffered (anywhere from a few percentage points to possibly as high as 75 percent) will cease after switching to recycled water use.

Switching to AWPF recycled water, the leaching requirement to achieve the same salinity threshold in the soil would drop to two (2) percent. However, with such high-quality irrigation water, it would be wise to set a lower salinity threshold in the root zone, with a corresponding leaching requirement of about six (6) percent. Thus, water savings from the switch to the higher quality AWPF would be in the neighborhood of twenty (20) percent (25 – 6 = 19). Assuming an annual irrigation water application rate of 3 acre-ft per acre, and a water cost of $1,400/AF, results in a savings (to the farmer) of $840/acre in water costs alone.

Reliability and Quality in Recycled Water as Utilized Elsewhere in the State.
For the past 16 years, recycled water has been used in Monterey County to irrigate 12,000 acres of prime farmland in Northern Monterey County growing a variety of vegetable crops. Initially, artichokes, lettuce, broccoli, cauliflower, and celery were the main crops grown on these farms. Over this 16-year period, more and more farmers began to switch from raising artichokes to growing strawberries under plastic. The extent of this switch to high-value crops is directly related to the availability and reliability of recycled water with acceptable quality for growing these high-value crops.”[1]

CULTURAL PRACTICE
The Oxnard Plain has four specific styles of cultural practice: Green House; Hoop House or Cold Frame; Row Crop/Turf Crop Cultivation; and Permanent Tree Crop. Each style has unique elements, inputs and a range of income potential.
1. Permanent Green House (Houweling Nurseries Inc.) cultivation is intended to maximize output and provide the greatest control of inputs in pursuit of the best tomatoes possible. The

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[1] Sheikh, April 2014. Bahman Sheikh, PhD, PE, Water Reuse Consultant. Bahman Sheikh’s academic training is in agriculture (B.Sc.), irrigation science (M.S.), and Soil Physics (PhD). He is also a civil engineer (CA PE license C26633). This combination of agronomic know-how and engineering expertise represent a unique skill set that is perfect for handling water recycling issues and prospects, especially in the service of growers wary about switching from a known water source to one with which they have little or no prior experience.

capital costs for this type of facility is the greatest, as a front loaded cost but can be amortized over the life cycle of the facility. Constant cropping, total control of growing environment, intense monitoring of all inputs for maximum growth and recycling of water for reuse, blending, and filtering are hallmarks of this cultural practice as identified below:

"WATER CONSERVATION: We do all we can to collect and reuse water. A four acre on-site retention pond captures rainwater and runoff, filtration technology cleans and recirculates, and computer- monitored drip irrigation conserves.

LAND USE: ... we produce in excess of 24 times the amount of tomatoes as traditional field farming. It would take over 3,000 acres (7,000 acres farm gate) of open fields to match the output of our 125 acres under glass.

WATER RECYCLING: Over 90% of waste is recycled."[2]

2. Hoop House or Cold Frame Cultivation (Reiter Affiliated Companies) uses the soil as the medium for growing. The hoop structures are used to maximize growing inputs of heat and light while protecting the crop from wind, and inclement weather that might impact crops while they are growing. The hoop house allows for greater intensity in cropping with some cover protection for the crop as it grows. Other inputs are controlled much as the Green House style but at a slightly lower capital input.

3. Row Crop/Turf cultivation (Southland Sod and Reiter Affiliated Companies) is based on a crop or two a year. Intensive control of water inputs and focus on minimizing cost while maximizing profit of the crop is the hallmark of this cultural practice. Planting, watering, weeding and harvest are all timed to get greatest value and marginal profit from the crop on delivery to market. In the case of turf, the expectation is to plant to order with the planning horizon a year in advance. This allows the crop to be maximized for delivery in a just in time style as developed in manufacturing.

4. Permanent Tree Cropping in the Oxnard Plain is a more sedate cropping pattern with much attention to minimizing water use in crop production. This cultural practice would be less likely to have a crop value that would allow full use of AWPF water. However, while each practice has pluses and minuses, the grower tends to select that style which creates profit in balance with input costs. Farming, like manufacturing, is about planning, reliability of input and development of market. Land costs, water costs, other input costs and regulatory compliance costs all factor into cropping or fallowing decision making. This follows for lease ground as well as owned ground.

ASSUMPTIONS: The following assumptions provide the basis of the current relationships between the stake holders of the Oxnard Plain specific to the questions above. Assumptions, as these are outlined, are specific and help to frame the issue of value and cost. The assumptions may also be changed in the event there is a changed condition in the relationships of the following:

1. The cost of the “new” water that is created by the AWPF plant is set, for the first phase or the first 7,000 AFY at $1,400 per acre-foot. This value is based on the O & M, plus lifecycle cost. It is “fully loaded” as to the bond repayment and offset to Oxnard Rate Payers.

2. Subsequent valuation for additional phases can reduce this initial cost, but as this is a “down the road cost,” that number is not of value for this present day conversation.

3. The Governor has declared a water emergency for the State. This declaration is mirrored in similar declarations by other agencies, including the Fox Canyon Ground Water Management Agency (“FCGWMA”) and the United Water Conservation District.

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[2] Houweling Cultural Practice

4. Water deliveries from the state water project are not reliable in the current water status for the State.

5. There is a willingness to use the AWPF water for Agriculture in the Oxnard Plain "...growers recognized that if they over-pumped, it was a business decision they were making."[3] Three current production groups (Houweling Nurseries Inc., Southland Sod, and Reiter Affiliated Companies) are ready and willing to engage in the initial phase of production through contract commitment.

6. Farming, as a business attempts to maximize profit based on cost of inputs in balance with income from sales of product. The combination of regulatory requirements for highest efficiency cost of cultural practice infrastructure (irrigation, special growing support, soil management equipment etc.) in combination with the desire to maximize profit drives the crop choices for any farming operation.

7. At least one agricultural user (Houweling Nurseries Inc.) has a cultural practice that will allow use of the water from the AWPF facility at a rate and cost that will offset pumping from the Oxnard Plain in a substantive way. The business practice of this user allows a much higher return on the water input thus allowing the user the flexibility to make use of AWPF purity to their economic advantage. Two other users (Southland Sod and Reiter Affiliated Companies) for the GREAT Program water have been identified and acceptable agreements are being prepared for those users to make business decisions relative to other farming inputs and market profit determinations that will allow the crop value to support the costs associated with the use of AWPF Water.

CONCLUSION: If water is reliable, of high quality, predictable in cost structure, and predictable in availability, then a farmer/business owner will then use it strategically as a valued commodity to produce the highest and best value crop, using the least possible amount of the water. Currently, farmers in the Oxnard Plain use the most efficient production models for irrigation. Having access to reliable, cleaner water, allows for more efficiency during irrigation. The purer the water, the less water would be used to flush down salts currently in the water supply.

2. How will the price of water effect the Three-Way Agricultural Relationships and the Rent of Farmland?

ISSUE: In a three-way agricultural relationship, there exists the landowner and all inputs, the farmer, and the marketing/purchasing/distribution system. If reliability of the water source is threatened, then these relationships are at jeopardy of continuing.

FACTS: Only in the last 10 years has recycled water been an acceptable input for food crops as a direct use. The use of recycled water, which meets the strict standards of Title 22, allows the benefits of direct use without harming the three-way contract between supplier, producer and buyer.

Ground that is leased for production is leased on the basis of the ground or soil quality and also the availability of water for growing. Rates vary, but the elements of those leases are constant. The owner is seeking to maximize value through having productive ground. In the case of the use of AWPF water, reliability, quality, quantity and price that are predictable are the critical issues. The fact that the cost basis for the first phase of the AWPF production is predictable at

[3] Director Lynn Maulhardt, FCGMA, 2013

$1,400 AFY, will allow a lease holder to make clear business decisions if this water is available for the lease hold in question.

ELEMENTS OF AGRICULTURAL LEASE CONTRACTS

Ground that is leased for production is leased on the basis of the ground or soil quality and also the availability of water for growing. Rates vary but the elements of those leases are constant. The owner is seeking to maximize value through having the ground be productive. The land agreement may be a flat rate lease or a profit share lease or a combination of the two. Payment for water, irrigation systems, growing medium management (ground prep, hoop house management and the like), and product income as a portion of the lease agreement are unique to each agreement. Reliability of water availability is probably more important than cost in the equation. Value can be added if a crop can be grown at a profit. If the cost of the water is too high, then the land will lay fallow. However, a predictable cost structure for the water and other inputs will increase the likelihood of finding a tenant who can turn a profit against known cost structures.

FARMING IS A BUSINESS

As a business, the purpose of the farm is to be profitable within the entire operation. Farming in Ventura County, and specific to the Oxnard Plain, is sophisticated, diversified, and seeks the highest margin for crops on a year over year basis. The input costs, land costs, other cultural costs and regulatory compliance are balanced against market returns. This balance influences crop choice, cultural practice and general business decisions. Water quantity and quality, soil quality and make-up, weather patterns and market access set the standard for what is grown. Where the inputs are predictable, the cropping patterns develop based on highest and best value from the balance of cost of inputs and profit from crop sales.

Use of high quality recycled water which meets regulatory standards has been demonstrated to have no negative impact on commodity groups or sale value of crops. As an example, "In 2007, California farmers agreed to standard procedures in handling raw-eaten leafy vegetables, to ensure food safety. As a result, the California Leafy Green Products Handler Marketing Agreement (LGMA) was formed. Members of the LGMA are working collaboratively to protect public health by reducing potential sources of contamination in California-grown leafy greens. The Leafy Green Marketing Agreement (LGMA) is consistent with the use of recycled water for irrigation of leafy vegetables and the Monterey farmers growing leafy vegetables with recycled water subscribe to LGMA." [4]4

In the evaluation of opportunities and constraints, the following elements are important to keep in mind: Topography, Soil Quality, Water, Weather, Crop Range, Zoning, Development Rights and other regulatory schemes unique to farming. The chart below provides information on the Top Ten Crops in Ventura County.

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[4] Sheikh White Paper, April, 2014, page 6

Table 3 Increase in Yield Attributable to Change from Well Water to AWPF Recycled Water for Irrigation

Top-Ten Crops in Ventura County	Relative Yield with Ground-water, %	Relative Yield with Recycled Water, %	Yield In-crease Due to Use of Recycled Water, %	County-wide Crop Value	County-wide Acres of Crop	Value of Crop per Acre	Increased Revenue, $/Acre
Strawberries	38%	100%	62%	691,303,000	11,149	62,006	38,444
Lemons	53%	100%	47%	201,820,000	15,562	12,969	6,095
Raspberries	72%	100%	28%	187,277,000	3,076	60,883	17,047
Nursery Stock	25%	100%	75%	186,351,000	161	1,159,431	869,573
Celery	78%	100%	22%	134,258,000	10,598	12,668	2,787
Avocados	40%	100%	60%	113,315,000	19,284	5,876	3,526
Tomatoes	97%	100%	3%	75,819,000	1,734	43,725	1,312
Peppers	80%	100%	20%	48,295,000	3,146	15,351	3,070
Cut Flowers	90%	100%	10%	48,829,000	849	57,514	5,751
Cilantro	80%	100%	20%	23,438,000	3,397	6,900	1,380
Average Overall Increase in Crop Value per Acre of Irrigated Land:							128,357

Note: Percentages with green highlight are obtained from Shannon (1997). Others are estimates based on yield responses of similar crop with available relative yield in the literature.
Note: Ventura County crop values are for 2012, obtained from Ventura County Office of Agricultural Commissioner, "Crop & Livestock Report—Changing Tastes".

Table courtesy of Bahman Sheikh, PhD, PE, Water Reuse Consultant

Income/Comparison of Increase in Yield Using Recycled Water						
	AF	$/AF		Strawberries Increase In Yield per acre	Avocados Increase in Yield per acre	Pepper Increase In Yield per acre
Groundwater	100	$300	$30,000			
Recycled water	100	$650	$65,000			
Groundwater	2	$300	$600	$62,006	$5,876	$15,351
Recycled water	2	$650	$1,300	$100,450	$9,402	$18,421
AF	Acre Feet					
$/AF	Dollars per Acre Foot					
Note: Water Use varies based on several factors. These Include weather and soil type as well as crop type, drainage and cultural practice. For the purpose of this chart the AF is held constant. Chart also assumes 2 AF required to grow example crops per acre per crop. Table is based on the values of Table 3 above						

UNIQUE REGULATORY SYSTEM REQUIREMENTS AND RELATIONSHIPS BETWEEN AGENCIES AND FARMERS AND OTHER USERS

On the Oxnard Plain, the long history of issues of over pumping has resulted in water quality and quantity being impacted. Agricultural allocations for the Oxnard Plain are based on 2 Acre Feet per year per acre for a single crop production cycle. The creation of water management agencies to regulate pumping, surface flow, diversion and environmental protection have created layers of regulation. This creates an inherent tension as each are regulated to interact collaboratively while each has a role in the protection, improvement of and sustaining behavior of the water supply that is used by many different communities of interest. This complex and integrated system is engaged through the unique regulatory relationships between the Fox Canyon Groundwater Management Agency, United Water Conservation District and the Metropolitan Water District (Calleguas Municipal Water District). The additional communities of interest include the Cities, Water Districts and Pumpers within the boundaries of the UWCD, and FCGMA.

The map below indicates the envisioned recycled water distribution system for the City of Oxnard and the potential off-takers.

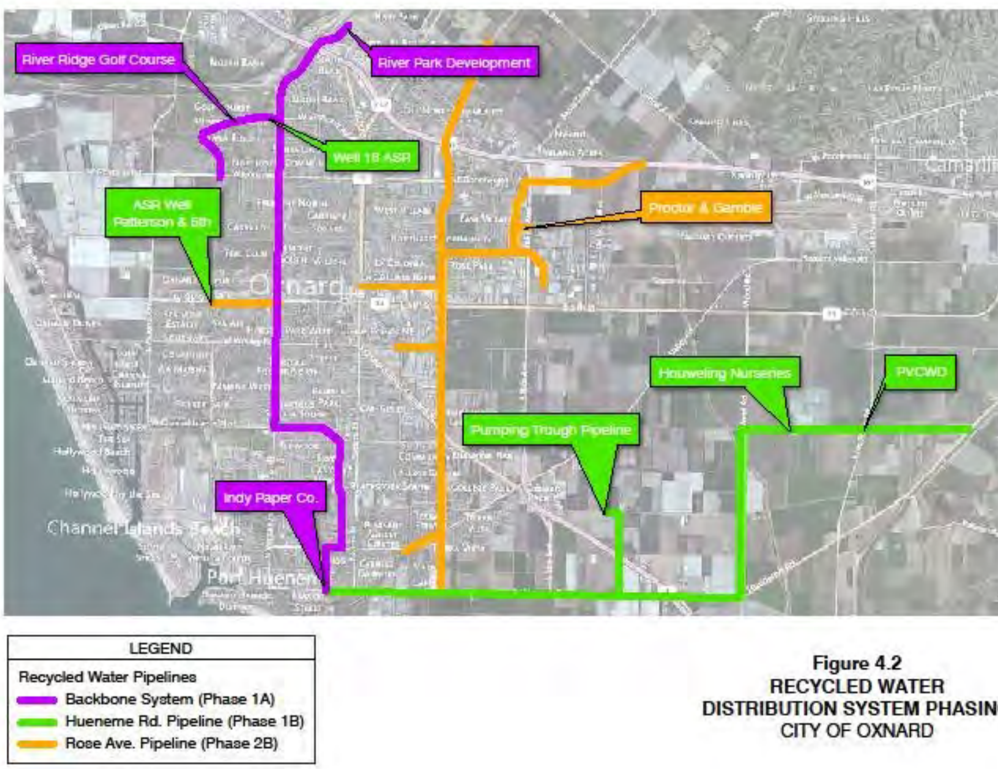


Figure 4.2
RECYCLED WATER DISTRIBUTION SYSTEM PHASING
CITY OF OXNARD

ASSUMPTIONS: The following assumptions provide the basis of the current relationships between the stake holders of the Oxnard Plain specific to the questions above. Assumptions, as these are outlined, are specific and help to frame the issue of value and cost. The assumptions may also be changed in the event there is a changed condition in the relationships of the following:

1. The cost of the "new" water that is created by the AWPF plant is set, for the first phase or the first 7,000 AFY at $1,400 per acre-foot. This value is based on the O & M, plus lifecycle cost. It is "fully loaded" as to the bond repayment and offset to Oxnard Rate Payers.
2. Subsequent valuation for additional phases can reduce this initial cost, but as this is a "down the road cost," that number is not of value for this present day conversation.
3. The Governor has declared a water emergency for the State. This declaration is mirrored in similar declarations by other agencies, including the Fox Canyon Ground Water Management Agency ("FCGWMA") and the United Water Conservation District.[5]
4. Water deliveries from the state water project are not reliable in the current water status for the State.

CONCLUSION: Reliable supply, quality, and cost will allow for the broadest possible cropping pattern. This then allows for the highest cropping marginal value and stabilizing the contract market. This removes the unpredictability of water costs and provides for adequate financial projections, and provides the business of farming the ability to make the best possible business decisions.

The creation of new water, which is reliable and predictable in the supply availability, will allow the grower to make the highest and best use of the leasehold. It will also provide stable value for the landowner and the water purveyor such that the three-way contract can be negotiated from known elements, which can be quantified such that there is benefit for supplier, landowner and

---

[5] The current surcharge rate for the Fox Canyon Ground Water Management Agency as adopted for 2014, is based on the following language: "Tier 2 rates historically have been the most applicable and most appropriate rate to apply as referenced above in Section 5.8.1.1 of the Agency's Ordinance: "the cost to import potable water from the Metropolitan Water District of Southern California, or other equivalent water sources that can or do provide non-native water within the Agency jurisdiction." The project will incorporate specific project design features and project construction measures, including best management NSM practices, in compliance with the following applicable federal, state, and local regulations and standards, which are more completely.

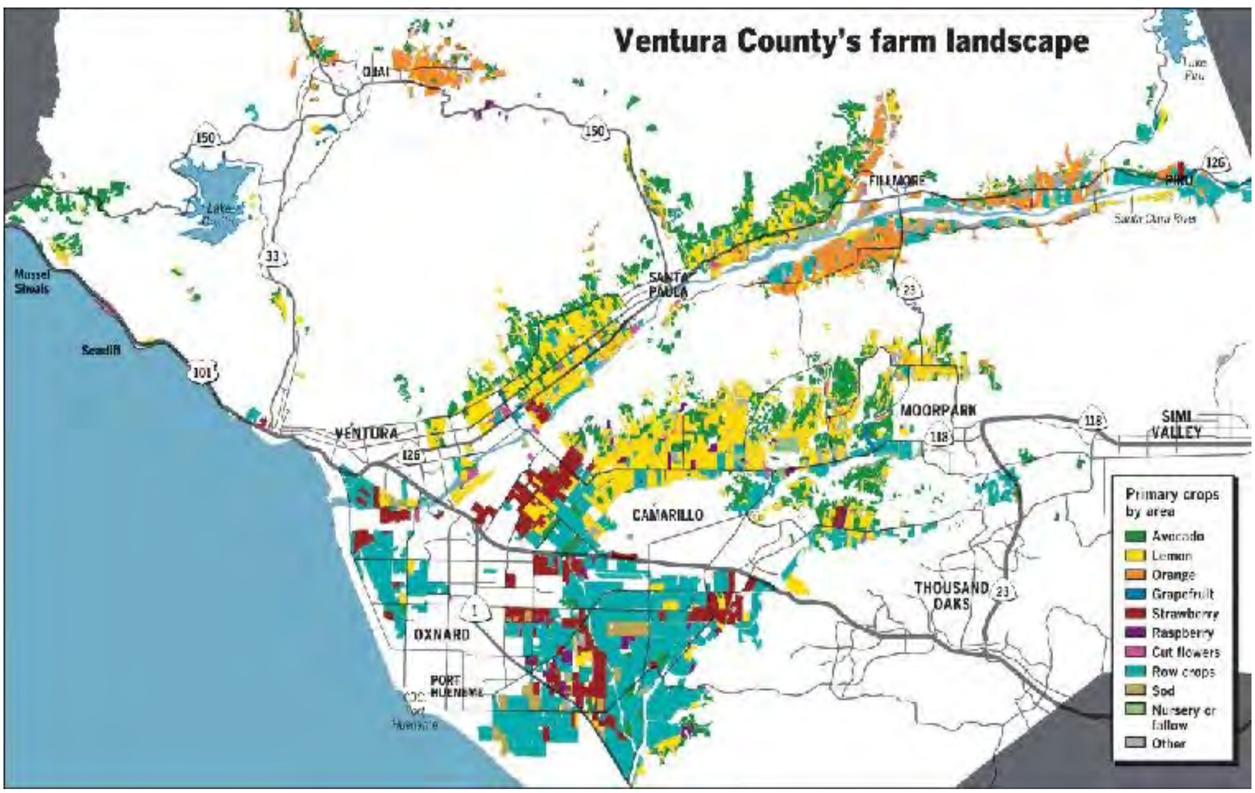
At the December 1, 2010 FCGMA Board meeting, the Board adopted Resolution No. 2010-07. That Resolution established three tiers: Tier I (25 acre-feet per year \[AFY] or less above allocation at $1,105.00); Tier II (25 AFY but less than 100 AFY above allocation at $1,355.00); and Tier Ill (1 00 AFY and more above allocation at $1,605.00) for groundwater extraction surcharge rates effective January 1, 2011. This Resolution and the tiered surcharge rates have been in effect since January 1, 2011. It has now been three years since the FCGMA Board adopted Resolution No. 2010-07 and correspondingly modified its surcharge rate. Agency staff believes the surcharge has been effective in limiting over extraction of groundwater beyond the Agency's established allocations, with some exceptions. At the April 3, 2013 meeting of the Calleguas Municipal Water District (CMWD) Board, the CMWD Board adopted a new Tier 2 rate of $1,315 effective January 1, 2014.

grower. As seen in the Income/Comparison of Increase in Yield Using Recycled Water Chart found on page 8, water costs, if there is an increase in production, can be absorbed in the profit margin. This will allow lease or rent agreements to cover this cost in a way that the production of the land will pay for an increase in the cost and so have no net impact on rents.

3. How will the grown crop effect the value of the land?

ISSUE: Reliability and quality of the water supply allows for a greater crop production range, which allows a higher value per acre.

FACTS: Farming is a business that needs clarity of water supply, water quality and cost basis of that water. The land of the Oxnard Plain is fertile as a growing medium. The increased value of a sure supply that is predictable will enhance that value. This leads to the next value which is cropping choice. Those crops that are of the greatest value and can be grown with the best outcome in the most predictable manner, will be the crops of choice. This range of cropping is the fundamental value in the production. Crop range changes over time as evidenced by the cropping changes all over the County. Highest and best crop values are sought once the base input of quality, reliability, cost and quantity of water is set. The map below indicates that primary crops grown in Ventura County.



Map: Ventura County Agricultural Commissioner, 2014

THE GROUNDWATER RECOVERY ENHANCEMENT AND TREATMENT PROGRAM ("GREAT PROGRAM") BENEFITS (NEW WATER DEVELOPMENT BENEFITS)

The GREAT program is an advanced water purification system that, through filtering and disinfecting, provides (in the initial phase) about 7,000 Acre Feet a Year ("AFY") of high quality water that previously would flow to the sea. The whole system, at build out, is sized to produce 28,000 AFY.

The map below indicates the recycled water distribution system.

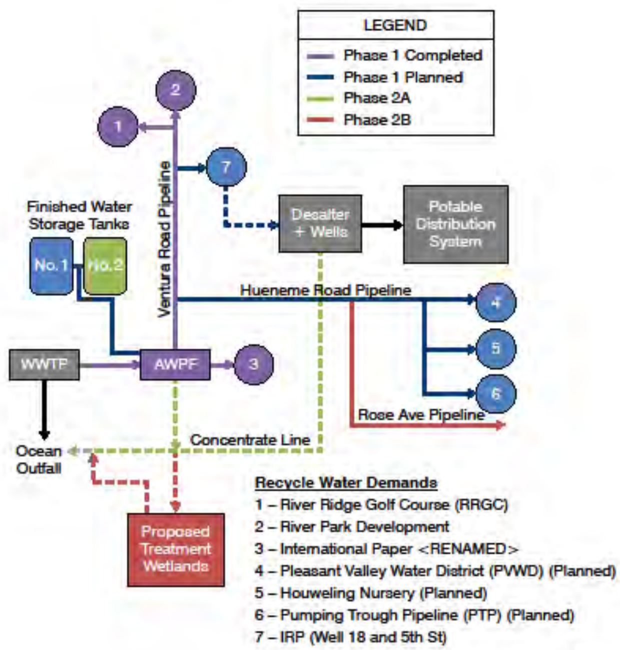


Figure 4.3
RECYCLED WATER DISTRIBUTION SYSTEM SCHEMATIC - PHASE 1 AND 2
CITY OF OXNARD

ox091814-8533.ai

Source: Carollo Engineers

The finished water from Oxnard AWPF will be used for agricultural and landscape irrigation (during dry seasons) and ground water recharge. In each case, the filtered and disinfected wastewater must meet California's Water Recycling Criteria, Title 22, Division 4, Chapter 3, of the California Code of Regulations unrestricted reuse criteria.

Clearly, the quality of water produced at the AWPF is well within the safe range for use on agricultural crops. Furthermore, the AWPF water quality is much better than the well water quality currently used for irrigation in the Oxnard area (based on averaging water quality data from numerous wells sampled and analyzed since the 1930s.)

In fact, the AWPF water quality would be considered adequate even for potable use based on Safe Drinking Water Act standards. Because of use of reverse osmosis membranes in the treatment system, nearly all contaminants of emerging concern (CECs) would be completely removed from the water. The microfiltration (MF) process uses low-pressure filtration for removal of particulate and microbial contaminants, including turbidity, Giardia, and Cryptosporidium. Filtered effluent from MF process is further treated through reverse osmosis (RO) followed by ultraviolet / advanced oxidation (UV/AOX). The RO process uses a pressure-driven membrane separation technique to remove dissolved contaminants (i.e., TDS, organic compounds) from water. The UV/AOX process is both a disinfection process and a process for reduction (destruction) of micro-pollutants such as NDMA and 1,4 Dioxane. (City of Oxnard)

ASSUMPTIONS: The following assumptions provide the basis of the current relationships between the stake holders of the Oxnard Plain specific to the questions above. Assumptions, as these are outlined, are specific and help to frame the issue of value and cost. The assumptions may also be changed in the event there is a changed condition in the relationships of the following:

1. The cost of the "new" water that is created by the AWPF plant is set, for the first phase or the first 7,000 AFY at $1,400 per acre-foot. This value is based on the O & M, plus life-cycle cost. It is "fully loaded" as to the bond repayment and offset to Oxnard Rate Payers.
2. Subsequent valuation for additional phases can reduce this initial cost, but as this is a "down the road cost," that number is not of value for this present day conversation.
3. The Governor has declared a water emergency for the State. This declaration is mirrored in similar declarations by other agencies, including the Fox Canyon Ground Water Management Agency ("FCGWMA") and the United Water Conservation District.
4. Water deliveries from the state water project are not reliable in the current water status for the State.

CONCLUSION: The value of the land is based on its ability to support agriculture. The value of the land is based on the reliability and quality of water, as well as weather and other land use constraints. If the GREAT Program can stabilize the quality and reliability of the water, the value of the land will increase as there is continuing pressure on other water supplies.

At full build-out, there are 28,000 AFY available from the GREAT program. Some portion is available to the agricultural community on the Oxnard Plain. Anyone who has available alternatives to other existing sources will have greatly enhanced land value and can grow crops when other sources are not available.

Diversified systems are more sustainable than mono systems.

APPENDIX A – REGULATORY STANDARDS REFERENCES

Federal Standards

Clean Water Act National Pollutant Discharge Elimination System ("NPDES") Program

Total Maximum Daily Loads Underground Injection Control Program

State Standards

State Water Resources Control Board Porter-Cologne Water Quality Control Act State Antidegradation Policy

State Water Reclamation Policy

Ocean Plan

Regional Water Quality Control Board (Region 4) Water Quality Control Plan State Waste
Discharge Requirements ("WDR")

Water Reclamation Requirements

NPDES Program

General WDRs and NPDES Permit for Discharges of Groundwater General NPDES Permit for
Discharges of Storm water

Total Maximum Daily Loads

Regional Water Quality Control Board Section 401 Certification DHS Domestic Water Supply
System for Potable Use

DHS Recycled Water for Non-potable Use

DHS Recycled Water for Indirect Potable Use

Local Standards

Fox Canyon Groundwater Management Agency Ordinance Ventura County Well Permit Ordinance

Ventura County Watercourse Encroachment Permit Countywide NPDES Municipal Storm water Permit

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Fox Canyon Groundwater Management Agency Act. Letter of March 14, 2014. Board of Directors, Fox Canyon Groundwater Management Agency, 800 South Victoria Avenue, Ventura, CA 93009-1610 EXECUTIVE OFFICER Jeff Pratt, P.E., Subject: Consideration of

Emergency Ordinance E Imposing Agency-Wide Reductions on Extractions, Suspending the Use of Credits and Prohibiting the Construction of New Extraction Facilities.

Vorissis, Mary, CH2M HILL, Thousand Oaks, CA, Lozier, Jim, CH2M HILL, Phoenix, AZ, Franks, Paul, CH2M HILL, Oakland, CA, Ortega, Ken, Public Works Director, Oxnard, CA, Emmert, Anthony, Water Resources Manager, Oxnard CA. Oxnard, California's Groundwater Recovery Enhancement and Treatment (GREAT) Program.

United Water Conservation District. Urban Water Management Plan for Oxnard-Hueneme System.

HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

June 12, 2014
Project No. 01-011-04

City of Oxnard
300 West Third Street
Oxnard, California 93030

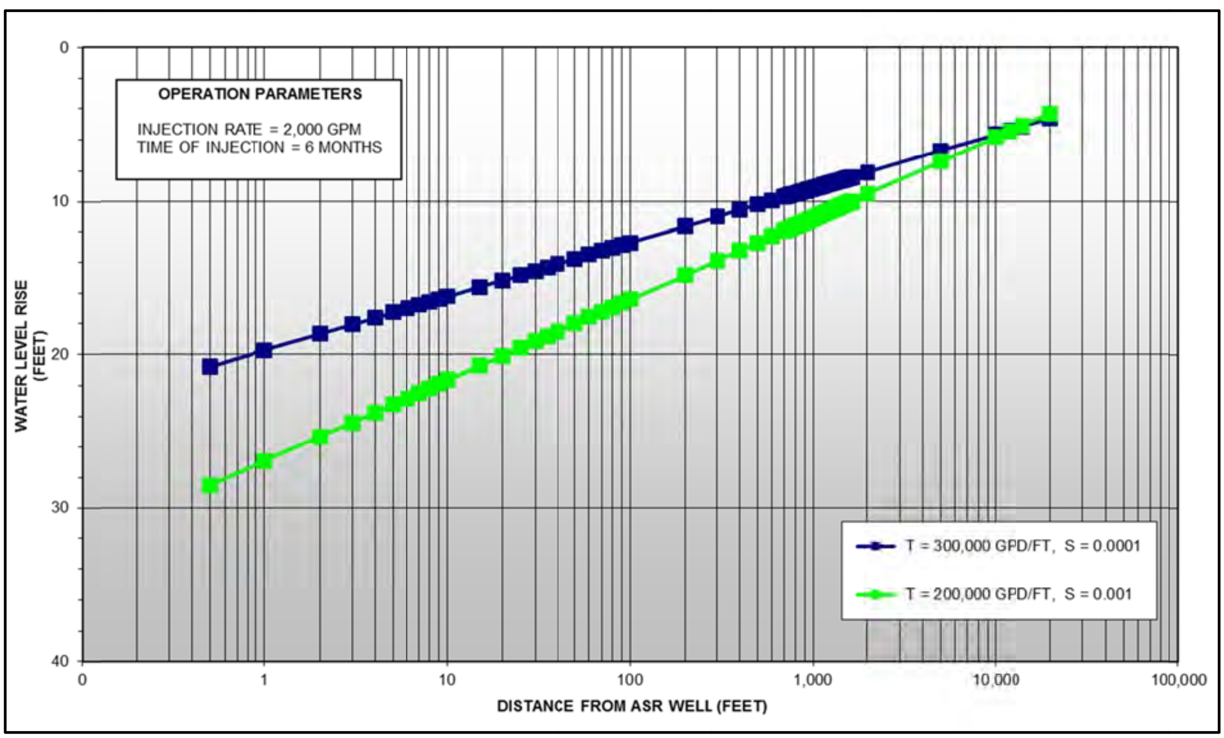
Attention: Mr. Daniel Rydberg
Capital Projects Manager

Subject: Preliminary Assessment of Groundwater Mounding Benefit From GREAT Program ASR Storage.

Dear Mr. Rydberg:

As requested, Hopkins Groundwater Consultants, Inc. conducted a review of the anticipated range of aquifer responses to City of Oxnard (City) Groundwater Replenishment Enhancement And Treatment (GREAT) Program aquifer storage and recover (ASR) on the local groundwater basins. For this review we used a range of aquifer parameters to bracket potential aquifer responses. Figure 1 – Potential Aquifer Response to ASR Storage of Groundwater shows the projected water level rise after 6 months of injecting 2,000 gallons per minute.

Figure 1 – Potential Aquifer Response to ASR Storage of Groundwater



P.O. Box 3596, Ventura, California 93006 Phone: (805) 653-5306 e-mail: chop4@earthlink.net

The proposed ASR well location is approximately 4 miles from the coastline where these projections indicate the project benefit may provide 2 feet of water level rise in the aquifer zone, which would be beneficial for abating the landward movement of seawater.

We trust this review is sufficient for the intended purpose of the Grant application. If you have any questions or need any additional information, please give us a call.

Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

Curtis J. Hopkins
Principal Hydrogeologist
Registered Geologist RG 5695
Certified Engineering Geologist CEG 1800
Certified Hydrogeologist CHG 114

Attachment:

c:

CITY OF OXNARD
2010 URBAN WATER MANAGEMENT PLAN

Prepared for:

City of Oxnard

Prepared by:
Kennedy/Jenks Consultants

May 2012

CITY OF
OXNARD
CALIFORNIA

www.ci.Oxnard.ca.us

Kennedy/Jenks Consultants

2775 North Ventura Road, Suite 100
Oxnard, California 93036
805-973-5700
FAX: 805-973-1440

2010 Urban Water Management Plan

May 2012

Prepared for

City of Oxnard
251 S. Hayes Ave.
Oxnard, CA 93030

K/J Project No. 1189006*00

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Chapter 1: Introduction

This volume presents the 2010 Urban Water Management Plan for the City of Oxnard (City) service area. This chapter describes the general purpose of the Plan, discusses Plan implementation, and provides general information about the City of Oxnard and service area characteristics. A list of acronyms and abbreviations is also provided.

1.1 Purpose

An Urban Water Management Plan (UWMP or Plan) is a planning tool that generally guides the actions of water management agencies. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan include a section which "describes the opportunities for exchanges or water transfers on a short-term or long-term basis." (California Urban Water Planning Act, Article 2, Section 10630[d].) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor precludes a water management agency from exploring exchange/transfer opportunities not identified in the Plan. When specific projects are chosen to be implemented, detailed project plans are developed, environmental analysis, if required, is prepared, and financial and operational plans are detailed.

In short, this Plan is a management tool, providing a framework for action, but not functioning as a detailed project development or action. It is important this Plan be viewed as a long-term, general planning document, rather than as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty, and planning projections may change in response to a number of factors. From this perspective, it is appropriate to look at the Plan as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these "framework" questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands. The City of Oxnard will explore enhancing basic supplies outside of or in addition to traditional sources. These include additional groundwater extraction and recycling. Specific planning efforts will be undertaken in regard to each option, involving detailed evaluations of how each option would fit into the overall supply/demand framework, how each option would impact the environment, and how each option would affect customers. The objective of these more detailed evaluations would be to find the optimum mix of conservation and supply programs to ensure the needs of the customers are met.

The California Urban Water Management Planning Act (Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five year increments. (The City of Oxnard is going beyond the requirements of the Act by developing a plan which spans 25 years.)
- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry, and multiple-dry years.
- Implements conservation and efficient use of urban water supplies.

A checklist to ensure compliance of this Plan with the Act requirements is provided in Appendix A.

In short, the Plan answers the question: *Will there be enough water for the City of Oxnard in future years, and what mix of programs should be explored for making this water available?*

It is the stated goal of the City of Oxnard to deliver a reliable and high quality water supply for their customers, even during dry periods. Based on conservative water supply and demand assumptions over the next 25 years in combination with conservation of non-essential demand during certain dry years, the Plan successfully achieves this goal.

1.2 Implementation of the Plan

This subsection provides the cooperative framework within which the Plan will be implemented including agency coordination, public outreach and resources maximization.

1.2.1 Joint Preparation of the Plan

Agencies directly or indirectly involved in matters related to the City of Oxnard's water supplies are:

- Metropolitan Water District of Southern California (MWDSC): wholesale supplier of imported surface water
- Calleguas Municipal Water District (CMWD): wholesale supplier of imported surface water (Member agency of MWDSC)
- United Water Conservation District (UWCD): wholesale supplier of groundwater and primary groundwater replenishment agency for the Lower Santa Clara River watershed
- Port Hueneme Water Agency (PHWA): adjacent to the City and receives CMWD water through a portion of City system
- Fox Canyon Groundwater Management Agency (FCGMA): oversees the groundwater basins in southwestern Ventura County

- City of Ventura: adjacent to the City
- City of Camarillo: adjacent to the City
- City of Port Hueneme: adjacent to the City and member agency of PHWA
- County of Ventura: preparer of the Watersheds Coalition of Ventura County Integrated Regional Water Management Plan
- Channel Islands Beach Community Services District (CIBCSD): a member agency of PHWA
- Naval Base Ventura County (NVBC): member agency of PHWA
- City of Oxnard Development Services Department: planning information for generation of future demands
- Ventura Local Agency Formation Commission

As part of the City's plan, UWMP's from CMWD and UWCD were reviewed, along with the Regional UWMP prepared by MWDSC.

Table 1-1 shows the level of coordination with appropriate agencies, indicates the specific participating agencies and their roles in the UWMP development.

TABLE 1-1
AGENCY COORDINATION SUMMARY

	Participated in UWMP Development	Received Copy of Draft	Commented on the Draft	Attended Public Meetings	Contacted for Assistance	Sent Notice of Intention to Adopt	Not Involved/ No Information
Calleguas Municipal Water District	X	X			X	X	
United Water Conservation District	X	X	X		X	X	
Port Hueneme Water Agency	X	X			X	X	
City of Ventura	X	X			X	X	
County of Ventura	X	X			X	X	
Fox Canyon Groundwater Management Agency	X	X	X		X	X	
City of Camarillo		X				X	
City of Oxnard Development Services Dept.	X	X			X	X	

1.2.2 Public Outreach

The City of Oxnard has encouraged community participation in water planning. Notices of public meetings were published in the local press. Copies of the Draft Plan were made available at City Hall, local public libraries and sent to the County of Ventura, as well as other interested parties. The City's Public Works and Development Services Departments also coordinated regarding planned development and the probable implementation of approved development. Such informed data gathering on important issues is a means of checking the short-term "reality" of official projections.

The City of Oxnard notified the public within its service area of the opportunity to provide input regarding the Plan. Table 1-2 presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials, including newspaper notices and invitation letters are attached in Appendix B.

TABLE 1-2
PUBLIC PARTICIPATION TIMELINE

March 26, 2012	Preliminary Draft UWMP	Preliminary Draft released to solicit input
May 15, 2012	Public Hearing	UWMP considered for approval by the City of Oxnard
May 15, 2012	Adoption of UWMP	City Council adoption of 2010 UWMP per Resolution No. 14,175
June 14, 2012	Final UWMP	Final UWMP released

The components of public participation include:

Local Media

- Paid advertisements in Ventura County Star newspaper

Community-based Outreach

- Inter Neighborhood Council Forum (INCF)

City/County Outreach

- Meeting with City of Ventura
- Meeting with County of Ventura Watershed Protection District
- Meeting with City of Oxnard Development Services Department

Public Availability of Documents

- City Hall
- Public Libraries
- City website

1.3 City of Oxnard Service Area

The City of Oxnard provides retail water service to a population of approximately 201,600, through approximately 40,750 service connections. Figure 1-1 shows the boundaries of the City of Oxnard's service area. Current water suppliers include CMWD (imported surface water) and UWCD (groundwater). CMWD is a member agency of MWDSC.

1.4 Climate

The City is located in the Oxnard Plain, which has a mild Mediterranean style climate, with cool wet winters and mild, dry summers. Temperatures only rarely fall below freezing in winter. Average rainfall is approximately 15 inches per year, mostly during the winter period between December and April.

Table 1-3 shows the average temperatures, precipitation and evapotranspiration (ETo) for the City of Oxnard.

TABLE 1-3
CLIMATE DATA FOR THE CITY OF OXNARD

	Jan	Feb	Mar	Apr	May	Jun
Standard Monthly Average ETo (inches)[(a)]	1.83	2.20	3.42	4.49	5.25	5.67
Average Rainfall (inches)[(b)]	3.41	3.90	3.04	0.72	0.21	0.05
Average Max. Temperature (Fahrenheit)[(b)]	66	66	65	68	68	70

	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Standard Monthly Average ETo (inches)[(a)]	5.86	5.61	4.49	3.42	2.36	1.86	46.43
Average Rainfall (inches)[(b)]	0.02	0.07	0.36	0.36	1.37	2.11	15.62
Average Max. Temperature (Fahrenheit)[(b)]	73	74	74	73	70	66	69.4

Notes:
(a) ETo data provided for Oxnard region, http://wwwcimis.water.ca.gov/cimis/welcome.jsp
(b) Average weather for Oxnard, CA, http://countrystudies.us/united-states/weather/California/oxnard.htm

During the late summer and early fall period, hot, dry Santa Ana winds can create high water demands. Also, during frost days, agricultural growers may use water to prevent their crops from freezing, increasing demands in those early mornings; this will primarily impact the recycled water deliveries as part of the Groundwater Recovery Enhancement and Treatment (GREAT) Program (described in Chapter 4).

In its Regional UWMP, Metropolitan Water District indicated the critical periods are:

- Single dry year – 1977
- Multiple dry years – 1990 to1992

MWDSC dry periods include the impacts of drought beyond the local areas, since it receives water from both Northern California and the Colorado River.

Chapter 6 evaluates the impacts of climate and seasonal differences in terms of water supply and demand.

1.5 Potential Effects of Climate Change

A topic of growing concern for water planners and managers is global warming and the potential impacts it could have on California's future water supplies. California Department of Water Resources' (DWR's) California Water Plan Update 2005 contains the first-ever assessment of such potential impacts in a California Water Plan.

Volume 1, Chapter 4 of the California Water Plan, "Preparing for an Uncertain Future," lists some potential impacts of global warming, based on more than a decade of scientific studies on the subject:

- Could produce hydrologic conditions, variability, and extremes that are different from what current water systems were designed to manage
- May occur too rapidly to allow sufficient time and information to permit managers to respond appropriately
- May require special efforts or plans to protect against surprises or uncertainties

Should global warming increase over time, it may cause a number of changes impacting future water supplies, including changes in Sierra snowpack, hydrologic patterns, sea level, rainfall intensity, and statewide water demand. Computer models (such as CALVIN) have been developed to show water planners how California water management might adapt to climate change. DWR has committed to update and refine these models based on ongoing scientific data collection and to incorporate this information into future California Water Plans. As DWR develops more specific assessments of the potential effects of climate change on State Water Project (SWP) delivery reliability and water demands, the City of Oxnard can update its Plan accordingly.

1.6 List of Abbreviations and Acronyms

The following abbreviations and acronyms are used in this report.

AB	Assembly Bill
Act	California Urban Management Planning Act
ADWF	Average dry weather flow
AF	Acre-feet
AFY	Acre-feet per year
ASR	Aquifer storage and recovery
AWPF	Advanced Water Purification Facility
BDCP	Bay-Delta Conservation Plan
BIA	Building Industry Association
BMO	Basin management objective
BMP	Best management practice
BWRDF	Brackish Water Reclamation Demonstration Facility
CAT	Climate Action Team
CAUSE	Central Coast Alliance United for a Sustainable Economy
CCR	Consumer Confidence Report
CFS or cfs	Cubic feet per second
CIBCSD	Channel Islands Beach Community Services District
CII	Commercial, industrial, and institutional
City	City of Oxnard
CMP	Conservation Master Plan
CMWD	Calleguas Municipal Water District
COG	Council of Governments
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DMM	Demand management measure
DPH	Department of Public Health
DWR	Department of Water Resources
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ETo	Evapotranspiration
FCGMA	Fox Canyon Groundwater Management Agency
GPCD	Gallons per capita per day
GPM	Gallons per minute
gpd/ft^2	Gallons per day per square foot
GREAT	Groundwater Recovery, Enhancement and Treatment
HCD	Housing and Community Development

HCF	Hundred cubic feet
HCP	Habitat Conservation Plan
INCF	Inter Neighborhood Council Forum
LAS	Lower Aquifer System
MAF	Million acre-feet
MCL	Maximum contaminant level
M&I	Municipal and industrial
MGD	Million gallons per day
mg/L	Milligrams per liter
MTBE	Methyl tertiary butyl ether
MOU	Memorandum of Understanding Regarding Water Conservation in California
MWDSC	Metropolitan Water District of Southern California
NBVC	Naval Base Ventura County
NPDES	National Pollutant Discharge Elimination System
O-H	Oxnard-Hueneme System
OVMWD	Ocean View Municipal Water District
OVS	Ocean View System
OWWTP	Oxnard Wastewater Treatment Plant
P&G	Procter and Gamble
PHG	Public health goal
PHWA	Port Hueneme Water Agency
Plan	2010 Urban Water Management Plan
RHNA	Regional housing needs allocation
RO	Reverse osmosis
RWBS	Recycled Water Backbone System
RWMP	Recycled Water Master Plan
SB	Senate Bill
SBX7-7	Senate Bill 7 of Special Extended Session 7
SCAG	Southern California Association of Governments
SQUIMP	Stormwater Quality Urban Impact Mitigation Plan
SWP	State Water Project
TDS	Total dissolved solids
UAS	Upper Aquifer System
UWCD	United Water Conservation District
UWMP	Urban Water Management Plan
VCOG	Ventura Council of Governments

FIGURE 1-1
CITY OF OXNARD WATER SERVICE AREA

Chapter 2: Water Use

This section describes historic and current water usage and the methodology used to project future demands within the City's service area. Water deliveries are divided into sources including imported water, groundwater, and recycled water. Water usage is divided into sectors such as residential, industrial, landscape, and other purposes. For this evaluation, existing land use data and new construction information were compiled from the City's Development Services Department. This information was then compared to historical trends for new water service connections and customer water usage information.

Several factors are important when discussing City water demands:

- Water from City wells is extracted, treated, and delivered only to City customers under normal operations.
- Water from UWCD is delivered to Oxnard-Hueneme (O-H) Pipeline Contractors (including the City of Oxnard, PHWA, and mutual water companies within the City).
- Water from CMWD is delivered to:
  - City of Oxnard.
  - PHWA through the Three-Party Agreement between CMWD, the City of Oxnard and PHWA. Water is conveyed through the City's facilities to PHWA's Brackish Water Reclamation Demonstration Facility (BWRDF). A copy of the Three-Party Agreement is included in Appendix C.
  - Blending Station Number 6 occasionally delivers desalted groundwater to PHWA via the Oxnard-Del Norte Conduit system.
  - Procter & Gamble (P&G), a large industrial water customer in the City of Oxnard, has a direct connection to the Oxnard Conduit, which transports water from CMWD's Springville Reservoir. P&G's paper manufacturing processes require higher quality water than the City's current blended water system can provide. P&G and the City entered into a special non-tariff-based agreement for water supplies delivered through City facilities.

The term "water production" reflects the total amount of water purchased from CMWD and UWCD as well as the amount pumped from City-owned and operated extraction wells. Each source of water supply is metered before it enters the water distribution system. Unaccounted-for-water is the difference between metered production and billed water deliveries. Unaccounted-for-water typically includes but is not necessarily limited to: leakage in the system, un-metered fire hydrant water, un-metered construction water, and meter inaccuracies.

2.1 Population

The City of Oxnard has a mix of housing types, including single-family residences and multi-family residences. According to the 2010 U.S. Census, there was a population of approximately

198,000 persons within the City limits. Subtracting those served by mutual water companies and adding those now served by the Ocean View System (OVS) (described in Section 2.2.1) yields a population served of approximately 201,500. The average number of persons per household was 3.85 and the average family size was 4.16 persons. Between 1990 and 2000, Oxnard had the second fastest growth rate of all cities within Ventura County. Growth rates for Oxnard, Ventura County, and California then showed a decrease between 2005 and 2009. Population estimates and projections from 2001 to 2035 were provided by the City and were developed in 2008 with funding and technical assistance from the Southern California Association of Governments (SCAG), adopted by the Ventura Council of Governments (VCOG) and the Oxnard City Council. The population growth rate for the 25-year period covered by this Plan is shown in Table 2-1.

TABLE 2-1
POPULATION GROWTH RATES

Period	Rate
2011-2015	7.7
2016-2020	3.9
2021-2025	3.7
2026-2030	3.6
2031-2035	3.5

Table 2-2 provides historic and projected population estimates for the City's service area using these growth rates.

TABLE 2-2
POPULATION PROJECTIONS

Year	2010[(a)]	2015	2020	2025	2030	2035
Population	201,499	216,964	225,399	233,834	242,269	250,706

Note: (a) 2010 Census Redistricting Data (Public Law [P.L.] 94-171) Summary File—Oxnard city/prepared by the U.S. Census Bureau, 2011, less mutual water companies' population, and including population served by the OVS.

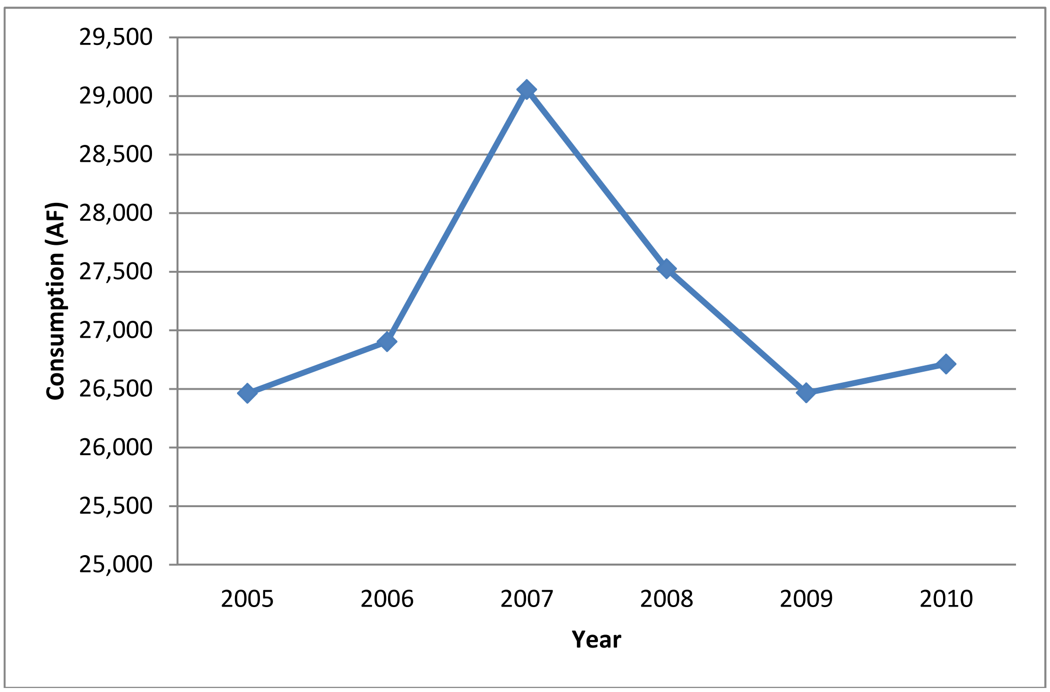
2.2 Historical Water Use

Predicting future water supply requires accurate historic water use patterns and water usage records. The historical use of all water supplies in acre-feet (AF) used to meet municipal water requirements, including the use of local groundwater, imported water supplies and recycled water, are summarized in Table 2-3. Figure 2-1 illustrates this use, which shows a steady increase in water demand until 2008, with a downturn in recent years likely due to economic conditions and response by customers to dry-year conservation efforts.

TABLE 2-3
HISTORIC WATER USE (AF)

Year	Water Use
2005	26,462
2006	26,903
2007	29,055
2008	27,525
2009	26,466
2010	26,712

FIGURE 2-1
HISTORIC WATER USE



The City currently serves 40,802 potable water connections, all of which are metered accounts. In 2010, approximately 85.6 percent of the service connections were residential and commercial. Table 2-4 shows the City's service connections since 2005.

TABLE 2-4
HISTORIC SERVICE CONNECTIONS

Customer Class	2005	2006	2007	2008	2009	2010
Single-family	30,363	31,041	31,583	32,188	32,544	32,837
Multi-family/Commercial	2,000	2,022	2,020	2,018	2,027	2,031
Industrial/Institutional/Government	2,509	2,557	2,549	2,598	2,604	2,648
Landscape	1,353	1,386	1,442	1,489	1,525	1,540
Agricultural	0	0	0	0	50	50
Other	1,504	1,596	1,527	1,605	1,648	1,696
Total	**37,729**	**38,602**	**39,121**	**39,898**	**40,398**	**40,802**

Predicting future water supply requires accurate historic water use patterns and water usage records. Table 2-5 shows historic water use by customer class from 2005 to 2010.

TABLE 2-5
HISTORIC USE BY CUSTOMER CLASS (AF)

Customer Class	2005	2006	2007	2008	2009	2010
Single-family	11,128	11,444	11,822	11,400	11,005	10,126
Multi-family/Commercial	4,446	4,324	4,240	4,321	4,214	4,034
Industrial/Institutional/Government	7,760	7,860	8,948	7,876	6,531	8,498
Landscape	3,008	3,172	3,516	3,754	3,466	3,067
Agricultural	0	0	0	0	1,141	940
Other	120	103	529	174	109	47
Total	**26,462**	**26,903**	**29,055**	**27,525**	**26,466**	**26,712**

2.2.1 Historic Water Sales to Other Agencies

The City of Oxnard, CMWD and PHWA entered into a Three-Party Agreement in 2002, which provides PHWA with CMWD water through Oxnard's O-H pipeline. The City also supplied water to the Ocean View Municipal Water District (OVMWD) until 2008, when the OVMWD was dissolved and has since been managed and operated by the City. The OVMWD's distribution system is now referred to as the Ocean View System and the demand of the Ocean View customers is accounted for as part of the City's total demand, with much of the demand categorized as agricultural water use. Table 2-6 shows the historic sales to PHWA and OVMWD from 2005 to 2010. The City does not sell water to any other agencies; however, with the completion of Blending Station Number 6 in 2011, the City can provide desalted groundwater to PHWA in the case that PHWA's O-H pipeline supply becomes temporarily unavailable.

TABLE 2-6
HISTORIC SALES TO OTHER AGENCIES (AF)

	2005	2006	2007	2008	2009	2010
PHWA	1,644	2,063	2,567	1,198	1,279	841
OVMWD	1,041	983	1,040[(a)]	1,737	0	0
Total	**2,685**	**3,046**	**3,607**	**2,935**	**1,279**	**841**

Note: (a) Water use in May, June, July and August 2007 estimated by United Water Conservation District while meter underwent replacement.

2.2.2 Recycled Water Sales

The City currently does not serve recycled water to any customers. Section 4 discusses the City's plans for its recycled water program.

2.2.3 Historical Other Water Uses

The City monitors water used for system operations, such as hydrant flushing, dead end flushing, flushing for water quality purposes, broken fire hydrants, main leaks, etc. The City has estimated 10.5 acre-feet per year (AFY) for fire suppression/treatment, well testing/flushing, damaged hydrants and main breaks. These amounts are shown in Table 2-7.

TABLE 2-7
HISTORIC USE FOR SYSTEM OPERATION (AF)

2005	2006	2007	2008	2009	2010
10.5	10.5	10.5	10.5	10.5	10.5

However, the City, like all water agencies, does have some unaccounted-for water. Unaccounted-for water is the difference between the amount of water produced and the amount of water billed to customers. Over the last five years unaccounted for water has averaged between 5 and 6 percent of produced water within the City's system.

The percentage of unaccounted-for water was estimated by comparing water production statistics to water sales statistics. Sources of unaccounted-for water include:

- Fire Hydrant Operations by the Fire Department: This represents the use of water for emergencies.
- Customer Meter Inaccuracies: Customer meters represent one of the main sources of unaccounted-for water as they tend to under-represent actual consumption in the water system.
- Leaking water lines: Leakage from water pipes is a common occurrence in water systems. A significant number of leaks remain undetected over long periods of time as they are very small; however these small leaks contribute to the overall unaccounted-for water.

- Unaccounted for jumper losses: jumpers placed in lieu of service water meters during construction contribute to unaccounted-for water usage that is generally not measured and difficult to estimate.

Table 2-8 indicates unaccounted-for water loss within the distribution system. The City has also conducted an American Water Works Association M36 water audit; the results are attached in Appendix D.

TABLE 2-8
UNACCOUNTED-FOR WATER LOSSES

Year	Water Production (AF)	Water Sales and System Operation Use (AF)	Unaccounted-for Water (AF)	Unaccounted-for Water (Percent)
2005	27,354	26,472	882	3.2
2006	28,021	26,913	1,108	4.0
2007	28,597	29,065	-468	0.0
2008	27,681	27,535	146	0.5
2009	27,427	26,476	951	3.5
2010	26,809	26,722	87	0.3

In the 1990s the City operated a groundwater injection program for seasonal storage. Table 2-9 summarizes what DWR refers to as "other" water uses, besides metered deliveries and sales to other agencies. In late 2010, the City injected imported surface water into the Hueneme aquifer for extraction in 2011.

TABLE 2-9
HISTORIC "OTHER" WATER USES (AF)

Water Use	2005	2010
Saline Barriers	0	0
Groundwater Recharge	0	976
Conjunctive Use	0	0
Recycled Water	0	0
System Operations and Losses[(a)]	892.5	97.5
Total	**892.5**	**1,073.5**

Note: (a) From Tables 2-7 and 2-8.

2.2.4 Total Historical Water Use

Table 2-10 presents information on all historic water uses for the years 2005 and 2010.

TABLE 2-10
HISTORIC TOTAL WATER USE (AF)

Water Use	2005	2010
Total Water Deliveries (from Table 2-3)	26,462	26,712
Sales to Other Water Agencies (from Table 2-6)	2,685	841
Additional water uses and losses (from Table 2-9)	892	1,074
Total	**30,039**	**28,627**

2.3 Existing and Targeted Per Capita Water Use

2.3.1 Base Daily Per Capita Water Use for SBX7-7 Reduction

As described in Senate Bill 7 of Special Extended Session 7 (SBX7-7), it is the intent of the California legislature to increase water use efficiency and the legislature has set a goal of a 20 percent per capita reduction in urban water use statewide by 2020. As SBX7-7 applies to retail water suppliers, the City of Oxnard must comply with its requirements. Consistent with SBX7-7, the 2010 UWMP must provide an estimate of Base Daily Per Capita Water Use. This estimate utilizes information on population as well as base gross water use. For the purposes of this UWMP, population was estimated as described in the previous section. Base gross water use is defined as the total volume of water, treated or untreated, entering the distribution system of the City, excluding recycled water, net volume of water placed into long-term storage and water conveyed to another urban water supplier.

The UWMP Act allows urban water retailers to evaluate their base daily per capita water use using a 10 or 15-year period. A 15-year base period within the range January 1, 1990 to December 31, 2010 is allowed if recycled water made up 10 percent or more of the 2008 retail water delivery. If recycled water did not make up 10 percent or more of the 2008 retail water delivery, then a retailer must use a 10-year base period within the range January 1, 1995 to December 31, 2010. Recycled water did not make up 10 percent of the 2008 delivery and for this reason Base Daily Per Capita Water Use for the City has been based on a 10-year period. The period from the year 1999 through 2008 was chosen to represent the Base Daily Per Capita Water Use because it allows for the highest target. In addition, urban retailers must report daily per capita water use for a five-year period within the range January 1, 2003 to December 31, 2010. This 5-year base period is compared to the Target Base Daily Per Capita Water Use to determine the minimum water use reduction requirement. The 5-year period from 2003 through 2007 was chosen because it allows the highest target.

Using the methodology found in *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use*, the City determined its targets for SBX7-7 compliance as shown in Table 2-11. Table 2-11 provides the data used to calculate the Base Daily Per Capita Water Use in gallons per capita per day (GPCD), and the 10-year and 5-year base periods for the City of Oxnard. Population was calculated using 2010 Census Redistricting Data (Public Law [P.L.] 94-171) Summary File—Oxnard city/prepared by the U.S. Census Bureau, 2011, less mutual water companies' population, and including population served by the OVS.

TABLE 2-11
CITY OF OXNARD - BASE DAILY PER CAPITA WATER USE

Base Period Year		Distribution System Population	Annual System Gross Water Use (AFY)	Annual Daily Per Capita Water Use (GPCD)	10-Year Average (GPCD)	5-Year Average (GPCD)
Sequence Year	***Calendar Year***					
1	1995	149,368	21,863	130.7	-	-
2	1996	151,158	23,227	137.2	-	-
3	1997	153,392	24,555	142.9	-	-
4	1998	156,582	20,110	114.7	-	-
5	1999	159,743	24,449	136.6	-	-
6	2000	164,022	26,224	142.7	-	-
7	2001	168,363	26,088	138.3	-	-
8	2002	172,582	27,208	140.7	-	-
9	2003	175,384	26,919	137.0	-	-
10	2004	179,466	29,805	148.3	136.9	-
11	2005	181,355	27,354	134.7	137.3	-
12	2006	183,149	28,230	137.6	137.4	-
13	2007	186,104	29,009	139.2	137.0	139.3
14	2008	188,569	28,138	133.2	138.8	138.6
15	2009	201,432	26,497	117.4	136.9	132.4
				Period Selected	1999-2008	2003-2007

Note: Shaded cells show calendar years used in selected 5-year average.

2.3.2 Compliance Water Use Targets for SBX7-7 Reduction

In addition to calculating base gross water use, SBX7-7 requires that the City, as a retail water supplier, identify its demand reduction targets for 2015 and 2020 by utilizing one of four options:

- Option 1. 80 percent of baseline GPCD water use (i.e., a 20 percent reduction).
- Option 2. The sum of the following performance standards: indoor residential use (provisional standard set at 55 GPCD); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (80 percent ETo existing landscapes, 70 percent of ETo for future landscapes); plus 10 percent reduction in baseline commercial, industrial institutional use by 2020.
- Option 3. 95 percent of the applicable state hydrologic region target as set in the DWR "20x2020 Water Conservation Plan" (February 2010) (20x2020 Plan).
- Option 4. Savings by Water Sector: this provisional method developed by DWR, identifies water savings obtained through identified practices and subtracts them from the base daily per capita water use value identified for the water supplier.

The City has selected compliance Method 3 as the most feasible option to meet the Urban Water Use Target. It should be noted that the City is able to select Method 3 because of the already water efficient usage by City customers. The ten-year Baseline Daily Per Capita Water

Use is 138.8 GPCD. Method 1 and 4 result in a lower target and Method 2 is not feasible because it requires extensive documentation of the City's landscaped areas.

The City of Oxnard's service area is within the South Coast Hydrologic Region as defined by DWR and this hydrologic region has been assigned a 2020 water use target of 149 GPCD per the DWR 20x2020 Plan. The Urban Water Use Target using Method 3 is 95 percent of the hydrologic region target, or 142 GPCD. The 2015 target is defined as the point halfway between the baseline and the 2020 Target, and is 152 GPCD. However, since the City's current usage is already below the target (117.4 GPCD in 2009), it needs to comply with a minimum 5 percent reduction of average GPCD as described in SBX7-7 (determined over a five-year period). This results in a 2020 target of 132.4 GPCD.

Table 2-12 reports the City's baseline and target daily per capita water use. The City will need to maintain per capita use at current levels to stay below the SBX7-7 targets.

TABLE 2-12
BASELINE AND TARGET DAILY PER CAPITA WATER USE SUMMARY (GPCD)

Baseline Daily Per Capita Water Use	138.8
2015 Interim Urban Water Use Target	135.6
2020 Urban Water Use Target (Max allowable GPCD target in 2020 - 95% x 5-year baseline)	132.4

2.4 Projected Water Use

The following sections describe the City's projected water demands from customers, sales, and other water uses. A discussion of projected water demands from low-income households is also provided.

2.4.1 Projected Water Demands

The City's Development Services Department provided projected water demands based on development projects that are under evaluation, are in the planning process or are the result of its own water planning efforts for its service area. The City maintains historical data and works closely with property owners and developers in its service area to ensure they have an adequate water supply and the necessary infrastructure to provide water service.

New demand was based on development applications for known projects, build-out as projected in the 2030 General Plan, infill, redevelopment, and densification. For projects not specified by any City plans, demand was estimated at 1 percent over baseline demand per year. Projects expected include additional infill, redevelopment, the build-out of River Park, and the SouthShore, South Ormond Beach, Teal Club and Sakioka Farms community plans.

The projected water demand through 2035 is shown in Table 2-13.

TABLE 2-13
SUMMARY OF PROJECTED WATER DEMANDS (AF)

	2010[(a)]	2015	2020	2025	2030	2035
Baseline Demand[(b)]	26,722	32,996	32,996	32,996	32,996	32,996
New Demand[(c)]	0	3,033	6,688	8,113	9,443	10,773
Total Projected Demand	**26,722**	**36,029**	**39,684**	**41,109**	**42,439**	**43,769**

Notes:
(a) 2010 demands represent actual consumption.
(b) Baseline demand represents demand from existing customers and is expected to remain stable through 2035.
(c) New demand represents an increase in demand as a result of future currently known development projects with Specific Plans, as well as future infill, redevelopment, and other development designated in the City General Plan.

Table 2-14 shows the projected demands by customer type.

TABLE 2-14
CURRENT AND PROJECTED WATER DELIVERIES BY CUSTOMER TYPE (AF)

Customer Class	2015	2020	2025	2030	2035
Single-family	14,316	15,769	16,335	16,863	17,392
Multi-family/Commercial	5,589	6,155	6,376	6,582	6,789
Industrial/Institutional/Government	10,183	11,216	11,619	11,995	12,370
Landscape	4,426	4,875	5,050	5,214	5,377
Agricultural	1,410	1,553	1,609	1,661	1,713
Other	105	116	120	124	128
Total	**36,029**	**39,684**	**41,109**	**42,439**	**43,769**

2.4.1.1 Water Neutrality Policy

First established in 2008 and recently reaffirmed in 2011, the Oxnard City Council has established a water demand “neutrality” policy. That is, all new development approved within the City must offset the water demand associated with the project with a supplemental water supply. As noted above, “new development” includes all planned (anticipated in the current General Plan) and any unplanned future development occurring in the City.” Under the policy, a development can be water neutral by meeting its projected demand through: existing FCGMA groundwater allocations that are transferred to the City; contributing to increased efficiency by funding water conservation or recycled water retrofit projects; providing additional water supplies; or any combination of these options. While this City policy has not been codified, it has been applied to every development project approved since 2008.

2.4.2 Projected Sales and Other Water Uses

The City expects to continue providing PHWA with CMWD water through the Three-Party Agreement. As the City’s recycled water program is implemented, recycled water sales are expected to begin in 2013 and increase as more customers are connected to the system. Table 2-15 shows the projected sales and other water uses.

TABLE 2-15
PROJECTED SALES AND OTHER WATER USES (AF)

Water Use	2015	2020	2025	2030	2035
Sales to Other Agencies[(a)]	1,000	1,000	1,000	1,000	1,000
Saline Barriers	0	0	0	0	0
Groundwater Recharge[(b)]	5,200	11,400	8,500[(c)]	8,500	8,500
Conjunctive Use	0	0	0	0	0
Recycled Water[(d)]	0	0	0	0	0
System Operations and Losses[(e)]	1,600	1,600	1,600	1,600	1,600
Total	**7,800**	**14,000**	**11,100**	**11,100**	**11,1000**

Notes:
(a) Sales to PHWA are projected to be 1,000 AF/year. PHWA recently installed meters throughout their service area, resulting in decreased demands. 2010 demands were 841 AF (Table 2-6) and the City expects little future variation from the 2010 demands.
(b) Groundwater recharge may occur when recycled water sales are less than the amount of recycled water produced by the AWPF. Excess recycled water will be injected into the groundwater for storage for future use or to combat seawater intrusion. Excess recycled water may also be sold to users outside of the City's service area in exchange for groundwater pumping allocation.
(c) Recycled water production will increase in the year 2020 as capacity is expanded at the AWPF. The majority of the recycled water produced will be used for groundwater recharge until additional municipal and industrial customers are retrofitted for recycled water use (by the year 2025) and the recycled water is delivered to these customers to offset potable demand.
(d) The City will be producing recycled water in the years 2015-2035 (see Table 4-1); however, the City does not consider this water as an "other water use." A portion of the recycled water produced will be used to offset current demands and is accounted for in Table 2-13, and the other portion will be used either for groundwater recharge or to offset groundwater use outside of the City's boundaries in exchange for pumping allocation. These uses are accounted for in the Groundwater Recharge line of this table (2-15).
(e) While losses reported in Table 2-9 are lower, the City has analyzed its water losses using the detailed American Water Works Association's Water Audit Software (Version 4.1) and associated M36 Water Audits and Loss Control Manual and has found that system losses average between 5 and 6 percent. Therefore, the City's projects future losses to be 1,600 AF, or 6 percent of its baseline demand.

2.4.3 Total Projected Water Use

Table 2-16 presents information on all projected water uses for the years 2015 through 2035.

TABLE 2-16
TOTAL PROJECTED WATER USE (AF)

Water Use	2015	2020	2025	2030	2035
Total Water Deliveries (from Table 2-13)[(a)]	35,029	38,684	40,109	41,439	42,769
Sales to Other Water Agencies (from Table 2-15)	1,000	1,000	1,000	1,000	1,000
Additional Water Use and Losses (from Table 2-15)	6,800	13,000	10,100	10,100	10,100
Total	**42,829**	**52,684**	**51,209**	**52,539**	**53,869**

Note:
(a) Total Water Deliveries in Table 2-13 include 1,000 AF of water delivered to PHWA. In this table (Table 2-16), deliveries to PHWA are separated out into their own line, "Sales to Other Water Agencies."

2.4.4 Projected Water Demands for Low Income Households

Senate Bill 1087 requires that water use projections in an UWMP include the projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county general plan in the service area of the supplier.

Housing elements rely on the Regional Housing Needs Allocation (RHNA) generated by the State Department of Housing and Community Development (HCD) to allocate the regional need for housing to the regional Council of Governments (COG) (or a HCD for cities and counties not covered by a COG) for incorporation into housing element updates. Before the housing element is due, the HCD determines the total regional housing need for the next planning period for each region in the state and allocates that need. The COGs then allocate to each local jurisdiction its "fair share" of the RHNA, broken down by income categories; very low, low, moderate and above moderate, over the housing element's planning period.

Jurisdictions located within the region covered by SCAG, including the County of Ventura, were required to submit their adopted Housing Elements to the State Department of Housing and Community Development by July 1, 2008. In Oxnard, 14.7 percent of households fall in the extremely-low income category, compared to 10.3 percent in Ventura County and 14.6 percent fall in the low income category, compared to 10.4 percent in Ventura County. The City of Oxnard last updated its housing elements in 2011, and it covers the January 1, 2006, to June 30, 2014, planning period.

Table 2-17 shows the expected low income water demands.

TABLE 2-17
LOW INCOME WATER DEMANDS[(a)] (AF)

	2015	2020	2025	2030	2035
Demand w/Conservation					
Extremely Low	5,296	5,833	6,043	6,239	6,434
Low	5,260	5,794	6,001	6,196	6,390
Total	**10,556**	**11,627**	**12,044**	**12,435**	**12,824**

Note: (a) Demands already included within projections.

The City of Oxnard will not deny or condition approval of water services, or reduce the amount of services applied for by any proposed development unless one of the following occurs:

- City of Oxnard specifically finds that it does not have sufficient water supply,
- City of Oxnard is subject to a compliance order issued by the State Department of Public Health (DPH) that prohibits new water connections, or
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

2.4.5 Other Factors Affecting Water Usage

A major factor that affects water usage is weather. Historically, when the weather is hot and dry, water usage increases. The amount of increase varies according to the number of consecutive years of hot, dry weather and the conservation activities imposed. During cool, wet years, historical water usage has decreased, reflecting less water usage for exterior landscaping. This factor is discussed below in detail.

2.4.5.1 Weather Effects on Water Usage

California faces the prospect of significant water management challenges due to a variety of issues, including population growth, regulatory restrictions and climate change. Climate change is of special concern because of the range of possibilities and their potential impacts on essential operations, particularly operations of the SWP. The most likely scenarios involve increased temperatures, which will reduce the Sierra Nevada snowpack and shift more runoff to winter months, and accelerated sea level rise. These changes can cause major problems for the maintenance of the present water export system since water supplies are conveyed through the fragile levee system of the Sacramento-San Joaquin Delta. The other much-discussed climate scenario or impact is an increase in precipitation variability, with more extreme drought and flood events posing additional challenges to water managers[1].

2.4.5.2 Conservation Effects on Water Usage

In recent years, water conservation has become an increasingly important factor in water supply planning in California. Since the 2005 UWMP there have been a number of regulatory changes related to conservation, including new standards for plumbing fixtures, a new landscape ordinance, a state universal retrofit ordinance, new Green Building standards, demand reduction goals and more. The California Plumbing Code has instituted requirements for new construction that mandate the installation of ultra low-flow toilets and low-flow showerheads.

During the 1987 to 1992 drought period, overall water requirements due to the effects of hot, dry weather were projected to increase by approximately 10 percent. As a result of extraordinary conservation measures enacted during the period, the overall water requirements actually decreased by more than 10 percent.

Residential, commercial, and industrial usage can be expected to decrease as a result of the implementation of more aggressive water conservation practices. In southern California, the greatest opportunity for conservation is in developing greater efficiency and reduction in landscape irrigation. The irrigation demand can typically represent as much as 70 percent of the water demand for residential customers depending on lot size and amount of irrigated turf and plants. Currently, the City of Oxnard lies well below typical demand, with landscape water use making up an estimated 44 percent of the City's total annual water use; however conservation efforts will increasingly target this component of water demand.

[1] Final California Water Plan Update 2009 Integrated Water Management: Bulletin 160.

Chapter 3: Water Resources

The City's current water supply consists of imported surface water from CMWD, local groundwater from UWCD, and local groundwater from City wells. The City blends water from these three sources to achieve an appropriate balance between water quality, quantity, reliability, and cost.

From 2006 to 2010 the blend ratio of imported surface water and groundwater (either from UWCD or City wells) has varied between 1:1 and 1:2. Each of these sources is described in the following chapters.

Table 3-1 summarizes the City's current and projected water supplies through 2035.

TABLE 3-1
SUMMARY OF CURRENT AND PROJECTED WATER SUPPLIES (AF)

Water Supply Sources	2010[a]	2015	2020	2025	2030	2035
Existing Supplies:						
Imported Water - Calleguas Municipal Water District	11,277	17,379	17,379	17,379	17,379	17,379
Groundwater - United Water Conservation District[b]	10,852	9,800	7,800	7,800	7,800	7,800
Groundwater - City-produced[c]	7,442	10,782	9,782	9,782	9,782	9,082
Brine Loss[d]	(1,254)	(1,490)	(1,641)	(1,700)	(1,755)	(1,810)
Subtotal Existing Supplies	**28,317**	**36,471**	**33,320**	**33,261**	**33,206**	**32,451**
Planned Supplies						
Future City Groundwater[e]	0	527	1,789	2,269	2,269	2,269
Future City Groundwater[f]	0	5,200	11,400	8,500	8,500	8,500
Recycled Water[g]	0	1,800	2,600	5,500	5,500	5,500
Subtotal Planned Supplies	**0**	**7,527**	**15,789**	**16,269**	**16,269**	**16,269**
Total Estimated Supplies	**28,317**	**43,998**	**49,109**	**49,530**	**49,475**	**48,720**

Notes:
(a) 2010 supplies represent actual consumption, not a limitation in water supply.
(b) City's sub-allocation held by UWCD plus the additional allocation resulting from the M&I Supplemental Water Program.
(c) City's historical and baseline allocation (9,082 AF) plus additional credits resulting from the City's participation in the Ferro Pit Program and credits transferred to the City from PHWA as a result of the Three Party Agreement. The City also has FCGMA credits available as a supply source if needed.
(d) Brine loss is assumed to be 20% of permeate production from desalting operations. Assumes that the City will continue its 2010 blend ratio of groundwater, desalted groundwater, and imported water to maintain product water quality between 600 to 700 TDS.
(e) Future City groundwater allocations transferred to the City as agricultural lands are developed.
(f) Future City groundwater allocations made available to the City as agricultural users abandon or reduce the use of their wells in exchange for recycled water and/or as a result of groundwater recharge.
(g) GREAT Program recycled water sold to City water customers for municipal and industrial uses, including landscape irrigation.

3.1 Wholesale (Imported) Water Supplies

To provide for long-range improvement of its water quality, the City annexed to CMWD in February 1961. CMWD is a member agency of MWDSC. MWDSC is the State Water Contractor from which CMWD purchases SWP supplies.

3.1.1 Imported Water, State Water Project: MWDSC

The SWP originates in northern California and is conveyed over 500 miles to southern California through the SWP's system of reservoirs, aqueducts and pump stations. The SWP is the largest state-built, multi-purpose water project in the country. It was authorized by the California State Legislature in 1959, with the construction of most initial facilities completed by 1973. Today, the SWP includes 34 storage facilities, reservoirs and lakes, 20 pumping plants, four pumping-generating plants, five hydro-electric plants and approximately 700 miles of aqueducts and pipelines. The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. Storage released from Oroville Dam on the Feather River flows down natural river channels to the Sacramento-San Joaquin River Delta (Delta). While some SWP supplies are pumped from the northern Delta into the North Bay Aqueduct, the vast majority of SWP supplies are pumped from the southern Delta into the 444-mile-long California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains and the aqueduct then divides into the East and West Branches.

The amount of SWP water delivered to MWDSC and other State Water Contractors in a given year depends on a number of factors, including the demand for the supply, amount of rainfall, snowpack, runoff, water in storage, pumping capacity from the Delta, and legal/regulatory constraints on SWP operation. Water delivery reliability depends on three general factors: the availability of water, the ability to convey water to the desired point of delivery, and the magnitude of demand for the water. Urban SWP contractors' requests for SWP water, which were low in the early years of the SWP, have been steadily increasing over time. Regulatory constraints have changed over time, becoming more restrictive.

Since the last round of UWMPs was prepared in 2005, the California Department of Water Resources has twice updated its State Water Project Delivery Reliability Report. The biennial Report assists SWP contractors in assessing the reliability of the SWP component of their overall supplies. The 2009 SWP Reliability Report updates DWR's estimate of the current (2009) and future (2029) water delivery reliability of the SWP. The updated analysis shows that the primary component of the annual SWP deliveries (referred to as Table A deliveries) will be less under current and future conditions, when compared to the preceding report (State Water Project Delivery Reliability Report 2007). The report discusses factors having the potential to affect SWP delivery reliability:

- Restrictions on SWP and Central Valley Project (CVP) operations due to State regulation and federal biological opinions to protect endangered fish such as Delta smelt and spring-run salmon;
- Climate change and sea level rise, which is altering the hydrologic conditions in the State;
- The vulnerability of Delta levees to failure due to floods and earthquakes.

"Water delivery reliability" is defined as the annual amount of water that can be expected to be delivered with a certain frequency. SWP delivery reliability is calculated using computer simulations based on 82 years of historical data.

The 2009 SWP Reliability Report recognizes continuing challenges to the ability of the SWP to deliver full contractual allotments of SWP water. For current conditions, the dominant factor for these reductions is the restrictive operational requirements contained in the federal biological opinions. Deliveries estimated for the 2009 Report expressly account for the operational restrictions of the biological opinions issued by the U.S. Fish and Wildlife Service in December 2008 and the National Marine Fisheries Service in June 2009 governing the SWP and CVP operations.

For future conditions, the 2009 SWP Reliability Report conservatively assumes that the restrictions imposed by the biological opinions will still be in place, and includes the potential effects of climate change to estimate future deliveries. The changes in run-off patterns and amounts are included along with a potential rise in sea level. Sea level rise has the potential to require more water to be released to repel salinity from entering the Delta in order to meet the water quality objectives established for the Delta. The 2005 SWP Reliability Report did not include any of these potential effects. For the 2007 SWP Reliability Report, the changes in run-off patterns and amounts were incorporated into the analyses, but the potential rise in sea level was not.

These updated analyses in the 2009 SWP Reliability Report indicate that the SWP, using existing facilities operated under current regulatory and operational constraints and future anticipated conditions, and with all contractors requesting delivery of their full Table A amounts in most years, could deliver 60 percent of Table A amounts on a long-term average basis.

An ongoing planning effort to increase long-term supply reliability for both the SWP and CVP is taking place through the Bay Delta Conservation Plan (BDCP). The co-equal goals of the BDCP are to improve water supply and restore habitat in the Delta. The BDCP is being prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties.

Several “isolated conveyance system” alternatives are being considered in the BDCP which would divert water from north of the Delta and convey it “around” the Delta to a point where water is pumped for the SWP and CVP. The new conveyance facilities would allow for greater flexibility in balancing the needs of the estuary with reliable water supplies. In December 2010, DWR released a “Highlights of the BDCP” document which summarizes the activities and expected outcomes of the BDCP. The results of preliminary analysis included in the document indicate the proposed conveyance facilities may increase the combined average long-term water supply to the SWP and CVP from 4.7 million acre-feet (MAF) per year to 5.9 MAF/year. This would represent an increase in reliability for State Water Project contractors from 60 percent to 75 percent. Planned completion of the BDCP and corresponding environmental analysis is early 2013.

For planning purposes, MWDSC based its 2010 Regional Urban Water Management Plan (November 2010) imported water supply projections on the 2009 SWP Reliability Report. Starting with the conservative water supply projections contained in the 2009 report, MWDSC assumed that measures to protect fish species and reduce water supply impacts would be implemented through the Bay-Delta process in the near term and that a new form of Delta conveyance would be fully operational by the year 2022. MWDSC also receives water from the Colorado River under a permanent service contract with the Secretary of the Interior; however, the water sold to CMWD consists only of water originating from the SWP.

3.1.2 Imported Water: CMWD

The SWP water purchased by CMWD is filtered and disinfected at MWDSC's Joseph Jensen Filtration Facility in Granada Hills. CMWD receives the treated water from MWDSC via the West Valley Feeder and either stores the treated water in Lake Bard to be treated before distribution or feeds the water directly to the Springville Reservoir near Camarillo. The water supply projections detailed in CMWD's 2010 UWMP (May 2011) are based on MWDSC's SWP projections, along with anticipated local supplies.

3.1.3 Imported Water: The City

The City receives SWP water from CMWD's Springville Reservoir through the City's Oxnard and Del Norte Conduits that feed five of the City's six water blending stations.

In 2010, the City purchased approximately 11,277 AF of water from CMWD. Of this amount, approximately 841 AF was distributed directly to PHWA. PHWA is responsible for providing water to the City of Port Hueneme, NBVC and the CIBCSD. The 11,277 AF also includes approximately 1,950 AFY for P&G, a private user that receives unblended water directly from CMWD through an agreement with the City.

Existing agreements between the City and CMWD do not guarantee the quantity of water the City may purchase. The City has a current MWDSC Tier 1 entitlement of 17,379.4 AFY. Tier 1 water corresponds to the amount "contracted for" by the City. It is in essence a capacity reservation and includes the water being delivered to PHWA. MWDSC Tier 2 water is normally available to the City of Oxnard; however, the cost per acre-foot is higher. There is less availability and reliability of Tier 2 water in periods of drought.

The Tier 1 entitlement of 17,379.4 AFY includes:

- P&G: 2,300 AFY

- "Reservation" for PHWA: The City has an agreement whereby if water from United Water Conservation District's Oxnard-Hueneme Pipeline is not available, then the City will make water available from its system. The 2010 sub-allocation is 3,467 AFY. This is 75 percent of the base, which is 4,623.33 AFY. For purposes of water supply discussion, it is being considered as a reservation from the Calleguas allocation, although the likelihood of the O-H system not being able to deliver water is relatively remote.

3.2 Groundwater

This section presents information about the City's groundwater supplies, including a description of the groundwater basin, and a review of historical, current, and projected conditions.

3.2.1 Groundwater Basin Description

The groundwater sources of supply for the City of Oxnard are groundwater from UWCD and groundwater from the City's own wells, drawn from two basins referred to locally as the Oxnard Forebay Groundwater Basin and the Oxnard Plain Groundwater Basin. The Oxnard Forebay Groundwater Basin and the Oxnard Plain Groundwater Basin are both located in the Oxnard Subbasin of the Santa Clara River Valley Groundwater Basin (Groundwater Basin Number

4-4.02), as identified in DWR Bulletin 118 (2006). Groundwater, whether from City wells or from UWCD wells, comprises approximately 60 percent of the City's water supply.

Within the Oxnard Forebay Groundwater Basin and the Oxnard Plain Groundwater Basin, there are two primary aquifer systems of importance to the City of Oxnard:

1. Upper Aquifer System (UAS) – The UAS consists of the semiperched zone, the Oxnard Aquifer, and the Mugu Aquifer.

2. Lower Aquifer System (LAS) – The LAS is comprised of the Hueneme, Fox Canyon, and Grimes Canyon Aquifers.

Water from UWCD is from the O-H System wells located in the Oxnard Forebay Groundwater Basin. The Forebay is an important part of the aquifer system, where the aquifers come together and are unconfined. The Basin is recharged from the Santa Clara River and by river water that is diverted to UWCD's spreading basins. The Basin is hydraulically connected to the aquifers in the Oxnard Basin. Thus, the primary recharge to the Oxnard Basin is from the underflow from the Forebay, rather than from deep percolation of water from surface sources on the plain.

Other groundwater areas of the Oxnard Plain are confined, meaning the groundwater aquifers are overlain by one or more clay layers. Above the uppermost layer there is perched water, but this water is of poor quality and is not used as a water supply.

The semiperched zone is the uppermost water-bearing unit in the area. It is composed of fine to medium-grained sand with interbedded silty clay lenses, with an average thickness of about 30 feet with a maximum of 80 feet. Immediately below the semiperched zone and overlying the Oxnard Aquifer is a confining bed, or clay cap, consisting primarily of silty and sandy clays with an average thickness of approximately 35 feet (Kennedy/Jenks, 1994) and with a maximum thickness of 150 feet.

The Oxnard Aquifer, part of the Upper Aquifer System and the most important water source on the Oxnard Plain, is composed of fine to coarse-grained sand, gravel, and boulder deposits. Within these areas, the aquifer is a single unit of high permeability with no prominent silt or clay lens interruptions and has an average and maximum thickness of approximately 91 and 150 feet, respectively, at an average depth of 100 to 180 feet below grade. Permeability, or the ability to transmit water, of this aquifer ranges from 1,700 to 2,000 gallons per day per square foot (gpd/ft^2). The transmissivity of this aquifer is significant, and typically ranges from 100,000 to over 400,000 gpd/ft^2 (Kennedy/Jenks, 1994).

Immediately below the Oxnard Aquifer, and separating it from the Mugu Aquifer, is an aquitard composed of silty clay with some interbedded sandy clay lenses. The average thickness of this aquitard is approximately 30 feet, although the maximum thickness has been reported to be 150 feet. The material which forms the Mugu Aquifer is fine to coarse-grained sand and gravel with some interbedded silty clay. The average thickness of the water-bearing zone is approximately 110 feet. Permeability at the Mugu Aquifer ranges between 1,900 and 2,200 gpd/ft^2. In the Forebay area where the Santa Clara River enters the Oxnard Plain near Saticoy and near the Mugu Lagoon, the Mugu Aquifer merges with the Oxnard Aquifer. The Mugu Aquifer is reported to be in hydraulic continuity with the ocean (Kennedy/Jenks, 1994).

Underlying the Mugu Aquifer is an aquitard composed of silty clay that reaches a maximum thickness of 80 feet within the Oxnard Plain. This aquitard is continuous, except in the Forebay area, where the Hueneme Aquifer merges with the other groundwaters.

The Hueneme Aquifer is composed of irregularly interbedded sand, silt and clay, with some gravel, ranging in thickness from 100 feet within the City of Port Hueneme to about 300 feet north of the City of Oxnard. Permeability for this water-bearing zone is estimated to be 400 to 600 gpd/ft^2. This aquifer is reported to be in hydraulic continuity with the ocean. The Hueneme Aquifer is separated from the underlying Fox Canyon aquifer by an aquitard composed of silt and clay and which is absent only where the Fox Canyon Aquifer merges with the Hueneme Aquifer in the northern portion of the Forebay area. The maximum thickness in the basin is approximately 170 feet (Kennedy/Jenks, 1994).

The Fox Canyon Aquifer is composed of fine to coarse-grained sand with gravel stringers and interbedded silt and clay. With a maximum thickness of approximately 550 feet in the Oxnard Plain, permeability of this water-bearing zone range from 200 to 400 gpd/ft^2. The aquitard that separates the Fox Canyon and the underlying Grimes Canyon Aquifers is composed of silt and clay, and attains a maximum thickness of about 40 feet in the Oxnard Basin.

The Grimes Canyon Aquifer is composed of fine to coarse-grained materials, with a maximum thickness of more than 1,500 feet and corresponds in area to the Fox Canyon Aquifer (Kennedy/Jenks, 1994).

The City has wells that take water from both the Upper Aquifer System and the Lower Aquifer System, as further described in Section 3.2.4.

The groundwater levels in the Oxnard Plain Basin aquifers change considerably from year to year depending on Santa Clara River recharge and total pumping quantities.

3.2.2 Fox Canyon Groundwater Management Agency

The FCGMA was created at the direction of the State Water Resources Control Board to address ongoing overdraft and seawater intrusion into the Oxnard Plain Pressure Basin. The purpose of the FCGMA is to manage the region's groundwater supply by protecting the quantity and quality of local groundwater resources and by balancing the supply and demand for groundwater resources.

The FCGMA was formed in 1982 by Act 2750 passed by the California Legislature. The Agency monitors and controls pumping within the FCGMA boundaries. Preceding this Act was State Assembly Bill No. 2995 (AB 2995) passed by the California Legislature in September 1982. Specifically, the legislation allows the agency to perform the following functions:

"Planning, managing, controlling, preserving and regulating the extraction and use of groundwater within the agency (§§ 402, 403). May collect data and carry out investigations (§ 501). May recommend and encourage wastewater reclamation and reuse projects that contribute to good groundwater management (§ 503). May control extractions from the Oxnard and Mugu aquifers with the goal of balancing supply and demand within the basin by year 2010 (§ 601); develop groundwater management plan for the Grimes Hueneme and Fox Canyon basins and may limit future extractions, considering the effects of seawater intrusion and other factors (§§ 313, 602). If the board determines that groundwater management activities are necessary to protect an aquifer, it may require conservation practices, control groundwater extractions and extraction facilities, pursue legal actions to prevent unreasonable use and unreasonable methods of use that adversely affect the groundwater supply, impose spacing limitations on new extractions, establish operating procedures for extraction facilities including rotation pumping requirements (§ 701). May require registration of extraction facilities and installation of water flow measuring devices (§§ 801, 804). May require reports of annual extractions (§ 810)."

Importantly, the FCGMA may establish uniform groundwater extraction charges (§§ 1001, 1003). This is a mechanism intended by the FCGMA to limit the amount of groundwater pumping to amounts that meet basin objectives. This authority was granted by Senate Bill 747 (SB 747), approved in June 1991, which amended and added to AB 2995, to allow extraction allocations for each water well.

The FCGMA has jurisdiction over groundwater pumping for all of the land which overlies the Fox Canyon Aquifer. This encompasses approximately 185 square miles and includes the Oxnard Forebay and the Oxnard Plain Pressure Basins underlying most of the City of Oxnard. While the basins of the FCGMA are not adjudicated basins, the basins are fully managed by FCGMA.

3.2.2.1 FCGMA Programs

In 1985, a plan for management of the LAS and UAS within the FCGMA boundaries was adopted. Major elements of the UAS Plan include the following:

1. Ventura County Ordinance No. 3739, which prohibits the construction, repair or modification of UAS wells in areas where increased extractions would increase the overdraft and the rate of seawater intrusion in the Oxnard Plain.

2. Completion of the Seawater Intrusion Abatement Project through improvement of the Vern Freeman Diversion Dam Project and operating the project under criteria developed to ensure proper water allocation.

3. Annual monitoring to determine the effectiveness of the Vern Freeman Project.

An update to the FCGMA Groundwater Management Plan (GWMP) was prepared in May 2007. The 2007 Update discusses and reviews a number of aspects of groundwater management.

Major elements of the 2007 Update include:

- Background information on the groundwater basins;
- History of groundwater extractions within the FCGMA;
- Water quality issues, both generally and basin-by-basin;
- Basin Management Objectives (BMOs) to indicate the health of the basins and the efficacy of current and future management strategies;
- The yield of the groundwater basins;
- Current management strategies and their effectiveness;

- Management strategies under development and their potential effectiveness;
- Potential future management strategies and their potential effectiveness; and
- Recommended actions to be taken by the FCGMA.

According to the 2007 Update: "Current groundwater conditions meet the BMO criteria in some, but not all of the basins. They fail to meet the BMOs in the Lower Aquifer and some portions of the Upper Aquifer in the Oxnard Plain and Santa Rosa basins."

3.2.2.2 FCGMA Ordinances

The most significant ordinance of the FCGMA is Ordinance No. 5, adopted in August 1990; its current terms and conditions are contained in Ordinance 8, as amended. This ordinance requires reductions in groundwater extractions with the objective of reducing extractions to a "safe yield" by the year 2010.

Ordinance No. 5 was periodically updated over the years. Ordinance 8, as amended, provides for baseline allocations, historical allocations and a schedule of historical pumping allocation reductions. The baseline pumping allocations of one acre-foot per acre are credited to the pumper for lands not irrigated during 1985-89 base period. Historical extractions were established during the 5-year period from 1985 to 1989. A series of 5 percent reductions to baseline pumping allocations were implemented over the period 1990 to 2010. Ordinance No. 7, adopted in June 1991, which later was amended into Ordinance No. 5.1 and now is contained in Ordinance 8, as amended, was established to prevent the waste of water by agricultural users. An agricultural water well operator is required to be 80 percent efficient when considering ETo and crop factors when an operator lacks enough historical allocation for the current crop being grown to avoid penalties.

Ordinance No. 8 was adopted in 2002 and is a conglomeration of all prior ordinances into an Ordinance Code. Ordinance No. 8.6 (December 7, 2012), also known as the "Ordinance Code", is the most recent revision to Ordinance No. 8. It is attached in Appendix E. The main purpose of combining the ordinances together was to reduce confusion, eliminate redundant text, and to shorten the laws into a more manageable format.

Unused groundwater allocation (or conservation credits) can currently be accumulated and used in future years without monetary penalty. Groundwater pumpers, including the City, can also accrue groundwater storage credits by recharging the aquifers with foreign water. These groundwater storage credits can also be used in the future, with FCGMA advance approval, without incurring the FCGMA penalty. In addition, adjustments and transfers of groundwater extraction allocations are allowed under Ordinance 8, as amended.

When irrigated agricultural land changes to Municipal and Industrial (M&I) use, the groundwater extraction allocation is transferred to the M&I water supply provider. The amount of allocation available for transfer from agricultural land is based on the water produced during the 1985-1989 base period. Up to two (2) AFY can be transferred to the M&I provider for each acre of land irrigated for agricultural uses during the base period. Any remaining amount of the historic extraction allocation is eliminated. The FCGMA also allows the assignment of an extraction allocation from one M&I operator to another.

Extractions beyond the current pumping allocation (with reductions) are subject to a penalty fee, which is based on the cost to import water and other alternative sources of supply. If pumpers utilize less than their pumping allocation, conservation credits are accrued. Similarly, if "foreign water" is recharged into the aquifer, storage credits are accrued with prior FCGMA approval. Credits can be utilized at a later date or, can be transferred to other parties with the approval of the FCGMA Executive Officer. Under Ordinance 8, as amended, credits earned as a result of agricultural use cannot be transferred to an M&I Provider, Operator, or User unless specifically approved by the FCGMA Board.

3.2.2.3 City Access to Groundwater Under FCGMA Regulations

The City of Oxnard has two existing allocation pools: one (a suballocation) held in trust through UWCD and one for the City's own wells. Each of these allocations is discussed in Sections 3.2.3 and 3.2.4, respectively. The City will also receive additional transferred groundwater allocations as allowed by Ordinance 8, as amended when agricultural land within the City's planning area is converted to municipal and industrial uses (consistent with the City's General Plan) and extraction allocations associated with existing groundwater wells are transferred to the City.

The FCGMA also allows pumpers to carryover unused allocation from year-to-year; that is, if a pumper utilizes less than its pumping allocation, it accrues conservation credits. Similarly, if "foreign water" (including recycled water) is used in-lieu of groundwater pumping and/or recharged into the local aquifers, additional credits (either conservation or storage credits) may be accrued.

The City has undertaken both types of programs in the past, with FCGMA approval. The City has managed its total FCGMA allocation to establish and maintain approximately 30,000 AF in FCGMA groundwater credits. The City will use its groundwater credits conjunctively with its imported supplies and groundwater allocation. During periods when imported supplies are restricted or when other operational considerations warrant it, the City relies more heavily on local groundwater, using a portion of its accumulated credits. During other periods, the City will reduce its groundwater use below its historical allocation to build back up its credits.

3.2.2.4 FCGMA Groundwater Management Plan

The FCGMA establishes its management policies based on its comprehensive assessment of current and anticipated future groundwater conditions, given its assessment of changes in groundwater use, planned local and regional water supply projects, and other relevant conditions. The most recent assessment is documented in the FCGMA "Groundwater Management Plan," adopted in May 2007.

The main management strategies in the Groundwater Management Plan include reducing local groundwater pumping in areas that are difficult to recharge and prone to localized over-pumping. Alternatively, surface water, foreign water (including recycled water), or groundwater from easily recharged areas will be delivered to the stressed areas. In turn, the conservation credits developed from the reduced pumping in the stressed areas are transferred for use in and around the Oxnard Forebay Basin. Both the City's GREAT Program (see Section 3.6.1) and the M&I Supplemental Water Program (see Section 3.2.3) are consistent with this strategy.

The following impacts to the City's water supplies from the FCGMA Groundwater Management Plan are as follows:

- The City will maintain its groundwater allocation and credits through both the UWCD O-H Pipeline and City groundwater wells (see Sections 3.2.3 and 3.2.4).
- The City will accumulate groundwater pumping credits when the full UWCD or City wells allocation is not used in any given year.
- The City will maintain its additional groundwater from the M&I Supplemental Water Supply Program, subject to temporary reductions associated with significantly depressed groundwater levels in the Oxnard Forebay.

The implementation of the City's GREAT Program is a key element of the FCGMA's groundwater management program.

3.2.3 United Water Conservation District Groundwater

UWCD currently provides a portion of the City's groundwater supply. This arrangement has been in place since 1954, and was formalized in the 1996 Water Supply Agreement for Delivery of Water through the Oxnard-Hueneme Pipeline (included in Appendix F). UWCD holds a pumping sub-allocation for all users of the O-H Pipeline, which includes the City, PHWA, and a number of small mutual water companies. The water supply contract defines each contractor's delivery and capacity rights in UWCD's facilities. Along with the FCGMA suballocation listed in Table 3.2 below, the City's peak capacity right is 26.75 cubic feet per second (cfs) and PHWA holds a peak capacity right of 22.25 cfs.

UWCD diverts Santa Clara River water at the Vern Freeman Diversion Dam southeast of Saticoy and delivers a portion of the water to the Saticoy and El Rio Spreading Grounds and to agricultural users on the Oxnard Plain. Water percolated in these spreading basins recharges the Forebay Basin and the Oxnard Plain Basin. Eleven wells are then used to extract the water and deliver it to the O-H users. Of the eleven wells, three extract water from the LAS, and the remaining eight extract water from the UAS. The El Rio wellfield has sufficient active pumping capacity to supply the peak O-H pipeline capacity of 53.0 cfs. Water extracted by these wells is delivered to the El Rio Pumping Station, disinfected, and pumped through the O-H Pipeline to each of the O-H customers. UWCD built the O-H system in 1954 to move municipal groundwater extraction away from coastal areas subject to seawater intrusion. The O-H System consists of 12 miles of transmission pipeline.

Table 3-2 shows the sub-allocation amounts for the City of Oxnard and PHWA.

TABLE 3-2
UWCD SUB-ALLOCATIONS (AFY)

Year	City of Oxnard	Port Hueneme Water Agency
2005	7,709.5	3,698.66
2010 and beyond	6,802.5	3,467.50

UWCD also maintains FCGMA groundwater credit subaccounts for each of its contractors, including the City. As of December 31, 2010 the City had a balance of 10,863 AF of credit available through the UWCD sub-allocation. In addition to the City's sub-allocation held by UWCD described above, in 2006 the City entered into an agreement (Appendix G) with UWCD to gain access to additional groundwater through participation in the M&I Supplemental Water Program. The M&I Supplemental Water Program allows CMWD to transfer groundwater pumping credits to UWCD for the benefit of its O-H system users, including the City. CMWD generates the credits transferred to UWCD through its Conejo Creek program, which it implemented in partnership with Camrosa Water District and Pleasant Valley County Water District.

From 2010 through 2015, the City expects to have an additional 3,000 AFY available through its participation in the M&I Supplemental Water Program. Beginning in the year 2016, the City projects a reduction in the available amount of M&I Supplemental Water Program water to 1,000 AFY.

The City's purchased volume of water from UWCD since 2005 is shown in Table 3-3.

TABLE 3-3
CITY WATER PURCHASES FROM UWCD (AF)

Year	Amount Purchased	Amount Purchased – Ocean View System[(a)]	Total
2006	4,001	983	4,984
2007	10,347	1,040[(b)]	11,387
2008	9,863	1,737	11,600
2009	11,648	1,387	13,035
2010	9,717	1,135	10,852

Notes:
(a) In addition to the prior column.
(b) Water use in May, June, July and August 2007 estimated by United Water Conservation District while meter underwent replacement.

UWCD and the O-H users amended the Water Supply Agreement in 2002. The primary change affecting the City was the combining of the City's and the former OVMWD's peak capacity in the O-H Pipeline. This was done to recognize that the City's rights under the agreement entitle it to the combined allocation and peak capacity previously listed separately for the City and the former OVMWD. In 2007, the OVMWD dissolved, with the City having responsibility to provide water service to the former OVMWD customers.

3.2.4 City Groundwater

As indicated in Section 3.2.1, local groundwater is generally extracted from the aquifers of the Oxnard Plain Groundwater Basin. The Oxnard Plain Groundwater Basin is generally made up of the Upper Aquifer System and the Lower Aquifer System.

The City's baseline groundwater pumping allocation is 936 AFY and the historical groundwater pumping allocation is approximately 8,146 AFY after 2010 when the FCGMA 25 percent reduction was fully realized. These figures do not take into account allocations for properties with private wells that develop and convert to City water. Generally, the transferred allocations are either one or two AFY per acre, depending on the circumstances. Baseline allocations are not reduced by percentage cutbacks; however, historical allocations are. The two AF per acre transferred from agriculture to urban is effectively 1.5 AF per acre.

In addition to the City's baseline groundwater pumping allocation and any future allocation that results as private wells are converted to City water described above, in 2009 the City participated in the Ferro Pit Program (Appendix H), in which the City helped UWCD purchase an additional recharge basin, known as the Ferro Pit, in exchange for a one-time transfer of 11,000 AF of Good Deed Credit Trust groundwater credits. The Ferro Pit Program provides an additional 1,000 AF of credits each year from 2012 through 2019.

Through the 2002 Three Party Agreement Water Supply Agreement, between the City, CMWD and PHWA, the City also obtains an annual transfer of 700 AF of FCGMA credits from PHWA. These credits result from reduction in pumping of PHWA member agency wells as a result of the operation of PHWA's BWRDF.

The FCGMA programs, as highlighted in the 2007 GWMP, are designed to bring the basins to safe yield.

The FCGMA's Ordinance No. 8.1 limits the amount of groundwater the City can extract with its wells and the amount of groundwater being pumped and provided by UWCD. These limitations increase the City's reliance on imported water supplies and put a greater importance in developing new, local sources of supply, such as recycled water.

The City currently has six active wells located at the Water Campus and four additional wells located at Blending Station No. 3, as shown in Table 3-4.

TABLE 3-4
GROUNDWATER WELL LOCATIONS, STATUS AND CAPACITY

Well Location	Status	Aquifer	Well Capacity (gpm)
Blending Station No. 1			
Well No. 20	Active	Oxnard/Upper	2,900
Well No. 22	Active	Oxnard/Upper	3,000
Well No. 23	Active	Oxnard/Upper	2,800
Well No. 32[(a)]	Active	Oxnard/Upper	2,000
Well No. 33[(a)]	Active	Oxnard/Upper	3,000
Well No. 34[(a)]	Active	Oxnard/Upper	2,500
Blending Station No. 3			
Well No. 28	Active	Hueneme/Lower	2,000
Well No. 29	Active	Hueneme/Lower	3,000
Well No. 30	Active	Mugu/Upper	2,000
Well No. 31	Active	Oxnard/Upper	2,000
		Total	**25,200[(b)]**

Notes:
(a) Well Nos. 32, 33, and 34 feed the City's desalter.
(b) Total well capacity does not equal the City's total production capacity. While the City currently has a total of 25,200 gpm of well capacity, it does not have enough pipeline capacity to operate all of its wells at one time.

The pumped groundwater is mixed (blended) with imported water or desalted water at the Blending Stations. Groundwater pumping capacity is a function of aquifer condition as well as the condition of the well, pumping equipment, and groundwater levels. The City's groundwater production and (for comparison) production from other sources for the period from 2006 to 2010, are summarized in Table 3-5.

TABLE 3-5
CITY WATER PRODUCTION (AF)

Year	Total City Well Production	Brine Loss	UWCD	CMWD	Portion, CMWD – P&G	Portion CMWD – PHWA	Total
2006	14,056	(0)	4,001	5,904	1,996	2,063	28,020
2007	440	(0)	16,660	7,608	1,621	2,223	28,552
2008	4,245	(0)	9,863	10,800	1,575	1,198	27,681
2009	7,478	(1,398)[a]	13,036	6,799	1,513	1,278	28,706
2010	7,442	(1,254)[b]	10,852	8,225	1,544	841	27,650

Notes:
(a) Total City well production was 7,478 AF; however, 1,398 AF had to be discharged as brine as a result of the desalting process.
(b) Total City well production was 7,442 AF; however, 1,254 AF had to be discharged as brine as a result of the desalting process.

3.3 Recycled Water

One key component of the GREAT Program is the development of the Advanced Water Purification Facility (AWPF) and the Recycled Water System. The first phase of the AWPF is under construction with an expected completion date of December 2012. Likewise, the Recycled Water Backbone System (RWBS) is currently under construction and is expected to be complete by December 2012. The first phase of the recycled water program is expected to deliver approximately 1,500 AFY of recycled water to municipal and industrial customers by 2013.

Future expansions of the AWPF and the Recycled Water System will be developed when funding becomes available. These programs are further described in Chapter 4 of this UWMP.

3.4 Transfers, Exchanges, and Groundwater Banking Programs

Currently, the City has interconnections with other water purveyors. Specifically the City has one interconnection with PHWA, one interconnection with the City of Port Hueneme, two interconnections with the Channel Islands Beach Community Services District, and two interconnections with Naval Base Ventura County. The City completed design for an interconnection with the City of Ventura; however this interconnection has not been constructed. That interconnection would, if constructed, convey only emergency sources of supply. CMWD water cannot be exported to Ventura's service area, as Ventura is not a member agency of CMWD or MWDSC.

The City does not currently anticipate other transfer or exchange opportunities.

3.5 Total Anticipated Water Supply

The total anticipated water supplies available to the City of Oxnard are shown in Table 3-6.

TABLE 3-6
ANTICIPATED WATER SUPPLIES (AF)

Water Supply Sources	2015	2020	2025	2030	2035
Existing Supplies:					
Imported Water - Calleguas Municipal Water District	17,379	17,379	17,379	17,379	17,379
Groundwater - United Water Conservation District[(a)]	9,800	7,800	7,800	7,800	7,800
Groundwater - City-produced[(b)]	10,782	9,782	9,782	9,782	9,082
Brine Loss[(c)]	**(1,490)**	**(1,641)**	**(1,700)**	**(1,755)**	**(1,810)**
Subtotal Existing Supplies	**36,471**	**33,320**	**33,261**	**33,206**	**32,451**
Planned Supplies					
Future City Groundwater[(d)]	527	1,789	2,269	2,269	2,269
Future City Groundwater[(e)]	5,200	11,400	8,500	8,500	8,500
Recycled Water[(f)]	1,800	2,600	5,500	5,500	5,500
Subtotal Planned Supplies	**7,527**	**15,789**	**16,269**	**16,269**	**16,269**
Total Estimated Supplies	**43,998**	**49,109**	**49,530**	**49,475**	**48,720**

Notes:
(a) City's sub-allocation held by UWCD plus the additional allocation resulting from the M&I Supplemental Water Program.
(b) City's historical and baseline allocation (9,082 AF) plus additional credits resulting from the City's participation in the Ferro Pit Program and credits transferred to the City from PHWA as a result of the Three Party Agreement. The City also has FCGMA credits available as a supply source if needed.
(c) Brine loss is assumed to be 20% of permeate production from desalting operations. Assumes that the City will continue its 2010 blend ratio of groundwater, desalted groundwater, and imported water to maintain product water quality between 600 to 700 TDS.
(d) Future City groundwater allocations transferred to the City as agricultural lands are developed.
(e) Future City groundwater allocations made available to the City as agricultural users abandon or reduce the use of their wells in exchange for recycled water and/or as a result of groundwater recharge (Table 2-15).
(f) GREAT Program recycled water sold to City water customers for municipal and industrial uses, including landscape.

3.6 Planned Water Supply Projects and Programs

The City plans to have available imported surface water from CMWD at up to the Tier 1 allocation of 17,379.4 AFY through its planning horizon; however, the City does not intend to increase its reliance on imported water. Similarly, the City expects that the Three Party Water Supply Agreement with PHWA will remain in place, through which PHWA has available (reserved) a portion of the CMWD allocation as discussed above. The City will have available the right to acquire additional water from CMWD at the Tier 2 rate; however, this water is more expensive than the City's other options. In any given year, the City may elect to take less than its full Tier 1 entitlement based on the City's operational needs and its intent to optimize the use of its available supplies.

With respect to groundwater from UWCD, the City's sub-allocation was 6,725.50 AFY in 2010 and is expected to remain at that value. In addition, the City anticipates 3,000 AFY of allocation from its participation in the M&I Supplemental program through the year 2015, reducing to 1,000 AFY of additional allocation in years 2016 through 2035.

Finally, with respect to groundwater from its existing and future wells, the City has a total allocation of 9,082 AFY. This allocation will, however, be increased by the transfer of allocation from properties currently on private wells which develop and connect to the City system (Chapter 6). Additionally, the City anticipates 1,000 AFY of additional allocation through its participation in the Ferro Pit program from 2012 through 2019 and an annual transfer of 700 AF of FCGMA groundwater credits from PHWA through 2034, as stipulated in the Three Party Water Supply Agreement.

3.6.1 GREAT Program

The City's Groundwater Recovery Enhancement and Treatment Program is a key element of the FCGMA's groundwater management program. Ultimately, the GREAT Program may provide substantial additional recycled water supplies within the region. As discussed in the 2002 GREAT Program Advanced Planning Study, the components of the GREAT Program are:

A. Recycled Water for M&I Use. The Oxnard Wastewater Treatment Plant (OWWTP) currently produces secondary treated effluent and discharges to the ocean via an outfall. This effluent, if treated to tertiary standards to meet the State's requirements for recycled water, can be used to replace a portion of the City's municipal and industrial demands. The City has constructed a delivery system and is working with its existing customers to retrofit their sites for recycled water use. The goal is to deliver approximately 1,500 AFY of recycled water concurrent with the operational date for the initial phase of the GREAT Program, estimated by early 2013. A key project is the AWPF located near the OWWTP, which will provide the recycled water its final treatment. The initial phase of the AWPF is expected to produce up to 6.25 million gallons per day (MGD), or 7,000 AFY, of recycled water. Recycled water produced which is not delivered to customers is expected to be used for groundwater injection at location(s) within the City.

B. Groundwater Injection. Irrigation demands vary throughout the year with substantially lower demand during the winter months. Therefore, in addition to agricultural and M&I demand for recycled water, this water will be injected as a groundwater replenishment project or, in the future, may be injected on the south Oxnard Plain to serve as a seawater barrier project. This injected water would then allow Oxnard to pump an equal amount at a later date as the City accrues storage credits from groundwater injection, which can be redeemed at City wells.

C. Recycled Water Delivered to Agricultural Users in Exchange for Groundwater Credits. The municipal and industrial customers identified for the recycled water as described above initially account for approximately 1,500 AFY. When recycled water is delivered to agricultural users or to the seawater barrier, the volume of recycled water use will substantially increase. Tertiary-treated wastewater meeting State Title 22 requirements is not suitable for some agricultural use because of the total dissolved solids (TDS), chloride, and boron levels. The AWPF will provide additional treatment beyond that required for tertiary-treated wastewater to a portion of the flow from the OWWTP, lowering concentrations of TDS, chloride and boron and making it suitable for the irrigation of sensitive crops, including strawberries and raspberries.

   In exchange for the delivery of recycled water, agricultural customers would transfer their groundwater pumping allocation to the City of Oxnard on a one-for-one basis. This will increase the City's ability to pump additional groundwater.

D. Groundwater Desalination Facility. The additional groundwater that would be made available to the City from groundwater credits transferred from agricultural users and pumped by City wells from the poor quality Oxnard Aquifer would require additional treatment prior to delivery to the City's distribution system. The GREAT Desalter constructed in 2007/2008 does not increase the total water supply. It does, however, allow full utilization of the City's groundwater resources.

E. Concentrate Collection System*.* The AWPF and the GREAT Desalter produce a high TDS by-product concentrate as a result of the treatment process. Discharging this concentrate to the sewer system could eventually cause treatment problems at the OWWTP. Therefore, the GREAT Program proposes a concentrate collection system separate from the sanitary sewer system. The collection system could also potentially serve other industrial customers whose wastewater product is suitable for disposal without further treatment and meets the requirements of the OWWTP's National Pollution Discharge Elimination System (NPDES) permit.

F. Concentrate Disposal/Wetlands Development and Enhancement*.* Two concentrate disposal points were identified in the GREAT Program report – the existing ocean outfall from the OWWTP and wetlands in the Ormond Beach area that have been identified for potential restoration and enhancement. A third option is disposal via the CMWD Salinity Management Pipeline and ocean outfall.

G. Overall Yield of the GREAT Program*.* The GREAT Program is projected to produce 6.25 MGD (7,000 AFY) of recycled water in the initial phase and up to approximately 25 MGD (28,000 AFY) ultimately, with full build-out of the City General Plan areas.

Since the 2005 UWMP, the following activities have occurred:

A. Construction of the GREAT Desalter. The GREAT Desalter was constructed in 2007/2008 and began operation in 2009. The GREAT Desalter includes low pressure reverse osmosis units with 7.5 MGD capacity. A 0.6-million gallon permeate storage tank was also constructed to support the GREAT Desalter operation. Three newer wells (Well Nos. 32, 33, and 34) currently pump water from the poor quality Oxnard Aquifer and feed the Desalter.

B. Construction of the Advanced Water Purification Facility. Construction of the AWPF began in 2010 and is expected to be completed in 2012. The AWPF receives secondary treated effluent from the OWWTP and treats it with microfiltration, reverse osmosis, and ultraviolet disinfection. The initial capacity of the AWPF is 6.25 MGD of recycled water.

C. Construction of the Recycled Water Backbone System. The Recycled Water Backbone System is also currently under construction and is expected to be complete at the same time as the AWPF. The RWBS will initially serve recycled water from the AWPF to municipal and industrial customers within the City's service area.

3.7 Desalinated Water

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[i]). The City currently operates the GREAT Desalter, which utilizes reverse osmosis to treat brackish groundwater. The product water is blended with untreated groundwater to balance water quality and cost and the concentrate is discharged to the sewer system. The GREAT Desalter has a production capacity of 7.5 MGD and is expandable to 15.0 MGD. The City may expand the GREAT Desalter in the future, or construct a similar desalter facility at Blending Station No. 3 if it becomes cost-effective to do so.

The City does not have any plans to implement a seawater desalination program. However, the City could provide financial assistance to MWDSC, other SWP contractors, or their member agencies in the construction of their seawater desalination facilities in exchange for SWP supplies.

The City has been following existing and proposed seawater desalination projects along California's coast. Table 3-7 provides a summary of the status of several of California's municipal/domestic seawater desalination facilities.

As shown Table 3-7, most of the existing and proposed seawater desalination facilities are or would be operated by agencies that are not SWP contractors. However, in these cases as described above, an exchange for imported water deliveries would most likely involve a third party (MWDSC or another SWP contractor), CMWD and the City.

TABLE 3-7
EXISTING AND PROPOSED SEAWATER DESALINATION FACILITIES ALONG THE SOUTHERN CALIFORNIA COAST

Project	Member Agency Service Area	AFY	Status
Long Beach Seawater Desalination Project	Long Beach Water Department	10,000	Pilot study
South Orange Coastal Ocean Desalination Project	Municipal Water District of Orange County	16,000 - 28,000	Pilot study
Carlsbad Seawater Desalination Project	San Diego County Water Authority	56,000	Permitting
West Basin Seawater Desalination Project	West Basin Municipal Water District	20,000	Pilot study
Huntington Beach Seawater Desalination Project	Municipal Water District of Orange County	56,000	Permitting
Camp Pendleton Seawater Desalination Project	San Diego County Water Authority	56,000 to 168,000	Planning
Rosarito Beach Seawater Desalination Feasibility Study	San Diego County Water Authority	28,000 to 56,000	Feasibility study
	Total AFY	**102,000 - 280,000**	

Source: MWDSC 2010 Regional UWMP.

Chapter 4: Recycled Water

This chapter of the Plan describes the existing and future recycled water opportunities available within the City of Oxnard service area. The description includes estimates of potential supply and demand for 2010 to 2035 in five-year increments, as well as the City's proposed incentives and optimization plan.

4.1 Recycled Water Master Plan

The City completed the *Recycled Water Master Plan (*RWMP) – *Phase 1* in January 2009. The RWMP Phase 1 identified approximately 2,700 AFY of demand from golf courses, parks, schools and industrial customers. The Recycled Water Retrofit Program, under the City's GREAT Program, identified additional customer demand. As of the 2011 customer list, 23 projects are complete or under construction, 23 projects are being designed and 25 additional customer projects are planned for the future.

The City is currently constructing the RWBS to serve Phase 1 municipal and industrial customers within the City. Future expansions of the RWBS will serve additional industrial and irrigation customers and aquifer storage and recovery (ASR) wells within the City. Furthermore, expansions serving agricultural customers and potential seawater intrusion barrier wells are also likely.

The initial potential customers include the Riverpark Development, the River Ridge Golf Club, City parks, schools, and several commercial/industrial customers. These customers represent approximately 1,500 AFY of recycled water demand. The first deliveries of recycled water are expected by 2013.

4.2 Potential Sources of Recycled Wastewater

4.2.1 Existing Facilities

The source of water for the recycled water system is the OWWTP. The OWWTP is a secondary treatment plant located at 6001 S. Perkins Road in the City of Oxnard. All the treated effluent is currently discharged to the Pacific Ocean. The OWWTP has an average dry weather flow (ADWF) design capacity of 31.7 MGD (35,500 AFY) with provision for an ultimate ADWF design capacity of 39.7 MGD (44,500 AFY). Current flow to the OWWTP is 23 MGD (25,800 AFY); the City anticipates there will be sufficient wastewater to support the recycled water program planned for the 2035 condition, which is 14,000 AFY.

4.2.2 Planned Improvements and Expansions

There are no plans to expand the capacity of the OWWTP at this time. The Recycled Water Program will be expanded as the City's Capital Improvement Program funds allow. There are no immediate plans to expand beyond the Phase 1 recycled water facilities; however, the City is involved in ongoing discussion regarding Phase 2 recycled water expansions, including industrial and agricultural uses, along with injection. Capital projects needed to support these expansions would include storage, pipeline extensions and treatment capacity expansions at the AWPF.

4.3 Recycled Water Demand

In this section, current recycled water use is discussed, and potential recycled water users within the City's service area are identified as determined from the customer list created as part of the City's Recycled Water Retrofit Program.

4.3.1 Current Use

There are currently no recycled water customers served by the City of Oxnard. Table 4-1 shows actual and projected use of recycled water within the City's service area, and to agricultural users outside the City's service area.

TABLE 4-1
ACTUAL AND PROJECTED RECYCLED WATER USE (AF)

Type of Use	Actual 2010 Use	2015	2020[a]	2025	2030	2035
Agriculture/Groundwater Injection[b]	0	5,000	11,400	8,500	8,500	8,500
Landscape[c]	0	1,200	1,500	3,000	3,000	3,000
Industrial	0	600	1,100	2,500	2,500	2,500
Total	**0**	**7,000**	**14,000**	**14,000**	**14,000**	**14,000**

Notes:
(a) Phase 2 of the GREAT Program is projected to come online in 2020, providing an additional 7,000 AF of recycled water a year.
(b) To minimize pumping impacts in overdrafted areas, recycled water not sold to municipal and industrial customers to offset potable water uses will either be sold to agricultural users in exchange for groundwater pumping allocation or injected into the ground.
(c) Landscape usage includes the River Ridge Golf Club's Vineyard and Victoria Lakes golf courses, in addition to other landscape uses such as City parks or schools.

4.3.2 Potential Users

Potential recycled water users were identified in the RWMP Phase 1 and the Draft RWMP Phase 2 and include the River Ridge Golf Course, the Riverpark development (schools and parks), and other landscape irrigation customers. Two significant industrial users are P&G and International Paper.

4.3.3 Potential Recycled Water Demand

In the near term, landscape, large industrial users, and the municipal golf course are the primary potential recycled water customers within the City's service area. Outside the City's service area, a significant potential exists to serve agricultural users throughout the western Ventura County region with recycled water. The GREAT Program Advanced Planning Study identified almost 40,000 AFY of potential agricultural demand (in average years) in the Oxnard Plain, particularly in the area of the Plain negatively affected by seawater intrusion and overpumping. In the 5 to 10 year horizon, the GREAT Program generated recycled water may also be used for groundwater recharge. In addition, future uses of GREAT Program recycled water may also be used as barriers to seawater intrusion.

All of the above uses are identified within the FCGMA 2007 Groundwater Management Plan as key strategies to alleviate overpumping within the Oxnard Plain and Pleasant Valley areas of western Ventura County. (See 2007 Groundwater Management Plan, § 9.1.)

Use of high quality recycled water within the region will have a direct benefit of introducing a new, additional water supply source to the region. The high quality water (low salt content) also has the supplemental benefit of reducing the salt content of water used within the region. To the extent this high quality water is used within the City to offset current potable demand, it will also have the direct benefit of offsetting or reducing use of local groundwater and imported water. Direct agricultural use of recycled water will provide tandem benefits of reducing reliance on local groundwater and reducing salt loading in comparison to the lower quality groundwater and surface water currently used for applied irrigation. FCGMA policies will allow the City to obtain the right to pump groundwater in an amount equivalent to the recycled water used within the region.

4.3.4 Recycled Water Comparison

The City's 2005 UWMP projected a total recycled water demand of 4,800 AFY by the year 2010. The City has not yet served recycled water to any customers, but is in the process of constructing the Recycled Water Backbone System to provide municipal and industrial customers with recycled water. Table 4-2 provides a comparison of the 2005 projected demand versus the actual 2010 demand.

TABLE 4-2
RECYCLED WATER USES
2005 PROJECTION COMPARED WITH 2010 ACTUAL (AF)

User Type	2005 Projection for 2010	2010 Actual Use
Agriculture	3,525	0
Landscape	1,275	0
Industrial	0	0
Total	**4,800**	**0**

4.4 Methods to Encourage Recycled Water Use

In order to promote recycled water use, the City adopted Recycled Water Ordinance No. 2728 in November 2006 mandating recycled use for certain applications. In 2009, the City Council established recycled water rates at 85 percent of the potable water rate. The City has also prepared Standard Drawings for Recycled Water to standardize facilities installed throughout the City, whether by City forces or private developers. The City is also funding site surveys of potential recycled water customers and preparing customized reports analyzing conversion feasibility.

The City may consider providing financial assistance to customers to cover a portion or all of the costs to convert their potable water system to receive recycled water.

4.5 Optimization Plan

Currently, the City has an active public outreach program to market and optimize recycled water within its service area. Another aspect of optimizing recycled water use is participation in funding opportunities. The City participates in MWDSC's Local Resources Program and federal and state funding programs for recycled water projects when available.

Chapter 5: Water Quality

The quality of any natural water is dynamic in nature. This is true for the imported water and the local groundwater of the Oxnard Forebay and Oxnard Plain Basins. During periods of intense rainfall or snowmelt, routes of surface water movement are changed; new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over the course of a year. These same basic principles apply to groundwater. Depending on water depth, groundwater will pass through different layers of rock and sediment and leach different materials from those strata. Water depth is a function of local rainfall and snowmelt. During periods of drought, the mineral content of groundwater increases. Water quality is not a static feature of water, and these dynamic variables must be recognized.

Water quality regulations also change. This is the result of the discovery of new contaminants, changing understanding of the health effects of previously known as well as new contaminants, development of new analytical technology, and the introduction of new treatment technology. All water purveyors are subject to drinking water standards set by the Federal Environmental Protection Agency (EPA) and the California DPH.

Oxnard water is a blend of imported water purchased from CMWD, local groundwater purchased from UWCD, and groundwater produced by the City's wells. The City operates ten groundwater wells that are tested and monitored on a consistent basis to ensure the water meets safe drinking water standards. The Water Resources Division also conducts routine source water assessments in order to detect potential contaminants in its groundwater before they become a problem. Potential sources of contaminants include: chemical and petroleum processing and storage facilities, historic gas stations, private septic systems, dry cleaners, metal plating, finishing and fabricating facilities, and agricultural drainage.

Oxnard is currently part of the Ventura Countywide Stormwater Quality Management Program, which was established under requirements of the Federal Clean Water Act. Under this Act, all point source discharges of pollutants, including those from municipal storm drain systems must be regulated by a NPDES permit. As part of the municipal storm water program, the Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan (SQUIMP) is intended to address storm water pollution from new development and redevelopment primarily through implementation of Best Management Practices. In addition, in compliance with Federal Regulations and the NPDES permits for the OWWTP, the City has been implementing a Pretreatment Program. By regulating the discharge of toxic pollutant into the OWWTP, the Program reduces the likelihood of toxic contamination of the effluent and increases overall reliability in the treatment process.

The City of Oxnard is committed to providing its customers with high quality water that meets all federal and state primary drinking water standards. Some contaminants are naturally-occurring minerals and radioactive material. In some cases the presence of animals or human activity can contribute to the constituents in the source waters. The following sections address constituents reported in the 2010 Consumer Confidence Report (CCR), Public Health Goals Reports, and past UWMPs that may impact water quality. Fortunately, the City has multiple sources of water from varying locations with the ability to reduce or eliminate one source, at least for the short-term, while resolving a water quality issue with another source.

This section provides a general description of the water quality of both imported water and groundwater supplies. The exact ratio of the blend has varied. It is the City's intent that current and future blending of surface water and groundwater produce water that has a TDS level between 600 and 800 milligrams per liter (mg/L), which does not exceed the upper limit of the secondary drinking water standards (1,000 mg/L). Water from three sources is blended at the City's six blending stations and delivered to customers through the City's distribution system. Quality of the water delivered by the City from the different sources meets all requirements set by the state and federal government.

5.1 Imported Water

The State of California's Surface Water Treatment Rule requires that domestic water suppliers using surface water sources conduct a sanitary survey of their source watersheds every 5 years. CMWD conducted an initial survey of the Lake Bard watershed in 1994, and subsequent surveys in 1999, 2004 and 2009. A copy of the sanitary survey is available for review at the CMWD office in Thousand Oaks, California. The lake is well protected against potentially contaminating activities. Access to the entire watershed is restricted and CMWD staff monitors all activities in the watershed. Recreational use of the reservoir is not permitted. With continued implementation of watershed protection measures and compliance with all water treatment requirements, CMWD customers are assured of a high quality supply in the future.

5.1.1 Total Dissolved Solids

The water quality from CMWD has historically been the highest quality available to the City, particularly with respect to TDS. In fact, the City has blended CMWD water with its groundwater resources, which have higher TDS, to achieve a lower overall TDS. There is no reason to suspect that the water quality of the CMWD water would negatively impact the availability of this source of supply.

5.2 Groundwater

The City receives groundwater from UWCD and from City-owned groundwater wells. The following subsections describe water quality concerns from these two sources.

5.2.1 UWCD Groundwater

UWCD diverts water from the Santa Clara River into the El Rio Spreading Grounds. Groundwater from the aquifer beneath the Spreading Grounds is then pumped from several of UWCD's wells. The El Rio Pumping Station provides pressurized chloraminated groundwater directly through the O-H Pipeline along Rose Avenue to Oxnard's six blending stations. UWCD completed a comprehensive survey of the Santa Clara River watershed to identify and monitor potential sources of contamination in its drinking water in 2000. UWCD completed a sanitary survey update in 2010 (UWCD, January 2011). A copy of the Watershed Sanitary Survey is available for review at UWCD's office in Santa Paula, California and at http://www.unitedwater.org/images/stories/reports/Water-Quality/Sanitary_Survey_Update_2010_Final.pdf.

5.2.1.1 Nitrates

The O-H system occasionally experiences high nitrate levels, mainly due to the presence of surrounding agricultural lands and their use of fertilizer and domestic septic systems in the El Rio area. Nitrate levels are typically higher in the summer due to the lack of river water for dilution. It is not uncommon for one or more well to exceed the maximum contaminant level (MCL) of 45 mg/L. All the UWCD wells feed into a common manifold and are blended to reduce nitrate levels.

During longer dry periods, nitrate levels may be such that blending does not reduce them below the MCL. In this case, the deep aquifer wells would be brought online to provide a source of low nitrate supply to deliver water with a nitrate level below the MCL. Additionally, the extension of the City's wastewater collection system to the El Rio area and abandonment of approximately 1,500 private septic systems, completed in April 2011, should help reduce nitrate levels in the future.

5.2.1.2 Methyl Tertiary Butyl Ether (MTBE)

In the past, the Ventura County Department of Environmental Health has detected MTBE from the Poole Oil site along Vineyard Avenue, approximately 1,300 feet from its Well No. 15, which supplies the O-H system. The site has been cleaned up and no MTBE has been detected for several years. Monitoring will continue for several more years to ensure the well is not impacted.

5.2.2 City Groundwater

The City of Oxnard currently operates groundwater wells No. 20, 22, and 23 at Blending Station No. 1 and wells 28, 29, 30 and 31 at Blending Station No. 3. The City recently constructed three new wells at Blending Station No. 1 (wells 32, 33, and 34) which were activated in late 2008 and have produced water since 2009. Local groundwater accounted for an average of approximately 12 percent of the City water supplies for the period 2007 through 2009. Some purveyors have concerns regarding future regulations for arsenic with respect to groundwater production. The City does not believe this will be problematic for its water system, as past arsenic results from City groundwater have been low and reverse osmosis is a treatment method for arsenic.

5.2.2.1 Nitrates

On average, all City source waters meet the state and federal drinking water MCL and Public Health Goal (PHG) of 45 mg/L. However, in 2008 the maximum level of nitrate in the City combined wells was 94 mg/L, which exceeds both the MCL and the PHG. On average, nitrate concentrations from 2007 through 2009 in the City of Oxnard groundwater did not exceed the PHG or MCL; however, as nitrate causes acute toxicity, a single detection may result in public health concerns. The most probable source of the nitrate detected in the City wells is runoff and leaching from fertilizer use, leaching from septic tanks and sewage, and/or erosion of natural deposits. Predominately, nitrates occur in the shallow aquifer wells due to agricultural practices and certain areas with septic tank systems. As a result of the County's and City's septic conversion programs, nearly 2,000 septic systems have been abandoned and customers are now served by conventional sewer systems. It is expected that nitrate contamination will be reduced significantly as a result.

Typically, nitrate levels are lowest in the winter and spring when recharge to the groundwater basin is occurring from Santa Clara River runoff. The City has the advantage that its water is delivered to customers after first being blended with higher quality water, which allows the City to mitigate high nitrate levels in a particular well. Water from City wells 32, 33, and 34 is treated by reverse osmosis, which removes the majority of nitrate from the water before blending. As previously mentioned, UWCD also operates its system to mitigate high nitrate levels and can go to deep well pumping or a blend of deep and shallow water to stay below the MCL if high nitrates are detected.

5.2.2.2 Radionuclides

On average, the levels of gross alpha particles in the water from City wells are below the state and federal MCLs. However, gross alpha levels in the water from City wells do not meet the U.S. EPA MCLG of zero for radionuclides. Elevated levels have been detected in groundwater sources in 2008 and 2009. To mitigate radionuclides, the City of Oxnard utilizes groundwater from City-owned wells and UWCD wells and blends that water with surface water from CMWD. Additionally, the City uses reverse osmosis (RO) treatment for water from wells 32, 33, and 34. RO is the Best Management Practice (BMP) for radioactivity. Average concentrations of these radionuclides in City source waters do not exceed the current MCLs. The City of Oxnard continues to monitor for radiological compounds every four years as required for regulatory compliance, and provides these results to DPH.

5.3 Water Quality Impacts on Reliability

Three factors affecting the availability of groundwater are: (1) sufficient source capacity (wells and pumps), (2) sustainability of the groundwater resource to meet pumping demand on a renewable basis and (3) protection of groundwater sources (wells) from known contamination, or provisions for treatment in the event of contamination. The first two of those factors are addressed in Chapter 3.

Additional groundwater contamination sources are: spillage of agricultural chemicals, runoff from industrial areas, accidents involving tanker trucks and hazardous chemicals, sewage spills, petroleum spills, and the like. UWCD and the City would handle such instances on a case-by-case basis for their respective facilities. The City also routinely reviews information from regulatory agencies on hazardous materials use, storage and releases, in order to provide opportunity to intervene to protect groundwater quality.

Therefore, no anticipated change in reliability or supply due to water quality is anticipated based on the present data, as is shown in Table 5-1.

TABLE 5-1
CURRENT AND PROJECTED WATER SUPPLY CHANGES DUE TO WATER QUALITY IN PERCENTAGE CHANGE

Water Source	2015	2020	2025	2030	2035
Imported Water	0%	0%	0%	0%	0%
Groundwater					
UWCD	0%	0%	0%	0%	0%
City Wells	0%	0%	0%	0%	0%

Overall, there are no currently known or anticipated water quality concerns that would cause the City to be unable to meet its future water demands.

Chapter 6: Reliability Planning

The Act requires urban water suppliers to assess water supply reliability that compares total projected water used with the expected water supply over the next twenty years in five-year increments. The Act also requires an assessment for a single dry year and multiple dry years. This chapter presents the reliability assessment for the City's service area.

It is the stated goal of the City of Oxnard to deliver a reliable and high quality water supply for its customers, even during dry periods. Based on conservative water supply and demand assumptions over the next 25 years, in combination with conservation of non-essential demand during certain dry years, the Plan successfully achieves this goal.

Chapters 2 and 3 discuss current and future water supplies and demands. Chapter 4 discusses recycled water. This section compares supplies and demands under several scenarios for the period 2010 to 2035, and then presents recommendations with respect to the future supplies for the City of Oxnard.

Since the analysis includes the demands from all anticipated development through 2035, the findings are applicable for not only the 2010 Urban Water Management Plan, but for Water Supply Assessments prepared in accordance with Senate Bills 221 and 610.

Table 6-1 shows the factors resulting in inconsistency of supply for the City's water supply sources.

TABLE 6-1
FACTORS RESULTING IN INCONSISTENCY OF SUPPLY

Water Supply Sources	Limitation Quantification	Legal	Environmental	Water Quality	Climatic
Imported Water		X	X		X
Groundwater from UWCD	X		X	X	X
Groundwater from City Wells	X			X	X
Recycled Water	X				

6.1 Reliability of Water Supplies

Given its multiple water supply sources, the City's overall water supply is deemed reliable through its 2035 planning horizon, during normal, single dry and multiple dry years. Because the City has access to both local and imported supplies, as well as recycled water, it can balance and optimize the use of these supplies during variable hydrologic conditions. In other words, the City can alter its water use between imported water purchases and local supplies (groundwater and recycled water) based on the wide variety of factors that may influence the City's operation decisions, while maintaining a reliable, safe, good quality water supply to its customers. The reliability of each of the City's sources is discussed in the following sections.

6.1.1 Reliability of Imported Water Supplies: MWDSC

Under current and normal circumstances, 100 percent of water that CMWD delivers is from MWDSC. MWDSC receives most of its water from the State Water Project and from the Colorado River. In addition, over the past few years MWDSC has added a number of programs involving the development of water supplies located within the southern California area. Both MWDSC and CMWD analyzed the reliability of their water supplies in their 2010 UWMPs.

MWDSC used the SWP as its reference point for its 2010 Regional UWMP (November 2010) reliability analysis since the SWP is MWDSC's largest and most variable supply. Future supply capacities were estimated using the Draft 2009 State Water Project Delivery Reliability Report. Within the SWP system the single driest year was 1977 and the three-year dry period was 1990-1992. For the average year analysis 83 years of historic hydrology (1922-2004) were used to estimate supply and demand. MWDSC then projected water demands based on its established reliability goal, which states that full service demands at the retail level would be satisfied under all the "foreseeable hydrologic conditions" through 2020. Full service demands are MWDSC's Tier I and Tier II demands, and "foreseeable hydrologic conditions" are defined as the range of historical hydrology spanning the years 1922 through 2004. The results of MWDSC's analysis show that the region can provide reliable water supplies under both the single driest year and the multiple dry year scenarios (Regional UWMP, November 2010).

A topic of growing concern for water planners and managers is climate change and the potential impacts it could have on California's future water supplies. Climate change models have predicted that potential effects from climatic changes will result in increased temperature, reduction in Sierra Nevada snowpack depth, early snow melt and a rise in sea level.

In June 2005, Governor Arnold Schwarzenegger issued Executive Order S-3-05, which requires biennial reports on climate change impacts in several areas, including water resources. The Climate Action Team (CAT) was formed in response to Executive Order S-3-05. To help unify analysis across topic areas, the CAT worked with scientists from the California Applications Program's California Climate Change Center to select a set of future climate projections to be used for analysis. In the assessment *"Using Future Climate Projections to Support Water Resources Decision Making in California,"* the CAT selected six different global climate change models to evaluate climate change impacts, assuming two different greenhouse gas emission levels (a high end and a low end), for a total of 12 scenarios. The results of the study indicate that climate change has already been observed, in that in the last 100 years air temperatures have risen about one degree Fahrenheit and there has been a documented greater variance in precipitation, with greater extremes in both heavy flooding and severe droughts.

In July 2006, DWR issued "*Progress on Incorporating Climate Change into Management of California's Water Resources*," as required by Executive Order S-3-05. That report demonstrated how various analytical tools could be used to address issues related to climate change. The report presents analysis results showing potential impacts on SWP operations, including reservoir inflows, delivery reliability, and average annual carryover storage, as well as many other operational parameters. Some of the main impacts include changes to south-of-Delta SWP deliveries (from an increase of about one percent in a wetter climate change scenario to about a ten percent reduction for a drier scenario), increased winter runoff and lower SWP allocations in the three driest scenarios, lower carryover storage in drier scenarios and higher carryover storage in the wetter scenario.

In the 2009 update of the DWR *California Water Plan*, multiple scenarios of future climate conditions are evaluated. These changing hydrological conditions could affect future planning efforts, which are typically based on historic conditions. The *California Water Plan* identifies the following probable impacts due to changes in temperature and precipitation:

- Decrease in snowpack, which is a major part of annual water storage, due to increasing winter temperatures.
- More winter runoff and less spring/summer runoff due to warmer temperatures.
- Greater extremes in flooding and droughts.
- Greater water demand for irrigation and landscape water due to increased temperatures and their impacts on plant water needs.
- Increased sea level rise, further endangering the functions of the SWP, which can depend on movement of water through the low-lying channels of the Sacramento-San Joaquin Delta. Sea level rise could also require the SWP to release additional storage water to avoid sea water intrusion into the Delta.

In its *State Water Project Delivery Reliability Report (Reliability Report)* (2009), DWR included the potential effects of climate change in its analysis of SWP delivery reliability under future conditions. For that report, DWR used a single climate change scenario, selecting a scenario with median effects out of a number of climate change scenarios it analyzed in 2009.

Even without population changes, water demand could increase. Precipitation and temperature influence water demand for outdoor landscaping and irrigated agriculture. Outdoor water use is a large component of southern California water demands. Lower spring rainfall increases the need to apply irrigation water. Further, warmer temperatures increase evapotranspiration, which increases water demand.

These effects and their potential to impact the supplies available to southern California were evaluated indirectly in DWR's *Reliability Report*, which was used as the basis for MWDSC's reliability assessment.

6.1.2 Reliability of Imported Water Supplies: CMWD

To evaluate whether or not available supplies can sufficiently meet demands in single- and multiple-dry years in its 2010 UWMP (May 2011) CMWD subtracted expected local supplies from projected demand to determine its demand on MWDSC. CMWD then compared this demand to MWDSC's projected allocation for CMWD under single- and multiple-dry year conditions. The results of this analysis suggest that the estimated allocation of water from MWDSC during both single dry years and multiple dry years is sufficient to meet the CMWD's projected imported water demands from 2015 through 2035 (2010 UWMP, May 2011).

As discussed in CMWD's 2010 UWMP (May 2011), a concern is that CMWD receives water from MWDSC via one feeder pipeline. In the past, Calleguas only had Lake Bard with its 8,000 AF of storage (the portion acceptable for potable water delivery) as a back-up supply. However, with the full development of the Las Posas Project, CMWD now has a second storage facility.

6.1.3 Reliability of Imported Water Supplies: The City

The City of Oxnard receives its supply via two CMWD feeders (O-SR 1 and O-SR 2) and through one reservoir, the Springville Reservoir. Disruption to the pipeline or the reservoir would impact the delivery of imported water. This concern is mitigated by the additional sources of water available to the City, as described below.

Should there be a significant decrease or cessation in the receipt of water from CMWD, the City would increase deliveries of water from its groundwater wells and/or increase its purchase from UWCD. The City would then make adjustments at a later date to avoid exceeding its groundwater allocations by taking more CMWD water when it becomes available.

6.1.4 UWCD Groundwater

As noted in Section 3.2.3, the City holds a water supply contract with UWCD. The City obtains a portion of its groundwater supplies through this contract and UWCD facilities. UWCD also has responsibility in managing the water resources of the Santa Clara River. In particular, UWCD operates the Freeman Diversion and the Santa Felicia Dam, both of which are relied upon to augment the natural groundwater recharge on the Oxnard Plain, and provide a source of direct use of surface water to certain agricultural users in the region.

UWCD is currently managing certain environmental issues involving endangered species that may impact the current operations of the Freeman Diversion and Santa Felicia Dam. In particular, the Steelhead Trout is a species listed as endangered under the federal Endangered Species Act (ESA). The National Marine Fisheries Service has determined that Santa Felicia Dam and the Freeman Diversion may require modifications to their operations to be more protective of Steelhead habitat.

With the respect to the Freeman Diversion, UWCD is currently operating under interim conditions while it develops a Habitat Conservation Plan (HCP) pursuant to section 10 of the ESA. Such a plan would establish operating conditions for the dam for many years (perhaps as many as 40 or 50) covering impacts to steelhead. The interim operating conditions have led to some loss of water for aquifer replenishment, and it is expected that the HCP will also require providing river flows that otherwise could have been diverted for groundwater spreading.

Pursuant to requirements set forth in UWCD's Federal Energy Regulatory Commission permit for operation of Santa Felicia Dam on Piru Creek, UWCD must conduct numerous studies and monitoring plans relating to impacts on fish passage and recovery in that watershed. Among these is the study of the feasibility of fish passage at the dam. It is yet to be determined what mitigation measures might be required as a result of this work, including providing of higher rates of release from the dam throughout the year.

Any changes in the operations of these facilities may only indirectly impact the availability of groundwater to the City. In other words, the City's purchase of water from UWCD is not directly dependent on the operation of the Freeman Diversion or Santa Felicia Dam. Other, independently-operated facilities are used to supply groundwater from UWCD to the City through the UWCD O-H system. However, regional groundwater levels may be negatively impacted should the groundwater recharge or surface water yields from these UWCD facilities be materially compromised as a result of ESA compliance and the resulting change of operations of these facilities. At this stage it is too speculative to attempt to predict the actual results of these ongoing discussions over Freeman Diversion and Santa Felicia Dam operations.

The UWCD 2010 Urban Water Management Plan Update (June 2011) for the O-H System states “that UWCD has a sufficiently reliable supply of water for the purpose of this Urban Water Management Plan.” The UWCD 2010 UWMP Update (June 2011) further states that the O-H system survived the last drought without any reductions to O-H customers. The O-H system is expected to have adequate water for any single dry year and multiple dry year periods for the foreseeable future.

6.1.5 City Groundwater

The City has a base groundwater allocation of 9,082 AFY. This allocation will, however, be increased by the transfer of allocation from properties currently on private wells which develop and connect to the City system and the conversion of agricultural lands to private development. As noted above, the City’s groundwater wells pump from the Oxnard Plain aquifer in areas in common with the City’s groundwater supplies purchased from UWCD. Based on UWCD’s 2010 UWMP (June 2010) assessment of local groundwater supplies and the ongoing implementation of the 2007 FCGMA Management Plan, local groundwater supplies are considered reliable through 2035 planning horizon.

6.1.6 Reliability of Recycled Water Supplies

Once the construction of the AWPF and RWBS facilities is completed in 2012, the recycled water supply will be highly reliable. The amount of recycled water treated at the AWPF is much less than the flow to the OWWTP.

6.2 Normal, Single-Dry, and Multiple-Dry Year Planning

The City of Oxnard has a consistent water supply through imported water and groundwater, which is sufficient to meet demands during normal, single-dry, and multiple-dry years. The following sections elaborate on the supplies available to the City.

6.2.1 Supply and Demand Comparison

The available supplies and water demands for the City’s service area were analyzed to assess the region’s ability to satisfy demands during three scenarios: a normal water year, single-dry year, and multiple-dry years. The tables in this section present the supplies and demands for the various drought scenarios for the projected planning period of 2010 to 2035 in five-year increments.

6.2.2 Normal Water Year

The City’s current and future water demands were discussed in Chapter 2 and current and future water supplies were described in Chapter 3. Conservative assumptions were utilized concerning availability of supplies. Results for this assessment indicate that available water supplies will exceed demands for the period 2010-2035 (Table 6-2).

Table 6-3 summarizes the City's water supplies available to meet demands over the 25-year planning period during a normal/average year.

TABLE 6-2
PROJECTED SUPPLY AND DEMAND COMPARISON
SCENARIO: NORMAL YEAR (AF)

Water Supply Sources	2015	2020	2025	2030	2035
Existing Supplies					
Imported Water[(a)]	17,379	17,379	17,379	17,379	17,379
UWCD Groundwater[(b)]	9,800	7,800	7,800	7,800	7,800
City Groundwater[(c)]	10,782	9,782	9,782	9,782	9,082
Brine Loss[(d)]	(1,490)	(1,641)	(1,700)	(1,755)	(1,810)
Total Existing Supplies	**36,471**	**33,320**	**33,261**	**33,206**	**32,451**
Planned Supplies					
Future City Groundwater [(e)]	527	1,789	2,269	2,269	2,269
Future City Groundwater[(f)]	5,200	11,400	8,500	8,500	8,500
Recycled Water[(g)]	1,800	2,600	5,500	5,500	5,500
Total Planned Supplies	**7,527**	**15,789**	**16,269**	**16,269**	**16,269**
Total Existing and Planned Supplies	**43,998**	**49,109**	**49,530**	**49,475**	**48,720**
Demand w/o Conservation[(h)]	36,029	39,684	41,109	42,439	43,769
20x2020 Reduction[(i)]	3,373	7,009	7,271	7,533	7,796
Reduction from Recycled Water[(j)]	1,800	2,600	5,500	5,500	5,500
Reduction from Water Conservation[(k)]	1,816	3,017	3,963	4,993	4,987
Demand w/Conservation[(l)]	**34,213**	**36,667**	**37,146**	**37,446**	**38,782**

Notes:

(a) The City's Tier 1/Tier 2 cutoff from CMWD, Table 3-6.
(b) City's sub-allocation held by UWCD plus the additional allocation resulting from the City's participation in the M&I Supplemental Water Program, Table 3-6.
(c) City's historical and baseline allocation (9,082 AF) plus additional credits resulting from the City's participation in the Ferro Pit Program and credits transferred to the City from PHWA as a result of the Three Party Agreement. The City also has FCGMA credits available as a supply source if needed, Table 3-6.
(d) Brine loss is assumed to be 20% of permeate production from desalting operations. Assumes that the City will continue its 2010 blend ratio of groundwater, desalted groundwater, and imported water to maintain product water quality between 600 to 700 TDS, Table 3-6.
(e) Future City groundwater allocations transferred to the City as agricultural lands are developed, Table 3-6.
(f) Future City groundwater allocations made available to the City as agricultural users abandon or reduce the use of their wells in exchange for recycled water and/or as a result of groundwater recharge, Table 3-6.
(g) GREAT Program recycled water sold to City water customers for municipal and industrial uses, including landscape, Table 4-1.
(h) Demand w/o Conservation data from Table 2-13.
(i) 20X2020 Reduction – the 20 percent conservation requirement is assumed to continue through 2035 and continue to be met with a combination of recycled water and conservation.
(j) Recycled Water Reduction from the GREAT Program from Table 3-6.
(k) Reduction from Water Conservation includes both passive water conservation from plumbing code updates and other legislation and active conservation programs outlined in the City's Water Conservation Master Plan, Table 2-14.
(l) Demand with Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

6.2.3 Single-Dry Water Year

A single dry year condition (based on 1977, the driest year on record) is not anticipated to result in a supply decrease for the City. As stated in CMWD's 2010 UWMP (May 2011), it is projected that CMWD will be able to meet all of its purveyor demands during a single dry year. CMWD has met the City's imported water demands without curtailment during each of the prior years. In future single dry years, the City should have an adequate water supply from its three water sources, City-produced groundwater, UWCD and CMWD to meet customer demands. In dry year conditions (both single- and multiple-dry years) the groundwater supply is assumed to remain 100 percent available because the long-term average of the groundwater basin includes dry periods; any single- or multiple-dry year cycle does not impact the long-term yield of the basin, and full implementation of the FCGMA Groundwater Management Plan 2007 will lead to stable groundwater basins.

Therefore, the City's supplies are not anticipated to be reduced. As indicated in Table 6-3, the single dry-year assessment resulted in a sufficient water supply to meet water demand through 2035.

TABLE 6-3
PROJECTED SUPPLY AND DEMAND COMPARISON
SCENARIO: SINGLE DRY YEAR (AF)

Water Supply Sources	2015	2020	2025	2030	2035
Existing Supplies					
Imported Water[(a)]	17,379	17,379	17,379	17,379	17,379
UWCD Groundwater[(b)]	9,800	7,800	7,800	7,800	7,800
City Groundwater[(c)]	10,782	9,782	9,782	9,782	9,082
Brine Loss[(d)]	(1,490)	(1,641)	(1,700)	(1,755)	(1,810)
Total Existing Supplies	**36,471**	**33,320**	**33,261**	**33,206**	**32,451**
Planned Supplies					
Future City Groundwater [(e)]	527	1,789	2,269	2,269	2,269
Future City Groundwater[(f)]	5,200	11,400	8,500	8,500	8,500
Recycled Water[(g)]	1,800	2,600	5,500	5,500	5,500
Total Planned Supplies	**7,527**	**15,789**	**16,269**	**16,269**	**16,269**
Total Existing and Planned Supplies	**43,998**	**49,109**	**49,530**	**49,475**	**48,720**
Demand w/o Conservation[(h)]	36,029	39,684	41,109	42,439	43,769
20x2020 Reduction[(i)]	3,373	7,009	7,271	7,533	7,796
Reduction from Recycled Water[(j)]	1,800	2,600	5,500	5,500	5,500
Reduction from Water Conservation[(k)]	1,816	3,017	3,963	4,993	4,987
Demand w/Conservation[(l)]	**34,213**	**36,667**	**37,146**	**37,446**	**38,782**

Notes:
(a) The City's Tier 1/Tier 2 cutoff from CMWD, Table 3-6.
(b) City's sub-allocation held by UWCD plus the additional allocation resulting from the City's participation in the M&I Supplemental Water Program, Table 3-6.
(c) City's historical and baseline allocation (9,082 AF) plus additional credits resulting from the City's participation in the Ferro Pit Program and credits transferred to the City from PHWA as a result of the Three Party Agreement. The City also has FCGMA credits available as a supply source if needed, Table 3-6.
(d) Brine loss is assumed to be 20% of permeate production from desalting operations. Assumes that the City will continue its 2010 blend ratio of groundwater, desalted groundwater, and imported water to maintain product water quality between 600 to 700 TDS, Table 3-6.
(e) Future City groundwater allocations transferred to the City as agricultural lands are developed, Table 3-6.
(f) Future City groundwater allocations made available to the City as agricultural users abandon or reduce the use of their wells in exchange for recycled water and/or as a result of groundwater recharge, Table 3-6.
(g) GREAT Program recycled water sold to City water customers for municipal and industrial uses, including landscape, Table 4-1.
(h) Demand w/o Conservation data from Table 2-13.
(i) 20X2020 Reduction – the 20 percent conservation requirement is assumed to continue through 2035 and continue to be met with a combination of recycled water and conservation.
(j) Recycled Water Reduction from the GREAT Program from Table 3-6.
(k) Reduction from Water Conservation includes both passive water conservation from plumbing code updates and other legislation and active conservation programs outlined in the City's Water Conservation Master Plan, Table 2-14.
(l) Demand with Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

6.2.4 Multiple-Dry Water Years

Multiple consecutive dry years (based on 1931-34, the driest four-year period on record) are not anticipated to result in a supply decrease for the City due to future supply and reliability programs. As stated in CMWD's 2010 UWMP (May 2011), it is projected that CMWD will be able to meet all of its purveyor demands during a multiple dry year event. CMWD has met the City's imported water demands without curtailment during each of the prior years. In dry year conditions (both single- and multiple-dry years) the groundwater supply is assumed to remain 100 percent available because the long-term average of the groundwater basin includes dry periods; any single- or multiple-dry year cycle does not impact the long-term yield of the basin, and full implementation of the FCGMA Groundwater Management Plan 2007 will lead to stable groundwater basins. In future droughts, the City should have an adequate water supply from a combination of City-produced groundwater, UWCD-produced groundwater and CMWD to meet customer demands.

Therefore, the City's supplies are not anticipated to be reduced during a multiple dry-year period. As shown in Table 6-4, the multiple dry-year assessment resulted in sufficient water supply to meet water demands through 2035.

TABLE 6-4
PROJECTED SUPPLY AND DEMAND COMPARISON
SCENARIO: MULTIPLE DRY YEAR (AF)

Water Supply Sources	2015	2020	2025	2030	2035
Existing Supplies					
Imported Water[(a)]	17,379	17,379	17,379	17,379	17,379
UWCD Groundwater[(b)]	9,800	7,800	7,800	7,800	7,800
City Groundwater[(c)]	10,782	9,782	9,782	9,782	9,082
Brine Loss[(d)]	(1,490)	(1,641)	(1,700)	(1,755)	(1,810)
Total Existing Supplies	**36,471**	**33,320**	**33,261**	**33,206**	**32,451**
Planned Supplies					
Future City Groundwater [(e)]	527	1,789	2,269	2,269	2,269
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Recycled Water[(g)]	1,800	2,600	5,500	5,500	5,500
Total Planned Supplies	**7,527**	**15,789**	**16,269**	**16,269**	**16,269**
Total Existing and Planned Supplies	**43,998**	**49,109**	**49,530**	**49,475**	**48,720**
Demand w/o Conservation[(h)]	36,029	39,684	41,109	42,439	43,769
20x2020 Reduction[(i)]	3,373	7,009	7,271	7,533	7,796
Reduction from Recycled Water[(j)]	1,800	2,600	5,500	5,500	5,500
Reduction from Water Conservation[(k)]	1,816	3,017	3,963	4,993	4,987
Demand w/Conservation[(l)]	**34,213**	**36,667**	**37,146**	**37,446**	**38,782**

Notes:
(a) The City's Tier 1/Tier 2 cutoff from CMWD, Table 3-6.
(b) City's sub-allocation held by UWCD plus the additional allocation resulting from the City's participation in the M&I Supplemental Water Program, Table 3-6.
(c) City's historical and baseline allocation (9,082 AF) plus additional credits resulting from the City's participation in the Ferro Pit Program and credits transferred to the City from PHWA as a result of the Three Party Agreement. The City also has FCGMA credits available as a supply source if needed, Table 3-6.
(d) Brine loss is assumed to be 20% of permeate production from desalting operations. Assumes that the City will continue its 2010 blend ratio of groundwater, desalted groundwater, and imported water to maintain product water quality between 600 to 700 TDS, Table 3-6.
(e) Future City groundwater allocations transferred to the City as agricultural lands are developed, Table 3-6.
(f) Future City groundwater allocations made available to the City as agricultural users abandon or reduce the use of their wells in exchange for recycled water and/or as a result of groundwater recharge, Table 3-6.
(g) GREAT Program recycled water sold to City water customers for municipal and industrial uses, including landscape, Table 4-1.
(h) Demand w/o Conservation data from Table 2-13.
(i) 20X2020 Reduction – the 20 percent conservation requirement is assumed to continue through 2035 and continue to be met with a combination of recycled water and conservation.
(j) Recycled Water Reduction from the GREAT Program from Table 3-6.
(k) Reduction from Water Conservation includes both passive water conservation from plumbing code updates and other legislation and active conservation programs outlined in the City's Water Conservation Master Plan, Table 2-14.
(l) Demand with Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

6.2.5 Summary of Comparisons

As shown in the analyses above, the City of Oxnard has adequate supplies to meet demands during normal, single-dry, and multiple-dry years throughout the 25-year planning period.

Chapter 7: Demand Management

This section describes the water Demand Management Measures (DMMs) implemented by the City of Oxnard as a part of the effort to reduce water demand.

7.1 Background

The City of Oxnard, like many agencies in California, faces several challenges in meeting future demands. These include groundwater overdraft, climatic conditions, environmental regulations, pumping restrictions and new State regulatory requirements.

In response to these challenges, the City of Oxnard has identified and is developing a set of tools, all directly related to improving water use efficiency and prioritizing appropriate use:

- **GREAT Program**. The GREAT Program includes several components. The GREAT Desalter was completed in 2009 and has been treating brackish groundwater for distribution to the City's customers. The AWPF, which is currently under construction, uses state of the art micro-filtration, reverse osmosis, and advanced oxidation disinfection technologies to purify wastewater effluent. This highly purified water will be used for landscape irrigation, agricultural irrigation, industrial processes, and possibly a future seawater intrusion injection barrier.

- **Water Conservation Ordinance**. The City of Oxnard updated its water conservation ordinance in 2009, with some minor modifications in 2010, as part of a joint effort among MWDSC's water purveyors to prohibit common water wasting activities. The updated ordinance prohibits hose washing of hard surfaces, requires leaks to be repaired within 72 hours, prohibits excessive runoff, prohibits restaurants serving water unless requested, restricts filling/refilling of swimming pools, and restricts the timing and frequency of landscape irrigation.

- **Enhanced Conservation Programs**. In June 2009, the City Council approved implementation of all of the California Urban Water Conservation Council (CUWCC's) Water Conservation Best Management Practices.

- **Tiered Conservation Rates Reform**. Tiered wastewater rates and revised tiered conservation water rates were approved by the Council in November 2009.

- **Water Conservation Master Plan**. In 2010, the City prepared a Water Conservation Master Plan (CMP) to provide a step-by step process for reaching short and long-term water efficiency goals and develop a staged implementation process for conservation programs. The CMP was a thorough assessment of existing uses, potential savings and development of a strategy to meet the City's required goals. Adopted in February 2011, this plan will be used to guide the City's water conservation efforts for the next ten years.

The City recognizes that conserving water is an integral component of a responsible water strategy and is committed to providing education, tools and incentives to help its customers reduce the amount of water they use.

7.2 The City of Oxnard and the Demand Management Measures

The City is subject to the Urban Water Management Planning Act, AB1420 and SBX7-7 requirements, in addition to the commitment of compliance with the BMPs as a signatory to the CUWCC Memorandum of Understanding Regarding Water Conservation in California (MOU).

In 2004 the City became a signatory to the MOU and a member of the CUWCC, establishing a firm commitment to the implementation of the BMPs or DMMs. The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, the City committed to implement a specific set of locally cost-effective conservation practices in its service area.

The MOU and BMPs were revised by the CUWCC in 2008. The revised BMPs now contain a category of “Foundational BMPs” that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs and water waste ordinances) and Public Education (public outreach and school education programs). The remaining “Programmatic” BMPs have been placed into three categories: Residential, Large Landscape, and Commercial, Industrial, Institutional (CII) Programs and are similar to the original quantifiable BMPs. These revisions are reflected in the CUWCC reporting database, starting with reporting year 2009 and the 2010 UWMP’s DMM compliance requirements. The new category of foundational BMPs is a significant shift in the revised MOU.

A key intent of the recent MOU revision was to provide retail water agencies with more flexibility in meeting requirements and allow them to choose program options most suitable to their specific needs. Therefore, as alternatives to the traditional Programmatic BMP requirements, agencies may also implement the MOU through a Flex Track or GPCD approach.

Under the Flex Track option, an agency is responsible for achieving water savings greater than or equal to those it would have achieved using only the BMP list items. The CUWCC has developed three Flex Track Menus — Residential, CII, and Landscape — and each provides a list of program options that may be implemented in part or any combination to meet the water savings goal of that BMP. Custom measures can also be developed and require documentation on how savings were realized and the method and calculations for estimating savings.

The GPCD option sets a water use reduction goal of 18 percent reduction by 2018. The MOU defines the variables involved in setting the baseline and determining final and interim targets. The City has chosen to implement the GPCD compliance option because it best reflects the approach developed in the Water Conservation Master Plan.

Signatories to the urban MOU are allowed by Water Code Section 10631(j) to include their biennial CUWCC BMP reports in an UWMP to meet the requirements of the DMM sections of the UWMP Act. The City has chosen to comply with the requirements of the Act by appending the BMP reports for 2009 and 2010, as well as the certificate of compliance issued by the CUWCC (Appendix I). The following sections provide more detail on the City’s conservation programs and compliance with the BMPs.

7.2.1 Foundational BMPs

The City is in compliance with all of the requirements of the Foundational BMPs and will continue to perform all the required activities to maintain compliance.

The City is currently looking to adjust its conservation rate structure to push more revenue towards the fixed component and the first tier to compensate for difficulties in covering fixed costs during significant decreases in demand. The City hopes to design a new rate structure that can cover fix costs while remaining in compliance with the CUWCC requirements for conservation rate structures.

7.2.2 Programmatic BMPs

The City is pursuing a GPCD approach to complying with the Programmatic BMPs. The 2018 GPCD target is 112.6, determined using the CUWCC's Target Calculator tool (Appendix J). The compliance schedule is shown in Table 7-1. The BMP goal exceeds the SBX7-7 target of 132.4 gpcd.

TABLE 7-1
GPCD COMPLIANCE SCHEDULE

		Target		Highest Acceptable Bound	
Year	**Report**	**% Base**	**GPCD**	**% Base**	**GPCD**
2010	1	96.4%	132.4	100%	137.4
2012	2	92.8%	127.5	96.4%	132.4
2014	3	89.2%	122.5	92.8%	127.5
2016	4	85.6%	117.6	89.2%	122.5
2018	5	82.0%	112.5	82.0%	112.6

7.3 Implementation Plan

The Water Conservation Master Plan outlines how the City will meet both its SBX7-7 and BMP requirements. The Plan provides a thorough assessment of existing uses and potential savings, processed through the following steps:

1. Analysis of End-User Data by Sector
2. Identification of Water Conservation Measures and Programs
3. Cost-Benefit Analysis and Prioritization of Conservation Measures and Programs
4. Development of a Conservation Master Plan

The resulting Plan provides an implementation strategy that meets the specific goals set by SBX7-7 and the BMPs. The strategy incorporates all of the elements required for success including quantifiable water saving programs, education and outreach, regulation and measurement (pricing is also addressed in a separate effort).

In choosing and prioritizing the quantifiable water savings programs, the following attributes were considered:

- Low overall costs
- High acre-foot lifetime savings
- Low cost per acre-foot
- Value of the benefits
- Benefit to cost ratio higher than 1

The vetting process yielded nine programs which address all market segments—residential, commercial, institutional, industrial, and irrigation — and focus on landscape uses, which have been identified as having the greatest conservation potential. The selected programs have reliable and quantifiable water savings, are relatively easy to implement, and have been proven in other water agency service areas. These features result in a portfolio of water conservation programs that are cost-effective, supported by customers, and an integral part of the City of Oxnard's portfolio of water resource alternatives.

The final program list, along with reasons for each selection, is shown in Table 7-2.

TABLE 7-2
PROGRAMS IDENTIFIED FOR IMPLEMENTATION

Final Selection for Programs with Quantifiable Water Savings	Reason for Final Selection
High Efficiency Nozzle Direct Installation Program	Focuses on landscape. Cost-effective. Has great water savings potential and is easily scalable to larger productivity if needed. Works for residential and commercial market.
High Efficiency Nozzle Distribution Program	Focuses on landscape. Cost-effective. Has great water savings potential and is easily scalable to larger productivity if needed. Works for residential and commercial market.
High Efficiency Toilet Distribution Program	High cost effectiveness and long term savings. Can be targeted to the low-income community. Good public relations with City residents.
Industrial Process Water Use and Cooling Tower Audit and Incentive Program	Targets largest users in the City. Highest water savings potential per site. Provides local businesses with economic support.
Save A Buck Program	Funded and administered by MWDSC. Low cost and ease of operation for the City.
SoCal WaterSmart	Funded and administered by MWDSC with added funds from Calleguas MWD. Low cost and ease of operation for the City.
Smart Controller Direct Installation Program	Targets landscape and the largest water users in the City. High water savings per site.

Final Selection for Programs with Quantifiable Water Savings	Reason for Final Selection
Water Budget	Targets landscape market and aids market transformation. Educated customers will see opportunity for savings.
Multi-family and Hotel/Motel HET Direct Installation Program	High cost effectiveness and long term water savings. May have available Member Agency Allocated funds from MWDSC.

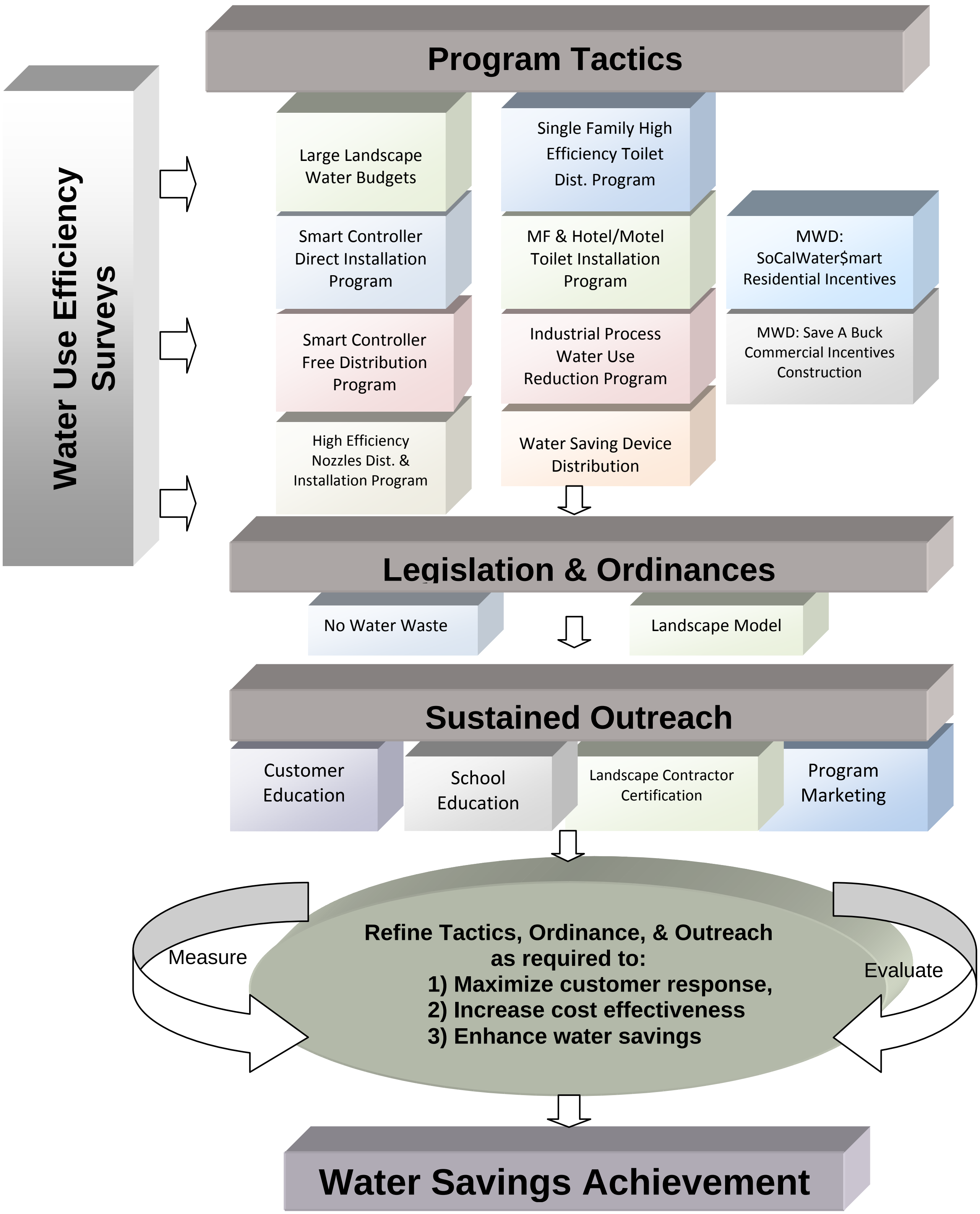
The implementation schedule is shown in Figure 7-1, with programs phased in over a five-year period.

FIGURE 7-1
IMPLEMENTATION SCHEDULE

Tas	Star	En	Projecte End
Water Budget	7/1/201	12/31/20	201
MW SoCalWat $mart	7/1/201	6/28/20	2015
Ongoing	7/1/201	6/28/20	
Initiate Augmented Marketing	9/30/20	6/28/20	
MW Save A Buck	7/1/201	6/30/20	2015
Ongoing	7/1/201	6/30/20	
Initiate Augmented Marketing	10/1/20	6/30/20	
Multi-family and HE Installation	9/20/20	12/31/20	201
Solicit	9/20/20	11/2/20	
Select Vendor and Secure	11/2/20	12/30/20	
Initiate	1/1/201	12/31/20	
Residential HE Toilet S	1/3/201	12/31/20	201
Solicit	1/3/201	1/27/20	
Select Vendor and Secure	2/2/201	2/25/20	
Coordinate	3/1/201	4/8/201	
Initiate	4/1/201	5/11/20	
Hold	5/1/201	12/31/20	
High Efficiency Nozzle Progra	2/1/201	12/31/20	201
Solicit Product	2/1/201	3/1/201	
Select Equipment Supplier and Purchase	3/1/201	4/1/201	
Initiate Distribution	4/2/201	12/31/20	
High Efficiency Nozzle Direct Progra	3/3/201	12/31/20	201
Solicit	3/3/201	3/30/20	
Select Vendor and Secure	4/2/201	4/29/20	
Conduct Initial	5/1/201	6/1/201	
Contractors Install	6/1/201	12/31/20	
Industrial Process Water Use Cooling Tower Audit & Progra	9/2/201	12/31/20	201
Solicit	9/2/201	9/30/20	
Select Vendor and Secure	10/1/20	11/30/20	
Implement Start-up	12/2/20	1/2/201	
Initiate Marketing	1/3/201	12/31/20	
Smart Controller Direct Progra	4/2/201	12/31/20	201
Solicit	4/2/201	4/27/20	
Select Vendor and Secure	6/1/201	7/31/20	
Implement Start-up	8/1/201	10/2/20	
Initiate Marketing	10/3/20	12/31/20	

The implementation plan also includes non-quantifiable elements such as conservation ordinances and legislation, education and outreach (Figure 7-2).

FIGURE 7-2
ELEMENTS OF THE CONSERVATION PROGRAM



Chapter 8: Water Shortage Contingency Planning

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought which limits supplies, an earthquake which damages water delivery or storage facilities, a regional power outage, or a toxic spill that affects water quality.

This chapter of the Plan describes how the City plans to respond to such emergencies so that emergency needs are met promptly and equitably. The City has established diverse approaches to meeting future water demands including: facility improvements and increased deliveries of local groundwater; increased deliveries of imported water; implementing a recycled water program; and supporting water demand management programs. This has allowed the City, to date, to meet demands in spite of drought conditions. Water shortages can be triggered by a hydrologic limitation in supply (i.e., a prolonged period of below normal precipitation and runoff), limitations or failure of supply and treatment infrastructure, or both. Hydrologic or drought limitations tend to develop and abate more slowly, whereas infrastructure failure tends to happen quickly and relatively unpredictably. The following section summarizes the City's plan to respond to such emergencies so that water demands are met promptly and equitably.

Ordinances No. 2729 and No. 2810 contained within City Code Chapter 22, Articles VII, IX and X, establish the City's contingency plan. Prohibitions, penalties and financial impacts of shortages are described in these sections of City Code and are summarized in this chapter.

8.1 Coordinated Planning

The City's first water shortage emergency procedures were established in 1991 by Ordinance No. 2246, but were later entirely repealed and restated by Ordinance No. 2729 in 2006. This ordinance established new water conservation and water shortage response procedures under Chapter 22, Article IX of Oxnard City Code. Article IX, which is also titled the "City of Oxnard Water Conservation and Water Shortage Response Ordinance," was later amended with language of Ordinance No. 2810 in 2009, which also provided amendments to Articles VIII and X, on Water Waste and Recycled Water Use, respectively. Copies of Ordinances 2729, 2810 and 2826 are provided in Appendix K. These amendments to City Code were deemed necessary to manage the City's potable water supply and to avoid or minimize the effects of drought and water supply variations within the City. The 2009 Ordinance establishes permanent water conservation standards to maximize water use efficiency for non-shortage conditions and refines response actions implemented during water shortage conditions. The conservation resulting from improved water use efficiency should help ensure a reliable and sustainable minimum supply of water for the public health, safety and welfare by maintaining local and imported water resources. Most recently, Ordinance No. 2826 in 2010 provided additional modifications, although minor, to the language pertaining to Water Waste.

8.2 Water Conservation and Water Shortage Response

As set forth in the City of Oxnard Water Conservation and Water Shortage Response Ordinance within Oxnard City Code, during a declared water shortage condition the water sources available to the City will be put to the maximum beneficial use to the greatest extent possible. The waste or unreasonable use of water will be prevented, and water available will be conserved for public welfare in the interests of City residents. The primary purpose of the Ordinance is to provide response procedures for use during water shortages, including procedures that will significantly reduce the consumption of City water over an extended period of time. The aim is to extend the water available to City residents while reducing the hardship on the City and the general public to the greatest extent possible.

8.3 General Water Waste Prohibitions

During non-shortage conditions, any waste or unreasonable use of water is prohibited, and conservation of water within and outside the city limits is mandatory in Oxnard. Examples of Oxnard's general water waste prohibitions and restrictions include limits on outdoor irrigation watering hours; limits on running water duration; no run-off; drinking water service upon request (water served only upon customer request at public places where food is served); various prohibitions in the commercial sector; no filling or refilling of swimming pools; and waste in general, including any indiscriminate use of water which is wasteful. In times of a water shortage, water use restricted under the general prohibition will also comply with any reduction levels described in a water shortage condition resolution adopted by City Council.

8.3.1 Implementation

The City Council is responsible for declaring a water shortage condition. Upon this declaration, the council will determine and establish the severity of the condition and establish the mandatory conservation measures needed to meet demand during the shortage. The City Manager will determine a baseline for the City's various customers to determine the reduction requirements. Customers with previous implementation of water conserving devices will, to the extent practical, not be penalized in establishing the baseline.

Water used on a one-time basis, for purposes such as construction and dust control, will be limited to that quantity identified in a plan submitted by the consumer to the Director of Public Works for approval. The City Council resolution describes the specific water use requirements and identifies acceptable alternative water sources not subject to restrictions.

The Director of Public Works will monitor and evaluate the projected water supply and demand by consumers. In the event of a prolonged severe water shortage emergency, the Director of Public Works will recommend to the City Council a water shortage plan that describes the delivery of water to customers. The City Council may order implementation of a water shortage strategy they deem necessary and appropriate to address any water shortage emergency. Following adoption of a water shortage condition resolution, the City Manager will inform city customers of all water use restrictions using all reasonable measures, which may include issuing notices through press releases, print and broadcast media and with customer water bills. Additionally, specific impacted industry groups, such as hotels, school districts, and restaurants may receive written and verbal notification from the City Manager. On a finding by the City Council that a water shortage emergency no longer exists, any water shortage plan then in effect will terminate by City Council resolution.

8.3.2 Goals and Allocations

After determining the severity of the water shortage emergency, the City Council will establish, by resolution, water conservation goals by stages as listed in Table 8-1. Immediately after adoption of a City Council resolution declaring the water conservation goals, water allocations will be in effect and customers will be prohibited from using water in excess of their allocation. Each customer will be solely responsible for managing his/her water uses in such a manner as to not exceed the amount of water allocated. Percentage reduction stages and goals will be in effect with the first full billing period commencing on or after the effective date of the City Council resolution adopting a water shortage plan. Single-family domestic/residential water allocations will be made on a per consumer basis and will be established by the City Manager based on factors including historical use and usage for similar situated customers per Ordinance No. 2810. This methodology will, to the extent practical, limit potential penalization of customers who have already adopted conservation practices. Monthly allocation will be subject to percentage stage reductions as declared by City Council resolution as shown in Table 8-1.

TABLE 8-1
REDUCTION GOALS AND ALLOCATIONS

Deficiency	Stage	Demand Reduction Goal	Type of Program
Up to 15%	1	Based on Baseline Use[a]	Mandatory
15-25%	2	Based on Baseline Use[a]	Mandatory
26-35%	3	Based on Baseline Use[a]	Mandatory
Greater than 35%	4	Based on Baseline Use[a]	Mandatory

Note: (a) Baseline Use will be established for each customer based on factors including historical use and usage for similar situated customers.

Priorities for use of available water, based on Chapter 3 of the California Water Code, are:

- Health and Safety: Interior residential, sanitation and fire protection
- Commercial, Industrial, and Governmental: Maintain jobs and economic base
- Existing Landscaping: Especially trees and shrubs
- New Demand: Projects with permits when shortage declared

Water quantity calculations used to determine interior household GPCD requirements for health and safety are provided in Table 8-2. As developed in Table 8-2, the California Water Code Stage 2, 3, and 4 health and safety allotments are 68 GPCD, or 33 hundred cubic feet (hcf) per person per year. When considering this allotment and the City's population of approximately 201,500 in 2010 as presented in Chapter 2.0, the total annual water supply required to meet the first priority use during a water shortage is approximately 15,265 AFY.

TABLE 8-2
PER CAPITA HEALTH AND SAFETY WATER QUANTITY CALCULATIONS

	Non-Conserving Fixtures		Habit Changes		Conserving Fixtures	
Toilets	5 flushes x 5.5 gpf =	27.5	3 flushes x 5.5 gpf =	16.5	5 flushes x 1.6 gpf =	8.0
Showers	5 min x 4.0 gpm =	20.0	4 min x 3.0 gpm =	12.0	5 min x 2.0 gpm =	10.0
Washers	12.5 GPCD (1/3 load) =	12.5	11.5 GPCD (1/3 load) =	11.5	11.5 GPCD (1/3 load) =	11.5
Kitchens	4 GPCD =	4.0	4 GPCD =	4.0	4 GPCD =	4.0
Other	4 GPCD =	4.0	4 GPCD =	4.0	4 GPCD =	4.0
Total GPCD		68.0		48.0		37.5
CCF per capita per year		33.0		23.0		18.0

8.3.2.1 Single-Family Residential Customers

A resident verification form will be used to determine the number of residential units and the number of persons using water in order for the City to allocate water for residential customers. Any single-family domestic residential customer failing to truthfully complete a resident verification will be guilty of a violation.

8.3.2.2 Multi-Family Residential Customers

Multi-family domestic/residential water allocations will be made per consumer and will be based on the number of persons per consumer and reasonable landscaping requirements (unless landscaping is separately metered) relative to the severity of the drought conditions. The monthly allocation will be subject to percentage stage reductions as declared by City Council resolution.

A resident verification form will be used to determine the number of residential units and the number of persons using water in order for the City to allocate water for residential customers. Any multi-family domestic residential customer failing to truthfully complete a resident verification will be guilty of a violation and penalties can be imposed.

8.3.2.3 Commercial, Industrial, Agricultural and Landscape Customers

Commercial, industrial, agricultural and landscape water allocations will be based upon an historical base period reduced by the percentage stage reduction (Table 8-1) as declared by City Council resolution.

8.3.2.4 New Customer

Any commercial, industrial, agricultural, or landscape customer that was not a customer during the historical base period will be assigned an average monthly allocation of water that corresponds to the usage of a similar customer. Each new customer will be solely responsible for managing the customer's water uses in such a manner as to not exceed the amount of water allocated to that customer.

8.3.3 Minimum Supply over the Next Three Years

Table 8-3 presents the minimum supply for the next three years.

TABLE 8-3
THREE-YEAR ESTIMATED MINIMUM WATER SUPPLY (AF)

Source	2012	2013	2014
Calleguas Municipal Water District	17,379	17,379	17,379
United Water Conservation District	6,800	6,800	6,800
City Wells (minus brine loss)	9,238	9,238	9,238
Total	**33,417**	**33,417**	**33,417**

8.4 Catastrophic Supply Interruption Plan

Water supplies as well as other public facilities can be negatively impacted by catastrophic events, including regional power outages and earthquakes. Compared to many other purveyors the City is well-positioned to respond to such events because:

- The City has accumulated groundwater credits in the Oxnard Basin equal to 24 months of imported water.
- The City has multiple sources of water, currently from CMWD, UWCD and City wells.
- The City's pipeline system has a tremendous by-pass system ("looping"), referring to the interconnection of pipelines and avoidance of critical pipelines where a break due to a seismic event, for example, would leave substantial areas of the City without water.
- In terms of a regional power outage, the City has back-up diesel generators at its major facilities (i.e., blending stations and water wells). UWCD also has generation capacity. There is also additional pumping capacity plus diesel-powered generation capacity at all wellfields and the desalter.

Table 8-4 shows the City's preparation actions in the event of a catastrophe.

TABLE 8-4
PREPARATION ACTIONS FOR A CATASTROPHE

Possible Catastrophe	Summary of Actions
Regional power outage	City will use its emergency generators
Earthquake	City, as with other California cities, is subject to earthquake events. Fortunately the City: • Has a well looped pipeline system. • Has and will have multiple blending stations capable of feeding the system. • Has more well capacity than needed. See discussion below this table.

Possible Catastrophe	Summary of Actions
Tsunami	No critical potable water facilities are located in an area that might be impacted by a tsunami. The most vulnerable would be the Advanced Water Purification facility and that facility is not critical since it is feeding recycled water to agricultural and landscape areas and one industrial customer that is also within the tsunami zone. Growers could revert back to their wells, for instance.

The most vulnerable source of supply would likely be the CMWD supply that comes through the Springville Reservoir and then through the Oxnard-Del Norte Conduits System to the City's blending stations, Procter & Gamble, and Port Hueneme Water Agency. The Del-Norte Conduit serves one blending station and the Oxnard Conduit delivers the balance of the imported water. In the event of a break in the Oxnard Conduit, the City would increase pumping from its groundwater wells. Then, to stay within its allocation, a greater portion of CMWD water would be used once that water became available until the proper amount of groundwater pumped during the year was met. Of course, an earthquake event late in the year may not allow for this to be met and in that instance, it is presumed that the FCGMA would allow the total water pumped to be adjusted over a 2-year period.

As of December 31, 2010, the City had a balance of 30,663 AF of FCGMA conservation credit reserves available, of which the City intends to maintain a minimum balance of 30,000 AF in 2011 and one year's worth of demand beyond that. These credits will be used primarily in emergency and drought situations.

8.5 Enforcement of Water Use Allocations

During a water shortage emergency, the City Manager will take specific actions in response to the failure of any customer to comply with established water use restrictions. Based on the magnitude of the water overuse and the number of separate infractions, a penalty in addition to the regular rate charged for water shall be imposed on the customer (Table 8-5). Penalties can range from water use billed at two times the highest unit rate for the specified customer class to seven times the highest unit rate. A customer's failure to comply with water allocation requirements will be cumulative for the duration of a water shortage condition.

For the fourth failure to comply with the water use restrictions the City Manager will authorize installation of a flow-restricting device of one gallon per minute capacity for services up to 1.5 inch size, and comparatively sized restricting devices for larger services, on the service of the customer at the premises where the violation occurred. The device will remain in place until either the City Manager authorizes its removal or the water shortage resolution ends. The City will charge the customer for the costs incurred for installing and for removing a flow-restricting device and for restoration of regular service. The charge and any surcharges will be paid before regular service is restored.

TABLE 8-5
WATER SHORTAGE EMERGENCY PLAN PENALTIES

Water Shortage Stage	First Two Offenses	Three or More Offenses
1	Water use in excess of allotment billed at **two** times the highest unit rate for that customer class	Water use in excess of allotment billed at **four** times the highest unit rate for that customer class.
2	Water use in excess of allotment billed at **three** times the highest unit rate for that customer class	Water use in excess of allotment billed at **five** times the highest unit rate for that customer class
3	Water use in excess of allotment billed at **four** times the highest unit rate for that customer class	Water use in excess of allotment billed at **six** times the highest unit rate for that customer class.
4	Water use in excess of allotment billed at **five** times the highest unit rate for that customer class	Water use in excess of allotment billed at **seven** times the highest unit rate for that customer class

Source: Oxnard City Code Article XIII, Sec. 22-157

The penalties and charges imposed on customers will take effect in all stages of a water shortage condition (Table 8-6).

TABLE 8-6
PENALTIES AND CHARGES

Penalty or Charge	Stage When Penalty Takes Effect
Penalty for excess use	All stages
Charge for excess use	All stages

Table 8-7 shows the consumption reduction methods the City will employ when a water shortage is declared.

TABLE 8-7
CONSUMPTION REDUCTION METHODS

Consumption Reduction Method	Stage When Method Takes Effect	Projected Reduction (percent)
Penalties and Charges	After the Second Violation under Normal Conditions and Starting at Stage 1 Under a Water Shortage Condition	To be determined by the City Manager based on the nature and duration of the declared water shortage.

Consumption Reduction Method	Stage When Method Takes Effect	Projected Reduction (percent)
Flow restrictors	After the Fourth Violation under Normal Conditions and Starting at Stage 1 under a Water Shortage Condition	To be determined by the City Manager based on the nature and duration of the declared water shortage.
Discontinue service	After the Fourth Violation under Normal Conditions and Starting at Stage 1 under a Water Shortage Condition	To be determined by the City Manager Based on the nature and duration of the declared water shortage.

It is anticipated that penalties and fines for using more than the allocated amount of water will be effective in terms of achieving needed reductions. However, since not all customers will achieve their stated reductions, it is anticipated that the City will set goals slightly higher than actually needed such that the actual achieved results are acceptable.

In lieu of, or in addition to above mentioned enforcement, the failure to comply with any provisions set forth in the City of Oxnard Water Conservation and Water Shortage Response Ordinance, the City Manager may reduce the amount of water provided to a customer to the level required for compliance.

8.5.1 Notice of Violation

The City Manager will give written notice of violation by regular mail or personal delivery to the customer committing the violation. The notice will include details on the applicable water use allotment or restriction, as well as the actual measured use and alleged violation. The notice will also contain a description of the facts of the violation, a statement of the potential penalties for each violation and information on the customer's right to request and adjustment or appeal.

8.5.2 Request for Adjustments

A customer's right to request an adjustment to or relief from an allowed allocation will be based on consideration of all relevant factors by the hearing officer. Circumstances that might warrant allotment modifications may be based on the customer's historical use, changes in household size or number of employees in commercial, industrial and governmental offices, or the addition of landscaped area to the customer's property. Consideration will also be given to whether the allotment reductions will result in unemployment or unique economic hardship compared to similarly situated customers or whether water use adjustments are caused by emergency, health or safety issues, including necessary increases in water use related to family illness or health. Factors that may warrant adjustments may also include water uses during new construction, the filling of a newly constructed swimming pool under permit, multi-dwelling water use serviced by a single water meter, unusual or unexplained water usage, and substantially lower water usage compared to similar customers resulting from conservation practices.

8.5.3 Appeal and Hearing

Any customer, against whom penalties are to be assessed for violations under normal or water shortage conditions, has the right to appeal through a hearing before which imposition of assessed remedies or penalties will not occur. The written request for hearing shall be filed within fifteen days of the date of notification of the violation. During the hearing that shall be conducted promptly following the request, the customer may present any relevant evidence tending to show that the alleged violation has not occurred. The formal rules of evidence will not apply to this review and all relevant evidence customarily relied upon by reasonable persons in the conduct of serious business affairs will be admissible unless a valid objection justifies its exclusion. If the customer fails to provide information relevant to the resolution of the appeal, relief shall be denied. The final decision of the City Manager will be provided to the customer in writing within thirty days of receipt of the appeal and will exhaust all administrative process.

8.6 Emergency Service Connections

At present, the City does not have any emergency service connections and is reliant upon its three independent sources. In the event CMWD water becomes unavailable, the City would be totally reliant upon groundwater. Over the short-term, the City could utilize its full well capacity and request its full entitlement from UWCD to provide limited service at a reduced water quality. If UWCD service were to be curtailed, limited service could also be provided using City wells and CMWD water. Barring contamination, it is assumed that the City wells would be available under all scenarios.

Currently, the City has no interconnections with other water purveyors. The City completed design for an interconnection with the City of Ventura; however, this interconnection has not been constructed. That interconnection would, if constructed, convey only emergency sources of supply. CMWD water cannot be exported to Ventura's service area as Ventura is not a member agency of CMWD or of MWDSC.

8.7 Analysis of Revenue Impacts of Reduced Sales during Shortages

The City of Oxnard operates its water system as an enterprise fund. Within that fund are both operational and capital funds. In general, the operational funds are supported by water sales and the capital funds are supported by fees paid by developers as well as a portion of water sales revenue.

Water billing for City accounts consists of two parts: (1) a fixed charge, also referred to as the service charge or meter charge, based on the meter size, and (2) a variable component or commodity charge based on water purchase. Ideally, most water utilities would like to collect sufficient funds from the fixed charges to cover the fixed expenses, such as salaries and benefits and the costs involved in maintaining facilities. However, due to the need to maintain "lifeline" rates for customers, this is not always achieved. In addition, the CUWCC MOU requires that 70 percent of water rate revenues be obtained through the variable component of the rate.

For the City of Oxnard, the service charges collected are significantly short of the revenue needed to cover fixed costs – which are mostly for debt service payments and personnel.

Table 8-8 discusses various actions and conditions that may impact the City revenues.

TABLE 8-8
ACTIONS AND CONDITIONS THAT IMPACT REVENUES

Type	Anticipated Revenue Reduction
Reduced sales due to drought conditions	Up to a total reduction of 20 percent of water sales under normally expected drought conditions due to the City's resource mix. This would translate into a revenue reduction of approximately $3.25 million.
Slow-down in development, impacting capital revenue	Capital revenue is dependent on development or re-development within the City. The past several years have seen low growth rates throughout Southern California, including the City of Oxnard. Based on this reduction in the amount of land development activity – a primary source of capital- a drop in capital revenue of 50 percent or more can be expected in the future. In fact, between 2007 and 2011, the City experienced a drop in capital revenue of over 75 percent. Ultimately, as the City approaches a buildout condition, capital revenue will drop to minimal amounts. As a result of the economic downturn, slow growth can be expected for several years to come, which will also negatively impact development and capital revenue.

Table 8-9 discusses actions and conditions that impact expenditures.

TABLE 8-9
ACTIONS AND CONDITIONS THAT IMPACT EXPENDITURES

Category	Anticipated Cost
Increased staff cost	It is expected that staff salaries will increase with inflation.
Increased O&M cost	The City's O&M costs will be significantly impacted by the personnel and energy costs associated with the new AWPF.
Increased cost of supply and treatment	Treatment is discussed above. The cost of supplies includes water purchased from Calleguas Municipal Water District and United Water Conservation District. The current cost for Tier 1 water is $981 per AF as of January 1, 2011.

Table 8-10 discusses the measures that water utilities, including the City of Oxnard use to overcome the impacts of revenue changes. Where there are decreases, primarily due to reduced water sales, the City considers the corresponding reductions in expenditures (energy and water purchases) and then has the ability to adjust the rates. However, increasing rates when customers are decreasing water purchases (voluntary or mandatory) can be problematic. Therefore, to some degree decreased revenue could be somewhat offset from reserve funds.

TABLE 8-10
PROPOSED MEASURES TO OVERCOME REVENUE IMPACTS

Names of Measures	Summary of Measures
Rate adjustment	Rate adjustments or use of reserve funds can make up for drops in revenue. It is estimated that a 20 percent drop in water sales will decrease City revenue by approximately $3.25 million. However, there would also be a decrease in expenditures, particularly in the amount of purchased Calleguas water.
Development of reserves	The City currently has operational reserves that could accommodate reductions in water revenues of 10 to 20 percent for a particular year without the need to adjust rates.
Bond Financing	For larger capital expenditures, including the GREAT Program, the City has and will continue to utilize bond financing. This financing spreads costs over many years, mitigating revenue changes on a year-to-year basis.

Reductions in water purchases must be balanced carefully as this may impact future water costs. The City's purchase order with Calleguas includes a Tier 1/Tier 2 cutoff based upon 90 percent of actual purchases over the preceding ten years. Purchase of Tier 2 water would result in significantly higher expenditures.

Table 8-11 discusses measures to overcome expenditure impacts.

TABLE 8-11
PROPOSED MEASURES TO OVERCOME EXPENDITURE IMPACTS

Names of Measures	Summary of Measures
Rate increases	The City will adjust its water rates as necessary to meet expenditures.
Bond financing	The City is using bond financing for the larger capital expenditures.
GREAT Program	The GREAT program reduces the City's need for purchased water on a percentage basis. This will allow the City to better control and predict its expenditures.

Finally, the assumptions are that the impacts of drought will be relatively minor in nature due to the City's portfolio of water resources. However, the Municipal Code and this UWMP must examine a decrease of up to 50 percent in water sales. Such a drastic decrease would obviously have an impact. Such a significant reduction would create a need to increase rates by approximately 20 percent under current conditions unless there were other actions taken by the City.

8.8 Water Use Monitoring Procedures

Monitoring of water use reductions during a water shortage time period will be accomplished by monitoring the water use of all customers as reflected in the monthly meter reading to generate bills. Where water use exceeds the amounts allocated, notices will be sent and enforcement actions will be taken. Monitoring non-permitted uses will depend on: (1) Water Resources Division staff; (2) the City's Code Compliance Officers; and (3) complaints or information supplied by residents or workers within the City. Table 8-12 discusses water use monitoring mechanisms.

TABLE 8-12
WATER USE MONITORING MECHANISMS

Mechanisms for Determining Actual Reductions	Type and Quality of Data Expected
Review of meter reading	Monthly for all customers
Restrictions enforcement	Reports from citizens/workers or zoning enforcement officers
Water Resources Division staff observations	Reports on observed violations from field-based staff

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Appendix A

DWR Checklist

Urban Water Management Plan checklist, organized by legislation number

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
1	Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	10608.20(e)	System Demands		Section 2.3, Tables 2-11, 2-12
2	*Wholesalers:* Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions. *Retailers:* Conduct at least one public hearing that includes general discussion of the urban retail water supplier's implementation plan for complying with the Water Conservation Bill of 2009.	10608.36 10608.26(a)	System Demands	Retailer and wholesalers have slightly different requirements	Section 1.2.2, Table 1-2, Appendix B
3	Report progress in meeting urban water use targets using the standardized form.	10608.40	Not applicable	Standardized form not yet available	TBD
4	Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	10620(d)(2)	Plan Preparation		Section 1.2.1, 1.2.2, Table 1-1
5	An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.	10620(f)	Water Supply Reliability . . .		Section 3.6, 4.3
6	Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.	10621(b)	Plan Preparation		Section 1.2.2, Table 1-2., Notice of Public Hearings (Appendix B)
7	The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).	10621(c)	Plan Preparation		Section 1, Notice of Public Hearings (Appendix B)

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
8	Describe the service area of the supplier	10631(a)	System Description		Section 1.3, Figure 1-1
9	(Describe the service area) climate	10631(a)	System Description		Section 1.4, Table 1-3.
10	(Describe the service area) current and projected population . . . The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier . . .	10631(a)	System Description	Provide the most recent population data possible. Use the method described in "Baseline Daily Per Capita Water Use." See Section M.	Section s 2.1, Tables 2-1 and 2-2
11	. . . (population projections) shall be in five-year increments to 20 years or as far as data is available.	10631(a)	System Description	2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	Table 2-2
12	Describe . . . other demographic factors affecting the supplier's water management planning	10631(a)	System Description		Sections 2.4.1, 2.4.4, 2.4.5, Table 2-13, 2-17
13	Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a).	10631(b)	System Supplies	The 'existing' water sources should be for the same year as the "current population" in line 10. 2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	Chapter 3, Tables 3-1 through 3-6

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
14	(Is) groundwater . . . identified as an existing or planned source of water available to the supplier . . .?	10631(b)	System Supplies	Source classifications are: surface water, groundwater, recycled water, storm water, desalinated sea water, desalinated brackish groundwater, and other.	Section 3.2, Tables 3-1 through 3-6
15	(Provide a) copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management. Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	10631(b)(1)	System Supplies		NA
16	(Provide a) description of any groundwater basin or basins from which the urban water supplier pumps groundwater.	10631(b)(2)	System Supplies		Section 3.2.1
17	For those basins for which a court or the board has adjudicated the rights to pump groundwater, (provide) a copy of the order or decree adopted by the court or the board	10631(b)(2)	System Supplies		NA
18	(Provide) a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.	10631(b)(2)	System Supplies		NA
19	For basins that have not been adjudicated, (provide) information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.	10631(b)(2)	System Supplies		Section 3.2.2, Appendix E

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
20	(Provide a) detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.	10631(b)(3)	System Supplies		Section 3.2.4, Table 3-5
21	(Provide a) detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.	10631(b)(4)	System Supplies	Provide projections for 2015, 2020, 2025, and 2030.	Sections 3.2.3, 3.2.4, 3.5, 3.6, Tables 3-2, 3-6
22	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following: (A) An average water year, (B) A single dry water year, (C) Multiple dry water years.	10631(c)(1)	Water Supply Reliability . . .		Sections 6.1 through 6.4 Tables 6-3 through 6-5
23	For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.	10631(c)(2)	Water Supply Reliability . . .		Sections 6.1, 6.2, 6.3
24	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	10631(d)	System Supplies		Section 3.4
25	Quantify, to the extent records are available, past and current water use, and projected water use (over the same five-year increments described in subdivision (a)), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses: (A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof;(I) Agricultural.	10631(e)(1)	System Demands	Consider "past" to be 2005, present to be 2010, and projected to be 2015, 2020, 2025, and 2030. Provide numbers for each category for each of these years.	Sections 2.2, 2.4 Tables 2-4 through 2-10, 2-14 through 2-17, Figure 2-1

No.	UWMP requirement[(a)]	Calif. Water Code reference	Subject[(b)]	Additional clarification	UWMP location
26	(Describe and provide a schedule of implementation for) each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following: (A) Water survey programs for single-family residential and multifamily residential customers; (B) Residential plumbing retrofit; (C) System water audits, leak detection, and repair; (D) Metering with commodity rates for all new connections and retrofit of existing connections; (E) Large landscape conservation programs and incentives; (F) High-efficiency washing machine rebate programs; (G) Public information programs; (H) School education programs; (I) Conservation programs for commercial, industrial, and institutional accounts; (J) Wholesale agency programs; (K) Conservation pricing; (L) Water conservation coordinator; (M) Water waste prohibition;(N) Residential ultra-low-flush toilet replacement programs.	10631(f)(1)	DMMs	Discuss each DMM, even if it is not currently or planned for implementation. Provide any appropriate schedules.	Sections 7.2, 7.3, Tables 7-1, 7-2, Figures 7-1, 7-2, Appendix I
27	A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.	10631(f)(3)	DMMs		Section 2.3.2, 7.3, Table 2-12, Figure 7-2
28	An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.	10631(f)(4)	DMMs		Tables 6-3 through 6-5 Appendix I

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
29	An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following: (1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors; (2) Include a cost-benefit analysis, identifying total benefits and total costs; (3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost; (4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.	10631(g)	DMMs	See 10631(g) for additional wording.	Sections 7.2, 7.3, Table 7-2
30	(Describe) all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.	10631(h)	System Supplies		Section 3.6
31	Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.	10631(i)	System Supplies		Sections 3.6.1, 3.7, Table 3-7

No.	UWMP requirement[(a)]	Calif. Water Code reference	Subject[(b)]	Additional clarification	UWMP location
32	Include the annual reports submitted to meet the Section 6.2 requirement (of the MOU), if a member of the CUWCC and signer of the December 10, 2008 MOU.	10631(j)	DMMs	Signers of the MOU that submit the annual reports are deemed compliant with Items 28 and 29.	Appendix I
33	Urban water suppliers that rely upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).	10631(k)	System Demands	Average year, single dry year, multiple dry years for 2015, 2020, 2025, and 2030.	Section 3.1
34	The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.	10631.1(a)	System Demands		Section 2.4.4, Tables 2-17
35	Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.	10632(a)	Water Supply Reliability . . .		Section 8.4, 8.5, 8.6, Tables 8-1, 8-4
36	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.	10632(b)	Water Supply Reliability . . .		Section 8.4.3, Table 8-3

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
37	(Identify) actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.	10632(c)	Water Supply Reliability . . .		Section 8.5, Table 8-4
38	(Identify) additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.	10632(d)	Water Supply Reliability . . .		Section 8.3
39	(Specify) consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.	10632(e)	Water Supply Reliability . . .		Section 8.6, Table 8-7
40	(Indicated) penalties or charges for excessive use, where applicable.	10632(f)	Water Supply Reliability . . .		Section 8.6, Tables 8-5 through 8-7
41	An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.	10632(g)	Water Supply Reliability . . .		Section 8.8, Tables 8-8 through 8-11
42	(Provide) a draft water shortage contingency resolution or ordinance.	10632(h)	Water Supply Reliability . . .		Appendix K
43	(Indicate) a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.	10632(i)	Water Supply Reliability . . .		Section 8.9, Table 8-12
44	Provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area	10633	System Supplies		Chapter 4, Tables 4-1, 4-2

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
45	(Describe) the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	10633(a)	System Supplies		Section 4.2.1
46	(Describe) the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	10633(b)	System Supplies		Section 4.2.1
47	(Describe) the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.	10633(c)	System Supplies		Sections 2.2.2, 4.3.1, Table 4-1
48	(Describe and quantify) the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.	10633(d)	System Supplies		Sections 4.3.2, 4.3.3
49	(Describe) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.	10633(e)	System Supplies		Sections 2.4.2, 4.3.1, 4.3.4, Tables 2-15, 4-1, 4-2
50	(Describe the) actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.	10633(f)	System Supplies		Section 4.4
51	(Provide a) plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.	10633(g)	System Supplies		Section 4.5

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
52	The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.	10634	Water Supply Reliability . . .	For years 2010, 2015, 2020, 2025, and 2030	Chapter 5, Table 5-1
53	Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.	10635(a)	Water Supply Reliability . . .		Section 6.4, Tables 6-2 through 6-6
54	The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.	10635(b)	Plan Preparation		Section 1.2.1
55	Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	10642	Plan Preparation		Section 1.2.2, Table 1-2

No.	UWMP requirement[a]	Calif. Water Code reference	Subject[b]	Additional clarification	UWMP location
56	Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.	10642	Plan Preparation		Section 1.2.2, Table 1-2, and Notice of Public Hearing (Appendix B)
57	After the hearing, the plan shall be adopted as prepared or as modified after the hearing.	10642	Plan Preparation		Section 1.2 Table 1-2, and Resolution (Appendix B)
58	An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.	10643	Plan Preparation		
59	An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.	10644(a)	Plan Preparation		
60	Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.	10645	Plan Preparation		

Notes:

(a) The UWMP Requirement descriptions are general summaries of what is provided in the legislation. Urban water suppliers should review the exact legislative wording prior to submitting its UWMP.

(b) The Subject classification is provided for clarification only. It is aligned with the organization presented in Part I of this guidebook. A water supplier is free to address the UWMP Requirement anywhere with its UWMP, but is urged to provide clarification to DWR to facilitate review.

Appendix B

Public Outreach Materials

RECHARGE BASIN ALTERNATIVE

ITEM	CAPITAL COST Quantity	Units	Unit Cost, $	Cost
Land	1.5	acres	$ 551,000	826,500
Fencing /steel	1,420	L.F	$ 75	106,500
Landscaping	1,420	L.F	$ 30	42,600
Rough Grading	9,035	C.Y	$ 6	54,210
Precise Grading	1.6	Acres	$ 5,000	8,000
Conveyance Pipeline, 10-inch, PVC	2000	L.F	$ 160	320,000
Road Crossing	1	L.S.	$ 20,000	20,000
Inlet Works (spillway, Interconnecting pipelines)	1	L.S.	$ 112,550	112,550
Monitoring Wells	3		$ 35,000	105,000
Subtotal				**$ 1,595,360**
OTHERS				
Engin/construc/admin/contingency	40%		$ 638,144	**$ 638,140**
Estimated Project Cost				**$ 2,233,500**

O & M COSTS	$/Year
Annual variable O & M	32,000
Annual fixed O& M	15,000
Total O & M/yr	**$ 47,000**

GROUNDWATER AND SURFACE WATER CONDITIONS REPORT - 2013

United Water Conservation District
Open-File Report 2014-02

PREPARED BY

GROUNDWATER RESOURCES DEPARTMENT
MAY 2014

UWCD OFR 2014-02

GROUNDWATER AND SURFACE WATER CONDITIONS REPORT - 2013

United Water Conservation District
Open-File Report 2014-02

Groundwater Resources Department
May 2014

THIS REPORT IS PRELIMINARY AND IS SUBJECT TO MODIFICATION BASED UPON FUTURE ANALYSIS AND EVALUATION

Cover Photo: Sunrise at El Rio Spreading Grounds. By John Carman.

Preferred Citation:

United Water Conservation District, 2014, Groundwater and Surface Water Conditions Report - 2013, United Water Conservation District Open-File Report 2014-02.

GROUNDWATER AND SURFACE WATER CONDITIONS REPORT - 2013

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EXECUTIVE SUMMARY / ABSTRACT

United Water Conservation District is a public agency that encompasses nearly 213,000 acres of central and southern Ventura County. The District covers the downstream (Ventura County) portion of the valley of the Santa Clara River, as well as the Oxnard Plain. The District serves as the steward for managing the surface water and groundwater resources within all or portions of eight groundwater basins. This report includes data and records from the 2013 calendar year, including basic information and discussion on the operation of the District's facilities, weather and hydrologic information, groundwater levels and available storage within the basins, and the quality of surface water and groundwater.

Major water resource issues and concerns are the driving impetus for the District's projects and programs. Projects and programs are implemented to manage, mitigate, or eliminate those issues or concerns that threaten the water resources. Those issues and concerns include, but are certainly not limited to, groundwater overdraft and the intrusion of saline water in the Oxnard Plain and Pleasant Valley basins, the gradual, long-term declining water levels in the Santa Paula Basin, water quality of the Oxnard Forebay basin and the Piru basin, and concerns related to the management of the Piru and Fillmore basin water resources.

To address those issues and concerns, United implements a wide variety of activities. Some of the activities are District-wide, for example: water levels are monitored in an extensive network of water wells thorough the District and a significant number of these wells are sampled as a part of a water quality monitoring program. In addition, stream gauging is performed periodically to quantify surface water volumes and flow rates under various hydrologic conditions. These data are important to United's habitat conservation efforts and the facilitation of fish passage at the Vern Freeman Diversion, as well as optimizing various District operations (e.g., annual conservation release, diversion of water to recharge basins or for use in-lieu of groundwater pumping by agricultural operations on the Oxnard Plain and in Pleasant Valley basin). Currently, the largest District-wide project underway by the groundwater department is the update of the Ventura County Regional Groundwater Flow Model. This is a multi-year, multi-faceted project that requires the expertise of several groundwater science specialties and relies on the District's long record of water-level, water quality, and stream gauging data. When completed, the groundwater flow model will be a primary evaluative tool for various proposed water management scenarios and will assist stakeholders with enhancing the sustainability and reliability of local water resources.

Issue-specific projects are also implemented by United to assist local stakeholders in the management of local water resources (e.g., AB3030 Piru/Fillmore Groundwater Management Plan, analyses of groundwater conditions in the Santa Paula basin as a part of the Technical Advisory Committee) or the pursuit of grant funds (e.g., Local Groundwater Assistance Program grants from CA Department of Water Resources, Fox Canyon Groundwater Management Agency Groundwater

Supply Enhancement Assistance Program) to help defray the costs of some of the groundwater projects.

The benefits of the surface water and groundwater projects and programs operated by United are shared by the many groundwater pumping entities in the District and those who receive those waters. Many of the benefits are in the background and not readily recognized or apparent to individual water users, however, the positive impacts of the District's activities are significant to the agricultural, municipal, and industrial economies of Ventura County.

1 INTRODUCTION AND BACKGROUND

United Water Conservation District (also "United" or "District") is a public agency that encompasses nearly 213,000 acres of central and southern Ventura County. The District covers the downstream (Ventura County) portion of the valley of the Santa Clara River, as well as the Oxnard Plain. The District serves as a steward for managing the surface water and groundwater resources for all or portions of eight interconnected groundwater subbasins (Figure 1-1). It is governed by a seven-person board of directors elected by division, and receives revenue from property taxes, groundwater extraction (pump) charges, recreation fees, and water delivery charges. The developed areas of the District are a mix of agriculture and urban areas, with prime agricultural land supporting high-dollar crops such as avocados, berries, row crops, tomatoes, lemons, oranges, flowers, ornamental nursery stock and sod. Approximately 370,000 people live within the District boundaries, including those living in the cities of Oxnard, Port Hueneme, Santa Paula, Fillmore and eastern Ventura.

The District is authorized under its principal act (California Water Code Section 74000 et seq) to exercise multiple powers. These powers include the authority to conduct water resource investigations, acquire water rights, build facilities to store and recharge water, construct wells and pipelines for water deliveries, commence actions involving water rights and water use, prevent interference with or diminution of stream/river flows and their associated natural subterranean supply of water, and to acquire and operate recreational facilities in connection with dams, reservoirs or other District works.

This report includes general information about the District's mission and detailed data on the operation of the District's facilities, weather and hydrologic information for calendar year 2013, including discussion regarding groundwater levels and storage within the basins, and the quality of the surface water and groundwater. Recent and current studies and investigations conducted by the District's Groundwater Department are also detailed. This report updates information presented in a similar report detailing District conditions in 2011 (UWCD, 2012d), and some discussion is devoted to contrasting the wet-year conditions of 2011 to the dry-year conditions of 2013.

1.1 UWCD MISSION STATEMENT AND GOALS

The District's mission statement is:

United Water Conservation District shall manage, protect, conserve, and enhance the water resources of the Santa Clara River, its tributaries and associated aquifers, in the most cost-effective and environmentally balanced manner.

In order to accomplish this mission, United Water Conservation District follows these guiding principles:

- Construct, operate, and maintain facilities needed now and in the future to put local and imported water resources to optimum beneficial use;
- Deliver safe and reliable drinking water that meets current and future health standards to cities and urban areas;
- Provide an adequate and economical water supply to support a viable and productive agricultural sector;
- Fight overdraft and seawater intrusion and enhance the water quality of the aquifers through the use of District programs;
- Monitor water conditions to detect and guard against problems and to report those conditions to the public;
- Seek opportunities to develop cooperative programs with other agencies in order to maximize use of District resources and promote mutually beneficial projects;
- Acquire and operate high-quality public recreational facilities that are financially self-supporting;
- Balance District operations with environmental needs to maximize use of the region's water resources; and
- Conduct District affairs in a business-like manner that promotes safe investment policy, sound financial audits and the utmost in professional and financial integrity.

The District recognizes that many of the projects and activities required to implement these guiding principles have long timelines for development and initiation, and the positive impacts of these projects and activities may be realized over many years. This is consistent with the District's mission to provide for the long-term health of the water resources within the District. To fulfill its mission, the District retains technical experts in the fields of engineering, hydrogeology, surface water hydrology, environmental science, ecology, and regulatory compliance, as well as administrative personnel with specialties in accounting and finance.

1.2 UWCD HISTORY

The original founding organization for United Water Conservation District was called the Santa Clara River Protective Association. It was formed in 1925 to protect the runoff of the Santa Clara River from being appropriated and exported outside the watershed. The Santa Clara Water Conservation District was formed in 1927 to further the goals of the Association by protecting water rights and conserving the waters of the Santa Clara River and its tributaries. The District began a systematic program of groundwater recharge in 1928, primarily through constructing spreading grounds along the Santa Clara River. Sand dikes were constructed on the Santa Clara River near Saticoy to divert river water into spreading grounds in nearby upland areas.

As groundwater overdraft and seawater intrusion on the Oxnard Plain were recognized in the 1940s, it was clear that the District did not have the financial ability to raise money to construct the facilities necessary to combat the problem. With the help of the City of Oxnard, a new district was organized in 1950 under the Water Conservation District Law of 1931. The new district was called United Water Conservation District for its unification of urban and agricultural concerns. Substantial bond measures were approved by the constituents of the District, allowing United to construct a number of water conservation projects, including:

- Santa Felicia Dam (1955) to capture and store winter runoff on Piru Creek to release in controlled amounts during the dry season. The 200-foot high dam can currently store about 82,300 acre-feet (AF) in Lake Piru. The reservoir is located downstream of a State Water Project reservoir, enabling the District to receive Northern California water via flows down middle Piru Creek without the construction of expensive delivery pipelines;
- A pipeline to new spreading grounds at El Rio; and
- Municipal wells at the El Rio spreading grounds to produce water for the Oxnard-Hueneme (O-H) pipeline (1954) that supplies drinking water to the cities of Oxnard and Port Hueneme, a number of mutual water companies, and the two Navy bases at the coast. The O-H system supplies water from the Oxnard Forebay basin (the recharge area for the Oxnard Plain basin), rather than pumping individual wells in coastal areas of the Oxnard Plain that could accelerate seawater intrusion.

Following increasing intrusion of seawater from the 1950s to the 1980s, United Water built several new facilities to increase recharge to the aquifers and to decrease groundwater pumping in areas affected by the intrusion. These facilities provide both direct present benefit, and long-term benefits, to the groundwater aquifers and to the groundwater extractors in the District. In 1958 a pipeline was completed to deliver diverted surface water to Pleasant Valley County Water District, which serves agricultural water to the Pleasant Valley basin. The Pumping Trough Pipeline (PTP) was constructed in 1986 to convey diverted river water to agricultural pumpers on the Oxnard Plain, thus reducing the amount of groundwater pumping in critical areas. The Freeman Diversion (1991) replaced the temporary diversion dikes in the Santa Clara River with a permanent concrete structure, allowing diversion of storm flows throughout the winter. A major additional benefit of the Freeman Diversion was the stabilization of riverbed elevations upstream of the facility, correcting the long-term incision of the river related to decades of in-channel gravel mining in the Saticoy vicinity.

Following the construction of the Freeman Diversion, the Noble spreading basins (1995) were constructed to store and recharge additional water diverted from the river, particularly during wet periods. The Saticoy well field was constructed in 2003 to pump down the groundwater mound that develops beneath the Saticoy spreading grounds during periods of heavy spreading. In late 2009 United acquired the Ferro and Rose basins, former mining pits located in the Oxnard Forebay that will be used for future groundwater recharge activities. United intends to construct facilities to convey Santa Clara River water diverted at the Freeman Diversion to these basins. Both the City of

Oxnard and the City of Ventura have recently studied the feasibility of piping recycled municipal wastewater to United's recharge basins in the Oxnard Forebay as a way to replenish the groundwater basins from which they extract water. United anticipated that the City of Ventura might desire to move recycled water to the District's recharge basins (or alternatively, potable water from the Forebay to east Ventura) in the future and arranged for "pipe hangers" to be added to the Highway 118 bridge over the Santa Clara River during its reconstruction in 1993.

1.3 UWCD ORGANIZATION

The District is governed by a seven-person board of directors elected by division, and receives revenue from property taxes, groundwater extraction (pump) charges, recreation fees, and water delivery charges. The District currently employs about 50 full-time staff. Management, professional staff and administrative staff work out of the District's headquarters in Santa Paula. Operations staff are based at field offices located at Lake Piru, Saticoy and El Rio.

1.4 UWCD OPERATIONS AND FACILITIES

United Water Conservation District operates a series of water conservation facilities from the tributaries of the Santa Clara River to the Oxnard Plain and Pleasant Valley (Figure 1-1). These facilities store winter runoff for later release during the dry season, divert water from the Santa Clara River, recharge the aquifers through the natural river channel and off-channel spreading basins, and deliver surface water and groundwater to cities and growers so that groundwater pumping is reduced in critically overdrafted areas.

1.4.1 SANTA FELICIA DAM AND LAKE PIRU

Santa Felicia Dam was constructed in 1955 for the conservation of runoff on Piru Creek. The main function of the dam is to retain the high flows in Piru Creek during the winter and spring months, and release the stored water in the fall when the basins of the Santa Clara River valley and the facilities that receive water from the Freeman Diversion have the capability to receive the most benefit from the release. The current capacity of the Lake Piru is 82,300 AF (See Figure 1.4-1 for storage history). The operational minimum pool is set at 20,000 AF of storage to help prevent the accumulation of sediment around the outlet works for Santa Felicia Dam.

1.4.2 PIRU DIVERSION AND SPREADING GROUNDS

The Piru Diversion is operated to divert surface water into the Piru Spreading Grounds for groundwater recharge. The diversion is located on the western bank of lower Piru Creek just south of the old Center Street Bridge in the town of Piru. Part of the diversion dam is built under the two roadway bridges crossing lower Piru Creek at Center Street.

The existing diversion consists of an earthen berm that extends out across the river channel, a sluice channel that can accommodate approximately 200 cubic feet per second (cfs), and a diversion structure with a trash rack and four 24-inch inlets leading to a 48-inch diversion pipe that conveys diverted water to the spreading grounds. The structure lacks a fish screen and is not in compliance with National Marine Fisheries Service (NMFS) standards for diverting water in a stream that could possibly contain endangered southern California steelhead. The diversion will not be put back into operation until an incidental take permit has been issued.

1.4.3 FREEMAN DIVERSION AND SATICOY SPREADING GROUNDS

The Freeman Diversion is located on the Santa Clara River about 10 miles upstream from its mouth at the Pacific Ocean. The concrete diversion structure was completed in 1991 and replaced the previous diversion method of building temporary sand and gravel diversion dikes, levees, and canals. The prior method of diverting water from the Santa Clara River near Saticoy had been in practice since the 1920s. The Freeman Diversion facility replaced the former method of building temporary sand and gravel diversion dikes, levees, and canals along the Santa Clara River near Saticoy. With each high flow in the river the dikes were washed out, eliminating the ability to divert water until construction crews were able to work in the riverbed with bulldozers to restore the diversion levees. Construction of the Freeman Diversion has increased the conservation of flood flows by extending the time each year when flows can be diverted and not discharged to the ocean. The current facility consists of the following structures: diversion structure, fish passage facilities, headworks, canal, flocculation building, and desilting basin. The diversion is operated to redirect surface water from the Santa Clara River to United's recharge basins located in Saticoy, El Rio and the Noble Basins for the purpose of recharging the aquifers underlying the Oxnard Forebay and Oxnard Plain. The remainder of the diverted water is delivered directly to agricultural users to satisfy irrigation demand "in lieu" of the users pumping groundwater. These deliveries are designed to reduce groundwater pumping in areas where overdraft conditions and related water quality issues exist, such as where aquifers are most susceptible to saline water intrusion and the upwelling of saline waters. Water releases from Lake Piru and a portion of the natural runoff from the Santa Clara River are diverted by the Freeman Diversion.

1.4.4 EL RIO FACILITY AND SPREADING GROUNDS

The El Rio Spreading Grounds are located at the terminus of the El Rio branch of the main supply line, approximately two miles southwest of the Saticoy spreading grounds. Surface water diverted from the Santa Clara River is distributed to a series of ponds totaling approximately 80 acres for the purpose of groundwater recharge. .

1.4.5 MUNICIPAL WATER DELIVERIES

United built the Oxnard-Hueneme (O-H) system in 1954 to move municipal groundwater extraction on the Oxnard Plain away from coastal areas subject to seawater intrusion. The well field for the O-

H system surrounds the El Rio recharge basins, and water produced by the well field is a blend of recharge water that has filtered down through the aquifer, and water drawn laterally from surrounding areas. The El Rio well field includes both upper and lower aquifer wells, allowing a blending of sources for water quality purposes. In practice, the Lower Aquifer System (LAS) wells are rarely used, as they are primarily used as alternative wells when others have high nitrate concentrations.

The California Department of Health Services requires the publication of an annual water quality summary of water delivered by the O-H system. The 2013 Consumer Confidence Report for the O-H water delivery system is included in Appendix A. The O-H delivery system is operated as an enterprise fund; water rates are set and approved by the users to support operation and improvements to the system without subsidies from United's other rate payers. Major customers include the City of Oxnard, the Port Hueneme Water Agency, and a number of mutual water companies in the southern Oxnard Forebay and on the Oxnard Plain.

1.4.6 AGRICULTURAL WATER DELIVERIES

Water deliveries for agricultural purposes are achieved through two systems, the Pumping Trough Pipeline (PTP) System and the Pleasant Valley Delivery System. These systems are discussed separately in the following two subsections. See Figure 1-1 for locations.

1.4.6.1 PTP DELIVERY SYSTEM

The Pumping Trough Pipeline (PTP) delivery system was designed to serve surface water from the Santa Clara River to a portion of the Oxnard Plain where the Upper Aquifer System (UAS) was determined to be in severe overdraft. Five Lower Aquifer System wells were constructed along the pipeline to balance pipeline pressures and provide additional water to the system when surface water supplies are incapable of meeting demand. Like the O-H System, the PTP delivery system is operated as an enterprise fund. The four UAS wells of the Saticoy well field, completed in 2004, can also provide groundwater to the agricultural pipelines when groundwater elevations are high near the Saticoy Spreading Grounds.

1.4.6.2 PLEASANT VALLEY DELIVERY SYSTEM

Water diverted from the Santa Clara River is delivered to the Pleasant Valley County Water District (PVCWD) via the Pleasant Valley Pipeline. The pipeline terminates at the Pleasant Valley Reservoir, located east of the Camarillo Airport near the City of Camarillo. PVCWD operates the reservoir and eleven LAS wells in the western Pleasant Valley basin, supplying water to agricultural customers via a delivery system linking the wells and the reservoir. The delivery of diverted river water to PVCWD offsets pumping of irrigation wells in the area. United is obligated by contract to supply, on an annual basis, 12.22 percent of the water diverted at the Freeman Diversion to

PVCWD. Since 2002 PVCWD has also received surface water from the Conejo Creek Diversion, operated by Camrosa Water District.

1.5 GROUNDWATER ISSUES AND CONCERNS

United's core mission is to manage, conserve and protect the water resources that exist within the District boundaries. United operates Santa Felicia Dam and maintains contractual arrangements with a number of upstream agencies to store or convey surface runoff to the lower portions of the Santa Clara River watershed. United does not regulate the use of groundwater within the District, but operates a number of facilities intended to maximize the conjunctive use of surface water and groundwater resources. Aside from United's annual State Water imports of up to 3,150 acre-feet, the Ventura County portion of the Santa Clara River valley is wholly dependent on local water resources for irrigation and potable supply, an uncommon arrangement in southern California where most areas regularly import large quantities of water. Significant quantities of State Water are however purchased by the cities of Oxnard and Camarillo for urban use on the Oxnard Plain.

Despite long-term efforts to import more water to the District and optimize the use of local resources, water deficits exist in a number of areas throughout the District. In some places the depletion of groundwater reserves has simply resulted in lowered water tables. In other places significant water quality problems developed in response to conditions of overdraft. In some areas water quality problems are related to land use practices, or exist naturally.

Listed below are summaries of several of the water supply and water quality issues that exist within United's district boundaries. In some cases United's involvement includes groundwater recharge or water delivery to actively address issues related to overdraft. In other cases United has conducted or sponsored research in order to better define existing problems and help identify potential physical projects or management strategies to mitigate the problem. United management and staff are knowledgeable concerning groundwater management practices and have expertise in conducting monitoring programs and with applying various methods for evaluating basin conditions (e.g., Bachman et al, 2005). United's water management activities go well beyond the storage, distribution and deliberate recharge of water within the watershed of the Santa Clara River.

1.5.1 OVERDRAFT CONDITIONS

Although high chloride concentrations in groundwater were first documented near Port Hueneme in the 1930s (California Department of Water Resources [DWR], 1954), the conditions for widespread seawater intrusion in the Upper Aquifer System (UAS) on the Oxnard Plain were initiated as early as the 1940s, when groundwater levels beneath the southern portion of the Oxnard Plain basin dropped below sea level (FCGMA, 2007). Within 5 to 10 years, chloride concentrations in wells in the Port Hueneme area started to increase rapidly. At that time, seawater had only affected a few wells in the Port Hueneme area, encompassing an area less than one square mile. Overdraft conditions generally persisted in the UAS on the Oxnard Plain through the late 1970s, when several years of above-average rainfall increased recharge to the basin and pumping demands began to shift to the Lower Aquifer System (LAS), allowing some recovery in the UAS. The aquifers of the UAS were severely depleted again during the drought of the late 1980s. The construction of the Freeman Diversion in 1991 coincided with the start of an extended wet period, and artesian conditions were common following wet winters in 1995, 1998 and 2005. Rainfall has been scarce since the winter of 2011, and many UAS wells on the southern Oxnard Plain currently have water levels below sea level.

Overdraft conditions were recognized in the Lower Aquifer System (LAS) in the late 1980s after the impairment of water quality in the Upper Aquifer System led to the implementation of a Fox Canyon Groundwater Management Agency (FCGMA) strategy to require new or replacement wells to be drilled into the LAS to lessen pumping on the UAS. The overdraft conditions in the LAS now persist in the southern and eastern portions of the Oxnard plain, and in much of the adjacent Pleasant Valley groundwater basin. Land subsidence related to groundwater overdraft has not been thoroughly investigated on the Oxnard Plain, but one estimate suggests up to 2.6 feet of permanent land subsidence (Hanson et al, 2003).

Overdraft conditions in the Oxnard Plain and Forebay groundwater basins continue today with the annual overdraft amount estimated to be about 20,000 to 25,000 ac-ft/yr (UWCD, 2014).

1.5.2 SALINE WATER INTRUSION

High chloride levels were first detected on the Oxnard Plain in the vicinity of the Hueneme and Mugu submarine canyons in the early 1930s (CA DWR, 1971) and became a serious concern in the 1950s. Early monitoring programs used only existing production wells and abandoned wells as monitoring points; sampling of these wells indicated that there was a widespread area of elevated chloride concentrations in the Hueneme to Mugu areas. In 1989, the U.S. Geological Survey initiated their Regional Aquifer-System Analysis (RASA) study and cooperative studies with United Water Conservation District on the Santa Clara-Calleguas groundwater basin. As part of those studies, a series of 14 nested well sites, with three or more wells installed at each site, were drilled and completed at specific depths in the Oxnard Plain basin (Densmore, 1996).

Figure 1.5-1 shows the locations of the RASA well sites on the Oxnard Plain. Prior to the RASA study, it was believed that an area of the UAS extending from approximately Channel Islands Blvd. (2 miles north of Port Hueneme) and across to the area near Hwy 1 and Nauman Road, then south to include the area underlying Point Mugu Navy base was intruded by seawater. The installation of a dedicated monitoring network and detailed chemical analysis of water samples from the new wells and other wells yielded new interpretations on the extent of seawater intrusion on the Oxnard Plain. It is now known that some areas of the southern Oxnard Plain are not intruded by seawater, and that high chloride readings from older production wells were the result of perched water leaking down failed well casings and contaminating the aquifer (Izbicki, 1992; Stamos and others, 1992;

Izbicki and others, 1995; U.S. Geological Survey, 1996). Maps presented in this report delineate the approximate extent of high-chloride water at various depths on the Oxnard Plain (Section 4.3.6).

In addition to drilling the monitoring wells, the USGS conducted geophysical surveys to determine the general extent of the high-saline areas (Stamos and others, 1992; Zohdy and others, 1993). This work indicated that the high-saline areas consisted of two distinct lobes, with relatively fresh water separating the lobes (U.S. Geological Survey, 1996). These areas were resurveyed in 2010 by United (UWCD, 2012a). The lobes originally identified by the USGS form the basis of the areas of high chloride concentration shown on the maps in this report. Additional down-hole conductivity surveys by the USGS (also resurveyed recently by United) indicate that the edges of the lobes are relatively distinct, with the first saline intrusion occurring in thin individual beds of permeable sand and gravel. As intrusion continues, more individual beds are impacted, resulting in increasing chloride levels. Thus, the interpretation of high-chloride areas shown on Figure 1.5-1 and other enclosed maps combine measured concentrations from the monitoring wells, geophysical measurements, and study results about the nature of the intrusion front.

In addition, isotope studies of samples from the nested wells indicate that the cause of the elevated chloride levels varies on the Oxnard Plain (Izbicki, 1991; Izbicki, 1992; Izbicki et al, 2005a). Four major types of chloride degradation have been documented:

Lateral Seawater Intrusion - the inland movement of seawater adjacent to the Hueneme and Mugu submarine canyons;

Cross Contamination - the introduction of poor-quality water into the fresh water supply via existing wellbores that were improperly constructed, improperly destroyed, or have been corroded by poor-quality water in the Semi-Perched zone;

Salt-Laden Marine Clays - the dewatering of marine clays, interbedded within the sand and gravel-rich aquifers, yields high concentrations of chloride-enriched water. This dewatering is associated with aquifer compaction and land subsidence resulting from decreased pressure in the aquifers, caused by regional pumping stresses (also see Section 1.5.4); and

Lateral Movement of Brines from Tertiary formations - the lateral movement of saline water from older geologic formations that have been uplifted by faulting. The lateral movement occurs across a buried fault face near Pt. Mugu where Tertiary rocks are in contact with the younger aquifers (also see Section 1.5.4).

Chloride degradation from each of the processes identified above is directly related to water levels in the basin. The water balance of the Oxnard Plain and the offshore component of the aquifer units is a dynamic relationship between groundwater recharge, groundwater extraction and change in aquifer storage. The primary source of groundwater recharge for the Oxnard Plain groundwater basin is the unconfined northeastern portion of this basin, known as the Oxnard Forebay (and formerly the Montalvo Basin or Montalvo Forebay). High water levels in the Forebay exert a positive pressure on the confined aquifers of the Oxnard Plain, and water flows from the recharge areas toward the coast (Figure 4.3-22). While the pressure exerted by high water levels in the

Forebay propagates rapidly through the aquifers, the actual movement of water is very slow, approximately 3 feet per day or less in the Forebay (Izbicki et al, 1992). The pressure (piezometric) surface of the confined aquifer is diminished by the extraction of water from the system. If pressure heads at the coast fall below sea level, the lateral intrusion of seawater will occur, resulting in aquifers being recharged with seawater due to landward pressure gradients. The dewatering of marine clays will occur if heads in the surrounding sediments remain below their historic levels for prolonged periods, allowing formerly immobile salts to be expelled into surrounding aquifer material. The slow compaction of these clays also contributes to land subsidence.

1.5.3 DECLINING WATER LEVELS

In addition to the overdraft conditions in the coastal basins discussed in previous sections, long-term declining water levels have been observed in the Santa Paula Basin. Groundwater elevations in many of the wells (43 of 57 wells) in both the eastern and western portions of the Santa Paula basin failed to fully recover to 1998 levels after near-record precipitation in 2005. This observation is consistent with an observed long-term, gradual decline in basin groundwater elevations (Santa Paula Basin Technical Advisory Committee, 2011).

An evaluation of the spatial and temporal distribution of groundwater pumping in the basin (UWCD, 2011) concluded that no significant changes in pumping locations occurred over a 30-year study period (1980 to 2009) and that water level fluctuations observed from 1980 to 2009 in the Santa Paula Basin cannot be attributed solely to spatial or temporal variations in pumping. The Santa Paula Basin Technical Advisory Committee has initiated several specialty studies (Section 2.1.3) to provide additional data on the possible hydrologic cause(s) of the observed decline in groundwater elevations.

In 2003, a basin study titled "Investigation of Santa Paula Basin Yield" by experts from the City of Ventura, Santa Paula Basin Pumpers Association and United Water Conservation District suggested that the yield of the basin is probably near the historic average pumping amount (Santa Paula Basin Experts Group, 2003). There is now interest in conducting a more detailed study on the hydrogeology and yield of the basin, as well as identifying approaches to increasing the yield of the basin.

In March 1996, as a result of legal action relating to declining groundwater levels in the Santa Paula Basin during the 1984 to 1991 drought and the City of Ventura's stated intention to increase pumping from the basin, the Superior Court of the State of California for the County of Ventura approved a Stipulated Judgment for Santa Paula Basin (*United Water Conservation District vs. City of San Buenaventura,* original judgment March 7, 1996, amended judgment August 24, 2010). The Stipulated Judgment established pumping allocations for each basin pumper. Representatives from United, the Santa Paula Basin Pumpers Association and the City of Ventura submit an annual report detailing basin issues and conditions to the Court.

1.5.4 UPWELLING SALINE WATER

The upwelling of saline waters has been documented in a number of production wells in the Pleasant Valley basin. Advancements in the tools used in sampling pumping production wells has allowed for the documentation of flow and water quality profiles in long-screen production wells (Izbicki et al, 2005a, 2005b). Data from some area wells indicate that poor water quality at the wellhead results from saline water entering the well from specific aquifer zones. High chloride concentrations most commonly observed in the deepest portion of a well may be indicative of brines migrating from deeper zones towards a water level depression (low pressure area) created by long-term overpumping. This upwelling of brines is another form of saline intrusion, and like the compaction of marine clays, occurrence is not limited to coastal areas (Izbicki, 1992). An increase in the number of LAS wells recording increases in chloride concentrations suggest areas impacted by brine intrusion are increasing, most notably in the Pleasant Valley basin.

1.5.5 EXPORTATION OF GROUNDWATER

As agricultural land value continues to increase throughout the District, and as continued urbanization removes farmland from the valley floor, the development of the hillside lands located near a reliable supply of water is also expanding. In many cases the hillside properties will not support a productive well, and water is supplied to the property from a nearby groundwater basin or established surface water diversion. Both water supply options result in the increased use of existing water resources. Most basins within the District lack clear policy or regulation regarding the "export" of water from the basin floor to surrounding uplands, or from one basin to another, although numerous area ranches have employed such arrangements for many years.

The AB3030 Groundwater Management Council for the Piru and Fillmore groundwater basins has had difficulty finalizing a proposed export policy for these basins. Some council members are concerned about increased pumping from the basins, while others feel the energy costs associated with lifting water to hillside orchards will limit the amount of hillside development. A new well exporting large quantities of water from the Fillmore basin to users in the Santa Paula basin has also complicated the development of an export policy.

1.5.6 NITRATE IN FOREBAY GROUNDWATER BASIN

The Oxnard Forebay is vulnerable to nitrate contamination for some of the same reasons the basin is valued for water resource projects. The coarse alluvial sediments common to the area allow the rapid vertical transport of water from the near-surface to the water table. During wet periods, the regional water table is often only tens of feet below the land surface in the Forebay. Nitrate is highly soluble and very mobile, making it susceptible to leaching from soils and transport to groundwater. Public supply wells in some areas of the Oxnard Forebay periodically exceed the California Department of Public Health's maximum contamination level (MCL) for nitrate, which is 45 mg/l nitrate (or 10 mg/l nitrate as N). Exceedence of this MCL can result in methemoglobinemia ("blue baby syndrome") a condition where ingested nitrogen interferes with the blood's ability to carry oxygen. Infants less than three months of age are most sensitive to this condition (Canter, 1997). United has conducted a series of studies to determine the extent of nitrate concentrations and the possible causes of this contamination. The Santa Clara River, which provides much of the natural and artificial recharge to the Forebay, is consistently low in nitrate (averaging 7 mg/l nitrate, UWCD, 1996a). Nitrate loading to the groundwater is principally related to land uses within the Forebay, with the most significant sources being agricultural fertilizers and septic systems. United's groundwater recharge activities in the Oxnard Forebay introduce large volumes of low-nitrate water to the groundwater flow system, providing a water quality benefit to both local wells and wells located greater distances down-gradient from the recharge facilities.

Nitrate levels in the El Rio area have fluctuated widely through time, with highest nitrate levels commonly observed during and following drought periods, and relatively low nitrate levels are often recorded during wet periods (UWCD, 1998). Nitrate levels tend to stay relatively low during wet periods when low-nitrate Santa Clara River water is spread by United in the El Rio recharge basins and natural recharge to the basin is abundant. However, when there is not sufficient river water to spread at El Rio, nitrate levels in the O-H wells sometimes rise, particularly in the northeastern portion of the spreading grounds. Blending with water from other O-H wells with low nitrate concentrations keeps nitrate concentrations in delivered water within the health standard for potable supply.

During the drought of the late 1980s and early 1990s, nitrate peaks increased in intensity. Following previous droughts, nitrate concentrations in the wells generally decreased to low levels during the intervening wet years. However, following the 1980s to 1990s drought, nitrate levels in a series of wells even increased during the dry season of wet or average precipitation years when flow in the Santa Clara River was low and United was not recharging water at El Rio. The distribution of nitrate both laterally and with depth is difficult to document with certainty, but the sampling of monitoring wells installed over the past decade has shown that the highest nitrate concentrations are often recorded in the shallowest portions of the aquifer (UWCD, 2008). Whereas the large-scale groundwater flow patterns within the Upper Aquifer System of the Forebay are believed to be fairly well understood, the individual flow paths of small volumes of water are often complex. This complexity of flow paths, unknown travel times, and an imprecise knowledge of nitrogen inputs often limits what can be concluded about nitrate provenance from the basic chemical analyses common to many routine groundwater monitoring programs.

In response to long-term concerns about water quality in the Oxnard Forebay and down-gradient areas, and a regulatory order issued by the Los Angeles Regional Water Quality Control Board, areas of high-density septic systems in the greater El Rio area have been converted to sanitary sewers. More than 1,400 properties were connected to sewer between the years 2005 and 2011, with project costs totaling $35 million. The County of Ventura managed the eleven phases of this successful project. Ongoing programs also exist to promote efficient irrigation and fertilizer practices among area growers. These educational programs are conducted regularly by the

University of California Cooperative Extension, the Ventura County Farm Bureau and various agricultural product suppliers or manufacturers. Despite these programs to reduce nitrate loading to groundwater, a number of wells in the Forebay recorded nitrate concentrations above the MCL in 2013.

1.6 SURFACE WATER ISSUES AND CONCERNS

Complex and variable interactions between surface water and groundwater flow systems exist within the valley of the Santa Clara River. Along the length of the Santa Clara River there are several areas where flow in the river commonly percolates entirely, resulting in dry reaches of the riverbed. Surface flow resumes some distance downstream as "rising groundwater" and discharges flow to the river, usually near a boundary of one of the groundwater basins in the valley. Flow from tributary streams sometimes reaches the confluence with the river, while at other times stream flow percolates to groundwater upstream of the main river channel.

Given the complex dynamics related to the gaining and losing reaches of the Santa Clara River and its major tributaries, management activities for both water resources and environmental protection are more complicated than might be imagined. Flows in the river are naturally variable both seasonally and annually, but dry reaches are common in all but the wettest of years. These variables often complicate permitting requirements and management efforts to maintain various river habitats. In addition, water quality issues generally require consideration of the interaction of surface water and groundwater, as do efforts to convey stored surface water to points lower in the watershed via natural stream channels.

1.6.1 SANTA CLARA RIVERBED STABILIZATION

The construction of the Vern Freeman Diversion structure accomplished two primary objectives for the District: creating a diversion structure highly resistant to storm damage, and stabilizing the elevation from which surface water is diverted from the river. Following extensive mining of aggregate from the channel of the Santa Clara River in the Forebay area, riverbed elevations near Saticoy had dropped by about twenty feet by the late 1980s. Scour associated with large flow events in the river allowed the riverbed degradation to propagate ever farther upstream, and United was repeatedly required to move its Saticoy diversion location farther upstream. The completed structure has prevented further down-cutting of the river upstream of the facility as expected, and some recovery of channel elevations between Santa Paula Creek and the Freeman Diversion has been documented (Stillwater Sciences, 2007). Since completion in 1991 the elevation of the Freeman diversion point has been stable at 162 feet, and the facility has enabled the diversion of river flow soon after large storm events (Figure 1.6-1).

When the Freeman Diversion was constructed, the riverbed elevation upstream of the structure was elevated about ten feet, and materials excavated during construction were used to raise floodplain elevations in an area extending approximately 2,000 feet upstream of the facility. The dam structure extends about 90 feet in the subsurface and rests on a bench of low-permeability Pico Formation. While the facility was not intended to pond surface water, it does act as a dam in the subsurface. Groundwater elevations at an upstream location near the diversion structure vary little from the crest elevation of 162 feet, as groundwater moving through shallow river alluvium stages up behind the Freeman structure. Construction of the Freeman Diversion has benefited groundwater elevations in the Santa Paula basin, as the earlier incision of the river that was lowering the discharge elevation for shallow groundwater in the basin was arrested and partially restored in the area upstream of the diversion structure (Santa Paula Basin Experts Group, 2003).

1.6.2 INCREASED CHLORIDE CONCENTRATION IN THE SANTA CLARA RIVER

The watershed of the Santa Clara River is one of the largest in southern California, draining over 1,600 square miles in Los Angeles and Ventura Counties. The Piru groundwater basin underlies the Santa Clara River just west of the LA-Ventura County line, and the nature of the river channel is such that much of the time the entire flow of the river emanating from upstream areas infiltrates to groundwater in the eastern portions of the Piru basin. Water quality in the river has suffered periodically due to land use practices in Los Angeles County, and water quality impacts have been shown to persist in the groundwater of the Piru basin for many years after corrections have been made to restore quality in surface water.

In the 1950s and 1960s brines from oil production in the greater Newhall area were discharged to the Santa Clara River, and very high chloride and TDS concentrations were recorded during this period. These practices ceased in the early 1970s following the passage of the federal Clean Water Act, but residual degradation of groundwater quality was noted when water quality objectives were formulated by the Regional Water Quality Control Board years later (UWCD, 2006). Another episode of chloride contamination has occurred more recently and is associated with wastewater discharges from the City of Santa Clarita. Beginning in 1999, rapid urban growth and the increasing popularity of self-regenerating water softeners resulted in increased flow and rising chloride concentrations in the Santa Clara River at the Los Angeles County line. A clear trend of increasing chlorides continued until late 2004, when recorded chloride concentrations in the river peaked around 150 mg/l. Wells in the eastern Piru basin responded rapidly to the changes in the quality of the recharge water to the basin, and a group of concerned growers and other Ventura County interests repeatedly requested to the Regional Board to take action to regulate the chloride discharges which exceeded regulatory limits and advisory thresholds for agricultural use (100 mg/l).

Following several years of study and a successful groundwater modeling effort to predict the impacts of various discharge scenarios on downstream areas, a compromise solution emerged that was endorsed by most area stakeholders and approved by the Regional Board in fall 2008. The approved project was to allow chloride discharges as high as 117 mg/l to the Santa Clara River, and to construct a series of extraction wells, desalting facility and pipeline to convey blended water across the dry reach of the Piru basin. The local (Santa Clarita) board of the Sanitation Districts of

Los Angeles County refused to authorize the rate increases necessary to implement the approved project. In 2011 the Sanitation Districts, with support from Castaic Lake Water Agency, began work to modify the former project and eventually proposed several new dilution alternatives to mitigate future chloride impacts in the Piru basin. The extended implementation periods and lack of meaningful salt exports in the new proposals failed to gain support among Ventura County interests, and in summer 2013 the Sanitation Districts announced they would pursue a project that would attain treatment plant chloride discharges of 100 mg/l to the Santa Clara River. The proposed reverse osmosis treatment process would reduce discharge to the river by about 7,000 acre-feet per year, but chloride concentrations will be reduced to levels acceptable to agricultural users. It will likely take several years to permit, design and built the proposed salt removal facilities.

In the meantime, the successful removal of most water softeners from Santa Clarita and lower chloride concentrations in imported State Water has resulted in wastewater chloride concentrations below the peak concentrations seen in the mid-2000s. The chloride plume associated with the worst of the past discharges continues to migrate with groundwater flow across the Piru basin, and now extends past the midpoint of the basin.

1.6.3 WATER FOR ENVIRONMENTAL INITIATIVES

United's operation of the Freeman Diversion includes bypass flows to maintain migration corridors for southern California steelhead and habitats downstream of the facility. Operations of the Freeman Diversion are included in a Multiple Species Habitat Conservation Plan (MSHCP) that is under development as part of the federal permitting requirements triggered by the presence of listed and endangered species. United expects to submit a first complete draft of the MSHCP in the spring of 2015.

1.6.3.1 SANTA FELICIA DAM ENVIRONMENTAL FLOWS.

The original water rights license for Santa Felicia Dam requires a minimum release of 5 cfs or natural inflow, whichever is less. Due to the conditions in United's Federal Energy Regulatory Commission (FERC) license which were adopted in 2011, the bypass flows have now been changed to a minimum of 7 cfs with conditions which require higher flows to maintain downstream habitat when the monthly cumulative precipitation is above the historic average measured at County Station 160, located at the guard station entering Lake Piru. Release migration flows of 200 cfs have been implemented for fisheries migration in Piru Creek when the Santa Clara River has elevated flows due to storm runoff and surface flows in the river are continuous from Piru Creek to the Santa Clara River estuary near Ventura Harbor. The trigger to initiate migration releases occurs when the USGS gaging station on the Santa Clara River above Piru measures over 200 cfs at 8:00 am and is expected to stay above 200 cfs through the following day. Migration flows are to continue as long as flows at the county line are over 200 cfs.

The National Marine Fisheries Service has required that United evaluate the feasibility of both the upstream and downstream passage of southern California steelhead over Santa Felicia dam. United has convened a panel of fish passage experts to evaluate the range of facilities that might be required to allow fish passage over the 200-foot-high dam.

1.6.3.2 HABITAT CONSERVATION PLAN

The Freeman Diversion currently provides bypass flows for the upstream and downstream migration of the endangered southern California steelhead. State Water Rights Permit 18908 allows United to divert its license amounts as long as 40 cfs is provided through the fish ladder for 48 hours after the total river flow subsides below 415 cfs. These migration flow requirements are limited to storms that occur between February 15th and April 31st of each year. As part of the MSHCP development, United remains in consultation with National Marine Fisheries Service and is currently operating the bypass flows to better meet the needs of the species for migration between the ocean and the Freeman Diversion. The bypass flows currently being released are based on the "2009 and 2010 bypass flow operation plan." The 2009 plan addresses the bypass flows for upstream migration (adult steelhead) and the 2010 plan focuses on the bypass flows provided for downstream migration (smolts or juvenile steelhead). The plans are fairly complicated due to the widely varying river conditions on a given year. Section 2.2.7.4 discusses the actual bypass flows implemented recently along with an associated yield loss.

2 PROJECTS AND INITIATIVES

Figure 2.1-1 is a matrix introducing United's current projects underway by the Groundwater Department and the issues those projects address. The projects vary in scope and application. The groundwater and surface water projects are discussed in the following sections of this report.

2.1 GROUNDWATER

Section 2.1 introduces the groundwater projects that have been conducted by United. These consist of a wide range of projects which are discussed separately in the following sub-sections of this report. These are the same projects introduced in Figure 2.1-1.

2.1.1 UPDATE REGIONAL GROUNDWATER FLOW MODEL

The Ventura Regional Groundwater Model (VRGWM) is a numerical modeling tool being developed to evaluate multifaceted conjunctive use, water recycling, and water conservation projects designed to alleviate seawater intrusion, overdraft, land subsidence, and other problems. A calibrated groundwater flow model allows the prediction of benefits or impacts associated with either specific water supply projects (such as well fields, water deliveries, recharge projects, reservoir releases, etc.) or regional changes within the model domain (changing irrigation demands, changing rainfall patterns, extended drought, etc.). Both United and the FCGMA have relied upon existing versions of the VRGWM for planning and groundwater management activities.

The VRGWM was originally developed by the U.S. Geological Survey as part of the Regional Aquifer Systems Analysis (RASA) in the late 1980s and early 1990s. Local financial support for the RASA study was contributed by United, Calleguas Municipal Water District, and the Fox Canyon Groundwater Management Agency. The VRGWM by the USGS simulates regional groundwater flow in the Piru, Fillmore, Santa Paula, Mound, and Oxnard subbasins of the Santa Clara River Valley Basin, and the Pleasant Valley Basin, Arroyo Santa Rosa Valley Basin, and Las Posas Valley Basin in the Calleguas Creek watershed. The original MODFLOW model used a finite-difference grid consisting of 60 rows and 100 columns for a total of 3,354 active cells with constant nodal spacing of 2,640 feet. The model used two layers to simulate regional groundwater flow in the region's Upper Aquifer System and Lower Aquifer System.

Since completion of the original model by the USGS in 1996, UWCD has completed several modifications to the VRGWM to improve its predictive capabilities and better address project-specific questions:

- Model Grid Size Reduction – Reduced cell size from 1/2 mile to 1/6 mile for improved accuracy;
- Model Layer Addition – Added a third model layer to simulate groundwater flow and groundwater-surface water interactions in the shallow alluvial units in the Piru, Fillmore, and Santa Paula subbasins;
- Conceptual Model Updates – Added/modified groundwater flow barriers and hydrogeologic properties;
- Expanded Calibration Period - Added 1994 to 2000 hydrology;
- Model Recalibration – Recalibrated the Oxnard Basin through 1998 to better reflect the new conjunctive use projects built after USGS originally calibrated the model; and
- Improved Predictive Simulations – Expanded the forward model (predictive tool) period to a full 55 years that reflect the climate and hydrology of the years 1944 through 1998.

The revised MODFLOW model used a finite-difference grid consisting of 114 rows and 229 columns for a total of over 24,000 active cells with nodal spacing of approximately 900 feet throughout most of the model domain. The model used 3 layers to simulate regional groundwater flow in the Upper Aquifer System, Lower Aquifer System, and shallow alluvial aquifers.

While the existing VRGWM (the revised MODFLOW model) has been successfully used in this capacity for more than a decade, the model needs to be updated in order to answer the increasingly complex and detailed questions with which water managers are now faced. As environmental stewardship, climate change, drought preparedness, and recycled water have become integral aspects of groundwater management, the level of analysis required to support such planning has become increasingly more detailed in both time and space, as compared to the early 1990s when the model was developed. In its current form, the VRGWM is not fully capable of evaluating the complex issues Ventura County water managers are faced with today or expect to confront in future years.

Grant funds were used to partially fund the overhaul of the VRGWM. United's staff decided that it is more efficient to develop a completely new groundwater model instead of revising the existing VRGWM as more detailed data only available in recent years will enable United's staff to further divide Upper Aquifer System and Lower Aquifer System into seven aquifers. The new VRGWM development is divided into two geographic areas that will be completed in two separate but linked project phases. The first phase includes the Oxnard Forebay, Oxnard Plain, Mound and Pleasant Valley basins. The second phase will include other basins such as Piru, Fillmore, and Santa Paula. Each project phase has three tasks: (1) Develop Basin Conceptual Model; (2) Develop Groundwater Flow Model; and (3) Calibrate Groundwater Flow Model. The original grant funding was to facilitate completion of Tasks 1 and 2 of the first project phase, which was completed in February 2014. The remaining VRGWM development tasks will be funded via other sources including United's resources. The third task of the first project phase (Calibrate Groundwater Flow Model) is estimated to complete in fall 2014.

Task 1: Develop Basin Conceptual Model

The basin conceptual model provides the basis for developing the numerical groundwater flow model. The goal of Task 1 is to update the basin conceptual model for the Oxnard Forebay and Plain with improved geologic understanding so a new more-detailed groundwater flow model can be constructed. The existing VRGWM is based on a conceptual model that uses an aquifer system framework where multiple aquifers are grouped into upper and lower systems. This approach ignores difference in water levels and properties between the aquifers in each system, which are significant in many areas. As groundwater management issues become more complex, the need for aquifer-specific answers increases. Thus, a key objective of Task 1 is to expand the basin conceptual model to include aquifer-specific data.

Updating the basin conceptual model is a two-step process – data collection and data analysis. Data collection includes identifying and compiling available geological data. United has focused on subsurface data contained in water, oil, and gas well logs. District staff have identified available geophysical logs and prioritized the logs for digitization. The digitized logs were georeferenced and input into GIS for analysis. United's hydrogeologists thereafter identified and correlated regional hydrogeologic units (aquifers and aquitards); constructed geologic cross-sections; and identified regional facie changes that affect the occurrence and movement of groundwater within the hydrogeologic units. Geologic maps and studies were also reviewed to identify geologic structures (faults and folds) that are potential or partial barriers to groundwater flow. United's staff has developed a 3-dimensional (3-D) geologic model covering Oxnard Forebay, Oxnard Plain, and Mound basins for developing the numerical groundwater flow model (Task 2).

Task 2: Develop Groundwater Flow Model

The goal of Task 2 is to develop the numerical model architecture and initial inputs that will be used for calibration. The model is constructed using USGS's Modular Three-Dimensional Ground Water Flow Model code (MODFLOW) and the commercial pre-processing package Groundwater Vistas offered by Environmental Simulations, Inc. Groundwater model development is further divided into a two-step process that includes: (1) grid design and (2) model setup.

(1) Grid Design

United's groundwater staff has constructed a finite-difference grid for the model domain based on the 3-D geologic model prepared in Task 1. The 3-D geologic model identifies seven aquifers (Semi-perched aquifer, Oxnard aquifer, Mugu aquifer, Hueneme aquifer, Upper Fox Canyon aquifer, Basal Fox Canyon aquifer, and Grimes Canyon aquifer). A seven-layer numerical groundwater flow model has been developed corresponding to the seven geologic aquifers.

(2) Model Setup

In numerical model setup groundwater stresses and boundary conditions are implemented to simulate artificial conditions of groundwater flow. The stresses include the natural recharge from precipitation, artificial recharge from spreading grounds, and groundwater extraction by wells. United's operations records were used to calculate the recharge rate at the spreading grounds. The pumping records from UWCD and FCGMA were collected, reviewed and incorporated in the model. The boundary conditions include no flow or fluxes along the edge of model domain. The geological faults were identified and may be implemented as barriers, conduits or no flow depending upon the evidence of groundwater data. The new VRGWM is a transient flow model with simulation period from 1985 to 2012 with monthly time step.

Task 3: Calibrate Groundwater Flow Model

The groundwater model needs to go through a calibration process in order to provide credible simulation results. The calibration of groundwater model is accomplished by adjusting input parameters and modifying model conditions so that the simulated water levels closely approximate observed water levels. The groundwater elevation measurements from wells within groundwater model domain were collected and reviewed. Seasonal changes in water levels will be used as primary targets for model calibration. By adjusting the input parameters including hydraulic conductivity, specific yield, and storage coefficient, the calibrated groundwater flow model is expected to mimic the long-term trends and seasonal fluctuations of recorded groundwater levels from 1985 through 2012. During the calibration exercise, the available aquifer pumping test data and literature review will provide guidance in determining the optimal input parameters. Where possible, UWCD will also seek opportunities to perform aquifer tests or collect other field data that will help quantify the hydraulic properties of aquifers and flow barriers.

Following the successful calibration of the groundwater flow model, the model can be utilized to evaluate specific water supply projects or broader pumping or precipitation changes within the watershed. The evaluation of individual projects requires the construction of model input files that define changes in pumping or recharge associated with the project under consideration. Model scenarios that include the new water project are typically compared to a "base case" scenario that characterizes how the basin or basins operate without the new project. United anticipates that the new calibrated VRGWM will be used to assist cities or management agencies such as the FCGMA in evaluating large and/or complex water supply or water management proposals.

2.1.2 AB3030 GROUNDWATER MANAGEMENT PLAN UPDATE

An update to the AB3030 Groundwater Management Plan (GMP), which is currently in draft form, is a cooperative effort of United Water, the City of Fillmore, and water companies/pumpers in the Piru and Fillmore Groundwater basins (Piru/Fillmore Groundwater Management Council, 2011). The original 1996 GMP was formulated with input gained from public information meetings and hearings. The draft GMP is an update of the original 1996 Plan (Piru/Fillmore Groundwater Planning Council, 1996).

The GMP uses the groundwater management plan authority contained in California Water Code Section 10750 et seq. initially enacted in 1992 through Assembly Bill 3030. An initial 1995 Memorandum of Understanding (MOU) between United, the City of Fillmore, and the water companies/pumpers, was incorporated in the plan and established the GMP as a cooperative groundwater management plan for the basins. The MOU outlines the roles of the various parties in implementing the Plan (M.O.U., 1995). The Piru and Fillmore subbasins are considered part of the Ventura Central Basin which is subject to critical conditions of overdraft (California Department of Water Resources, 1980).

United, as the lead agency, has formally adopted the GMP, which was formulated to ensure local control of groundwater management. It is the intent of the GMP to foster local control in as many aspects of the management of the basins as possible. The draft GMP update includes numeric Basin Management Objectives (BMO) for groundwater levels, groundwater quality, and surface water quality. Water Code Section 10753.7 now requires the inclusion of BMOs in a GMP for any local agency seeking state funds administered by the California Department of Water Resources for the construction of groundwater projects or groundwater quality projects. In addition the update includes a formal groundwater export policy which was a requirement of the original GMP. For various reasons, adoption of the updated plan has not yet occurred.

2.1.3 SANTA PAULA BASIN SPECIALTY STUDIES

In March 1996, the Superior Court of the State of California for the County of Ventura approved a stipulated Judgment for the Santa Paula Basin. (*United Water Conservation District vs. City of San Buenaventura etc, Ventura County Superior Court Case No. CIV115611,* Judgement entered March 7, 1996, and amended August 24, 2010) [hereinafter "Judgment"]). The Judgment recognized that all of the parties have an interest in the Santa Paula Basin, and in the proper management and protection of both the quantity and quality of this important groundwater supply. The basin is a significant water resource in the County of Ventura. Members of the Santa Paula Basin Pumpers Association and the City of San Buenaventura exercise rights to pump water from the basin for reasonable and beneficial uses. The United Water Conservation District does not produce water from the basin, but the basin is located within its boundaries and the District is authorized to engage in groundwater management activities and to commence actions to protect the water supplies which are of common benefit to the lands within the District or its inhabitants.

In 2010 the Judgment was amended to join various groundwater pumpers that were not previously joined as parties to the adjudication, and to clarify certain provisions pertaining to shortage conditions, the responsibilities of the Santa Paula Basin Pumpers Association and groundwater production by its members, and water rights transfer procedures.

The Judgment provides for the creation of a Technical Advisory Committee (TAC). The committee is charged with establishing a program to monitor conditions in the basin, including, but not necessarily limited to, verification of future pumping amounts; measurements of groundwater levels; estimates of inflow to and outflow from the basin; increases and decreases in groundwater storage; analyses of groundwater quality; studies relative to the basin; development of programs for its conjunctive use and operation; and other information useful in developing a management plan for the basin. The Judgment also authorizes the TAC to consider and attempt to agree on the safe yield of the basin.

The Judgment among other things requires the TAC to monitor and annually report individual and cumulative groundwater production from the basin. The Judgment further specifically provides that *"United Water Conservation District shall have the primary responsibility for collecting, collating, and verifying the data required under the monitoring program, and shall present the results thereof in annual reports to the Technical Advisory Committee."* The United Water Conservation District submits draft annual reports to the Santa Paula Basin TAC members for review, comment, and approval.

The 2008 Annual Report, filed with the Court in 2010, noted that the TAC has observed a long-term, but gradual, decline in basin groundwater elevations. The Annual Report stated that the TAC would over the following 12-24 months seek to determine the cause of the long-term gradual decline in the groundwater elevations, and formulate remedial actions to reverse the problem should it persist (United Water Conservation District, 2009).

In 2011 the Santa Paula Basin TAC created a Santa Paula Basin Working Group to investigate the cause of the long-term gradual decline in groundwater elevations. The Working Group consists of technical experts from the United Water Conservation District, the Santa Paula Basin Pumpers Association and the City of San Buenaventura. The Working Group has initiated a series of studies that will address the cause of the long-term gradual decline in groundwater elevations.

In August 2011, the TAC issued a list of ten work items which were evaluations and studies to be completed for the Santa Paula Basin. These items are listed below:

- Investigation of Hydrologic Base Period.
- Investigation of groundwater and surface water inflow at Fillmore-Santa Paula Basins boundary.
- Evaluate groundwater confinement and differentiate measured wells by aquifer.
- Evaluate water level trends in both confined and unconfined parts of the Santa Paula Basin.
- Identify crop change over time.
- Investigation of groundwater storage change.
- Evaluate historical changes to the Santa Paula Creek channel and potential effects on basin recharge.
- Refine and finalize spatial and temporal Pumping Trends Report (UWCD, 2011b).
- Compilation of Santa Clara River infiltration data (UWCD, 2013c).
- Compilation of Santa Paula Creek infiltration data (UWCD, 2013d).

Some of these studies have now been completed and will likely serve as supporting documents for a new effort to determine the safe yield of the Santa Paula basin. There is concern among some parties that pumping allocations defined in the Stipulated Judgment exceed the safe yield of the basin. TAC members have agreed to hire a technical consultant to assess the safe yield of the basin. A concurrent study will examine approaches to increasing the operational yield of the basin. If the yield study determines the current pumping allocation cannot be supported by the basin, pumpers may have the opportunity to fund projects to increase the operational yield of the basin rather than reducing the pumping allocations of individual parties. It is anticipated that both the safe yield and yield augmentation studies will be completed in the fall of 2014.

2.1.4 DISTRICT-WIDE GROUNDWATER LEVEL MONITORING

United monitors groundwater elevations in all or portions of eight groundwater basins within the District boundaries. The regular monitoring of a large number of wells in the multiple aquifers throughout the District is necessary to adequately define the regional influences of groundwater extractions as well as natural and artificial groundwater recharge to the basins. Measurements are collected from both active production wells and dedicated monitoring wells. "Nests" of monitoring wells exist in some locations, allowing determination of heads in various aquifer units, and vertical gradients between aquifer zones at these locations.

In excess of 3,000 water level measurements were collected by District staff in 2013, on either a monthly, bimonthly, quarterly or semi-annual basis. The semi-annual runs are the most extensive runs and are scheduled to document annual high groundwater conditions in the spring and annual low groundwater conditions in the fall. The locations of wells measured by United at various frequencies are shown by basin in Figure 2.1-2. The locations of wells with groundwater elevation measurements are represented in various figures in Section 4 of this report.

Beginning in 2009, United has increased its efforts to instrument additional wells in each groundwater basin with pressure transducers ("transducers"). These units consist of a compact pressure transducer and data logger, and are commonly suspended in a well by a special cable that allows records to be retrieved without removing the device from the well. The transducers are programmed to record water levels at frequent time intervals, allowing the acquisition of data sets that would be impossible or impractical to collect by hand. The automated collection of head measurements are very useful in evaluating transient events, such as tidal influences, the area of influence surrounding pumping wells, and water table responses to both natural and artificial recharge events. As of fall 2013, approximately 109 pressure transducers were deployed throughout the District (Figure 2.1-2).

Groundwater conditions in the Oxnard Forebay tend to be more dynamic than in other basins within the District. Groundwater mounding associated with recharge to the basin variously occurs beneath United's spreading grounds and the channel of the Santa Clara River. United has transducers in 30 Forebay wells. Analysis of these records has lead to a much better understanding of groundwater storage within the basin, and how groundwater levels affect the percolation of river flows in the upstream portions of the Forebay.

In the Santa Paula basin, a more extensive groundwater elevation monitoring effort was initiated in 1998 and is continuing. The monthly, bimonthly and semi-annual monitoring of wells is conducted to assist technical work in progress to determine the perennial yield of the basin, and related to a March 1996 Court Settlement regarding pumping in the basin. The use of pressure transducers was expanded beginning in 2011, and 21 basin wells are now instrumented with transducers. Several of these transducers were purchased by the Santa Paula Basin Pumpers Association and the City of Ventura.

Beginning in the spring of 1999 the number of Upper and Lower Aquifer System wells monitored in the Oxnard Forebay, Oxnard Plain, Pleasant Valley and Mound basins was increased substantially. The increased frequency and distribution of groundwater elevation data in the coastal basins is intended to better define areas of groundwater abundance and deficit, and how these conditions relate to groundwater recharge and extraction in the basins, and geologic features within and between the basins. The implementation of an extensive semi-annual (spring and fall) water level measurement program in these basins is also intended to define the extremes of water levels throughout the year. Pressure transducers are useful for determining seasonal high and low groundwater elevations and United currently has transducers in 22 Oxnard Plain wells.

A number of other Ventura County agencies routinely measure and record groundwater elevations in their wells, most commonly on a monthly or quarterly basis. Most cities and the larger mutual water companies measure water levels in their wells, often under both static and pumping conditions. Water levels are also routinely measured in monitoring wells at a number of environmental sites, such as landfills, large scale contaminant sites, or wastewater percolation ponds. United obtains water level records from these various sources and archives the records in a central database.

The Groundwater Section of the Water and Environmental Resources Division of the Ventura County Watershed Protection District also maintains a long-term groundwater elevation monitoring program (VCWPD, 2014). As with United's monitoring program, the lengthy water levels records now associated with many of the wells in the County's program are valuable records for assessing long-term changes in water levels within area basins. United and the County of Ventura regularly exchange groundwater elevation records. The County of Ventura in turn reports groundwater elevation records to the California Department of Water Resources (DWR) as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) program. This reporting program was authorized by the Legislature in 2009 as part of bill SBX7 6, and encourages local agencies to develop monitoring programs that adequately characterize groundwater conditions in their areas and regularly report the records to DWR for archiving and improved public accessibility.

2.1.5 DISTRICT-WIDE WATER QUALITY SAMPLING

United's water quality monitoring program integrates the District's sampling with sampling conducted by a variety of other organizations. Together, this monitoring serves the following varied purposes:

- For purveyors' wells, monitoring of a variety of regulated constituents ensures that groundwater is safe for potable use, and ensures taste and odor are within established guidelines.
- The saltwater intrusion monitoring network tracks the migration of saline water by direct seawater intrusion and the movement of chloride from clay layers between the aquifers. The network monitors the full series of aquifers from the Oxnard to the Grimes Canyon aquifer.
- Monitoring of wells allows documentation of both abrupt and long-term changes in water quality.

United staff samples numerous monitoring and production wells on a regular basis in order to evaluate the quality of groundwater within the District. Monitoring programs sometimes focus on specific areas within the District, typically for a specific type of degradation or improvement of water quality. In addition to United's regular sampling programs, water quality data are routinely acquired from other sources, most notably the California Department of Public Health (DPH) and the County of Ventura's Groundwater Section. Other sources of information include the California Department of Water Resources, cities, consultant reports and technical studies, landfill operators and individual well owners.

United routinely samples production wells and dedicated monitoring wells throughout the District, but monitoring is performed with increased frequency and density in two critical areas. One such area is the Oxnard Forebay basin, where United operates its main groundwater recharge facilities and the well field supplying the Oxnard-Hueneme potable water system. The monitoring serves to document both typical conditions and the variability of groundwater quality in areas of groundwater recharge and areas of groundwater production near specific land uses. Another area of frequent monitoring is the coastal area near and between the Hueneme and Mugu submarine canyons. Elevated chloride levels from the intrusion of saline waters continue to be a concern in this area, especially in the area surrounding the naval base at Point Mugu. Over the past decade there has been a renewed interest in documenting the changing chloride conditions in the Piru basin. Water quality monitoring has increased in that basin, with much of the increased sampling of production wells being performed by the Groundwater Section of the Ventura County Watershed Protection District. Changing water quality conditions are also a concern in the Pleasant Valley basin.

When water is delivered to the public, the California Department of Public Health enforces minimum monitoring requirements to assure that delivered water is free of chemical and biological contaminants. Testing requirements vary depending on the number of people served by the system and a system's vulnerability to contamination, as determined by the DPH. United regularly collects samples from the wells supplying the O-H potable water system, with sampling frequency exceeding the minimum DPH requirements. Water purveyors throughout California are required to report results of all water analyses to the DPH, and United regularly obtains these water quality records from the DPH for integration into United's water quality database.

United's groundwater staff regularly collects water quality samples from approximately 150 monitoring wells located throughout the District. Nearly all of these wells are PVC wells with a diameter of two inches. A portable submersible sampling pump is lowered into the well in order to purge the well prior to collecting a sample. Alternatively, an air compressor and long air line are used to purge other wells, where compressed air is released in the well below the water surface and water is "air lifted" as the air expands and rises to the surface. Most of the monitoring wells have a short screened interval, allowing the collection of water from a limited section of the aquifer. Many monitoring wells were installed as a "nest" or cluster of wells in a single borehole, allowing the collection of piezometric head and water quality samples from multiple depths at the same location. United measures field parameters during sampling, but all water quality analyses are performed by a commercial laboratory.

United also monitors a number of private domestic and irrigation wells throughout the District as part of its regional monitoring programs. The sampling of production wells spares the expense of drilling new monitoring wells, and provides examples of water quality pumped by groundwater users. However, the long screen intervals common to most production wells often draws water from multiple water-bearing zones, which can mask poor quality water that may source from specific aquifer zones. The Groundwater Section of the Ventura County Watershed Protection District also conducts annual sampling of a number of production wells in Ventura County, commonly in the fall of the year. The County sampled over 174 wells in 2013, 92 of which were in located within United's district boundaries. This sampling complements the sampling performed by United and significantly contributes to the water quality sample coverage for several local basins.

The distribution of wells sampled by United is shown in Figure 2.1-3. As shown in the map, the Oxnard Forebay and the coastal areas of the southern Oxnard Plain have the highest density of monitoring wells. Production wells belonging to private parties and monitored by United are concentrated around the Oxnard Forebay and in the basins of the Santa Clara River Valley. The figure includes a table showing the number of wells monitored in each basin.

Special water quality studies are occasionally conducted within Ventura County. One significant recent study was the Groundwater Ambient Monitoring and Assessment (GAMA) program, conducted by the United States Geological Survey (USGS) in cooperation with the CA State Water Resources Control Board. This project sampled a number of "representative" wells throughout the Santa Clara River valley and the Oxnard Plain in order to assess the quality of local groundwaters commonly used for public supply. Many wells were sampled in spring 2007 for a broad suite of compounds at very low concentrations in order to document both the character of natural waters and the nature of contamination where it exists. While the identities of the wells sampled remain confidential, results from this sampling effort allowed characterization of groundwater in the study area. Contamination related to human activities was found to be relatively uncommon, and associated with shallow wells screens and younger waters when present. Older and deeper groundwater in some areas has somewhat elevated mineral content, and may have elevated iron and manganese concentrations related to reducing groundwater conditions (Burton el al, 2011). The geologic setting and nature of the area's aquifers are largely responsible for the high mineral content in the water, resulting in some aesthetic issues but not health concerns.

2.1.6 SALINE WATER INTRUSION MAPPING

The intrusion of saline waters remains the principal water quality threat to the groundwater resources of the Oxnard Plain and the Pleasant Valley basin. As described in Section 1.5.2, the movement of brines into fresh aquifer units remains a concern as long-term overdraft conditions persist in these basins, and chloride impacts are no longer limited to the coastal areas adjacent the Hueneme and Mugu submarine canyons. Water with elevated chloride concentration is not suitable for either potable use or for irrigation water. In recent years United has conducted several investigations to better define the extent of saline water in the coastal basins. Some of the subprojects of this effort include:

- Seismic reflection survey on south Oxnard Plain – this subproject focused on meso-scale geologic structures/features that were postulated to impact groundwater movement on the south Oxnard Plain (UWCD, 2011a);
- Time domain electromagnetic survey in the Port Hueneme and Point Mugu areas – this subproject was designed to reassess the areal extent of saline water intrusion and compare it to the USGS data from the early 1990s (UWCD, 2012a);
- Borehole electrical conductivity surveys in existing piezometers in the Port Hueneme and Point Mugu areas - conductivity profiling in existing wells/piezometers was performed to determine if the saline waters have begun to impact strata other than the screened intervals of the wells (data from the conductivity profiling is currently being evaluated and findings have yet to be published);
- Collection of flow profile data and discrete-depth water quality samples - conducting flow profiling, depth-specific sampling with water quality analyses, and mass balance calculations is proposed for existing production wells to identify changes in salinity near impacted areas surrounding Mugu and Hueneme canyons that may be masked in high-capacity/long-screen wells; and
- A feasibility study is currently underway to evaluate the technical and economic viability of using groundwater of a quality degraded by sea water as source water for a brackish water treatment facility that would create irrigation-quality water for growers in overdrafted areas.

To date, two of these subprojects have been completed and results are contained in the respective Open-File Reports.

2.1.6.1 COLLECTION OF FLOW PROFILE DATA AND DISCRETE-DEPTH WATER QUALITY SAMPLES

This proposed subproject includes conducting flow profiling, depth-specific sampling with water quality analyses, and mass balance calculations on production wells to identify salinity changes for Mugu and Hueneme saline water impact areas that may be masked in a high capacity well. United Water proposes to field verify the TDEM geophysical results by performing production profiles and discrete-depth water quality sampling from existing production wells located near the leading edge of the saline zones identified by the TDEM survey. Production profiles (also called flowmeter surveys) are performed on wells to determine the distribution of water entering the perforated intervals. The results of a production profile are often presented as gallons/minute (gpm) per ft of perforated interval or percentage of the total flow per perforated interval.

Inflow rates to a production well can be measured and typically the flow rates are not equal along the length of the perforations. By identifying the proportional flow rates, discrete-depth water samples can be collected from each flow interval and mass balance calculations can be used to determine the water chemistry in the aquifer surrounding the inflow zones. These techniques are in use by many water districts and the USGS to better understand the impact well hydraulics have on water quality sampling and evaluate variations in groundwater geochemistry with depth. For our study, we propose to use this technique to look for production intervals within existing wells that have elevated chloride values and determine the depths at which the well has been impacted by saline waters. Funding for this subproject has been included in United's budget for the 2013-14 fiscal year.

In 2002 United sponsored a similar study for a number of high-capacity production wells in the Pleasant Valley Basin. Researchers from the USGS performed flow profiling and collected water quality samples at specific depths within the screened interval of the wells under pumping conditions. The work demonstrated that deeper portions of these wells generally produced little water but tended to have higher chloride concentrations (Izbicki et al, 2005a and Izbicki et al, 2005b). This study was proposed by United and funded by DWR through an AB303 local groundwater assistance grant.

2.1.6.2 BRACKISH WATER DESALTING FACILITY

United has hired an engineering firm to perform a feasibility study for a proposal to pump brackish water from impacted aquifers along the coastal area of the southern Oxnard Plain. Production wells distributed throughout the greater project area would supply poor-quality groundwater to a plant site where reverse-osmosis membranes would purify the water. Brine generated by the treatment process would be discharged to the nearby Salinity Management Pipeline. Product water would be sold to growers who want desire pure water for the production of high-value crops such as berries.

Production wells feeding the desalting facility would extract brackish groundwater resulting from past episodes of seawater intrusion during times of drought. Fresh plumes of seawater intrusion are likely developing in the current drought conditions as water levels in UAS wells near Port Hueneme have dropped below sea level. In the early years of operation the supply wells will be managed to remove existing salts from the aquifers. In later years extractions may act as a hydraulic control that could help mitigate the landward migration of groundwater impacted by saline intrusion. Potential impacts of the proposed operation of the facility will be modeled as part of the permitting and approval process for the project, should it be deemed feasible and economical.

2.1.7 FOREBAY AQUIFER DELINEATION/MAPPING USING SURFACE GEOPHYSICS

Reconnaissance-level time domain surveys performed by UWCD in 2010 identified previously unrecognized geologic conditions (e.g., faults, thick clay sequences) underlying several of the District's recharge basins. Previous investigations (e.g., Daniel B. Stephens & Associates, 2008) depict the presence of clay units (aquitards) in the Oxnard Forebay, but the lateral continuity and presence/absence of faulting were not addressed. The Oxnard Forebay is a critical component of the region's water supply system and is envisioned as a location for expansion of future groundwater pumping and the potential introduction of recycled water for aquifer recharge. As the groundwater resource utilization in the Forebay intensifies, a more refined understanding of the hydrogeologic conditions is needed to facilitate optimization of this resource.

Following the initial time domain electromagnetic (TDEM) survey in the Forebay, United purchased TDEM equipment and conducted additional surveys. In fall 2011 and summer 2012 an additional 139 soundings were made throughout the Forebay basin. These readings allowed the identification of several areas of anomalous resistivity in the subsurface, suggesting areas of higher and lower permeability. The TDEM readings identified some fault traces in the subsurface and generally confirmed the existing mapping of the Forebay boundary where shallow confining layers become prevalent (UWCD, 2013a). The Fox Canyon Groundwater Management Agency (FCGMA) provided funding for this surface geophysical survey with a grant from their *Groundwater Supply Enhancement Assistance Program (GSEAP)*.

In 2013 the TDEM surveys were expanded into adjacent areas in the western Santa Paula basin and the eastern Mound basin. United Water field crews have enjoyed extensive cooperation from land owners who have readily provided access to their property. Survey sites are limited to open spaces and agricultural areas as overhead power lines and buried metallic objects interfere with the electrical fields that allow the mapping of subsurface properties.

2.2 SURFACE WATER

The interaction of surface water and groundwater is complex and dynamic in the valley of the Santa Clara River. Surface water flows are often highly variable both between years and seasonally within single years. The water quality of stream flow also commonly varies throughout the year, with mineral content typically increasing as flows decrease. United's interest in surface water flows has historically centered on the Santa Clara River near Saticoy, where water is diverted from the river and routed to various facilities for either groundwater recharge or direct use as irrigation water. Because of various regulatory requirements imposed upon the District by the federal government, United has recently devoted more effort to the study and characterization of flow in the river and its major tributaries in order to better understand aquatic habitat within the lower watershed of the Santa Clara River. Of particular interest are seasonal migration opportunities for the endangered Southern California Steelhead and how United's activities affect flows in Piru Creek and the Santa Clara River.

2.2.1 STREAM FLOW

Flows in the Santa Clara Watershed are recorded by United, United States Geological Survey (USGS) and the Ventura County Watershed Protection District (VCWPD). Flows in the main stem of the Santa Clara River are recorded by the USGS at the Los Angeles/ Ventura County line (funded by United) and by the VCWPD downstream at Victoria Bridge near Oxnard. United also records continuous flows diverted at the Freeman Diversion. All of the major tributaries are monitored coming into the Ventura County portion of the watershed. United Water funds the USGS to monitor the flows above and below Lake Piru. The VCWPD funds the USGS to record Sespe and Santa Paula Creek while the VCWPD records Hopper and Pole Creek.

Additionally, manual discharge measurements are made in locations that are not at a continuous gauging location. These data provides the information needed to estimate benefits to each basin during the conservation/State Water release, discharge/percolation rates of each basin, and adjustment of environmental flows.

2.2.2 WATER QUALITY

United maintains a water quality monitoring program and samples from a number of locations (Figure 4.2-4) either seasonally, monthly or every two weeks. Sampling sites are generally located near groundwater basin boundaries or on major tributaries near their confluence with the Santa Clara River. Sampling of tributaries and the upstream reaches of the Santa Clara River assure that waters are acceptable for natural groundwater recharge. Sampling is conducted on a quarterly basis and consists of either a full general mineral suite or several key constituents. Water temperature and pH is documented at the time of sample collection. Sampling is conducted more frequently along the Santa Clara River near the Los Angeles County line (monthly) and at the Freeman Diversion (every two weeks).

Beginning in January 1999, United has sampled the Santa Clara River at Blue Cut near the Los Angeles County line each month. This monitoring is intended to improve understanding of how urbanization and community water supply decisions in the Santa Clarita area affect the quality and quantity of water flowing into Ventura County. From the late 1990s through 2003 discharges from the Valencia Water Reclamation Plant increased steadily in both volume and chloride concentration, with chloride concentrations exceeding 200 mg/l at the end of this period. Discharge rates continued to increase for several more years before diminishing slightly. Chloride concentrations in the discharges have fallen to levels common to the early 1990s (Figure 4.3-6), the result of lower chloride levels in State Water Project imports and a successful ban of self-regenerating water softeners in area homes.

Water quality monitoring of the river water diverted at the Freeman Diversion is performed every two weeks to confirm that the water is acceptable for use in both aquifer recharge and for irrigation deliveries. The mineral content of water in the river at this location exhibits a strong negative correlation with flow, where higher flows are less mineralized. Nitrate concentrations are routinely low in the river and do not show a strong correlation with flow. The County of Ventura maintains and operates composite sampling device at the Freeman, and samples storm flow and dry weather base flows several times per year. These samples are analyzed for a broad suite of organic contaminants and metals as part of a storm water quality program required by the Los Angeles Regional Water Quality Control Board.

In recent years both the City of Fillmore and the City of Santa Paula have eliminated discharges of treated wastewater to the Santa Clara River upstream of the Freeman Diversion. Santa Paula's new treatment plant came on-line in 2010 and utilizes percolation basins for wastewater disposal. Fillmore completed a new plant in 2009 and now distributes reclaimed water to both percolation basins near the plant site and a network of subsurface irrigation systems constructed in parks and school fields throughout the city.

2.2.3 SANTA FELICIA DAM CONSERVATION RELEASES

United's conservation releases are designed to replenish the Piru, Fillmore and Santa Paula Basins by direct percolation from the Santa Clara River. The remaining portion of the release is diverted at the Freeman Diversion and is either spread for percolation into the Forebay, or is sent to agricultural users in the Oxnard Plain or Pleasant Valley Basins via the surface water delivery system. The conservation release can be adjusted in quantity (duration and magnitude) and timing to optimize benefits within the district. The quantity in most years is limited by the supply from the wet season runoff and, to a lesser degree, the amount of State Water purchased. Lake Piru maintains a minimum pool of 20,000 AF of storage that is designed to keep the sediment deposits in the lake away from the outlet works. Releases beyond this point are only done when State Water released from Pyramid Lake is expected to fill the lake back to the minimum pool shortly after the conservation release.

The following factors are considered when deciding on how much of the stored water is to be released:

- Provide enough storage capacity in Lake Piru to minimize the chances of spilling in the following year;
- Meet the needs of the downstream basins;
- Meet the needs of the agricultural surface water deliveries to the Pleasant Valley and the Pumping Trough (PTP) pipeline systems;
- Meet the flows from the FERC Santa Felicia Water Release Plan in Piru Creek for the Southern California Steelhead;
- Maintain a minimum pool of 20,000 AF of storage in Lake Piru
- Hold over enough water in the lake in case the following year is a dry year.

In 2011 the volume of water released from SFD was 31,700 AF leaving 46,100 AF in the lake. The additional stored water was left due to the favorable groundwater conditions in the downstream basins and for the potential benefit to the basins if the following year was dry. This was prudent planning by United, as 2012 was a dry year.

In 2012 approximately 35,100 AF was released, which brought the lake storage to below minimal pool at 17,000 AF. This release was made knowing that 3,150 AF of inflow from State Water releases from Pyramid Lake would fill Lake Piru back up to minimum pool. The release in 2012 was a larger than normal release for a dry year due to the 24,500 AF of additional natural runoff stored from 2011 and the state water purchased from 2011 and 2012 totaling 5,670 AF (see accounting below for state water). Without the additional stored water from 2011 and the state water the release would have been less than 5,000 AF due to the minimal natural runoff from the dry year.

In 2013, the natural runoff that flowed into the lake totaled less than the mandated environmental bypass flows and evaporation from the lake. As a result the stored water in the lake was 17,000 AF (3,000 AF below minimum pool) without a conservation release. The basic hydrology for the past 3 years of inflows, outflows and storage in Lake Piru is shown in Figure 2.2-1.

Of the 31,700 AF released from Santa Felicia Dam in 2011, approximately 15,700 AF (50%) of the water directly percolated into the Piru and Fillmore basins (Upper basins). The remaining 16,000 AF either percolated into the Santa Paula basin or was diverted at the Freeman Diversion for groundwater recharge or surface water deliveries. In 2012, due to drier hydrologic conditions, more of the release water percolated into the Piru and Fillmore basins (estimated at approximately 22,200 AF (63%)). Figure 2.2-2 shows the response of the groundwater levels in the Piru Basin to the conservation releases in the recent past. Due to no release in 2013, water levels in the Piru basin continue to drop in the basin as seen in the Figure 2.2-2. As of December of 2013 water levels had dropped over 60 feet since the conservation release of 2011.

Table 2-1 shows estimates of the distribution of percolated flows in each basin during United's conservation releases since 1999. Both 2011 and 2012 releases were slightly more than the 16 year average of the releases in terms of total quantity of the release. The lowest volume released in the fifteen years prior to 2013 was in the dry year of 2004 at 12,200 AF. The last time prior to 2013 that there was no conservation release was during the drought in 1990. Figure 2.2-3 shows the 2012 conservation release and the associated direct benefit to each basin. Flow measurements were made near the Piru and Fillmore basin boundary to calculate the amount of water that percolated into the Piru Basin, and measurements were also made at Willard Rd. for the Fillmore/ Santa Paula basin boundary to calculate what percolated in the Fillmore Basin. The remaining discharge measured at Willard Rd. either benefits the Santa Paula Basin or is diverted at the Freeman Diversion ("Lower Basins" in following tables). Several surface water diversions exist in the Santa Paula basin, making it difficult to measure recharge to this basin. In 2010 and 2011 a detailed study was done in the Santa Clara River overlying the Santa Paula Basin. The study found that there was percolation in this reach and that the percolation was greater when groundwater levels in the alluvial aquifer were lower. (UWCD 2103c)

Table 2-1 Benefits of the SFD Conservation Release due to direct percolation

Year	Total Conservation Released from SFD AF	Direct Deliveries in AF. of SFD Release to:			
		Piru Basin	Fillmore Basin	Lower Basins (groundwater recharge)	Surface water Deliveries PTP and PV
1999	22,800	5,700	3,500	11,200	2,400
2000	47,200	13,800	6,100	24,150	3,150
2001	47,400	14,000	2,900	28,300	2,200
2002	20,200	8,000	5,100	6,530	570
2003	29,000	21,000	3,500	3,600	900
2004	12,200	8,000	2,150	1,600	550
2005	9,100	na	na	4,500**	0
2005	23,400	na	na	17,200**	150
2006	30,900	na	na	17,200**	1,600
2007	40,700	15,900	6,300	12,200	6,400
2008	44,400	15,400	5,700	17,400	5,800
2009	26,700	13,200	4,700	5,200	3,000
2010	33,000	14,500	4,800	10,700	3,200
2011	**31,700**	**12,400**	**3,300**	**14,100**	**1,600**
2012	**35,200**	**13,600**	**8,600**	**9,300**	**3,700**
2013	**0**	**0**	**0**	**0**	**0**
Average	28,369	11,962	4,358	11,449	2,201
16 yr. Total	453,900	155,500	56,650	183,180	35,220

*2005 had two conservation releases. Portion of the release includes spill water when the lake was full

** measured at the Freeman Diversion

2.2.4 IMPORTATION OF STATE WATER

Ventura County has a 20,000 AF allocation for State Water. United Water's share of the allocation is 5,000 AF. Port Hueneme Water agency uses 1,850 AF of the original 5,000 AF and takes delivery directly through Calleguas MWD. Up to 3,150 AF of water is permitted to be released from Pyramid Lake and sent to Lake Piru through the natural water course of Piru Creek. United may receive this water from November 1st through the end of February of each year. When available deliveries by DWR are less than United's full allocation, United has occasionally purchased a portion of either the City of Ventura's or Casitas Municipal Water District (CMWD) allocation to maximize the deliveries to the county. The purchase of the additional water along with United's State Water cannot exceed the conveyance limit of 3,150 AF in Piru Creek without additional environmental work to evaluate whether larger releases would not cause problems for endangered species in middle Piru Creek.

Typically, United's conservation release will end before the State Water has arrived in Lake Piru. In order to release the state water that year, United will continue the release below the lake's minimum pool to the volume of State Water that was purchased, knowing that the delivery of state water will fill the lake back to the minimum pool by the end of November. The State Water allows the conservation release to be extended a few extra days due to the extra volume of water. The volume of water that percolates into each basin on the extended days of the release is considered to be the direct benefit to each basin.

In 2011 the State Water Project made available 80% of water allocations held by subscribers to the system. United received its 80% (2,520 AF) by a release from Pyramid Lake in November and December of 2011. Due to the wetter than normal conditions United chose to store the State Water in Lake Piru until 2012 so that it could be delivered at the end of the conservation release along with the State Water purchased for 2012.

In 2012 the State Water Project made available 60% of the State Water allocations at the time of ordering the water. This gave United 1,890 AF of its total allocation of 3,150 AF. In order to increase its state water deliveries, United purchased 1,260 AF from CMWD to reach its full permitted amount it can convey down Piru Creek from Lake Pyramid.

The State Water component of United's 2012 conservation release consisted of 2,520 AF from 2011, 1,890 AF from United's 2012 allocation and 1,260 AF purchased from CMWD for a total of 5,670 AF. Discharge measurements at the basin boundaries showed that 3,900 AF (69%) of the released water passed the Piru and Fillmore basins to percolate into the Santa Paula Basin or be diverted at the Freeman Diversion for groundwater recharge or surface deliveries to the PV and PTP pipelines. The remaining 31% recharged the upper basins.

In 2013 the State Water Project made available 40% of its allocations. This gave United 1,102.5 AF of its total allocation of 3,150 AF. This time United attempted to purchase the difference between its conveyances limit of 3,150 AF and its potential delivery of 1,102.5 AF; however only an additional 1,140 AF of State Water from the City of Ventura was made available. This gave United and total of 2,242.5 AF that was delivered to Lake Piru in November of 2013. Due to the low lake levels a conservation release was not done this year, so the State Water remains in the lake until a future conservation release.

Table 2-2 is a summary of all the State Water purchased by United Water along with the direct benefits to each basin from percolation. Detailed stream flow measurements are taken near the basin boundaries throughout the releases to determine where the State Water is percolating.

Table 2-2 Summary of State Water Release from Santa Felicia Dam

	Summary of State Water Released From Santa Felicia Dam in 1991-2013 (Values in AF)				
Year State Water Purchased	From Santa Felicia Dam	Release to Upper Basins (Fillmore and Piru)	Releases to the Lower Basins (Santa Paula and Coastal Basins)	Delivered to PV. And PTP	Recharge To Lower Basins
1991	4,836	3,603	1,233	0	1,233
1992	988	84	904	0	904
2000	2,200	406	1,794	69	1,725
2002	3,150	1,455	1,695	192	1,503
2003	3,150	2,041	1,109	70	1,039
2004	4,047.5	3,348	700	228	472
2007	1,890	844	1,046	116	930
2008	1,980	673	1,307	306	1,001
2009	3,150	1,045	2,105	724	1,381
2010	3,150	917	2,233	559	1,674
2011	2,520*				
2012	3,150+2,520	1,770	3,900	1,097	2,803
2013	2,242**				
Total	34,212	16,186	18,026	3,361	14,665

* Released in 2012 conservation release

** Remains in the Lake at the time of the publication of this document

The benefit to groundwater levels in the Piru Basin of the conservation release along with the State Water released can be seen in Figure 2.2-2. Since November of 2007 a transducer has been recording water levels in a monitoring well near the Santa Clara River in the Piru Basin. The graph shows the immediate rise in water levels in a well during the releases (shown in red). Because the well is approximately 600 feet from the flow in the river, a groundwater mound will build rapidly when the release starts and dissipate a little more slowly at the end of the release. Water levels are always considerably higher following the release compared to the projected trends of water levels before the release.

2.2.5 PIRU DIVERSION EVALUATION

The Piru Diversion has historically been operated to divert surface water into United's nearby spreading grounds for groundwater recharge, however, this facility has not been operated since September of 2008. The diversion is located on the west bank of lower Piru Creek just south of the old Center Street Bridge in the town of Piru. Part of the diversion dam is built under the two roadway bridges crossing lower Piru Creek at Center Street.

The existing diversion consists of an earthen berm that extends out across the river channel, a sluice channel that can accommodate approximately 200 cfs, and a diversion structure with a trash rack and four 24-inch inlets leading to a 48-inch diversion pipe that conveys diverted water to the 44- acre spreading grounds.

The structure is not in compliance with National Marine Fisheries Service standards for diverting water in a stream that is considered by NMFS to constitute anadromous waters for Southern California steelhead. The diversion will not be put back into operation until the appropriate permits has been issued and the facility has been retrofitted.

2.2.6 FEDERAL ENERGY AND REGULATORY COMMISSION (FERC) LICENSED FLOWS IMPLEMENTATION

The original water rights license for Santa Felicia Dam requires a minimum release of 5 cfs or natural inflow, whichever is less. Due to the conditions in a new FERC license which was adopted in 2011, the bypass flows have now been changed to a minimum of 7 cfs. License conditions now require higher flows to maintain downstream habitat when the monthly cumulative precipitation is above the historic average measured at County Station 160, located at the guard station entering Lake Piru. Release migration flow requirements of 200 cfs are also in the license for fisheries migration in Piru Creek when the Santa Clara River has elevated flows due to storm runoff, and surface flows in the river are continuous from Piru Creek to the Santa Clara River estuary near Ventura Harbor. The trigger to initiate migration releases occurs when the USGS gauging station on the Santa Clara River near the Los Angeles County line measures over 200 cfs at 8:00 am and is expected to stay above 200 cfs through the following day. Migration flows are to continue as long as flows at the county line are over 200 cfs.

Based on recommendations from NMFS, FERC has also imposed license conditions on the rate at which United may decrease flows when ending conservation releases or environmental flows. Release ramping rates are to be adjusted so that water depths in Piru Creek never decreases more than two inches per hour. As an example ramping down the conservation release in fall 2011 took five days and a minimum of 25 adjustments to go from 300 cfs down to 7 cfs.

The FERC bypass flow plan was not adopted until late May 2011. In order to be in compliance with the new license requirements, a wet year habitat flow of a minimum of nine cfs was implemented on May 27, 2011 and maintained until October 1st. After October 1st minimum flows were decreased to 7 cfs until the appropriate triggers are met to change the flows.

Due to the below average rainfall in 2012 and 2013 the habitat flow trigger was never met so the minimum bypass flow of 7 cfs was maintained as the appropriate bypass flows. Additionally, the storm runoff, as measured at the USGS gage, on the Santa Clara River near the county line never met the trigger for the migration flows. Therefore no migration flows were released from Lake Piru. All of the additional water that was released from SFD for the habitat flows (7 cfs instead or 5 cfs or less) either percolated into the Piru basin or was used by downstream diverters.

2.2.7 SANTA CLARA RIVER FLOW DIVERSIONS

The Freeman Diversion diverted 92,600 AF from the Santa Clara River in 2011. This represents about 150% of the historical average diversions since 1955. In wet years such as 2011 various operational strategies were implemented to assure maximum yield at the diversion. Such strategies included limiting turbidity turn-outs, shifting the locations of spread water to reduce mounding near the river, alternating ponds to insure the maximum possible percolation rates, and implementing new SCADA controls to optimize canal levels. Some of these strategies are discussed below.

High flows in the river are normally associated with high turbidity. When the storm hydrograph is near its peak, diversions stop so that the sediment-laden water is not diverted. A recently implemented, more aggressive schedule to divert more turbid water allowed the facility to divert 2,000 to 3,000 acre feet more than it would have in prior years. This more aggressive turn-in procedure increases the use of the desilting basin, resulting in the need for more frequent cleanouts of accumulated sediment.

United's aggressive wet season spreading at Saticoy and the Noble Basin in 2011 increased water levels in the surrounding area to a point where groundwater from spreading in the Saticoy and Noble basins was discharging back to the river near the Highway 118 Bridge. Rising groundwater in this area reached around 50 cfs of discharge in the river in the month of April. The spreading ponds further away from the river were used to limit the amount of discharge back to the river. The discharging water is in large part due to the degradation in the riverbed near the Highway 118 Bridge. The riverbed is currently about 20 feet lower than it was in the early 1950's, resulting in a larger elevation differential between the ponds and the river. A portion of the discharging water will percolate downstream of the discharge point. The balance of the discharging river that breached the Forebay becomes part of the environmental flows that are required to maintain downstream passage for the Southern California Steelhead.

Nearly 72,000 AF were spread for groundwater recharge at United's three recharge facilities in 2011. El Rio recharged nearly half of the water, with Saticoy and the Noble Basins making up the other half (Figure 2.2-4). The remaining 20,600 AF went to surface water deliveries.

The dry years of 2012 and 2013, in contrast to the wet year of 2011, diverted only 37,000 AF and 10,200 AF, respectively, at the Freeman Diversion. The operational strategy of preferentially sending water to the ponds furthest away from the river when groundwater mounding and discharge occurs at the Saticoy and Noble Recharge basins was not applicable in the dry years of 2012 and 2013. The strategy in these years was focused on sending water preferentially to the El Rio spreading grounds to help alleviate the elevated nitrates concentrations observed in some of United's El Rio O-H well field Upper Aquifer wells. These elevated nitrates are commonly associated with the lower water levels that occur during dry periods. This strategy has been used effectively during past dry periods.

In 2012, approximately 20,800 AF were spread at United's three facilities, with El Rio receiving 78% (16,300 AF) and the remaining water spread at Saticoy and the Noble Pit. Combined agricultural surface water deliveries to the Pumping Trough pipeline (PTP), Pleasant Valley pipeline and the Lloyd-Butler diversion totaled to 16,200 AF.

In 2013 dry conditions were more severe than 2012, with only 4,000 AF spread at United's three facilities. 2,380 AF (60%) were spread at El Rio and the remaining water spread at Saticoy and the Noble Pit. The water spread at Saticoy and the Noble Pit was due to the recently adopted practice of turning in sediment-laden river water immediately after a storm. This water is preferentially spread at the Noble Basin because of the possibility of the sediment carried past the desilting basin clogging the ponds over time. Combined agricultural surface water deliveries to the Pumping Trough pipeline (PTP), Pleasant Valley pipeline and the Lloyd-Butler diversion totaled only 6,520 AF.

As a result of the small volume of water recharged to the Saticoy and Noble recharge basins in 2012 and 2013, groundwater levels did not mound to the surface at the recharge basins as they did in 2011, and as a result water did not discharge back into the Santa Clara River near the Highway 118 Bridge.

2.2.7.1 EL RIO RECHARGE BASIN

Recharge to El Rio in the wet year of 2011 exceeded the 59-year average in all months except for August. The total volume recharged was approximately 160% of average. El Rio becomes the preferred facility to recharge when mounding of water and discharge back to the river at the other facilities occurs. Due to the active O-H well field surrounding the El Rio facility, percolation rates are not reduced by groundwater mounding to the surface near the recharge basins.

Recharge to El Rio in 2012 was 69% of the 59-year average, while recharge in to El Rio in 2013 was 10% of the 59-year average. In 2012 and 2013 El Rio was the preferred facility for recharge because the water was needed to help alleviate elevated nitrates in some of the O-H well field upper aquifer wells.

Table 2-3 Recharge to El Rio for calendar years 2011, 2012 and 2013

Recharge to El Rio AF				
	2011 Year	2012 Year	2013 Year	average since 1955
Jan	3,776	1,968	1,036	2,651
Feb	3,617	1,525	1,028	3,061
Mar	5,283	1,295	317	3,383
Apr	6,070	3,610	0	2,678
May	2,188	1,198	0	1,986
Jun	2,594	20	0	1,018
Jul	1,459	0	0	842
Aug	224	0	0	1,106
Sep	2,283	725	0	1,562
Oct	4,370	3,964	0	1,744
Nov	3,520	85	0	1,523
Dec	2,461	1,903	0	2,134
Totals	37,845	16,293	2,381	23,688

2.2.7.2 NOBLE RECHARGE BASIN

The Noble Basin is normally the last of United's Forebay facilities to be used for groundwater recharge. It is difficult to maintain the ponds during the wet season due to greater pond water depths and proximity to shallow groundwater. During 2011, water was spread to this basin for a portion of four months during the natural runoff period, and two months during the conservation release. The spreading at this facility in 2011, at 10,679 AF, was nearly double the annual average since it was built in 1994.

In 2012 and 2013 the Noble basin was scarcely utilized, recharging 538 AF and 263 AF respectively. This limited amount of recharge to the Noble basin is typical for dry years when the El Rio and Saticoy Recharge basins are also underutilized.

Table 2-4 Recharge to the Noble Basin for calendar years 2011, 2012 and 2013

Recharge to Noble Basin AF				
	2011	2012	2013	average since 1994
Jan	766	197	263	271
Feb	2,507	0	0	723
Mar	2,259	97	0	1,150
Apr	4,305	244	0	1,252
May	0	0	0	549
Jun	0	0	0	389
Jul	0	0	0	188
Aug	0	0	0	97
Sep	0	0	0	135
Oct	137	0	0	145
Nov	705	0	0	151
Dec	0	0	0	166
Totals	10,679	538	263	5,216

2.2.7.3 SATICOY RECHARGE BASINS

The Saticoy facilities recharged 23,400 AF in 2011, which is about average for the 58-year period since construction of Lake Piru. As mentioned above, mounding occurred under the ponds and some recharged water was flowed back out to the river near the Highway 118 Bridge. Priority was given to the El Rio facility and the ponds furthest away from the river at this time in an attempt to decrease the amount of groundwater going back to the river.

In the dry years of 2012 and 2013, in contrast to the wet year of 2011, a much lower volume of water was recharged at Saticoy. In 2012 the Saticoy facility recharged 3,985 AF or 17% of the 59 year average. In 2013, a drier year than 2012, the Saticoy facility recharged only 1,395 AF or 6% of the 59-year average.

The lower volume of water recharged at Saticoy in 2012 and 2013 was due to the lower volumes of water in the Santa Clara River available for diversions at the Freeman Diversion. It was also was due to the prioritizing of both recharge to the El Rio facilities and the deliveries of surface water to the Pumping Trough and Pleasant Valley agricultural pipelines.

In 2012 and 2013 groundwater mounding did not reach the surface of the recharge basins at the Saticoy facility, and recharged water did not flow back to the river as it did in 2011.

Table 2-5 Recharge to Saticoy for calendar years 2011, 2012 and 2013

Recharge to Saticoy AF				
	2011	2012	2013	Average since 1955
Jan	7,608	30	436	2,155
Feb	1,946	0	159	2,419
Mar	2,208	0	158	3,247
Apr	4,478	318	235	2,975
May	265	0	222	2,297
Jun	164	0	67	1,411
Jul	0	559	117	1,200
Aug	0	308	0	1,045
Sep	816	345	0	1,409
Oct	5,041	2,364	0	1,935
Nov	909	0	0	1,248
Dec	0	61	0	1,635
Totals	23,435	3,985	1,395	22,977

2.2.7.4 ENVIRONMENTAL BYPASS FLOWS AT THE FREEMAN DIVERSION

The Freeman Diversion is operated to provide bypass flows for the upstream and downstream migration of the endangered southern California steelhead. State Water Rights Permit 18908 allows United to divert up to 375 cfs as long as 40 cfs is provided through the fish ladder for 48 hours after total river flow subsides below 415 cfs. These migration flow requirements are limited to storms that occur between February 15th and April 31st of each year, and are not to exceed an average annual loss of diversion of 500 AF. As part of the MSHCP development, United remains in consultation with National Marine Fisheries Service (NMFS) and is currently maintaining bypass flows to better meet the needs of the species for migration between the ocean and the Freeman Diversion. The current bypass flows are detailed in the 2009 and 2010 Freeman Diversion bypass flow plans. The flows are designed to increase the magnitude and extend the duration of the flows for upstream migration and to provide volitional passage for smolts to the estuary when conditions are favorable. While achieving the goals set forth for the migration of steelhead, diversions have been reduced since they have been implemented. United started implementing the bypass flow plans as detailed in the 2009 and 2010 plans in 2010 through 2011. The following is a summary of the operations in relation to the diversions for those years.

In 2010 four migration storms triggered the newly adopted bypass flows for upstream migration, allowing the ladder to run from late January to mid-March. United could have diverted an estimated 22,500 AF additional if the original water permit flow plan was implemented. A portion of the additional bypass flows percolated downstream in the riverbed overlaying the Forebay. The net loss of water to the basins for the 2010 migration season was estimated at 15,300 AF when considering percolation in the Forebay.

In 2011, three storms provided sustained flow in the Santa Clara River and allowed for the fish ladder to be in operation nearly continuously from February 19th to June 8th, 2011. An estimated 2,400 to 3,000 AF of water was used for fish migration flows that otherwise would have been used for groundwater recharge. However the losses could have been substantially more if United had the physical capabilities of diverting its full water right. Due to the high turbidity in the river and the mounding of the water, potential diversions allowed in the water license were rejected back to the river.

In 2012 there were three small storms that created only 8 days of targeted bypass flows. In the largest of the storms, two adult steelhead were observed ascending the fish ladder. In 2013 an estimated 2,700 AF was directed past the diversion although being a dry year much of this water percolated further downstream in the Forebay. The net estimated loss to the groundwater basins for 2012 was 1,000 AF.

In 2013 no storms produced enough runoff to initiate the bypass flows therefore all water during the year was diverted. The diversion was operated in compliance with the State Board water license, but migration requirements were not triggered.

Table 2-6 summarizes the loss in potential diversions and the total loss to groundwater basins with consideration of the additional percolation created downstream of the diversion. These bypass flows have only been implemented since 2010. Before 2010 different bypass flow regimes were implemented in accordance with the ongoing consultation with NMFS.

Table 2-6

Year	Loss in Potential Diversions due to additional bypass flows AF	Loss in Total recharge to Forebay AF
2010	22,500	15,300
2011	3,000	less than 1,000
2012	2,700	1,000
2013	0	0

2.2.8 PTP DELIVERY SYSTEM

The Pumping Trough Pipeline (PTP) delivers a combination of surface water diverted at the Freeman Diversion, Saticoy well field water, PTP Wells 1-5 and some water from OH wells 12 and 13 to help meet the demands on the pipeline. The total deliveries by the district to the system was nearly the same in recent years with (8,470 AF in 2011), (8,350 AF in 2012) and (8,610 AF in 2013).

In 2011 surface water diverted at the Freeman Diversion supplied nearly 90% of the demand on the PTP system. Flows were augmented by the Saticoy Well Field during the summer months and early in the rain season when the river flows were inadequate to meet demand. The peak demand on the PTP occurs in October during the establishment period for the strawberry crop. The conservation release from Lake Piru coincided with the peak demands to help reduce the amount of groundwater pumping in this area that would otherwise occur.

In 2012 the summer base flows in the river remained high, so about 75% of the demand was met by the surface water deliveries. The Saticoy well field and the PTP wells were used in the summer to help meet demands. Like in 2011, the conservation release from Lake Piru benefited the system during the peak demands in October.

In 2013 surface flows had diminished by March to a point where both the PTP wells and the Saticoy Well field were needed to augment flows. By September the Saticoy Well field was unable to produce any water because water levels had fallen to a point where the wells could no longer be operated. This put a larger burden on the PTP wells. By April of 2013 the district realized that it would not be able to meet peak demands during the month of October because of the lack of a conservation release from Lake Piru to help meet the demands. As a result the district asked the PTP customers to use their own wells, if able, during this peak demand period. In addition, the district used the OH wells 12 and 13 to help augment the flows to the PTP. As a result demands were met through the month of October due to the additional sources of water. The situation could have worsened if a Santa Ana wind event had occurred during the peak of the establishment period, driving up the demands on the system. In 2013 nearly two-thirds of the demands were met by groundwater pumping from the district's three different sources.

Figure 2.2-5 shows the percent of source water used for the PTP deliveries from 2011 through 2013.

2.2.9 PLEASANT VALLEY COUNTY WATER DISTRICT DELIVERIES

Supply to the Pleasant Valley County Water District (PVCWD) varies from year to year depending on the Freeman Diversion surface water supply. In 2011 when there was substantial surface water in the Santa Clara River the district was able to send over 12,000 AF of surface water augmented with a small amount from the Saticoy Well field. By 2013 when surface water was very limited for diversions the district was only able to deliver a little over 3,000 AF. Figure 2.2-6 shows the yearly total of deliveries to PVCWD. The graph differentiates the two different source of water delivered (surface water diversions and the Saticoy well field). Below is a table showing the total amount delivered in each year, along with the percent of total diversions. As mentioned in section 1.4.6.2, the district is required to deliver a minimum of 12.22 % of the total diversions to PVCWD on an annual basis.

Table 2-7. Percent of Freeman diversions delivered to PVCWD

	Total delivered to PVCWD AF	Percent of Total Diversions
2011	12,300	13.30%
2012	9,670	23.10%
2013	3,060	30.00%

2.2.10 SATICOY WELL FIELD USAGE AND CREDIT SYSTEM BALANCE

In conjunction with the conservation releases from Santa Felicia Dam, United temporarily stores water beneath the Saticoy Spreading Ground for later pumping and delivery to the overdrafted areas of the Pleasant Valley and Oxnard Plain basins. United constructed the Saticoy well field in 2004, allowing the pumping of mounded groundwater for delivery to the PV and PTP systems. The Fox Canyon Groundwater Management Agency thereafter adopted a resolution that created a pump- back storage program of the Saticoy spreading system and its well field usage. Recharged water from a Lake Piru conservation release can be pumped back from Saticoy for a period of two years. At the end of the two years the storage credits expire. Below is a table showing the history of the credit/ balance of this system. To date an additional 33,400 AF have been stored during the conservation releases at Saticoy, with a total of 11,616 AF extracted for deliveries to the PV and PTP irrigation delivery systems. The credit system does not include State Water. As of October of 2013, water levels at the well field have fallen below the pumps, so the wells are currently not being used. The credit system would still allow the extraction of 1,552 AF for 2014, although due to no release in 2013 and no release anticipated in 2014, the two-year credit system will have expired all credits until a release of suitable size stores additional water beneath the Saticoy Spreading Grounds.

Table 2-8 Credit system for the Saticoy Well Field

	Start of the year			End of the year	
Calendar Year	First year Storage*	Second year Storage	Total extractions to Surface water deliveries	Remaining second year Storage to expire	Remaining First year Storage
2007	7,846	0	1,753	0	6,093
2008	4,711	6,093	3,845	2,248	4,711
2009	8,715	4,711	2,455	2,256	8,715
2010	2,414	8,715	759	7,956	2,414
2011	2,221	2,414	737	1,677	2,221
2012	5,974	2,221	1,590	631	5,974
2013	1,552	5,974	477	5,497	1,552
2014	0	1,552			

* Water stored in the prior year's conservation release.

2.2.11 CASTAIC LAKE FLOODFLOW RELEASE

United is the lead member of a water conservation agreement between the California Department of Water Resources and the Downstream Water Users (DWU). The DWUs consist of United, Los Angeles County, Newhall Land and Farming, and Valencia Water District. The program is designed to hold back flood flows in Castaic Lake and release them at a later date in a manner that allows the flows to percolate in the basins downstream of the dam, benefiting the DWU's. United takes the lead role for the DWUs in requesting the storage and releases, and by monitoring the associated release to make sure that the flows are benefiting the basins. In 2011 approximately 11,000 AF of captured flood flows were released. Most of the released water percolated into the Piru Basin with some of it making it to the Fillmore Basin. Figure 2.2-7 shows the water level increase in a key well in Piru Basin during the release. Figure 2.2-8 shows the inflows/outflows from Castaic Lake in 2011. Due to the dry conditions in 2012 and 2013, no flood flows were retained for a later controlled release.

2.2.12 BOUQUET RESERVOIR RELEASES

United has an agreement with the Los Angeles Department of Water and Power (LADWP) that provides for the release of flow from Bouquet Reservoir to recharge the aquifers of the Santa Clara River Valley to the extent that they were recharged from the Bouquet Canyon watershed prior to construction of the reservoir. The agreement stipulates that LADWP release between 2,100 and 2,194 acre feet per year. This quantity is based on historical annual inflows to the reservoir. The agreement requires a continual release of 5 cfs between April 1st and September 30th; and 1 cfs between October 1st and March 31st of each year.

The prescribed flows were interrupted following an extreme weather event in 2005 that raised the streambed elevation and pushed it toward Bouquet Canyon Road. In several locations the stream is higher than the road and on occasion stream flows have entered the road, posing a threat to public safety. When water is observed on the road, flows from Bouquet Reservoir are reduced. To complicate matters, this area of Bouquet Creek is designated critical habitat for unarmored three-spine stickleback, and flow changes require special consideration for this species. United has been participating in the stakeholders meetings to ensure that the deficit of water will eventually be released. As of November 2013 the total deficit of releases has reached 5,540 AF.

3 HYDROGEOLOGY OF DISTRICT

United Water Conservation District overlies all or portions of eight groundwater basins in central and southern Ventura County. The geologic setting of the basins, the regional aquifers, and some characteristics of each basin are discussed in this section. Discussion related to 2013 conditions in the various basins are included in Chapter 4 of this report.

3.1 GEOLOGIC SETTING

The groundwater basins within United's district boundaries are part of the Transverse Ranges geologic province where the mountain ranges and basins are oriented east-west rather than the typical northwest-southeast trend of much of California. The geology associated with the Transverse Ranges is primarily east-to-west trending folds and faulting (fold axes trend east-west). This configuration creates the elongate mountains and valleys that dominate Santa Barbara County and Ventura County.

The boundaries of United Water Conservation District are located within the more regional Ventura Basin, which is an elongate east to west trending structurally complex syncline within the Transverse Range province (Yeats, et. al., 1981). The seven sub-basins of the Ventura Basin that underlie the District are the Piru, Fillmore, Santa Paula, Mound, Oxnard Forebay, Oxnard Plain, and Pleasant Valley basins (Figure 1-1). The western portion of the West Las Posas Basin also falls within the District boundary. All the sub-basins are share hydrologic connection (CA DWR, 1980; Hanson et al, 2003), and the common vernacular is to use the shorter term "basins" rather than sub-basins.

The Santa Clara River Valley occupies the Ventura Basin, which is one of the major sedimentary basins in the geomorphic province. The total stratigraphic thickness of upper Cretaceous, Tertiary, and Quaternary strata exceeds 55,000 feet (Sylvester and Brown, 1988). Only the uppermost portions of these deposits, however, contain fresh water.

Active thrust/reverse faults border the basins of the Santa Clara River Valley, contributing to the uplift of the adjacent mountains and down-dropping of the basins. The Piru, Fillmore, and Santa Paula basins are bounded by the Oak Ridge fault to the south and the San Cayetano fault system to the north. The Oxnard Plain and Mound basins extend across the offshore marine shelf to the shelf/slope break (the edge of the shelf).

The basins are filled with substantial amounts of Tertiary and Quaternary sediments that were deposited in both marine and terrestrial settings. The basins on the coast, including the Mound basin, are filled with recent sediments deposited on a wide delta complex that formed at the terminus of the Santa Clara River. Figure 3.1-1 shows the local formations which form the mountain ranges, surface/subsurface geology, and the major faulting in relation to the eight sub-basins within United's district boundary.

3.2 AQUIFERS

Most of the coastal basins within United Water Conservation District have a shallow perched aquifer zone, and the aquifers of all the basins can be classified as part of an Upper Aquifer System (UAS) and Lower Aquifer System (LAS) (e.g., Turner, 1975; Mukae and Turner, 1975). The UAS consists of the Oxnard and Mugu aquifers. The LAS consists of the Hueneme, Fox Canyon and Grimes Canyon aquifers. The aquifers contain gravel and sand deposited along the ancestral Santa Clara River, from alluvial fans along the flanks of the mountains, from a coastal plain/delta complex at the terminus of the Santa Clara River, and marine deposits from transgressional seas. The aquifers are recharged by infiltration of streamflow (primarily the Santa Clara River), artificial recharge of diverted streamflow, mountain-front recharge along the exterior boundary of the basins, direct infiltration of precipitation on the valley floors of the basins and on bedrock outcrops in adjacent mountain fronts, the percolation of reclaimed water from sanitary sewers and irrigation return flow in some agricultural areas.

Figure 3.2-1 is a schematic of the UAS and LAS showing their subsurface sequence. The figure also shows general depths in feet. However, more recent work with geophysical logs has suggested that some of the aquifers are actually deeper than originally thought and indicated on this schematic. Also note that the clay layers (aquitards) shown in the UAS are inter-fingering and in some places discontinuous.

3.2.1 PERCHED/SEMI-PERCHED

On the Oxnard Plain, the uppermost silt and clay deposits of the Oxnard aquifer are overlain by sand layers of the "semi-perched zone," which generally contains poor-quality water. This zone extends from the surface to no more than 100 ft in depth. The confining clay of the upper Oxnard aquifer generally protects the underlying aquifers from contamination from surface land uses. Deep percolation of rainfall and irrigation return flows are the major components of recharge to the semi-perched aquifer. Although difficult to quantify, there is likely some vertical leakage of water between this semi-perched aquifer and underlying confined aquifer units. The semi-perched zone is rarely used for water supply on the Oxnard Plain.

3.2.2 UPPER SYSTEM

The Upper Aquifer System (UAS) consists of the Oxnard and Mugu aquifers. These aquifers are characterized by recent alluvium (Oxnard aquifer) of Holocene age and older alluvium (Mugu aquifer) of late Pleistocene age. The Oxnard aquifer rests unconformably on the Mugu aquifer. A clay layer commonly occurs between the two aquifers.

Recent river channel deposits comprise the uppermost water-bearing units along portions of the Santa Clara River basins. These deposits are generally up to 100 ft in thickness. In the Santa Paula basin, water level records from nested monitoring wells indicate that this upper alluvial aquifer is somewhat isolated from the underlying aquifers of the San Pedro formation. The alluvial unit, from which there is considerable water production in the Santa Clara River basins, may be time-equivalent to portions of the UAS on the Oxnard Plain, but has not been assigned to the UAS in the literature.

3.2.2.1 OXNARD

The Oxnard aquifer materials generally consist of lagoonal, beach, river, floodplain and alluvial fan deposits (Turner, 1975). The Oxnard aquifer is present throughout the Oxnard Plain and other basins. The Oxnard aquifer is the primary aquifer used for groundwater supply on the Oxnard Plain. This highly-permeable assemblage of sand and gravel is generally found at a depth of approximately 100 ft to 250 ft below land surface elevation.

3.2.2.2 MUGU

The Mugu aquifer materials generally consist of lagoonal, beach, river, floodplain, alluvial fan terrace and marine terrace deposits. The Mugu aquifer rests unconformably on the LAS. Basal conglomerates occur in many areas (Hanson et al, 2003). In the Oxnard Plain, these coarse-grained basal deposits comprise the Mugu aquifer (Turner, 1975). The Mugu aquifer is generally penetrated at a depth of 255 ft to 500 ft below land surface.

3.2.3 LOWER SYSTEM

The Lower Aquifer System (LAS) consists of the Grimes Canyon, Fox Canyon, and Hueneme aquifers (Figure 3.2-1). The LAS is part of the Santa Barbara, San Pedro, and Saugus formations of Plio-Pleistocene age (Mukae and Turner, 1975).

In any of the basins, the aquifers of the LAS may be isolated from each other vertically by low-permeability units and horizontally by regional fault systems. The LAS is folded and tilted in many areas, and has been eroded along an unconformity that separates the Upper and Lower Aquifer Systems.

3.2.3.1 HUENEME

The Hueneme aquifer is considered to underlie the Oxnard Plain basin (Hanson et al, 2003). The Hueneme aquifer materials generally consist of terrestrial fluvial sediments, and marine clays and sands. In the basins along the Santa Clara River, the deeper aquifer system is generally considered to be the San Pedro Formation (Mann, 1959) or the time-equivalent Saugus Formation, although the U.S. Geological Survey considers this deeper aquifer to be equivalent to the Hueneme aquifer (Hanson et al, 2003).

3.2.3.2 FOX CANYON

The Fox Canyon aquifer underlies the Las Posas, Pleasant Valley, Oxnard Forebay and Oxnard Plain basins. The Fox Canyon aquifer materials generally consist of marine shallow regressive sands and some clays. The Fox Canyon aquifer is the lower unit in the San Pedro formation. This same unit also extends north into the Mound basin, but the character of the sediments change to more finely-bedded deposits (UWCD, 2012).

3.2.3.3 GRIMES

The lowest water-bearing unit of the East Las Posas and Pleasant Valley basins is commonly referred to as the Grimes Canyon aquifer (CA DWR, 1954; Turner, 1975). The Grimes Canyon aquifer materials generally consist of marine shallow regressive sands.

3.3 GROUNDWATER BASINS

The groundwater basins within the District vary in their water production and ability to be recharged rapidly. The groundwater basins detailed here are really sub-basins of the larger basin of the Santa Clara River Valley (CA DWR, 2003). Hydraulic connection exists between all basins within the District boundaries. The Fillmore basin receives recharge as underflow from the Piru basin, and the Santa Paula basin receives significant recharge from the Fillmore basin. Often, a component of the flow between basins occurs as surface water around the sub-basin boundaries. The Mound basin receives recharge from the Santa Paula basin as well as from the Oxnard Plain and Oxnard Forebay basins, although head differentials across the western Santa Paula basin boundary are greater than those between the other sub-basins of the Santa Clara River valley. The Oxnard Forebay basin is widely recognized as the primary recharge area for aquifers in the Oxnard Plain. Many of the confining clays present in the aquifer systems of the Oxnard Plain are absent or discontinuous in the Oxnard Forebay basin, creating a window for recharge to other down-gradient aquifers. High groundwater elevations in and near the Oxnard Forebay promote groundwater flow to the nearby Mound and West Las Posas basins. The Pleasant Valley basin is more distant from the Oxnard Forebay and receives less direct benefit from United's recharge operations, but pipelines have been constructed to convey irrigation water directly to water users in Pleasant Valley and on the southern Oxnard Plain.

3.3.1 PIRU

The Piru basin consists of recent and older alluvium underlain by San Pedro (Saugus) Formation. The recent and older alluvium is made up of coarse sand and gravel that are present to a depth of approximately 60 to 80 feet throughout the basin. The San Pedro Formation consists of permeable sand and gravel and extends to a depth of approximately 8,000 feet. Two faults bound the Piru basin, the Oak Ridge fault to the south and the San Cayetano fault to the north (UWCD, 1996b).

Groundwater flow in the alluvium of the Piru basin tends to be westerly, parallel to the river channel. Similarly, the flow gradient in the San Pedro Formation is westerly with a small north/south component as the groundwater moves parallel to the axis of the syncline that forms the basin. The basin is considered to be an unconfined groundwater basin. The Santa Clara River and Piru Creek are major sources of recharge to the Piru basin, with minor sources from smaller streams, from outcrops to the north of the basin, and from percolation of rainfall. United occasionally operates the Piru Spreading Grounds, a 44-acre recharge basin which diverts water from Piru Creek for groundwater recharge. The Piru basin readily accepts large volumes of recharge as surface water percolates to groundwater in the channel of the river. During United's conservation releases from Lake Piru a significant percentage of flow infiltrates through the river channel and serves to recharge the Piru basin.

Under low-flow conditions (up to approximately 100 cfs), all of the surface flow of the Santa Clara River coming from Los Angeles County commonly infiltrates into the Piru basin above the confluence of Piru Creek, so that there is no continuity of river flow across the basin. Continuous surface flow may extend the length of the basin following large winter storms, during large releases from Castaic Lake, and in the winter and early spring of exceptionally wet years. A lengthy "dry gap" of approximately five miles commonly exists in the central portion of the Piru basin, extending from the point of complete percolation of surface water east of Piru Creek to areas near the downstream end of the basin. During United's conservation releases flows ranging from 100-200 cfs are often required to establish surface flow between Piru Creek and the west end of the basin. In the area west of Hopper Creek groundwater flow is constricted as the basin narrows and shallow groundwater intersects the river channel. This "rising groundwater" contributes or restores surface flow in the river near the west end of the basin. When groundwater levels in the Piru basin are high, the area of rising groundwater extends farther east than in drier times, and the total flow of the discharge to surface water is greater. At the lower end of the Piru basin, a significant amount of groundwater flows into the Fillmore basin as underflow (Mann, 1959).

The channel of the Santa Clara River stays along the basin's southern edge over the length of the basin, likely secured in that position by the alluvial fans of Piru and Hopper Creeks entering the basin from the north. Chloride impacts associated with wastewater discharges sourcing from Los Angeles County over the past decade are now observed in wells along the northern portions of the middle of the basin. The northerly extent of these chloride impacts suggests the primary groundwater flow paths down the basin are north of the modern river channel. Groundwater flow paths are likely influenced by both geologic structure within the basin and the extraction of groundwater in the northern portions of the basin.

3.3.2 FILLMORE

The Fillmore basin consists of varying alluvial deposits resting on the San Pedro Formation. The younger alluvial deposits comprise recent sands and gravels of the Santa Clara River and Sespe Creek in the southern and eastern parts of the basin. Southward-sloping alluvial fan material forms the Sespe uplands in the north-central portion of the basin, and alluvial fan material of the Pole Creek Fan underlies the City of Fillmore (UWCD, 1996b). Alluvial thickness varies from about 60 to 120 ft. The San Pedro Formation, folded into an east-west syncline, underlies most of the Fillmore basin. Along the main axis of the syncline, the San Pedro Formation reaches a depth of 8,430 feet. At the western basin boundary, the San Pedro Formation extends to a depth of 5,000 to 6,000 feet.

The groundwater flow gradient in the Fillmore basin generally creates an east-to-west movement of groundwater through the alluvium. Groundwater that infiltrates from Sespe Creek generally flows towards the southwest. In the San Pedro Formation, the movement of groundwater is believed to be southerly beneath the Sespe fan, changing to westerly near the axis of the syncline. The basin is considered an unconfined groundwater basin. The Santa Clara River and Sespe Creek are two major sources of recharge to the Fillmore basin, as is underflow from Piru basin. As with the Piru basin to the east, the Fillmore basin readily recharges in years of abundant rainfall and streamflow.

The Fillmore basin narrows at the downstream end, resulting in an extensive area of rising groundwater and gaining flow in the Santa Clara River. Extensive wetlands exist in this area, and are easily visible on aerial photographs. Groundwater underflow into the Santa Paula basin is likely significant, although some suggest surface flow related to rising groundwater comprises a larger component of the discharge from the basin (Mann, 1959).

3.3.3 SANTA PAULA

The Santa Paula Basin is located along the Santa Clara River, extending from approximately Kimball Road and the town of Saticoy in the west to Santa Paula Creek in the east. The basin is bounded by the Sulphur Mountain foothills on the north and South Mountain on the south. The basin is elongated in a northeast-southwest direction, about 10 miles long and as much as 3.5 miles wide. The surface area of the basin is approximately 13,000 acres, and ranges in elevation from 130 feet above sea level near Saticoy to 270 feet above sea level near the City of Santa Paula.

Ongoing uplift along the Oak Ridge and other faults has created a deep basin, with Plio-Pleistocene deposits exceeding 10,000 feet in thickness.

The principal fresh water-bearing strata of the Santa Paula Basin are the Pleistocene San Pedro Formation, Pleistocene river deposits of the ancient Santa Clara River, alluvial fan deposits shed from the uplifted mountain blocks, and recent river and stream sediments deposited locally along the Santa Clara River and its tributaries. These water-bearing sediments are underlain by relatively impermeable Pliocene and older units. The sediments of the basin have been warped into a syncline that is oriented in a northeast-southwest direction along the center of the basin. To the east, the Santa Paula Basin has hydraulic connection with the Fillmore Basin. To the south, the Oak Ridge fault forms a partial barrier to groundwater movement. To the north, the portion of the aquifer represented by the San Pedro Formation is exposed in an outcrop along the Sulphur Mountain foothills. The Santa Paula basin borders the Oxnard Forebay and Mound basins on the west. The western boundary of the Santa Paula Basin is more complex, with local uplift and faults mapped by some investigators. Although there is general agreement that there is some hydraulic connection between Santa Paula Basin and the Mound Basin, the degree of connection is uncertain.

Long-term records of groundwater elevations within the Santa Paula basin demonstrate that the basin has a more muted recharge response to wet years than the Piru and Fillmore basins to the east. Much of the recharge likely occurs in the eastern portion of the basin (Santa Paula Basin Experts Group, 2003). Groundwater levels in many wells in the central and western portions of the basin show significant seasonal variability (UWCD, 2013b), suggesting some degree of confinement. During high rainfall years, monitor wells in the southern portion of the basin near the Freeman Diversion, and historically some other wells near Saticoy, have shown artesian flow. The complex subsurface geology in the western portion of the basin complicates interpretations of groundwater flow in this area.

3.3.4 MOUND

The principal fresh water-bearing strata of the Mound basin are the upper units of the San Pedro Formation and overlying Pleistocene deposits that are interpreted to be correlative with the Mugu aquifer of the Oxnard Plain basin. There is an upper confining layer of Pleistocene clay approximately 300 feet in thickness. The basin extends several miles into the offshore.

The sediments of the basin have been warped into a syncline that is oriented in an east-west direction that roughly follows Highway 126. Structural disruption along the Oak Ridge fault in the southern portion of the basin has resulted in considerable uplift and erosion of the San Pedro and younger sediments. This disruption is the cause of the topographic "mounds" near the intersection of Victoria Avenue and U.S. 101, for which the basin is named. The Montalvo anticline has traditionally been used to define the southern extent of the basin. These structural features generally offset only the deeper LAS units of the adjacent Oxnard Plain. The deposits of the Upper Aquifer System overlie the faults and folds along the southern margins of the basin, but the character of the deposits change as they extend to the north, becoming more finely bedded and fine-grained (UWCD, 2012b).

The limited number of wells in the Mound basin, especially in the northern half of the basin, complicates efforts to ascertain the primary sources of recharge to the basin. There likely is some component of recharge from precipitation falling on aquifer units that outcrop in the hills along the northern margin of the Mound basin (Figure 3.1-1), but no wells exist to provide evidence of this occurrence. There is general agreement that the basin benefits from recharge from the Oxnard Forebay and Oxnard Plain to the south, especially during periods of high water level on the Plain (GTC, 1972; Fugro, 1996; UWCD 2012b). The hydrogeologic boundaries of the Mound basin are not coincident with the structural boundaries of the basin, so there is hydrologic connection between the Mound basin and adjoining groundwater basins (UWCD, 2012b). The amount of recharge from the Santa Paula basin to the east is also unclear, but high heads in some wells in the eastern Mound basin suggests some degree of connection and recharge. Mann (1959) suggested that there is little underflow from the Santa Paula basin to the Mound basin, although more recent studies suggest it may be significant (Fugro, 1996; UWCD, 2012b).

Groundwater flow in the Mound basin is generally to the west and southwest with modest to weak gradients, especially in times of drought. The poor distribution and limited number of wells with water level records complicates efforts to contour groundwater elevations in the basin. During periods of drought and increased pumping, a pumping trough forms along the southern portion of the basin that significantly modifies groundwater gradients.

3.3.5 OXNARD FOREBAY

Both UAS and LAS aquifers are present in the Oxnard Forebay and Oxnard Plain basins. The Oxnard Forebay maintains direct hydraulic connection with confined aquifers of the Oxnard Plain basin, which extends several miles offshore beneath the marine shelf where outer edges of the aquifer are in direct contact with seawater. In areas near Port Hueneme and Pt. Mugu where submarine canyons extend nearly to the coastline, the fresh-water aquifers may be in direct contact with seawater a short distance offshore.

The Forebay is the main source of recharge to the Oxnard Plain basin. Recharge to the Forebay benefits other coastal basins (Mound, West Las Posas, Pleasant Valley) but a majority of the water recharged to the Forebay flows downgradient to the confined aquifers of the Oxnard Plain. The shallow sediments of the basin are dominated by coarse alluvial deposits of the ancestral Santa Clara River. The absence of low-permeability confining layers between surface recharge sources and the underlying aquifers in the Forebay allow rapid groundwater recharge in the Forebay. The recharge to the Forebay comes from percolation of Santa Clara River flows, artificial recharge from United's spreading basins, irrigation return flows, percolation of rainfall, and likely lesser amounts of underflow from the Santa Paula basin and mountain-front recharge from the nose of South Mountain. In the area of the Forebay between the El Rio and Saticoy spreading grounds, the LAS has been uplifted and truncated along its contact with the UAS. In this area recharge from surface sources may enter both the UAS and the underlying LAS. The U.S. Geological Survey estimates that about 20% of the water recharged to this area reaches the LAS, with the remainder recharging the UAS. In some areas of the Forebay significant clays are present among the deposits of the LAS.

3.3.6 OXNARD PLAIN

The Oxnard Forebay is hydraulically connected with the aquifers of the Oxnard Plain basin, which is overlain by an extensive confining clay layer. Thus, the primary recharge to the Oxnard Plain basin is from underflow from the Forebay rather than the deep percolation of water from surface sources on the Plain. Natural and artificial recharge to the Forebay serves to raise groundwater elevations in this up-gradient area of the groundwater flow system for the Oxnard Plain. Changes in the volume of groundwater in storage in the Forebay changes the hydrostatic pressure in the confined aquifers extending from the margins of the Forebay to the coastal and offshore portions of these continuous aquifer units. High water levels in the Forebay are desirable, as they are required to maintain offshore pressure gradients from the Forebay to coastal areas. While the physical movement of groundwater out of the Forebay is fairly slow, the pressure response in the confined aquifers distant from the Forebay responds more rapidly to significant recharge events in the Forebay. When groundwater levels are below sea level along the coastline, there can be significant recharge by seawater flowing into the aquifers.

Vertical gradients also commonly exist between aquifer units on the Oxnard Plain, resulting in some degree of water movement through low-permeability units that occur between most of the major aquifers. When LAS water levels are substantially lower than UAS water levels (creating a downward gradient), there may be substantial leakage of UAS water into the LAS through the various aquitards that separate the aquifer units. Likewise, a downward pressure gradient can exist between the Semi-perched aquifer and the Oxnard aquifer when heads in the shallow confined Oxnard aquifer are lowered (either regionally by drought conditions or locally by pumping wells). The movement of poor quality water from the semi-perched zone to the Oxnard aquifer has been documented in some locations, with abandoned or improperly constructed wells being a notable pathway for this downward flow (Izbicki, 1992; Stamos et al, 1992).

The highly-permeable deposits of the UAS are relatively flat lying across approximately the upper 400 feet of the Oxnard Plain. In the northern Oxnard Plain heads are often similar in the Oxnard and Mugu aquifers, but heads in the Mugu aquifer are considerably deeper in the greater area surrounding Mugu Lagoon. Deposits of the LAS are generally finer-grained and have been deformed by folding and faulting in many areas. An uneven distribution of pumping, along with structural and stratigraphic changes within the deposits of the LAS result in varied heads among the deep wells across the Oxnard Plain and Pleasant Valley.

3.3.7 PLEASANT VALLEY

The Pleasant Valley basin is bounded to the south by the Santa Monica Mountains, to the north by the Camarillo Hills, and to the west by the Oxnard Plain. The Bailey fault runs along the base of the Santa Monica Mountains, and the Camarillo fault along the Camarillo Hills to the north.

The Pleasant Valley basin is differentiated from the Oxnard Plain basin by a general lack of productive UAS aquifers (Turner, 1975). The UAS is composed of alluvial deposits about 400 feet thick. In Pleasant Valley much of the UAS is fine grained and not extensively pumped for water supply (Turner, 1975; Hanson et al, 2003). UAS deposits in the Pleasant Valley basin are comprised of sediments sourcing from the Calleguas Creek watershed, a much smaller drainage than that of the Santa Clara River which deposited the UAS deposits on the Oxnard Plain.

The LAS is composed of the Hueneme, Fox Canyon, and Grimes Canyon aquifers to a depth of about 1,400 feet. The Hueneme aquifer is composed of alternating layers of sand and finer grained deposits. The Fox Canyon and Grimes Canyon aquifers are composed of thick sequences of relatively uniform marine sand. The Fox Canyon aquifer is the major water-bearing unit in the basin.

In Pleasant Valley the LAS is surrounded and underlain by partly consolidated marine deposits and volcanic rocks. Marine deposits are present in the Camarillo Hills and in the western edge of the Santa Monica Mountains near the coast. As a result of faulting and uplift of the underlying marine deposits near Mugu Lagoon the LAS is not hydraulically connected to the Pacific Ocean in this area (Izbicki, 1996a; Hanson et al., 2003). Volcanic rocks consisting of basalts, submarine volcanic flows, and debris flows are present in the Santa Monica Mountains along the southern edge of the valley (Weber et al., 1976). The underlying marine deposits and volcanic rocks both contain high-chloride water.

Under predevelopment conditions groundwater movement in the UAS and LAS was likely from recharge areas in the eastern part of Pleasant Valley toward the Oxnard Plain to the southwest. The LAS in Pleasant Valley appears to be fairly isolated from sources of recharge, and the time since recharge of the ground water ranges from 3,000 to more than 6,000 years before present (Izbicki, 1996b). Groundwater age increases with depth and water within deeper aquifers has contacted aquifer material longer, reacting to a greater extent with these materials than water in overlying aquifers. Over the past two decades water levels in two wells in northern Pleasant Valley have recovered more than 250 feet. The re-establishment of surface flow in Arroyo Las Posas that subsequently percolates at the northern margin of the basin is now recognized as a source of recharge to the basin. The degree to which this large recharge mound serves to recharge the central portion of the basin is not well established. The City of Camarillo is proposing construction of a large-scale desalter to treat and utilize this water which tends to be more mineralized than the older water native to the basin.

High-chloride concentrations are present in water from wells throughout Pleasant Valley, especially along the southern edge of the valley near the Bailey Fault. Wells yielding high-chloride water in this area may have been drilled too deep and directly penetrate deposits having high-chloride water, or brines may have invaded deep freshwater aquifers from surrounding and underlying deposits as a result of pumping. Regardless of the source, changing hydraulic pressure as water levels within the Lower Aquifer System decline as a result of pumping wells, especially during dry periods, may increase chloride concentrations in water produced from deeper wells if the proportion of high-chloride water yielded to the well from underlying deposits increases (Izbicki et al., 2005a). Chloride concentrations in water from deep wells in the Pleasant Valley basin tend to increase during dry periods when ground-water pumping increases. Conversely, chloride concentrations generally decrease during wetter periods when alternative sources of irrigation water are available from surface supplies and groundwater pumping decreases. In addition to water from surrounding and underlying rocks, irrigation return flow also may contribute to high chloride concentrations in deep wells that are partly screened in the Upper Aquifer System. More recently, groundwater recharge from Arroyo Las Posas in the northern portion of the basin has been recognized as an additional source of salt in the basin.

3.3.8 LAS POSAS

The West Las Posas basin lies adjacent the northeast Oxnard Plain in the area south of South Mountain and north of the Camarillo Hills. The basins generally consists of a broad alluvial plain sloping to the south, and is drained by Beardsley Wash which flows west around the Camarillo Hills. Only the western portion of the West Las Posas basin lies within United's District boundary. Tree crops are the dominant land use in this agricultural area. Much of this area is served by groundwater imports from the Oxnard Plain, but some agricultural pumping is reported from deep wells near Beardsley Wash and other wells along the South Mountain foothills.

Most groundwater production in the West Las Posas basin is from deposits of the San Pedro Formation. Beneath most of the Las Posas Valley, the upper San Pedro Formation consists of low permeability sediments with lenses of permeable sediments which are age-equivalent to Hueneme Aquifer on Oxnard Plain (DWR, 1975). The permeable lenses form isolated, yet, locally important water sources. The water-bearing zones in the upper San Pedro Formation are not well connected. Some recharge to the deeper Fox Canyon aquifer may source from downward leakage from the upper San Pedro Formation. Many wells in the Las Posas Basin are perforated in the Fox Canyon aquifer, making it the principal water-bearing unit (Mukae, 1988). The Fox Canyon aquifer is exposed almost continuously along the southern flank of South Mountain. South of the outcrop, beds of the Fox Canyon aquifer dip below the valley and are folded into a series of anticlines and synclines. Groundwater in the Fox Canyon aquifer exists under confined conditions beneath the valley and unconfined conditions at the valley margins where the aquifer is folded upward and exposed at the surface. Much of the groundwater recharge to the western portion of the West Las Posas basin is believed to source from the Oxnard Plain. Minor amounts of recharge are derived likely from infiltration of precipitation and runoff in the outcrop areas.

4 ANNUAL HYDROLOGIC CONDITIONS

This section details the range of hydrologic conditions observed throughout United's district boundaries in the year 2013. While the emphasis is placed on surface water and groundwater conditions over the past year, some discussion is devoted to the comparison of recent conditions to conditions documented in the historical record. Rainfall totals were well below normal in both 2012 and 2013, and significant storms have not visited the region since March 2011. The basins of the district have responded to these unusually dry conditions.

4.1 PRECIPITATION AND EVAPOTRANSPIRATION

United participates in data collection in partnership with the Ventura County Watershed Protection District's three rainfall gages, two of which are also evaporation stations. The VCWPD maintains approximately 125 gages around the county (Figure 4.1-1). United's gages are located at the field offices in Saticoy, El Rio, and at the guard station at the Lake Piru. United also maintains records from the gage at the office in Santa Paula for its own use. United's monitoring stations showed that precipitation was about 136% of normal for the 2011 water year, with December and March accounting for 65% of the rainfall. Lake Piru recorded 28.48 inches of rainfall, approximately 8.6 inches more that the average received at that location, and in the top 20% in terms of rainfall totals for this station. In contrast, 2013 precipitation was about 38% of normal within the district with an average rainfall of just 6.6 inches across the district. The rainfall measured at the Santa Paula site for 2013 represents the second driest year measured since 1890. Table 4-1 and Figure 4.1-2 show the precipitation across the districts monitoring sites for 2011 through 2013.

Table 4-1 Monthly Precipitation for water years 2011-2013

Rainfall at UWCD Stations (Inches)			
WY	El Rio #239	Lake Piru # 160	Santa Paula # 245
2011	19.41	28.48	23.79
2012	9.7	13.07	10.18
2013	5.7	7.55	6.53

4.2 SURFACE WATER

The Santa Clara River Watershed is extensively monitored by multiple agencies for rainfall, daily stream discharge and flood flows. Data for many of the monitoring sites goes back to the early 1900s giving a long period of record for comparison purposes. The year 2011 overall would fall in the normal to wet category in terms of both precipitation and run-off. Below is a brief discussion of how 2011 compares to the historical record. Daily and monthly data for all the sites discussed can be obtained on-line at websites maintained by the USGS and VCWPD.

4.2.1 SANTA CLARA RIVER SYSTEM

The Santa Clara River is the largest river system in southern California remaining in a relatively natural state. The headwaters start on the northern slopes of the San Gabriel Mountains and the river flows approximately 84 miles to an estuary and river mouth at the Pacific Ocean near Ventura Harbor on the northern Oxnard Plain. The major tributaries include Castaic Creek and San Francisquito Creek in Los Angeles County, and Sespe, Piru and Santa Paula creeks in Ventura County. While the Los Angeles portion of the watershed accounts for 40% of the total area, it only produces about 20% of the total river flow, with dry-season base flows sustained by discharges from wastewater treatment plants and rising groundwater from the Eastern groundwater basin. As mentioned in other sections of this report, even though 2011 was wetter than most years, large sections of the main stem of the Santa Clara River remained dry for most of the year.

4.2.1.1 FLOW IN THE SANTA CLARA RIVER WATERSHED

Surface water flows in the Santa Clara River system were well above normal for the 2011 calendar year. The season started out wet with an early storm in December 2010. The storm peaked Sespe flows over 3,000 cfs a couple of times before runoff subsided in late February. Two smaller storms were then followed by a large March storm where the Sespe's peak flow exceeded 35,000 cfs. Flows in the Sespe were over 1,000 cfs for the next 10 days. In contrast to 2012 and 2013, the maximum runoff measured at the Sespe gage was 2,300 cfs for 2012 and just 77cfs for 2013. Base flows in these years went down to 2-3 cfs measured at the gage.

The USGS station 111090000, Santa Clara River near Piru, measures the entire contribution from Los Angeles County's portion of the watershed that flows into Ventura County. This station recorded a peak flow of nearly 9,000 cfs in the March storm. Flows subsided to a little over 300 cfs within a couple of days after the peak. A large release from Castaic Lake in the month of April brought the average flow up to 11,000 AF that month. In contrast peak flows for 2012 reached 1,520 cfs and 893 cfs in 2013. Due to the effluent dominating the low flows, all years experienced base flows as low as 10 -12 cfs during the summer months.

Table 4-2 Total Discharge for various stream flow stations

USGS/VCWPD Stream flow Stations	2011	2012	2013
	AF	AF	AF
Santa Clara River Near Piru USGS Sta. 11109000	69,813	31,582	23,271
Piru Creek Above Santa Felicia Dam USGS Sta. 11109600	69,885	13,081	6,605
Piru Creek Below Santa Felicia Dam USGS Sta. 1110900	41,989	39,893	22,765
Sespe Near Fillmore USGS Sta. 1111300	158,271	15,104	4,307
Santa Paula Creek VCWPD 709	32,811	4,408	1,164

Table 4-2 shows the annual water year runoff for the monitoring sites above the Freeman Diversion. The Sespe, Piru Creek above Santa Felicia Dam and Santa Paula Creek in general represent the natural runoff produced by rainfall. Because Pyramid above Lake Piru has adopted an inflow = outflow flow regime this gage can be included as a more natural flow regime. Both the Piru Creek below Santa Felicia Dam and The Santa Clara River Near Piru sites represent a more regulated stream flow with SFD on Piru Creek and the Los Angeles County effluent discharge upstream of the other site. As a result of the more regulated flows the dry year of 2013 has less of an effect on the flows when compared to the more natural watersheds. In 2013 the natural watersheds produced a total of 261,000 AF of runoff in 2011 and only 12,000 AF of runoff in 2013. The dry year of 2013 represents only 5% of the total runoff produced in 2011. In contrast the regulated flows in Piru and the County Line dry year represents 33% of the total runoff produced in 2011. Figure 4.2-1 shows the discharge measured at the above mentioned USGS sites for 2011 through 2013.

4.2.1.2 WATER QUALITY

United maintains a surface water quality monitoring program and collects samples from a number locations at frequencies ranging from quarterly to every two weeks. Sampling sites are generally located on the Santa Clara River near groundwater basin boundaries and at the major tributaries near the confluence with the river. Additional water quality sampling sites include the Santa Clara River at the Freeman Diversion and the weir where surface water arrives at United's El Rio recharge basins. Sample analysis commonly consists of either a full inorganic general mineral suite or several key constituents such as TDS, chloride and nitrate. This surface water quality monitoring provides documentation of variations in surface water quality and information on the quality of water that is recharging the groundwater basins of the District. Sampling is conducted every three months at most of the sites, but more frequently at some key locations (Santa Clara River: every month near County Line and every two weeks at Freeman Diversion).

Water quality at the various sampling sites throughout the District tends to vary seasonally, with the lowest annual mineral concentrations commonly recorded in the winter and spring when flow is higher. Results from United's 2013 surface water sampling are shown on Figures 4.2-2 and 4.2-3, where the annual recorded maximum concentrations of chloride and TDS, respectively, are displayed over the annual minimum values. The range in values is from four seasonal samples at most locations, so the true range in quality in the water bodies is likely greater than what is documented. In 2013 several sites had dry channel conditions at the time of scheduled sampling, so less than four annual samples were collected at those locations. With the dry conditions in the watershed this year, the mineral content of surface waters tended to be higher at some locations. At locations when rising groundwater is a primary component of surface flow, dry season water quality tends to be fairly stable year-to-year.

Water quality in Piru Creek is influenced by Pyramid Lake located higher in the Piru Creek watershed, which receives large volumes of water from the State Water Project. Water in middle Piru Creek is a blend of State Water and local runoff from the upper Piru Creek watershed. When chloride concentrations in State Water are high, the chloride in middle Piru Creek (below Pyramid dam) and Lake Piru can be much higher than what would occur naturally. In 2013 the maximum-recorded chloride in Lake Piru was 63 mg/l. Chloride concentrations as high as 135 mg/l were recorded flowing into the lake, but the 2013 flows associated with these high chloride concentrations were minor.

Chloride concentrations in the Santa Clara River near the Los Angeles County line are also influenced by chloride in imported State Water, as Castaic Lake Water Agency delivers State Water to water retailers in the greater Santa Clarita area. Nearly 50% of the chloride load in wastewater discharges is from the chloride load in delivered water (LACSD, 2008). Additional chloride loading occurs during beneficial use of the delivered water, but loading has been significantly reduced in recent years as the Los Angeles County Sanitation District has managed a successful campaign to remove thousands of self-regenerating water softeners from the community. The Sanitation Districts are trying to satisfy regulatory requirements for the quality of their effluent, but the approach to be taken is not yet clear as community residents have resisted funding a chloride TMDL proposed by the Sanitation Districts and approved by the Los Angeles Regional Water Quality Control Board in December 2008.

Over the past few decades chloride concentrations in the Santa Clara River have varied considerably near the Los Angeles County line as water quality at this location is heavily influenced by discharges from the Valencia Water Reclamation Plant. From the late 1990s through 2003 the discharges from the Valencia plant increased steadily in both volume and chloride, with chloride concentrations exceeding 200 mg/l near the end of this period. Since 2003 chloride concentrations in the discharges have fallen somewhat: however, chloride in the river commonly exceeds the 100 mg/l surface water objective during months without significant rainfall (Figure 4.2-4). The lower chloride concentrations in the Santa Clara River in recent years are largely related to lower chloride in wastewater discharges from the Valencia WRP (Figure 4.3-4). This is likely the result of lower chloride levels in State Water Project imports and a successful ban of self-regenerating water softeners in City of Santa Clarita area homes. Prior to 1970 the discharge of oilfield brines significantly impaired water quality in the river at this location, but flows associated with this poor water quality were likely minor.

Beginning in January 1999, United has sampled the Santa Clara River near the Los Angeles County line each month for chloride and other analytes. Sampling in 2013 documented chloride concentrations ranging from 112 to 135 mg/l. Chloride concentrations in the water released from Lake Piru ranged from 61 to 63 mg/l over the same time period (Figure 4.2-2).

Sespe Creek at times has high chloride concentrations, historically and in recent years. Low chloride concentrations are also commonly measured in the runoff from the Sespe watershed, and the source of chloride has not been determined.

In recent years both the City of Fillmore and the City of Santa Paula have eliminated discharges of treated wastewater to the Santa Clara River. Santa Paula's new treatment plant came on line in 2010 and now utilizes percolation basins for wastewater disposal. Fillmore completed a new plant in 2009 and now distributes reclaimed water to both percolation basins near the plant site and a network of subsurface irrigation systems constructed in parks and school fields throughout the City. The City of Fillmore has banned installation of self-regenerating water softeners as part of its efforts to reduce chloride loading to the watershed. There are now no Ventura County water reclamation plants discharging flow to the Santa Clara River. Continuous river flow from Los Angeles County line to the Freeman Diversion is uncommon, but when there is connection, flows are usually high in the lower watershed and the recycled water component sourcing from Los Angeles County is very minor. The maximum-recorded chloride concentration in the Santa Clara River at Freeman Diversion in 2013 was 140 mg/l (Figure 4.2-2). In the summer and fall of 2013 when chloride in the Santa Clara River was recorded at concentrations greater than 100 mg/l, flow in the river was approximately one cfs or less.

United frequently monitors water quality in the Santa Clara River at the Freeman Diversion, the point where water is diverted from the river for either direct deliveries to agricultural users or groundwater recharge in the Oxnard Forebay. Samples are collected at the Freeman Diversion approximately every two weeks to confirm that the water is acceptable for use in both aquifer recharge and for irrigation deliveries. The TDS and chloride content of water in the river at this location exhibits a strong negative correlation with flow, with higher flows being less mineralized (Figure 4.2-5 and Figure 4.2-6). Under dry watershed conditions groundwater discharge (rising water) from the Fillmore basin comprises a large portion of the river flow at the Freeman Diversion. Under wetter conditions tributary flow, most notably from Sespe and Santa Paula Creeks, contribute flow to the lower river and improves water quality compared to low-flow conditions. High river flows resulting from the direct runoff of precipitation commonly has the lowest dissolved mineral content, as does the recession limb of hydrographs from large flow events (Figure 4.2-5). United commonly diverts large volumes of water from the river for groundwater recharge during these periods of high flow and good water quality. Recorded TDS concentrations at the Freeman Diversion ranged from 1110 to 1570 mg/l in 2013 (Figure 4.2-3). As with chloride concentrations at this location, poor quality is associated with low flows in the river, and this water is generally used for irrigation deliveries rather than groundwater recharge.

Nitrate concentrations in the Santa Clara River at Freeman Diversion show some negative correlation with flow but concentrations are routinely low in the river during both high and low flows (Figure 4.2-6). A weak seasonal signature has been observed, with nitrate concentrations rising slightly in the fall (UWCD, 2008). For the 27 samples collected at Freeman Diversion in 2013 the maximum-recorded nitrate concentration was 7.7 mg/l, well below the CA DPH health standard of 45 mg/l.

The County of Ventura maintains and operates composite sampling device at the Freeman Diversion, and samples storm flow and dry weather base flows several times per year. These samples are analyzed for a broad suite of organic contaminants and metals as part of a storm water quality program required by the Los Angeles Regional Water Quality Control Board. Detections of organic contaminants such as pesticides are uncommon and generally of low concentration (VCWPD, 2010)

4.2.2 CALLEGUAS CREEK

United does not actively gage or sample surface water in the Calleguas Creek watershed. Much of the monitoring activity in the Calleguas Creek watershed is currently associated with the Salts TMDL under development for the watershed.

4.3 GROUNDWATER

Groundwater is utilized extensively for municipal and agricultural use throughout the boundaries of United Water Conservation District, as imported water supplies are unavailable over much of this area. United has a responsibility to monitor conditions in the basins throughout the District so that the basins are understood and managed as needed. Many small water supply projects are completed without United's direct involvement, but proponents of most large water projects engage United's support in some way (e.g., data sets, technical support, financial assistance, etc.).

The following sections detail 2013 basin conditions within the eight groundwater subbasins which fall wholly or partially within United's District boundaries. Groundwater elevations have fallen considerably in a number of areas since 2011, the last year with significant local rainfall. In 2013 rainfall and streamflow were well below average, which limited the amount of recharge to the basins. For the first time since 1990 there was no conservation release from Lake Piru. Some discussion in the following section is devoted to comparing current conditions to past periods of abundant rainfall or drought, or periods pre-dating some major water supply projects within the District.

4.3.1 PIRU BASIN

The unconfined Piru basin has the capacity to rapidly accept water from the channel of the Santa Clara River and tributary streams. Groundwater in storage within the basin is slowly discharged to the downstream Fillmore basin, so in some ways the Piru basin acts as a "forebay" to downstream groundwater basins in the Santa Clara River Valley. Surface water flow resulting from the discharge of rising groundwater at the west end of the basin is greater when groundwater elevations are higher in the downstream portions of the basin. Groundwater elevations remain above historic lows, but over the past decade chloride impacts sourcing from Los Angeles County have migrated down past the midpoint of the basin.

4.3.1.1 WATER LEVELS

Historical groundwater elevations for United's Piru basin key well, located northwest of the confluence of Piru Creek and the Santa Clara River are shown on the hydrograph in Figure 4.3-1. The historical record for this well shows that groundwater elevations in the Piru basin fluctuate dramatically, and that the basin is capable of rapid recovery of water levels following periods of drought. Water level recovery at this location is largely related to channel recharge associated with high and prolonged flow in the Santa Clara River and in Piru Creek, such as that which occurs during reservoir releases or large winter storms.

The basin fills in wet years such as 1998 and 2005, as shown by the flat-topping of groundwater elevations at 620 feet (Figure 4.3-1). The winter of 2011 was moderately wet but the basin did not fill to historical highs. Water levels in this key well recovered by about 13 feet in response to United's fall 2012 conservation release, but have fallen continuously since that time. Water levels in this well have fallen 80 feet since the spring of 2011, to a level within 20 feet of the level recorded in the drought conditions of 1991.

Piru basin groundwater levels have benefited from the recharge of recycled water discharged to the Santa Clara River by water reclamation plants in Los Angeles County. Historically the Santa Clara River has maintained perennial flow in the vicinity of Blue Cut and the County line, with the flow sustained by groundwater discharge from the Eastern groundwater basin. The City of Santa Clarita began importing State Water in 1980, and steady growth in that community resulted in steady increases in wastewater discharges until recent years, when discharge has diminished slightly. United's fall conservation releases from Lake Piru provide an additional source of recharge to the basin. Release volumes vary year-to-year, and variable channel conditions affect the percentage of the released water that percolates in the Piru basin. Recharge through the channel of Hopper Creek is likely another source of significant recharge during wet years. Reclaimed water from the community of Piru is distributed to recharge ponds near the confluence of Hopper Creek and the Santa Clara River.

Groundwater elevation contours were interpreted from measured groundwater elevation highs from the spring of 2013 and groundwater elevation lows from the fall of 2013, and are shown in Figures

4.3-2 and 4.3-3 respectively. Groundwater flow is consistently from east to west, roughly following the land surface gradient of the river channel. In the eastern portion of the Piru basin, groundwater flow paths angle north towards areas of groundwater pumping north of the Santa Clara River. Depths to water are greater along the northern portions of the basin where alluvial fan deposits elevate the land surface.

The tight contours shown in the eastern Piru basin, just west of United's District boundary, indicate that this eastern portion of the basin is an area of significant recharge. This is the area where surface water sourcing from the Santa Clara River watershed in Los Angeles County infiltrates to groundwater and the river often goes dry. Spring 2013 measured groundwater elevations were approximately 30 feet higher than in the fall in this area.

Groundwater rises near the constriction at the downstream west end of the basin, contributing flow to the Santa Clara River. Groundwater elevations near the constriction at the west end of the basin are historically more stable than those in the central and eastern portions of the basin. Recorded groundwater elevations were about the same in this area in spring and fall of 2013. Near Hopper Creek, water levels were about 20 feet lower in the fall than they were in the spring. The contours also show groundwater flow from the Piru basin to the Fillmore basin to the west.

4.3.1.2 GROUNDWATER EXTRACTIONS

Reported groundwater extractions from 107 active wells in the Piru Basin totaled 12,800 acre-feet for the 2013 calendar year. This is about 420 acre-feet more than the historical average for the period 1980 to 2013, the period of available records. A portion of the Piru basin extends east of United's District boundary and any pumping from this portion of the basin is not reported to United. The historical annual extractions for the Piru basin are shown in the histogram in Figure 4.3-4. Only a small percentage of groundwater pumping in the Piru basin is for municipal and industrial use, consistent with agriculture being the dominant land use within the basin.

Figure 4.3-5 is a map showing reported groundwater extractions from individual wells in the Piru Basin for the 2013 calendar year. Pumping magnitude is indicated by dot size and color. Agriculture is the predominant land use within the Piru basin, and pumping is shown to be distributed throughout the basin. Few active wells exist along the southeastern margin of the basin, and some crops here are irrigated with water piped in from other areas. Two private mutual water companies operate within the basin. The Piru Mutual Water Company diverts water from Piru Creek for agricultural use in the north-central portion of the basin, and Warring Water Company pumps water primarily for domestic use in the town of Piru.

In some canyon and upland areas, orchards are irrigated with groundwater pumped from lower areas of the basin and lifted to higher elevations. Additional development of hillside areas surrounding the alluvial basin floor results in increased groundwater demand on the basin. Over the past decade a large number of orange orchards have been removed and replaced by row crops or box tree nurseries.

The primary losses of groundwater from the Piru basin are the result of discharge of groundwater to the Santa Clara River at the western boundary of the basin, the subsurface outflow of groundwater at the western boundary of the basin and extraction of groundwater by wells.

4.3.1.3 WATER QUALITY

Over the past fifteen years the main water quality concern in the Piru basin has been impacts associated with high chloride concentrations in the Santa Clara River flows sourcing from Los Angeles County. Discharge from the Valencia Water Reclamation Plant located next to the river at Interstate 5 significantly influences the flow and water quality of this reach of the river, which normally percolates completely in the eastern Piru basin (UWCD, 2006; CH2M Hill, 2006). The chloride concentration of plant discharges began to increase in the late 1990s and peaked at over 210 mg/l in 2003 (Figure 4.3-6). The chloride plume associated with these discharges has made a steady advance with groundwater flow down the Piru basin. The extent of chloride impacts now reaches Hopper Creek in the western third of the basin (Figure 4.3-7). Irrigation of salt-sensitive crops such as strawberries and avocado with water over 100 mg/l chloride is generally not recommended, and growers in Ventura County remain concerned about the westward progression of these impacts. More recently, chloride concentrations in Los Angeles County wastewater discharges are improving, the result of a successful campaign to remove self-regenerating water softeners from Santa Clarita residences and lower chloride concentrations in imported State Water Project deliveries. The Sanitation Districts of Los Angeles County have recently indicated their intention to construct a desalter and maintain chloride concentrations of less than 100 mg/l in their discharges. In the western portion of the basin chloride concentrations are generally less than 70 mg/l, indicative of background levels within the basin (DWR, 1989).

The Piru basin generally does not have problems with nitrate contamination, and samples collected in 2013 show only two wells exceeding the MCL of 45 mg/l. Many wells record TDS concentrations of 1,200 mg/l or less, but some wells near Highway 126 west of Hopper Creek record TDS concentrations approaching twice this value (VCWPD, 2014). Water quality of the Piru basin is characterized more thoroughly in the revised Groundwater Management Plan for the Piru and Fillmore basins (Piru/Fillmore Groundwater Management Council, 2011).

4.3.2 FILLMORE BASIN

The City of Fillmore overlies the northeast portion of the Fillmore basin, and relies entirely on groundwater for water supply. Sespe Creek is the largest tributary to the Santa Clara River and enters the Fillmore basin from the north. Sespe Creek is an important source of recharge to the basin, providing high-quality water from a largely undeveloped watershed draining the southern slopes of the Pine Mountain complex in the Los Padres National Forest. Groundwater supports extensive acreage of agriculture in the basin, ranging from row crops and nursery stock near the valley floor to citrus and avocado plantings at both low and high elevations. Groundwater discharge to the downstream Santa Paula basin is thought to be significant, and the extensive wetlands near this basin boundary are supported by rising groundwater. This groundwater discharge to the Santa Clara River in this vicinity commonly sustains surface flow downstream in the Santa Paula basin.

4.3.2.1 WATER LEVELS

Many water levels in the Fillmore basin behave in a manner similar to the Piru basin. Water levels from a key well in the Bardsdale area shows that water levels rise to a threshold elevation in significant wet years, as evidenced by the flat topping of groundwater elevations in 1998 and 2005 (Figure 4.3-8). In this vicinity south of the confluence of Sespe Creek and the Santa Clara River, groundwater elevations do not fluctuate as dramatically as those in the Piru basin.

Groundwater elevations at United's key well for the basin show that in 2011, a moderately wet year, the basin did not fill completely. In 2013 the recorded high groundwater elevation at United's key well was approximately six feet lower that the 2005 recorded high groundwater elevation, and approximately 23 feet higher than the recorded low groundwater elevation during the 1987 to 1991 drought.

Fillmore basin groundwater levels benefit from increased discharge from the Piru basin as that basin has sustained fairly high water levels in recent decades. The Fillmore basin also benefits from United's fall conservation release from Lake Piru which helps stabilize groundwater elevations. The unconfined Fillmore basin receives most of its recharge from the Santa Clara River and Sespe Creek. The upland areas in the northern portion of the basin likely receive relatively more recharge from direct precipitation and mountain front recharge.

Groundwater elevation contours are shown for spring and fall 2013 in Figures 4.3-2 and 4.3-3. Groundwater flow is predominantly east-to-west in the area of the Santa Clara River alluvium. In the Pole Creek fan area underlying the City of Fillmore, groundwater flow is generally westerly, but also is interpreted to trend northerly towards the City's active wells. Well control in the Sespe Upland area is relatively poor, but groundwater flow here is thought to be predominantly north-to-south. Along the valley floor groundwater gradients are quite uniform and are similar for the spring and fall of 2013. Groundwater flow converges near the west end of the basin where the groundwater flow aligns with the orientation of the river valley. Groundwater elevations in wells located in the Sespe Upland area and in the Pole Creek fan area of the basin generally exhibit more variability than wells along the valley floor.

The relatively tight contours shown in the eastern Fillmore Basin near the basin boundary reflect a steeper gradient as groundwater moves from the constriction of the Piru narrows and moves into the basin. In this area surface water commonly infiltrates to groundwater, resulting in diminished surface flow and a greater component of flow as groundwater. As in Piru basin, groundwater is forced to the surface near the downstream end of the Fillmore basin as geologic structure constricts the main aquifer units of the Fillmore basin. In this area groundwater elevations are more stable than elsewhere in the basin. At this discharge area of the basin contouring shows that spring and fall 2013 groundwater elevations are approximately the same (Figures 4.3-2 and 4.3-3). Extensive wetlands in this area are clearly visible on aerial imagery.

4.3.2.2 GROUNDWATER EXTRACTIONS

Reported groundwater extractions from 287 wells in the Fillmore Basin totaled approximately 50,400 acre-feet for the 2013 calendar year. This is 6,100 acre-feet more than the historical average from 1980 to 2013. The historical annual extractions for the Fillmore basin are shown in the histogram in Figure 4.3-9. Recently and historically, agriculture has been the predominant user of groundwater in the basin.

Figure 4.3-5 is a map depicting reported groundwater extractions from individual wells in the Fillmore Basin for the 2013 calendar year. This graphic shows that: 1) the City of Fillmore pumps from three wells located in the north Pole Creek fan area near Sespe Creek and no longer pumps from wells located near the Santa Clara River; 2) there are numerous wells in the Bardsdale area pumping small volumes of water, as there is no mutual water company distributing potable water in this area; 3) there are few active wells in the Sespe Upland area and most active wells are located at lower elevations; and 4) Groundwater extractions from wells at the Fillmore Fish Hatchery located at the eastern boundary of the basin accounts for a significant portion of the groundwater extractions of the basin. In 2013 Fillmore Fish Hatchery wells reported pumping of 7,500 acre-feet (15% of the total groundwater extractions from the basin). In 2012 Farmers Irrigation Company constructed a new well near the western boundary of the Fillmore basin. This well pumped 4,400 AF in 2013, supplying irrigation water to growers in the Santa Paula basin.

Twelve mutual water companies operate in the Fillmore Basin, serving water primarily for irrigated agriculture. Fillmore Irrigation operates a surface water diversion on Sespe Creek, supplying water to nearby agricultural lands. Several water companies operate wells near the valley floor and pump water to higher elevation where groundwater is not as plentiful. Plantings in Timber Canyon and many areas of the Sespe Uplands are served by such arrangements. In recent years many orange orchards at lower elevations have been removed and replaced by row crops or box tree nurseries. Plantings of citrus and avocado remain the primary agricultural land use at higher elevations.

Discharge of groundwater to the Santa Clara River at the western boundary of the basin, subsurface outflow of groundwater to the Santa Paula Basin and extraction of groundwater by wells are the three primary losses of groundwater from the basin. The extensive wetlands and stands of *Arundo donax* (an invasive giant cane) at the west end of basin likely transpire large volumes of water. By some estimates *Arundo donax* may transpire up to six times the amount of water as native vegetation (CA Invasive Plant Council, 2011).

4.3.2.3 WATER QUALITY

The Fillmore basin is not known for having any pervasive water quality problems. TDS concentrations can be somewhat elevated in some locations, as in other groundwater basins along the Santa Clara River Valley. The City of Fillmore no longer uses wells near the Santa Clara River, favoring locations near Sespe Creek where TDS tends to be lower. Naturally-occurring boron sourcing from the Sespe watershed, however, is sometimes a concern for citrus growers and the City of Fillmore. Deeper aquifer units may have elevated concentrations of iron and manganese, a common occurrence throughout Ventura County.

Chloride concentrations from samples collected in 2013 are shown on Figure 4.3-7. Recorded chloride concentrations exceeding 80 mg/l are uncommon, and the highest concentrations are observed along the southern edge of the basin. Concentrations in the 40s and 50s in the downstream/discharge portion of the basin are likely indicative of background chloride concentrations in the basin. While elevated chloride concentrations are sometimes observed in surface water in Sespe Creek, wells near the channel of Sespe Creek record chloride levels common to the rest of the basin.

4.3.3 SANTA PAULA BASIN

Groundwater storage in the Santa Paula basin is generally less dynamic than in surrounding basins, as recharge appears to be limited by confined aquifer conditions in some portions of the basin. Pumping in the Santa Paula basin is managed by a stipulated Judgment which assigns pumping allocations to each basin pumper that restricts the amount or groundwater each pumper can extract (on a seven-year rolling average). The City of Santa Paula occupies the eastern portion of the basin and relies entirely on groundwater for its water supply. Extensive water delivery systems have long existed in the basin, delivering water to agricultural users areas of the basin with poor water quality or areas that are not readily recharged.

4.3.3.1 WATER LEVELS

Long-term records of groundwater elevations in the Santa Paula Basin indicate that water levels do not recover as readily as in the Piru and Fillmore basins. The channel of the Santa Clara River is located south of the Oakridge fault in the central portion of the basin, and overlies older sedimentary units of low permeability. The basin likely receives significant recharge as underflow from the Fillmore basin. Recent gauging of surface water flows at various locations along Santa Paula Creek and the Santa Clara River suggests the amount of recharge the basin receives from these sources, at least during low-flow conditions, is limited. An extensive flood control project on lower Santa Paula Creek, completed in the late 1990s, may have negatively affected the amount of recharge derived from the watershed of Santa Paula Creek.

Historical groundwater elevations dating from 1923 to present are shown in a hydrograph for United's key well for the basin (Figure 4.3-10). The well is located near Peck Road and Highway 126 in the eastern portion of the basin. In contrast to the key wells from the Piru and Fillmore basins, this Santa Paula basin well shows a long-term decline in water levels. The hydrograph shows that the recorded high groundwater elevation for 2011 was approximately 8 feet lower than the recorded high groundwater elevation in 1998. The low water level measured in fall 2013 was within 5.5 feet of the February 1991 historic low for this well.

Evaluation of the key well hydrograph and other the hydrographs for other wells located throughout the basin show that water levels in many of the wells (43 of 57 wells) in both the eastern and western portions of the Santa Paula basin failed to fully recover to 1998 levels after near-record precipitation in 2005. This lack of complete recovery is consistent with an observed long-term, gradual decline in basin groundwater elevations (UWCD, 2009; Santa Paula Basin Technical Advisory Committee, 2011).

Figure 4.3-11 and Figure 4.3-12 show groundwater elevation contours in the Santa Paula Basin for spring and fall 2011, respectively. The spring contours represent the annual basin high groundwater elevations and the fall contours represent the annual basin low groundwater elevations. The difference between the spring high groundwater elevations and the fall low groundwater elevations is approximately 10 feet throughout the basin.

The contours show a general east-to-west flow direction with groundwater underflow from the Fillmore basin to the Santa Paula Basin and groundwater underflow from the Santa Paula Basin to the Mound basin. The relatively tight contours just west of the Santa Paula-Fillmore boundary show an area of recharge to the basin. The complex subsurface geology related to extensive faulting in the most western portion of the basin complicates the interpretation of groundwater flow in this area.

4.3.3.2 GROUNDWATER EXTRACTIONS

A histogram of reported basin pumping from 1980 to 2013 is shown in Figure 4.3-13. In recent years municipal pumping has accounted for more than 20% of the total pumping from the basin. The total reported groundwater extractions from 129 active wells in the Santa Paula Basin totaled nearly 26,700 acre-feet for the 2013 calendar year. A new Farmers Irrigation Company well located in the Fillmore basin immediately east of the Santa Paula basin Settlement Boundary pumped an additional 4,400 AF for delivery to the western Santa Paula basin. A 2003 basin study titled "Investigation of Santa Paula Basin Yield" was conducted by experts from the City of Ventura, Santa Paula Basin Pumpers Association and United. The study suggested that the yield of Santa Paula basin is probably near the historic average pumping of about 26,000 acre-feet per year. Additional study of the safe yield of the Santa Paula basin is planned, as modest declines in water levels have been observed in recent years when annual extractions have averaged about 26,000 acre-feet per year.

Figure 4.3-14 is a map showing groundwater extractions by wells in the Santa Paula Basin in year 2013. The map shows significant pumping within the Santa Paula city limits and near the Fillmore basin boundary. Numerous wells report pumping in agricultural areas in the central portion of the basin. Few active wells exist north, west and south of this vicinity. In the western third of the basin, significant pumping is reported south of Highway 126 and west of Ellsworth Barranca, and in the area north of Highway 126 and west of Brown Barranca.

Several private irrigation companies are active in the Santa Paula basin, operating wells and delivery pipelines that distribute large quantities of water around the basin. Farmers Irrigation Company pumps groundwater primarily from the eastern portion of the basin and distributes the water by pipeline for agricultural use in areas of the central and western basin. Also affiliated with Farmers Irrigation Company are Canyon Irrigation Company and Thermal Belt Mutual Water Company. Canyon Irrigation operates the Harvey Diversion on Santa Paula Creek, and some wells in the eastern basin, delivering water to agriculture in the area of Santa Paula Canyon. Thermal Belt Mutual pumps groundwater from the east basin for pipeline distribution for agriculture in the Foothill Road area and upland area of the north central basin. Alta Mutual Water Company extracts water from the Saticoy area in the west basin, and delivers water primarily to agricultural areas north of Telegraph Road. These extensive water delivery systems were largely established to deliver water to areas of the Santa Paula basin having poor quality groundwater. In the canyons and foothills along the northern flank of the basin, both well production and water quality are generally poor.

4.3.3.3 WATER QUALITY

Water quality is fairly variable throughout the Santa Paula basin, but water quality is generally worse in the western portion of the basin. The maximum recorded TDS concentrations for Santa Paula basin wells in calendar year 2013 are shown in Figure 4.3-15, with the highest concentrations recorded in the west. In these wells sulfate is commonly a large contributor to TDS. Deeper wells in the basin tend to have elevated iron and manganese concentrations, and both the City of Santa Paula and City of Ventura operate treatment facilities to reduce these constituents in delivered municipal water. Recorded nitrate concentrations from wells within the basin are generally low, but two irrigation wells recorded nitrate concentrations slightly over the MCL of 45 mg/l in 2013.

United conducts groundwater quality monitoring at the two nested monitoring well sites in the Santa Paula Basin, and in several production wells in the basin. Mineral concentrations are observed to vary with groundwater elevation in some wells. More thorough characterizations of groundwater quality in the Santa Paula basin can be found in other publications (DWR, 1989; Santa Paula Basin TAC, 2011).

4.3.4 MOUND BASIN

The Mound Basin is located in the westerly portion of the District and has experienced over time a progression of groundwater use that was historically dominated by agriculture, followed by a period of time when municipal and industrial pumping was dominant, and most recently a return to greater pumping by agriculture than by municipal and industrial users. The City of Ventura overlies much of the Mound basin, although some areas of agricultural land use remain.

4.3.4.1 WATER LEVELS

Historical groundwater levels for a key monitoring well in the Mound Basin are shown in Figure 4.3-16. Measured water levels have varied over about a 90-foot range over the period of record for this well, located in the eastern portion of the basin near Kimball Road. An extended period of low water levels was recorded in the late 1980s and early 1990s when water levels declined to below sea level. Water levels recovered in the 1990s and generally have remained more than 15 feet above sea level over the past decade, except when falling below sea level in 2004.

Recharge of the aquifers in this basin comes from multiple sources such as direct precipitation, mountain-front recharge, and subsurface flow from adjoining basins (e.g., Santa Paula, Oxnard Forebay, and Oxnard Plain). Recharge from the Oxnard Forebay and Oxnard Plain is thought to be significant, most notably during periods of high water levels in these adjacent basins (GTC, 1972; UWCD, 2012b). The aquifers utilized for groundwater production are confined.

Groundwater elevation records exist for nearly 60 active and historic wells located within the Mound Basin. A number of important wells have water levels dating to the late 1920s, allowing an evaluation of long-term water level trends within the basin. However, the distribution of wells is heavily skewed towards the southern half of the basin, with relatively few wells existing north of Telephone Road. In the western portion of the basin wells are concentrated along Olivas Park Drive and near the railroad tracks south of Highway 101. This poor distribution of active and historic wells complicates the assessment of potential mountain-front recharge to the basin from the north. The southern and eastern boundaries of the basin are defined by structural features, and water level records from adjacent areas help assess the nature of the basin boundaries in these areas. Water level trends for many wells within the basin are similar, with evidence of recharge from adjacent basins to the east and south (UWCD, 2012b). The main groundwater flow pattern is down the axis of the basin from east-to-west. The slope of the potentiometric surface within the basin is quite flat during dry periods and the gradient increases somewhat following periods of above-average rainfall. During dry periods, groundwater elevations in many wells fall below sea level.

The contouring of past water level conditions is complicated at times by sparse data. Available groundwater elevation data for the spring and fall of 2013 are presented in Figures 4.3-17 and 4.3-18. Increased collection of water level records is recommended in this basin to better define groundwater gradients between this basin and adjacent basins. The recent installation of monitoring wells north of the Santa Clara River near the northwestern margin of the Forebay should be helpful in better defining the flow of groundwater from the Oxnard Forebay to areas north of the Montalvo anticline (see Section 2.1.8). Relatively few wells, however, exist along the southeastern portion of the Mound basin, an area of sparse well records and known structural complexity.

4.3.4.2 GROUNDWATER EXTRACTIONS

The City of Ventura is the major municipal and industrial groundwater pumper in the Mound basin, with its wells concentrated in the area near the Ventura County Government Center. Agricultural pumping was historically the majority use of groundwater in the Mound Basin, but municipal and industrial use exceeded or approximately equaled agricultural use for the period 1999 through about 2006 (Figure 4.3-19). Municipal pumping peaked in 2003 and declined fairly steadily through 2011. Since the mid-1980s agricultural pumping has averaged nearly 4,100 acre-feet per year with a peak annual production of 5,850 acre-feet recorded in 1990. Over the past two years municipal pumping has increased again, and reported pumping in 2013 totaled 7,000 AF, equally divided between agriculture and urban use.

4.3.4.3 WATER QUALITY

While the quality of the groundwater produced by most wells within the Mound Basin is suitable for municipal and agricultural uses, the basin is not known for the high quality of its groundwater. Water quality is variable between wells, and many records indicate somewhat elevated concentrations of TDS, sulfate, hardness and other analytes. Water quality appears to be relatively stable among many of the Mound basin wells having long-term water quality records, although some municipal production wells (e.g., Victoria 1 and 2) in the central portion of the basin have been experiencing declining water quality (i.e., increasing TDS values) that currently reach about 1,800 mg/L. Available records from wells nearest the coast do not show evidence of saline intrusion.

A map showing recorded TDS concentrations in Mound basin wells from 2013 is shown as Figure 4.3-20. The map plots TDS (by summation) from production well samples collected by the Groundwater Section of the Ventura County Watershed Protection District, as well as TDS (by total filterable residue) as sampled by United Water and the City of Ventura. TDS in the production wells ranged from 1,050 to nearly 3,000 mg/l. Sulfate commonly contributes roughly half the TDS in these samples, and water quality results are often variable among nearby wells.

Records from existing monitoring wells within the basin reveal very poor quality water at depths up to several hundred feet in the central portion of the basin. Water from these wells is thought to be connate or perched waters that are not utilized for groundwater supply. The three 2013 samples recording TDS greater than 3,000 mg/l are from monitoring wells with screened intervals shallower than 510 feet below the land surface.

4.3.5 OXNARD FOREBAY

The Oxnard Forebay basin is an area of critical importance to the water resources of the Oxnard Plain. This is the unconfined portion of the Oxnard Plain where units of low permeability are generally absent or discontinuous, allowing water to percolate deep into the ground and recharge the aquifers which extend from the Forebay to the Oxnard Plain. The basin readily accepts large volumes of recharge water in wet years when abundant surface water is available for recharge. A time series of estimated changes in available groundwater storage within the Forebay is shown in Figure 4.3-21. The graphic shows that storage in the basin can change rapidly. In the dry conditions that have prevailed since spring 2011, groundwater storage in the Forebay has fallen by about 87,500 AF.

Coarse gravel deposits deposited by high flows of the ancestral Santa Clara River are common in the Oxnard Forebay. These gravels have historically been extensively mined, both within the river channel and in nearby upland areas. The high permeability of these coarse alluvial deposits also comprise an ideal substrate for groundwater recharge. Groundwater recharge occurs naturally where water percolates through the bed of the Santa Clara River, and in upland areas near the river where United distributes diverted river water to a series of recharge basins. United's recharge activities are sometimes termed "artificial recharge" because the activities augment the recharge that would naturally occur in this area. The term "managed aquifer recharge" has become more popular in recent years.

Groundwater recharge to the Forebay serves to raise groundwater elevations in this up-gradient area of the groundwater flow system for the Oxnard Plain. High water levels in the Forebay increase the hydrostatic pressure in the confined aquifers extending from the margins of the Forebay to the coastal and offshore portions of these continuous aquifer units. While the physical movement of groundwater out of the Forebay is fairly slow, the pressure response in the confined aquifers distant from the Forebay responds more rapidly to significant recharge events in the Forebay. During wet climatic years the Forebay has the ability to quickly accept large volumes of water, allowing storage of surface water that otherwise would be lost from the watershed. Water stored in the Forebay slowly bleeds out to the outlying areas, flowing naturally from areas of high elevation to areas of lower elevation on the Oxnard Plain and near the coast, which serves to raise or sustain groundwater elevations in wells in down-gradient areas. Groundwater extraction by wells, both in the Forebay and in the confined aquifers of the Oxnard Plain, hastens the decline of Forebay water levels as water is removed from the system. Under drought conditions, groundwater elevations in the Forebay may approach sea level, resulting in flattened groundwater gradients and only minor groundwater flow out of the Forebay. These conditions now exist for the first time since completion of the Freeman Diversion in 1991. While there have been very wet years in the past where groundwater storage in the Forebay has recovered greatly, United's ability to divert and recharge water is now more constrained by regulatory requirements relating to fish migration opportunities. Significant recovery of groundwater storage in the Forebay can still be expected in future wet years, but the degree of recovery may well be less than what has been observed in the past.

4.3.5.1 WATER LEVELS

Groundwater elevation contours for the Upper Aquifer System (UAS) in the spring of 2013 are shown in Figure 4.3-22. Less than 100 AF of water was recharged through United's Saticoy Spreading Grounds in early 2013, as diversions from the Santa Clara River were minor and available surface water was delivered elsewhere. Recorded groundwater elevations at the northern portion of the Forebay were only 50 feet above sea level in spring 2013. Despite a lack of significant recharge activities, a flatter but familiar pattern of groundwater flow radiating from the up-gradient portion of the Forebay to surrounding areas is readily apparent. Groundwater elevations near the southern boundary of the Forebay were less than 25 feet above sea level in spring 2013.

Figure 4.3-23 displays UAS groundwater elevation contours for the Oxnard Forebay and Plain in fall 2013. Groundwater elevations near the Saticoy Spreading Grounds remain about 50 feet above sea level, but elevations fall quickly to less than 10 feet near the midpoint of the basin. A pumping depression associated with the O-H well field at the El Rio Spreading Grounds is apparent, where water levels are below sea level. With low water levels around the perimeter of the Forebay there is the potential for shallow groundwater of the semi-perched zone on the Oxnard Plain to drain into the Forebay. This reverse flow out of this semi-perched zone would be difficult to document without additional wells, but there is some concern about the potential water quality impacts to the Oxnard aquifer.

Historical water level hydrographs from selected wells in the Forebay are shown in Figure 4.3-24. UAS water levels in the Forebay fluctuate by as much as 100 feet, with groundwater elevations dropping below sea level in drought periods and recovering during wet periods. Historic highs were recorded in a number of wells in recent years, following a number of consecutive wet years and the expansion of United's recharge facilities. Extremely dry conditions in the Santa Clara River watershed since spring 2011 have resulted in significant declines among some key wells in the Forebay: in less than three years the water level in United's key well near the Saticoy Spreading Grounds has fallen more than 90 feet and another well in the down-gradient portion of the basin has fallen more than 50 feet.

4.3.5.2 GROUNDWATER EXTRACTIONS

Reported 2013 groundwater extractions from the Forebay totaled nearly 23,500 acre-feet. Figure 4.3-25 shows reported extractions for the basin since 1980. The 2013 reported pumping from the Forebay was less than the average annual extraction rate of 25,000 AF. Pumping from the Forebay is often more variable than in other basins within the District, resulting the variable amount of groundwater pumping for delivery to the Oxnard Plain and Pleasant Valley basins. United's O-H well field is the largest pumping center in the basin, delivering water to coastal areas as part of a management strategy to move pumping away from coastal areas vulnerable to saline intrusion. The City of Oxnard is the largest O-H customer. The City's other two sources of water are their own wells on the Oxnard Plain and State Water imported by and purchased from Calleguas Municipal Water District.

In the 2013 calendar year only 2,400 AF were spread for groundwater recharge at the El Rio Spreading grounds (in contrast to 2011 when some 37,800 AF of water was diverted for recharge at El Rio). Over this same period 12,850 AF was pumped from UAS wells at El Rio for deliveries to the O-H system. In most years United recharges more water at El Rio than is pumped for delivery to O-H customers.

The distribution of UAS pumping for calendar year 2013 is shown in Figure 4.3-26. Significant pumping is apparent surrounding the El Rio Spreading Grounds, where municipal pumping in the basin is centered. The majority of the pumping in the up-gradient areas of the Forebay is for irrigation purposes, including the pumping on the south side of United's Saticoy Spreading Grounds. Wells screened in units of the Lower Aquifer System are relatively uncommon in the Oxnard Forebay, and 2013 pumping from LAS wells is shown in Figure 4.3-27.

4.3.5.3 WATER QUALITY

Water quality records from Forebay basin wells near the Santa Clara River and United's recharge facilities show that groundwater quality in these areas is generally similar to that of the Santa Clara River. The most recharge from the river takes place when flows are high, when water quality in the river is best. Some characterization of Santa Clara River water quality is included in Section 4.2 of this report. During the dry season when river flows are lower and mineral content is generally higher, much of the diverted surface water is blended with well water and used for irrigation in areas served by the PTP and Pleasant Valley pipelines.

Occasional high nitrate concentrations in UAS wells has historically been the water quality issue causing concern in the Forebay. A definitive evaluation of sources of nitrate and flow paths to area wells has proven difficult, but septic systems and fertilizer from irrigated agriculture are commonly believed to be major contributors of nitrate to the groundwater flow system (UWCD, 1998). The highest nitrate concentrations are often observed during drought periods, when nitrogen inputs continue but the diluting influence of natural and artificial recharge is reduced. High nitrate has also been documented in wells as water levels rise following periods of drought, as nitrogen stored in the vadose zones is mobilized as sediments become saturated by a rising water table. Installation of additional monitoring wells in the Forebay has contributed to the understanding that the highest nitrate concentrations are often observed in the shallowest wells (UWCD, 2008). Once high-nitrate water enters the groundwater flow system its movement is likely very complex. An incomplete understanding of nitrate inputs to the Forebay basin and the complexity of water movement in the unsaturated and saturated zones of the subsurface make predictions of future nitrate impacts to area wells impractical.

Maximum-recorded nitrate concentrations from wells in the Forebay and northern Oxnard Plain in 2011 are shown in Figure 4.3-28. With dry conditions prevailing in both 2012 and 2013, nitrate concentrations have increased in a number of production and monitoring wells in the Forebay. Five of the nine active O-H (UAS) wells recorded annual-maximum nitrate concentrations over the health standard. Other public supply wells in the El Rio community recorded high nitrate concentrations, but purchased water from the O-H system so as to not deliver water which exceeded the MCL for nitrate. Near United's Saticoy Spreading Grounds UAS nitrate concentrations ranged from four to nine mg/l, values that match the range of nitrate concentrations recorded for diverted Santa Clara River water spread nearby.

A major effort to sewer the El Rio community was recently completed, significantly reducing nitrate loading in this areas of shallow unconfined groundwater. Residents and regulators are hopeful that significant nitrate impacts will be avoided in future droughts, but a cautionary statement from a recent UC Davis report on nitrate contamination is repeated here as a reminder that flow paths to production wells are often not well understood, and may be longer and more complex than many might imagine: "Travel times of nitrate from source to wells range from a few years to decades in domestic wells, and from years to many decades and even centuries in deeper production wells. This means that nitrate source reduction actions made today may not affect sources of drinking water for years to many decades" (Harter and Lund, 2012).

4.3.6 OXNARD PLAIN BASIN

Early newspaper accounts suggest that the confined aquifers of the Oxnard Plain were first drilled for water supply wells in the early 1870s. Artesian conditions existed on the Oxnard Plain at this time, and the well installations that received press coverage were wells providing impressive flow at the land surface without a pump in the well. Artesian conditions are believed to have persisted through the late 1800s. The town of Oxnard was established in 1897, and in 1899 a large sugar beet processing facility began operations. The large water demands associated with irrigation of beets and other crops on the Oxnard Plain, along with the growing population and industrial uses, lowered the pressure in the Oxnard aquifer. By the turn of the century widespread artesian conditions were generally absent, requiring wells to be fitted with pumps to lift water from elevations below the land surface (Freeman, 1968).

Over the approximately 110 years since the initial depressuring of the Oxnard Aquifer in the late 1800s, artesian conditions have periodically returned to the Oxnard Plain during wet climatic cycles. Documentation of water levels in the aquifers of the Oxnard Plain are sparse until the early 1930s, but artesian conditions were documented in Oxnard City well #9 in the winters of 1917, 1919, 1922 and 1923 (CA Division of Water Rights, 1928). The early 1940s was a wet period, and widespread artesian conditions likely existed at that time. The year 1945 marked the beginning of a long dry period during which water levels fell across the plain and problems with saline intrusion intensified in coastal areas. These alarming developments at a time of urban and economic growth in Ventura County prompted significant investments in water resource projects, including the O-H well field at El Rio and a pipeline delivery system to urban areas on the coastal plain. In subsequent years pumping patterns continued to change as the City of Oxnard grew. The city once had water supply wells distributed throughout its service area, but now pumping is centralized in two primary well fields. As farmland around the city margins has converted to urban areas, pumping has generally been transferred to the City of Oxnard's main well field in the northern Oxnard Plain. Much of the population growth in the cities of Oxnard and Port Hueneme has been supported by State Water Project supplies, imported and delivered by Calleguas Municipal Water District.

Widespread artesian conditions were again present on the Oxnard Plain in the late 1990s following the completion of the Freeman Diversion and high precipitation totals in 1993, 1995 and 1998. More recently, artesian conditions periodically existed in coastal areas surrounding Port Hueneme, and are more common in UAS wells than in wells with deeper screened intervals. Near Point Mugu in the southernmost portion of the Oxnard Plain, water levels have remained below sea level for decades in both the UAS and LAS.

Following a period of drought in the 1970s and expansion of the areas impacted by saline intrusion, the Fox Canyon Groundwater Management Agency (FCGMA) was established in 1982 as a local agency with regulatory authority to bring overdraft conditions under control in southern Ventura County. The agency has successfully implemented a number of mandatory cutbacks for production from public supply wells, and agricultural pumpers are required to demonstrate the use of efficient irrigation practices. One early strategy was a shift of pumping from the Upper Aquifer System to the Lower Aquifer System on the Oxnard Plain. This shift in pumping resulted in improved conditions in the UAS but considerable overdraft of deeper aquifers. An update to the FCGMA's management plan was completed in 2007, and describes a number of projects and strategies that might be employed to bring pumping in the Oxnard Plain, Pleasant Valley and Las Posas basins into balance with recharge to the aquifers of these highly-developed basins (FCGMA, 2007).

The primary water quality concern on the Oxnard Plain is water quality degradation associated with the intrusion of saline waters. The direct lateral intrusion of seawater remains the primary threat in coastal areas, with the near-shore submarine canyons at Port Hueneme and Point Mugu exposing aquifer beds to the sea. The vertical movement of deep brines and shallow water of poor quality has also been documented. This movement of poor-quality groundwater is also related to overdraft conditions, but is not limited to coastal areas. Nitrate problems have been documented periodically in specific Oxnard Plain wells. In some cases this nitrate problem is likely related to the downward movement of poor-quality water, in other locations it may be related to nitrate contamination sourcing from the Oxnard Forebay (UWCD, 2008).

4.3.6.1 WATER LEVELS

As discussed in the groundwater basin descriptions of the Oxnard Forebay and Oxnard Plain, large volumes of groundwater flow from the Oxnard Forebay to the Oxnard Plain. Contouring of recorded UAS water levels from wells shows that groundwater flows radially from recharge areas in the Forebay to surrounding areas (Figures 4.3-22 and 4.3-23). Recharge from the Forebay serves to raise or sustain water levels in wells on the Oxnard Plain, countering the decline in groundwater elevations resulting from groundwater extractions. When water levels are high across the basin groundwater may flow past the coastline to the offshore extension of the aquifers of the plain, or exit the system at near-shore canyons as discharge to the sea.

Precipitation totals for the 2012-13 water year were only about a third of average. Only about six inches of rain was measured in Santa Paula, and no single day recorded rainfall greater than one inch. The lack of any significant storm event resulted in very low flows in the Santa Clara River throughout the year, limiting the amount of water available for artificial recharge in the Forebay. Recorded high water levels on the Oxnard Plain in spring 2013 were similar to those measured in fall 2012.

Selected hydrographs for UAS wells on the Oxnard Plain are shown in Figure 4.3-29. It is typical for water levels in the confined aquifers of the Oxnard Plain to exhibit a distinct annual signature, with increased pumping stresses and reduced recharge in the summer and fall resulting in water level declines of ten feet or more, followed by some degree of recovery the following winter and spring. The absence of notable recharge to the basin in winter 2013 resulted in a continuous water level decline in most wells over the past two years. Fall 2013 water levels are below sea level in all the well hydrographs shown in Figure 4.3-29. Contours of fall 2013 water levels across the basin are shown in Figure 4.3-24. The zero elevation (sea level) contour is mapped in an arc extending northeast from Port Hueneme to an area north of Fifth Street near downtown Oxnard. Approximately half the area of the Oxnard Plain is below sea level, including an area in the northeastern portion of the basin.. In the southern Oxnard Plain groundwater elevations in Oxnard aquifer wells in some areas are more than 20 feet below sea level. In the area south of Hueneme Road, piezometric heads in the Mugu aquifer of the UAS are commonly at least 20 feet lower than those in the Oxnard aquifer.

Groundwater elevations from Lower Aquifer System wells are contoured for the spring and fall of 2013 for the Oxnard Forebay, Oxnard Plain and Pleasant Valley basins (Figures 4.3-30 and 4.3-31). In the spring of 2013 a pumping depression centered near the Oxnard Plain/ Pleasant Valley basin was clearly visible. By fall 2013 the depression is much deeper and broader. Groundwater elevations in the central plain south of the Camarillo Hill are more than 130 feet below sea level, and 80 feet below sea level at the coast near the Mugu submarine canyon. Available records suggest that only small portions of the basin near the recharge areas (northern Oxnard Forebay, northern Pleasant Valley) remain above sea level.

These contours show a revised interpretation for LAS groundwater flow in the central and western Oxnard Plain. Evaluation of well construction, interpretation of geophysical well logs and construction of stratigraphic cross-sections for the area indicate that a number of wells in the Oxnard Forebay and north Oxnard Plain, utilized in the past for LAS contours, and previously classified as LAS wells, are likely influenced by higher heads in the UAS. Some of these wells may be screened in both the LAS and UAS. South of a certain point these "shallow LAS" wells are absent, and wells are screened much deeper due to structural and stratigraphic changes in the subsurface. The inclusion of the "shallow LAS" wells in earlier contouring resulted in a steep break in groundwater elevations that was thought to be indicative of a structural barrier to groundwater flow. The newer interpretation of LAS groundwater elevations functionally expands the pumping depression seen along the eastern Oxnard Plain and western portions of the Pleasant Valley basin north into the Forebay. LAS groundwater elevations above sea level near the Saticoy Spreading Grounds, however, indicates that the LAS pumping depression does not extend north to this area of the Forebay. Water level records and associated contouring shows that in the aquifers of the LAS, groundwater flows from the Oxnard Forebay to the large pumping depression in the eastern Oxnard Plain and the Pleasant Valley basin.

Also notable in this interpretation (of deeper LAS wells) is higher LAS heads along the coast in the western Oxnard Plain than in most other areas of the basin. Maps showing LAS pumping locations within the basin (next section) are consistent with the contouring. The LAS contouring presented here is somewhat preliminary and subject to modification in the future as work on the hydrogeology in this area is ongoing.

In the northwestern Oxnard Plain, LAS groundwater flow is likely from the Oxnard Forebay towards the coast. Few LAS wells exist in this area (Figure 4.3-27), as recharge to the Oxnard Forebay is very effective in sustaining groundwater elevations in this area (UWCD, 2010). LAS wells near Victoria Avenue and the northern boundary of the Oxnard Plain record groundwater elevations similar to nearby UAS wells (UWCD, 2010). The exclusion of "shallow LAS" groundwater elevations from Figures 4.3-30 and 4.3-31 provides an incomplete representation of LAS heads in the northwestern Oxnard Plain.

Historical water level records from selected LAS wells on the Oxnard Plain are shown on Figure 4.3-32. Periods of drought (notably ~1989-1991) are clearly evident in some of the wells, with measured water level declines exceeding 100 feet in some wells. Annual water level fluctuations of greater than thirty feet are common in the confined conditions of the LAS. As shown in the figure, the LAS hydrographs show fall 2013 water levels at more than 100 feet below sea level in Pleasant Valley and in the east-central Oxnard Plain. Water levels in wells near the coast are more muted, as recharge by seawater prevents heads from falling as low as they do in inland areas.

While the occurrence of land subsidence is not well documented in Pleasant Valley and on the Oxnard Plain, concern about increased subsidence is justified as water levels in the LAS approach historic lows.

4.3.6.2 GROUNDWATER EXTRACTIONS

The groundwater resources of the Oxnard Plain are heavily utilized to support overlying land uses. The area is famous for its highly productive agriculture, supporting year-round production of a wide variety of agricultural products. Groundwater supports much of the agriculture on the Oxnard Plain, but surface water is available in some areas. The area also supports an extensive urban population. The Cities of Oxnard and Ventura maintain active wells on the Oxnard Plain, but also rely on other sources of water. The City of Port Hueneme and other coastal communities generally maintain wells in reserve status and import water from inland areas given their location near the coast and vulnerabilities with respect to seawater intrusion.

The distribution of reported UAS pumping shown in Figure 4.3-26 is typical of pumping patterns in recent years. The City of Oxnard operates several wells at its main well field near Third Street and Oxnard Blvd., and at a smaller facility some distance to the northeast. Aside from these locations UAS pumping is uncommon in the urban areas of the Oxnard Plain. Agricultural interests pump extensively from the UAS in the northwest Oxnard Plain, as well as in the northeastern portion of the basin near the Oxnard Forebay. Additional pumping is scattered across the central Plain east of the City of Oxnard, where a number of wells reporting minor pumping are small domestic wells. Few UAS wells are active south of Hueneme Road on the southern Oxnard Plain.

The distribution of LAS pumping on the Oxnard Plain is concentrated in the eastern half of the basin, as shown in Figure 4.3-27. Near the basin boundary in the northwestern Oxnard Plain the City of Ventura operates two wells at the Ventura Municipal Golf Course, and exports water for municipal use in the Mound basin. LAS extractions are common for irrigation in the northeastern Oxnard Plain, as they are in the east-central portion of the basin. South of Hueneme Road LAS aquifers are pumped extensively for irrigation, in contrast to the UAS which is pumped very little in this area. Also notable is the near-absence of LAS pumping in the northwest portion of the basin.

A histogram of historical extractions from the Oxnard Plain are shown in Figure 4.3-33. Reported pumping for agricultural and municipal uses were greater in 2013 than in any year since 1990. The percentage of agricultural pumping is typically slightly greater in dry years, as less of the irrigation demand for various crops is satisfied by rainfall.

Some 60,900 acre-feet of pumping reported on the Oxnard Plain in 2013, about 10,000 AF more than was reported in 2011 and 2012. In the years 1985-1990, annual extractions totaling more than 70,000 AF were not uncommon. The Freeman Diversion was completed in 1991, which improved the quantity and reliability of surface water delivered to the Oxnard Plain. Municipal and Industrial (M&I) pumping has been subject to cutbacks mandated by the FCGMA, beginning with 5% in 1992 and currently at 25%. Municipal pumping has not actually been reduced by this amount: pumping allocations have been transferred to the Cities of Oxnard and Camarillo, as these cities have expanded into agricultural areas. As noted in earlier sections, large volumes of potable water are imported from both the Oxnard Forebay and from northern California, so the extraction totals represented in Figure 4.3-33 are less than the total demand for agricultural and M&I water in the area.

4.3.6.3 WATER QUALITY

Seawater intrusion was first recognized on the Oxnard Plain in the 1930s and since that time this issue has dominated water quality concerns in southern Ventura County (CA DWR, 1971; FCGMA, 2007). In areas not impacted by saline intrusion, groundwater quality is somewhat variable among wells but generally is adequate for most agricultural and municipal/industrial uses. Water in the confined aquifers of the Oxnard Plain tends to be somewhat mineralized due the marine deposition of many of the aquifers (TDS, sulfate, iron, manganese), but contamination by organic contaminants is uncommon (Burton et al, 2011). Nuisance concentrations of iron and manganese are most commonly associated with LAS wells where reducing conditions are present.

In the northern portion of the Oxnard Plain samples for some wells in 2013 show elevated concentrations of nitrate. The provenance of the high nitrate detected in these wells is generally difficult to determine, but high and variable concentrations are likely related to the downward leakage of near-surface waters (Izbicki, 1992, Zohdy et al, 1993). On the southern Oxnard Plain nitrate concentrations in wells are not commonly detected, and the rare detects are likely related to damaged or improperly constructed wells.

Recorded chloride concentrations across the central Oxnard Plain were consistently low in 2013, as shown in Figure 3.4-34. These values are similar to native chloride concentrations in the basins of the Santa Clara River Valley. South of Hueneme Road some wells record chloride concentrations of greater than 16,000 mg/l, concentrations similar to seawater.

4.3.6.3.1 SALINE INTRUSION

Since the 1930s the southern Oxnard Plain in Ventura County has been subject to seawater intrusion. The Oxnard, Mugu, Fox Canyon, and Grimes Canyon aquifers are believed to be geologically vulnerable, to varying degrees, to seawater intrusion by their exposure in offshore outcrop in the walls of submarine canyons and along the broader offshore shelf. Concerns related to the expansion of intruded areas in the 1970s and 1980s helped motivate local funding for cooperative studies with the U.S. Geological Survey.

In 1989 the U.S. Geological Survey initiated the Regional Aquifer-System Analysis (RASA) study in the Santa Clara-Calleguas groundwater basin. As part of this project a series of fourteen nested monitoring well sites were installed in coastal areas. Extensive sampling was conducted, and a number of advanced analytical techniques were used to provide a much better understanding of the nature and extent of saline intrusion on the Oxnard Plain. The USGS studies concluded that some areas classified as seawater intrusion in the past were in fact subject to increased chloride concentrations from connate saline water squeezed from fine-grained sediments within and separating the aquifers (Izbicki, 1992). The USGS mapped areas of high salinity in the major aquifer units of the southern Oxnard Plain, and classified sources of salinity as either seawater intrusion or saline intrusion from local sediments. A major product of the RASA study for the Santa Clara-Calleguas study area was a calibrated groundwater flow model. A solute transport component of the model was proposed in the scoping of the study, but this component was later abandoned after initial efforts proved unsuccessful.

United continues to sample the network of monitoring wells on the southern Oxnard Plain. In all of the recent samples from the southern Oxnard Plain, calcium or sodium are the dominant cations. Among samples not affected by high salinity, sulfate and bicarbonate are the dominant anions. For most samples impacted by saline waters, sodium and chloride are the dominant ions (UWCD, 2007). Major ion analysis is helpful in determining chemical conditions and changes over time, but not necessarily the source of brine causing water quality degradation. Researchers from the USGS have advanced methods for determining whether high chloride is sourcing from direct seawater intrusion or rather from deep or stranded brines (Izbicki, 1992 and Izbicki et al, 2005a). The minor ions iodide and bromide, along with the trace elements boron and barium, are useful indicators for delineating the source of brines impacting fresh aquifers. Analysis of minor ion concentrations and trace element ratios from coastal monitoring wells suggest that some wells are impacted by the recent intrusion of seawater via the near-shore submarine canyons at Port Hueneme and Point Mugu. Other wells are likely impacted by inland brines, such as those expelled from buried fine-grained marine deposits. Clays within these deposits compact over time in response to regional pumping stresses, allowing the brines to enter adjacent permeable beds within the aquifer system (UWCD, 2007).

Over the past decade the sampling of coastal monitoring wells has indicated that near Port Hueneme chloride conditions have generally improved as heads in most aquifers have remained near or above sea level. United's sampling of wells and contouring of groundwater elevations in this area suggest the chloride plumes associated with past periods of drought are now migrating southeast towards the Mugu area, most notably in the UAS (UWCD, 2004). Figure 4.3-35 displays chloride records for selected UAS monitoring wells in coastal areas of the southern Oxnard Plain. The figure shows well A1-195 located north of Port Hueneme has totally recovered from chloride impacts in the early 1990s. The chloride plume shown east of Hueneme Harbor likely extended north from Hueneme Canyon during the drought (chloride spike in well A1-195), and since that time the plume has slowly shifted towards the southeast (groundwater flow is perpendicular to the groundwater elevation contours shown on Figure 4.3-23). Within the plume of displaced seawater, samples from well CM4-275 remain above 6,000 mg/l, and chloride continues to rise in well CM7-190 some 20 years after the drought ended. In the Mugu area, however, saline groundwater would likely flow out from the groundwater basin if a significant seaward groundwater gradient could be maintained, but such conditions have not existed for many years. In inland areas surrounding Mugu Lagoon aquifers of the UAS remain impaired by high chloride. One well in the western portion of this area has shown some improvement in recent years, but chloride is still over 2,000 mg/l (Figure 4.3-35). Other UAS wells show continued degradation by either brines or direct intrusion of seawater (UWCD, 2007). With depressed water levels in the basin, another period of active seawater intrusion is now underway. While seawater is believed to be entering the aquifers of the UAS in the areas surrounding Hueneme and Mugu Canyons, high chloride concentrations from this new episode of seawater intrusion has not yet reached the coastal monitoring wells.

Selected chloride time series for Lower Aquifer System monitoring wells on the southern Oxnard Plain are shown in Figure 4.3-36. Near Hueneme Canyon few wells show chloride impacts, but well CM2-760 shows increasing chloride at concentrations greater than 10,000 mg/l. In the greater Mugu area chloride degradation is severe in a number of wells, and chloride is trending upwards in many wells. Degradation by brines continues unabated in LAS monitoring wells at the Q2 well site, located about two miles north of Mugu Canyon. Degradation in these wells is related to chronically depressed water levels in the area, allowing brines to migrate into the aquifers from surrounding sediments or deeper zones hosting poor-quality groundwater (UWCD, 2007). These trends are expected to continue as water levels remain severely depressed in the LAS in both coastal and inland areas.

Given the chronic groundwater depression existing north and northeast of the Mugu area, basin managers wish to better understand the extent of existing chloride impacts and the potential for further degradation. While additional monitoring wells allow the ability to sample discrete zones within an aquifer and identify vertical head gradients, expansion of the network of monitoring wells is fairly expensive. In recent years United has conducted geophysical studies to gain some information on chloride conditions in areas where wells are not available.

In 2010 United conducted a Time Domain Electromagnetic (TDEM) geophysical survey on the southern Oxnard Plain to assess the lateral extent of saline water intrusion over four different depth ranges (UWCD, 2012a). The survey was designed to replicate a study performed by the USGS in the early 1990s, conducted as part of the RASA project (Zohdy et al, 1993). United's field survey area was approximately 35 square miles and extended along the coast between Port Hueneme and Point Mugu (approximately 7 miles) and inland for approximately 5 miles. One hundred twenty five soundings were collected throughout the study area and the data were forward and inverse modeled for each sounding. The model data were used to construct resistivity maps, at four depth ranges typical of the UAS and LAS.

United's TDEM investigation was successful at delineating earth resistivity values that are typical of saline and brackish water in both the Upper and Lower Aquifer Systems. Resistivities typical of saline water occurred along the coast and extended farther inland near Point Mugu with brackish water inferred at various locations inland. An image of contoured resistivity values at depths approximating the lower portions of the UAS are shown in Figure 4.3-37. A second image of contoured resistivity values for the shallower portions of the LAS are shown in Figure 4.3-38. Groundwater salinity estimates from the TDEM surveys generally correlated well samples from areas monitoring wells. The work suggested that geologic features such as paleochannels may affect groundwater flow and the migration of chloride, particularly in deposits of the UAS (UWCD, 2012a).

Local water managers share a common desire to better understand the extent of saline water impacts on the southern Oxnard Plain and how rapidly it might be migrating toward pumping depressions that exist within the basin . There are relative few monitoring wells in the coastal areas of the southern Oxnard Plain and the extent of saline impacts is not precisely known, but it is well understood that elimination of groundwater overdraft conditions will largely mitigate the worsening of chloride impacts on the southern Oxnard Plain. Prevention of additional water quality degradation is a common goal for all stakeholders as degraded aquifers can negatively affect land values. Restoration of degraded aquifers is also a difficult and expensive prospect, especially in areas already suffering from groundwater overdraft. United recently retained an engineering firm to study the feasibility and expense of desalting brackish groundwater in coastal areas and delivering the treated water to growers on the Oxnard Plain.

4.3.7 PLEASANT VALLEY BASIN

The Pleasant Valley basin lies adjacent and east of the Oxnard Plain, occupying the area south of the Camarillo Hills. The entire area of the basin falls within the Calleguas Creek watershed. Aquifers of the Upper Aquifer System are poorly developed in this basin and dominated by fine-grained deposits. This change in UAS deposits forms the basis for the basin boundary with the Oxnard Plain. Aquifers of the Lower Aquifer System are continuous with areas to the west on the Oxnard Plain. The City of Camarillo occupies the northern portion of the basin and operates public supply wells located outside of United's boundaries. Agriculture is the predominant land use in the remainder of the basin, where the Pleasant Valley County Water District (PVCWD) operates an extensive water delivery system. United has delivered surface water from the Santa Clara River to PVCWD since 1958. Completion of the Conejo Creek Diversion in 2002 brought additional surface water to the Pleasant Valley area.

4.3.7.1 WATER LEVELS

Most wells in the Pleasant Valley basin area are completed in units of the Lower Aquifer System. Some wells are perforated in coarse basal units of the UAS, but pumping and water level measurements from UAS wells are uncommon as the UAS in the Pleasant Valley basin is predominantly comprised of fine-grained sediments (UWCD, 2003). United does not attempt to contour UAS water levels in the Pleasant Valley basin.

Groundwater elevation hydrographs for selected LAS wells are shown in Figure 4.3-39. The LAS well located in the northeast corner of the Pleasant Valley basin near Las Posas Road and Lewis Road recorded groundwater elevations approximately 140 feet below sea level in the early 1990s. Since the early 1990s water levels in this well have increased dramatically, reaching levels of about 140 feet above sea-level in 2011. This recovery is related to increased surface water flow in Arroyo Las Posas and the associated groundwater recharge in the northern portion of the basin. Since the 1990s flow in the Arroyo Las Posas has increased dramatically, largely due to population growth in upstream areas and related water imports and wastewater discharges (LPUG, 2011). This recharge in recent years has lead to the recognition that the basin is unconfined in this area and may be considered a forebay area for the Pleasant Valley basin (Hopkins, 2008). Some recovery in this well is likely related to the relatively wet period the area has experienced since the drought period ending in 1991. The degree to which this recharge has influenced water levels in the central portion of the basin remains a topic worthy of further study.

The groundwater elevation hydrograph for the LAS well located at the intersection of Las Posas Road and Pleasant Valley Road shows a clear decline during the drought conditions of the late 1980s, with water levels reaching approximately 180 feet below sea level in 1991. Since that time, with the onset of a relatively wet period, groundwater elevations increased steadily except for a slight decline during a dry period from 2002 to 2004. From 2005 through 2011 groundwater elevations remained below sea level but higher than the water levels recorded in the late 1980s and early 1990s. This recovery is likely related to the utilization of surface water diverted from Conejo Creek and delivered to agricultural users in the basin. Camrosa Water District constructed the Conejo Creek Diversion in 2002 and has negotiated agreements to provide water to Pleasant Valley County Water District (PVCWD), a major supplier of agricultural water in the Pleasant Valley basin. From 2004 to 2011, diversions from Conejo Creek have averaged approximately 5,600 acre-feet per year. Use of this water for irrigation has reduced pumping demands on the basin. Despite the general water level recovery in this well over the past twenty years, records from fall 2013 show levels have fallen to about 90 feet below sea level.

The groundwater elevation hydrograph for a well in the southern Pleasant Valley area, located along Laguna Road, shows a 1991 drought groundwater elevation of 174 feet below sea level. Since 1993, groundwater levels have returned to pre-drought levels and annual high water levels have remained fairly stable. Annual variability in groundwater elevation appears to be greater following the drought, which could be the influence of a nearby well. Unlike some wells in the northern portion of the basin, spring high water levels recorded in this well are not appreciably higher than they were in the 1980s. The highest recorded groundwater elevation for this well is approximately twenty feet below sea level.

Groundwater elevation contours for LAS wells measured in spring and fall 2013 are shown in Figures 4.3-30 and 4.3-31. The spring LAS contours on the maps show the significant pumping depression that exists in western Pleasant Valley and the eastern Oxnard Plain, where groundwater elevations are well below sea level over a broad area. The fall map shows a pumping depression over several square miles with groundwater elevations more than 120 feet below sea level. The severely depressed water levels in the basin promote the upwelling of brines from deeper formations, the compaction of both aquifers and aquitards, and land subsidence.

The contours for both spring and fall indicate groundwater flow from the west Oxnard Plain and from the Oxnard Forebay to the north. A steep groundwater gradient likely exists between the main pumping depression and the recharge area along Calleguas Creek in the northern part of the basin, but this area is not contoured due to sparse well control and the unknown influence of faulting in the northern basin.

4.3.7.2 GROUNDWATER EXTRACTIONS

Maps showing reported groundwater pumping from LAS wells in the Pleasant Valley basin and on the Oxnard Plain are shown in Figure 4.3-27. The northern and eastern portions of the basin fall outside of United's district boundary, and pumping in those areas is not shown on figures in this report. Pumping from the LAS within United's district boundaries is concentrated along the western portion of the basin, and aligns with the areas where water levels are deepest in the basin. Pumping of the UAS is limited, and skewed towards the eastern portion of the basin (Figure 4.3-26). A majority of the UAS wells report minor pumping and are likely used for domestic supply.

Reported Pleasant Valley basin pumping for the area within United's boundaries is shown in Figure 4.3-40. In 2013 pumping was the greatest since 1991, totaling 18,700 AF. Pumping from the Pleasant Valley basin is fairly variable, in large part due to the significant surface water deliveries that are possible during years of above-average precipitation.

4.3.7.3 WATER QUALITY

The map showing the maximum groundwater chloride concentrations recorded in 2013 is shown as Figure 4.3-34. Samples from wells in the Pleasant Valley basin are distinctly higher than those from the Oxnard Plain to the west (except for the intruded areas near the coast). Many wells in the Pleasant Valley Basin had chloride concentrations well over 100 mg/l, a common advisory chloride level for sensitive agricultural crops. A number of the samples are from wells operated by Pleasant Valley County Water District, which blends well water with surface water diverted from Conejo Creek and the Santa Clara River before delivery to areas growers.

During the RASA study in the early 1990s USGS investigators recognized high chloride in some Pleasant Valley basin wells. Innovative sampling techniques were employed to profile flow and chloride concentrations in deep production wells. It was recognized that the highest chloride and TDS concentrations were commonly sourcing from the deepest portions of these deep LAS wells, and that these zones contributed little water to the well. In 2001 United sought and was awarded an AB303 grant from the California Department of Water Resources to study the nature of the inland saline intrusion problem in the Pleasant Valley basin (UWCD, 2003). A major part of this study was depth dependent sampling and flow profiling of eight deep production wells in the basin. The USGS was contracted to perform this work, which included chemical analysis of major ions and trace elements as well as specific isotopes and chemical tracers. The report concluded that chloride increased with pumping during past period of drought, and that increased delivery of surface water to the area of the Pleasant Valley Basin pumping depression would help groundwater levels recover and likely decrease chloride concentrations in water produced from deep wells in the basin.

In 2005 the USGS published technical papers detailing the results of their sampling of Pleasant Valley wells, which included depth-dependent groundwater sampling, flow profiling, and analysis of isotopic and chemical tracers (Izbicki et al, 2005a; Izbicki et al, 2005b). The results detailed by the USGS included that: 1) high chlorides were entering wells from various sources at different depths; 2) concentrations of chlorides in the upper portion of some wells influenced by irrigation return flow were as high as 220 mg/L; 3) concentrations of chlorides in wells with depths greater than 1400 feet were as high as 500 mg/L and had the chemical and isotopic composition trending toward oil field production water in the area; 4) higher chloride concentrations occurred in deep wells near faults that bound the valley such as the Camarillo fault in the north basin and the Bailey Fault on the south side of the basin; and 5) chlorides increase with increased pumping during droughts.

A recommendation by the USGS was that sealing off the low-yield and poor-quality lower portions of some deep wells would act to improve water quality in many production wells without sacrificing appreciable yield. The 2013 chloride concentrations shown in Figure 4.3-34 suggests that a majority of the wells in the basin are impacted by elevated chloride concentrations. These impacts are likely to continue as chronic overdraft conditions persist in the basin and deep brines migrate upward in response to the hydraulic gradients produced by over-pumping. Figure 4.3-41 displays maximum chloride concentrations from calendar year 1990, a year when extensive sampling was conducted by the USGS as part of the RASA study. In this drought year few wells recorded chloride less than 100 mg/l. Comparison of chloride records from 1990 to 2013 reveals that recent samples from a number of wells record higher chloride now than they did in a past period of drought.

Recharge water sourcing from Arroyo Las Posas in the northern portion of the Pleasant Valley basin is another significant chloride input to the basin. Chloride loading associated with this recharge is currently under evaluation as part of a proposed desalter project for this area. The effort is being lead by the City of Camarillo. Calleguas MWD has constructed an ocean outfall and brine line ("Salinity Management Pipeline") to inland areas along Calleguas Creek. This pipeline is a tremendous development for the region, as a number of desalters are expected to be built to improve the quality of water delivered to both municipal and agricultural users.

4.3.8 WEST LAS POSAS BASIN

The West Las Posas basin is the western-most of a series of three subbasins that are referred to collectively as the Las Posas basin. The other subbasins of the Las Posas basin are the East Las Posas basin and South Las Posas basin. The West Las Posas basin is bounded to the north by South Mountain, to the south by the Camarillo Hills, to the west by the Oxnard Plain and to the east by the East Las Posas basin. Only approximately the western one-third of the West Las Posas basin is included within the boundaries of United Water Conservation District (Figure 1-1).

The Los Posas Basin Users Group (LPUG) is currently in the process of formulating a Basin Specific Groundwater Management Plan for the Las Posas Basin. The portion of the basin within the District, however, is excluded from the Plan. Del Norte Mutual Water Company made a formal request of the LPUG to be excluded from the current Las Posas basin plan on the basis of groundwater conditions, groundwater source, and political jurisdiction. LPUG agreed that the District's portion of the Las Posas basin does not have to be managed under the Las Posas basin plan, because groundwater users pay pump charges for groundwater recharge and management activities conducted by United (LPUG, 2011). Although the United portion of the West Las Posas basin will not be managed by the LPUG plan, it will be monitored because it is hydraulically connected to the remainder of the West Las Posas subbasin.

4.3.8.1 WATER LEVELS

Groundwater levels have been monitored for nearly a century in the Las Posas Valley. Groundwater elevations in the West Las Posas Basin are monitored by UWCD and Ventura County

Watershed Protection District (VCWPD) with private entities also providing data. Fewer wells are monitored in this basin than for most other basins within the District.

In the West Las Posas basin, piezometric heads range from approximately 100 feet below mean sea level (msl) near the Central Las Posas fault to approximately 50 feet above msl near the Oxnard Plain, indicating a general northwest to southeast flow direction (LPUG, 2011). The flow pattern in the West Las Posas basin suggests the aquifer is receiving inflow from the Oxnard Plain and recharge along the northern flank of the valley. Groundwater moves across the subbasin toward an area of focused pumping near Bradley Road where there has been a long history of depressed water levels (LPUG, 2011).

4.3.8.2 GROUNDWATER EXTRACTIONS

During calendar year 2013, a reported 4,000 acre-feet of groundwater were pumped from the portion of West Las Posas basin that lies within United's boundaries. The areal distribution of pumping in the UAS and LAS in 2013 is shown in Figures 4.3-26 and 4.3-27. Reported groundwater extraction from the basin has generally been increasing in recent years (Figure 4.3-42). The Del Norte Water Company pumps water from its well yard located near Highway 118 and Santa Clara Avenue on the Oxnard Plain, and delivers this water for agricultural use in northern portions of the West Las Posas Basin within United's District boundary. In 2013 Del Norte pumped and exported nearly 3,000 acre-feet from the Oxnard Plain to the West Las Posas Basin.

4.3.8.3 WATER QUALITY

Water quality samples from wells in the West Las Posas basin indicate groundwater quality is generally adequate for agricultural and municipal use, however, localized exceedances of the MCL for TDS, nitrates, and sulfates have been reported.

Ventura County Watershed Protection District (2014) reports that for the average TDS among the ten wells sampled in 2013 was 874 mg/l, and two wells had nitrate concentrations above the MCL for nitrate. Groundwater with this degree of mineralization is common throughout United's service area. In the West Las Posas basin TDS and chloride concentrations tend to be higher in the northern and western portions of this basin compared to other areas, suggesting that mountain front recharge along the southern flank of South Mountain and inflow from the Oxnard Plain Basin are the sources of higher TDS and chloride concentrations (LPUG, 2011).

5 SUMMARY

With two years of below-average rainfall in 2012 and 2013, the basins within United's service area are showing signs of stress. Groundwater elevations have fallen in all basins, and water levels across much of the coastal plain are now below sea level. A renewed period of active saline intrusion is now underway. Water quality problems associated with reduced rainfall and recharge are also apparent in some inland areas where nitrate, chloride and TDS concentrations are causing problems for some users of groundwater. Groundwater conditions are expected to deteriorate further over the summer and fall of 2014. Dry weather is expected for these months and there will not be a conservation release from Lake Piru in fall 2014. Much of United's current infrastructure is designed to maximize the use of surface water from the watershed of the Santa Clara River, but these projects are of limited use when the river is dry. Even when wet conditions do return to the area, the recovery of groundwater storage in the coastal basins is expected to be slower than it was in 1991-1995. United's ability to divert water at the Freeman Diversion is likely to be less than in prior years due to regulatory constraints associated with endangered species issues, and multiple wet years may not occur again following this period of drought.

United Water continues to evaluate various strategies to best manage and protect the surface and groundwater resources within the District. Current and on-going considerations include: the characterization of groundwater conditions, the most-efficient use of existing infrastructure and the need for additional or modified facilities, current and future water demands, current and anticipated water quality issues, and effective utilization of existing allocations of imported State Water Project water. United Water's goal is to identify the best use of local water resources and infrastructure, and to work with other agencies to implement these strategies, while honoring a coherent strategy and set of priorities that guides all future infrastructure and water management decisions.

The District's groundwater and surface water projects and programs are keyed to the issues and concerns that impact or potentially impact the water resources of the region. These issues and concerns evolve over time and United Water strives to adjust, modify, or devise new projects or programs in response to changing water resource challenges. Many of the projects and programs undertaken by United Water have long-term implementation schedules (e.g., District-wide groundwater level measurements, conservation releases), however, these types of efforts provide the critical data needed to make sound water resource management decisions that provide for the maintenance of reliable, sustainable, local water resources for the benefit of both agricultural and municipal and industrial water users in central and southern Ventura County. United is encouraged by the desalters and advanced water treatment plants that are either planned or under construction in the region, and it hopeful that these facilities will serve to lessen long-term demands on the groundwater basins.

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7 FIGURES AND TABLES

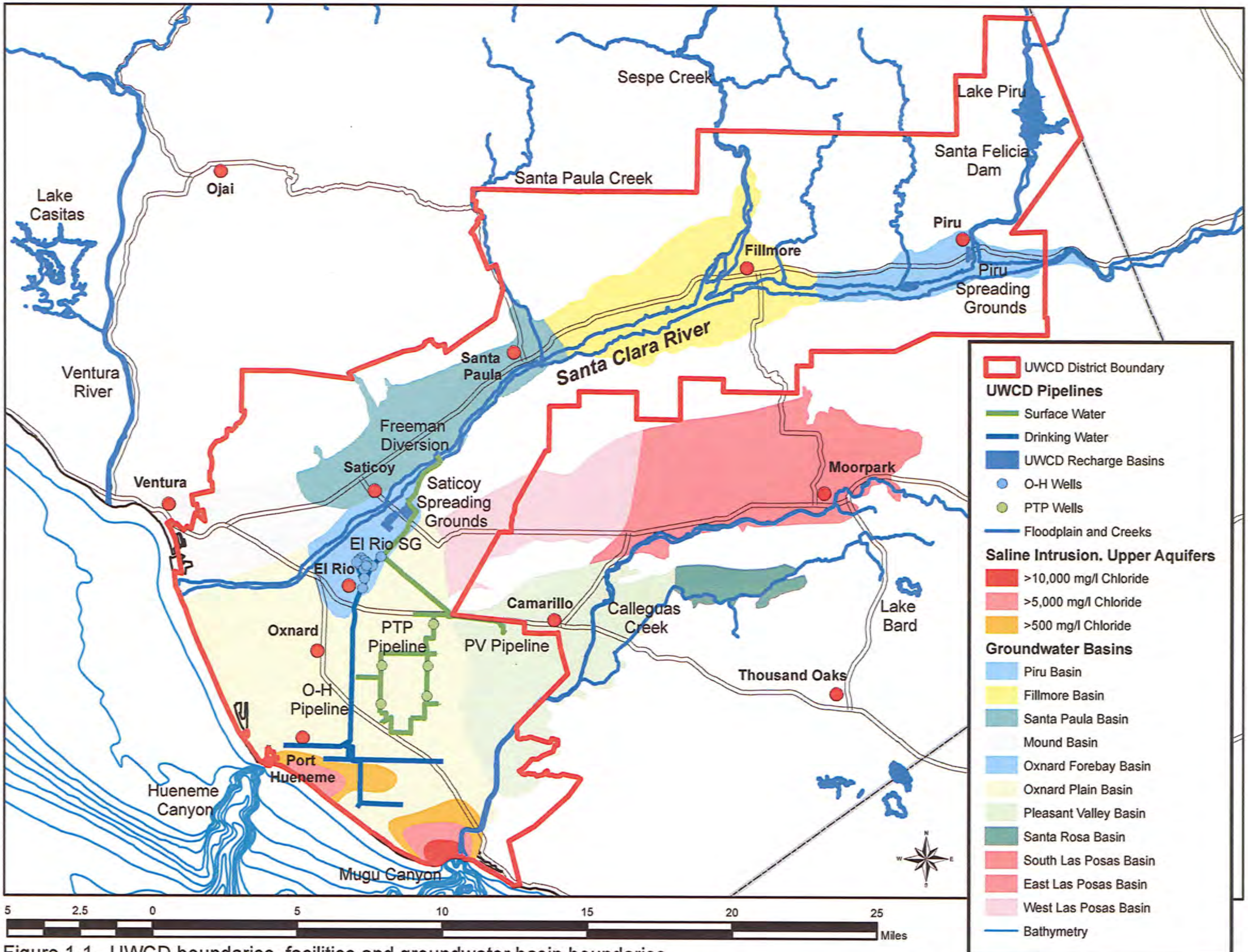


Figure 1-1. UWCD boundaries, facilities and groundwater basin boundaries

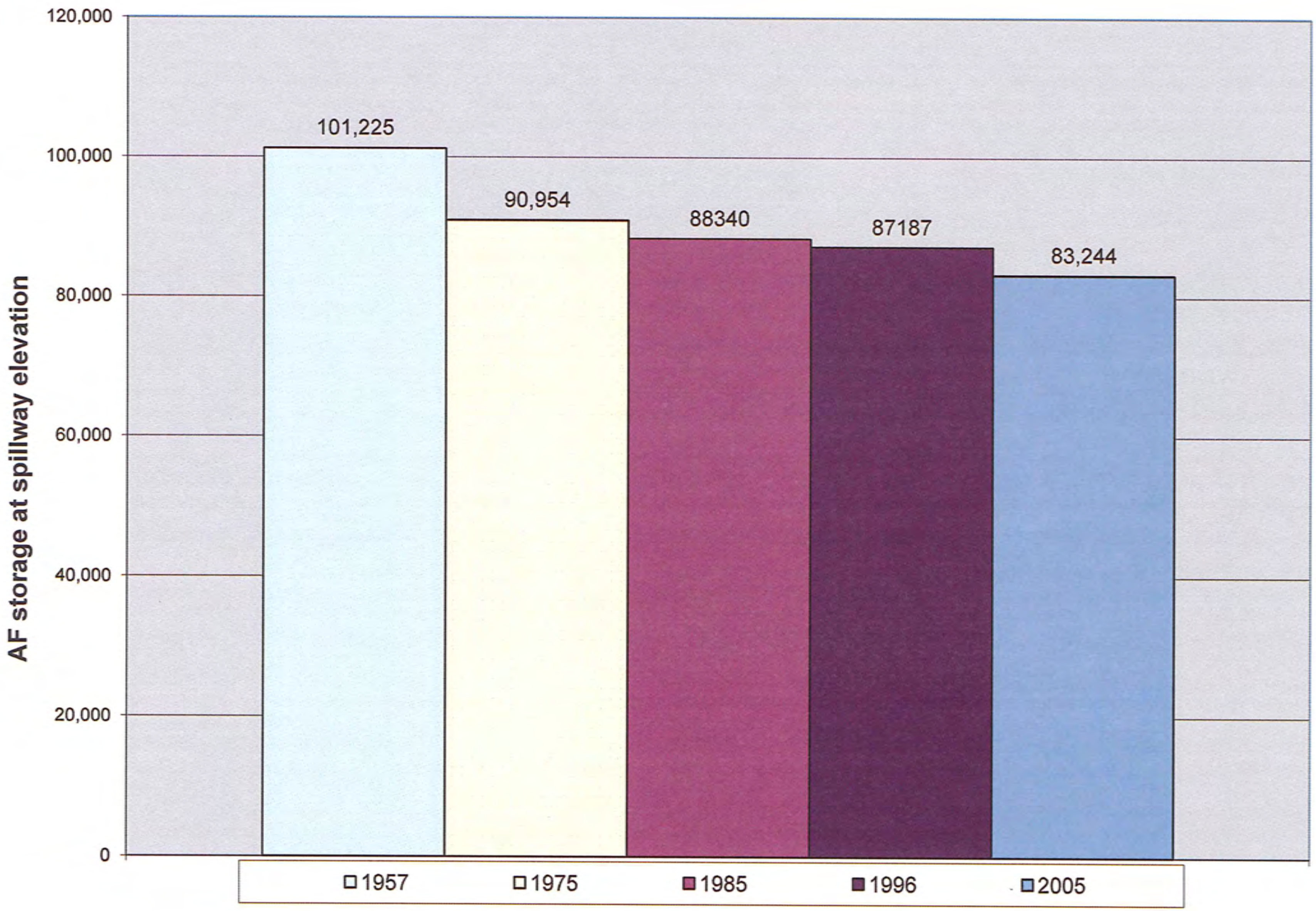


Figure 1.4-1. Silt surveys showing historic storage capacity in Lake Piru

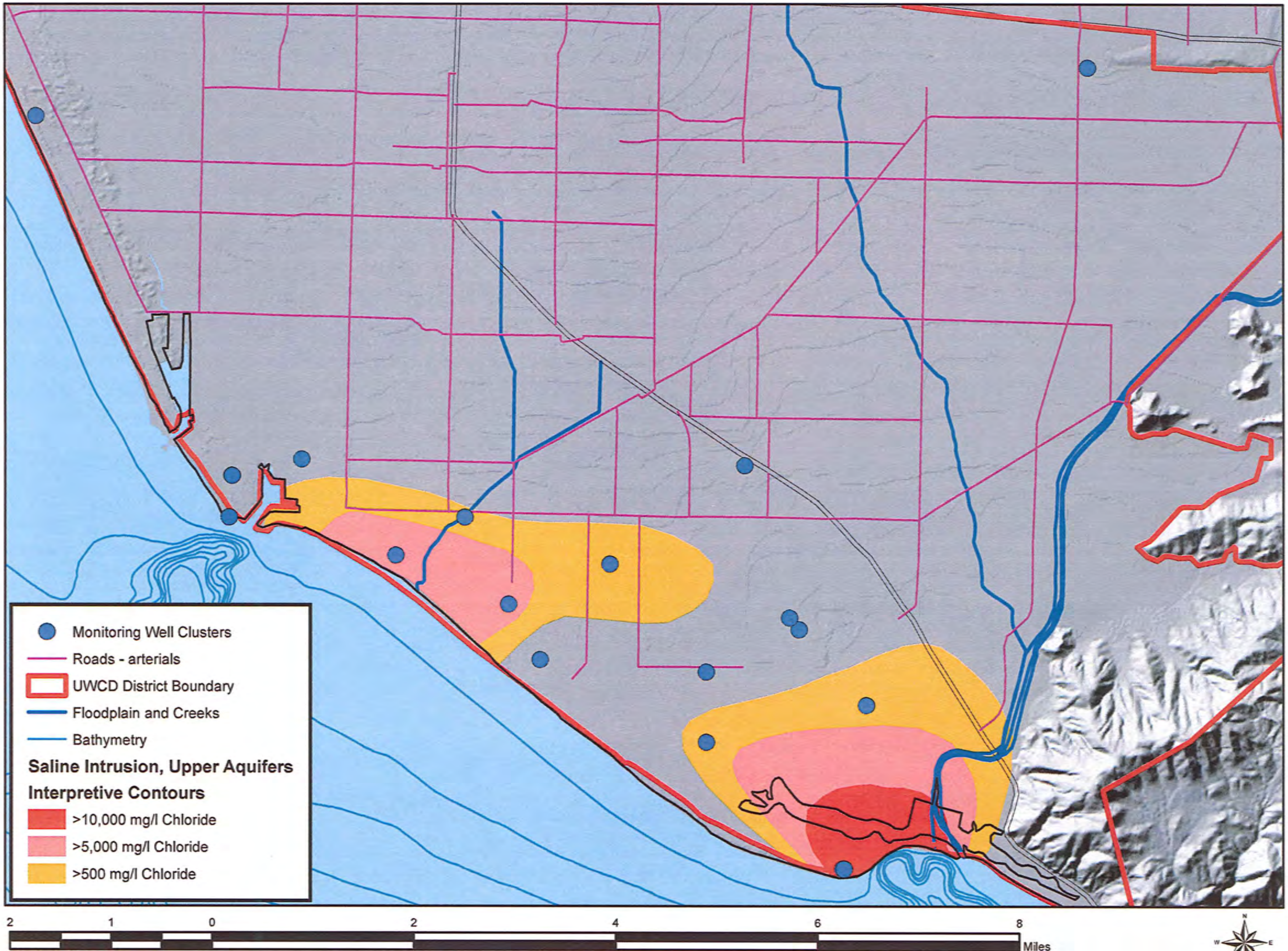


Figure 1.5-1. Locations of RASA coastal monitoring well clusters

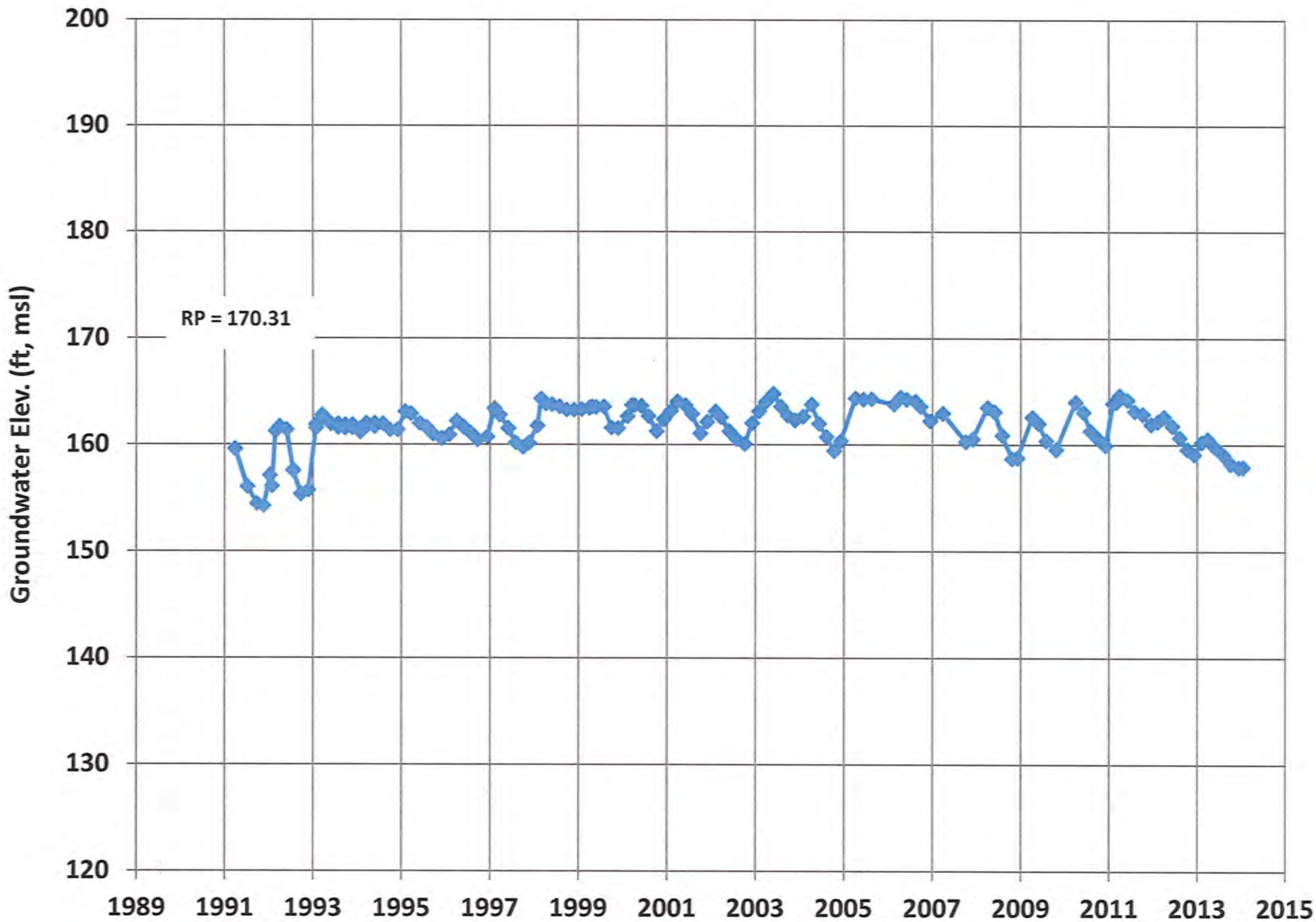


Figure 1.6-1. Groundwater elevations near the Freeman Diversion

Project	Overdraft Conditions	Declining Water Levels	Groundwater Exports	Saline Water Intrusion	Upwelling Saline Water	Riverbed Stabilization	Biological Opinion-SFD	Biological Opinion-VFD	VFD Operation	Aquifer Mapping	Recharge Optimization	Water Quality Degradation
Update Regional GW Flow Model	X	X	X	X	X	X				X	X	X
AB3030 Piru/Fillmore GW Management Plan Update			X								X	X
Santa Paula Basin TAC and Specialty Studies		X	X			X			X	X	X	
District-Wide GW Level Measurements / Piezometers	X	X	X	X	X	X	X	X	X		X	X
District-Wide Water Quality Sampling & Analyses	X	X	X	X	X						X	X
District-Wide Stream Gauging	X	X				X	X	X	X		X	X
Surface Geophysical Studies (Seismic Reflection, TDEM)	X	X		X						X	X	
SCR/Forebay Piezometer Installation		X					X	X	X		X	
Brackish Water Treatment Feasibility Study	X	X		X	X						X	

Figure 2.1-1. Groundwater issues and concerns versus projects

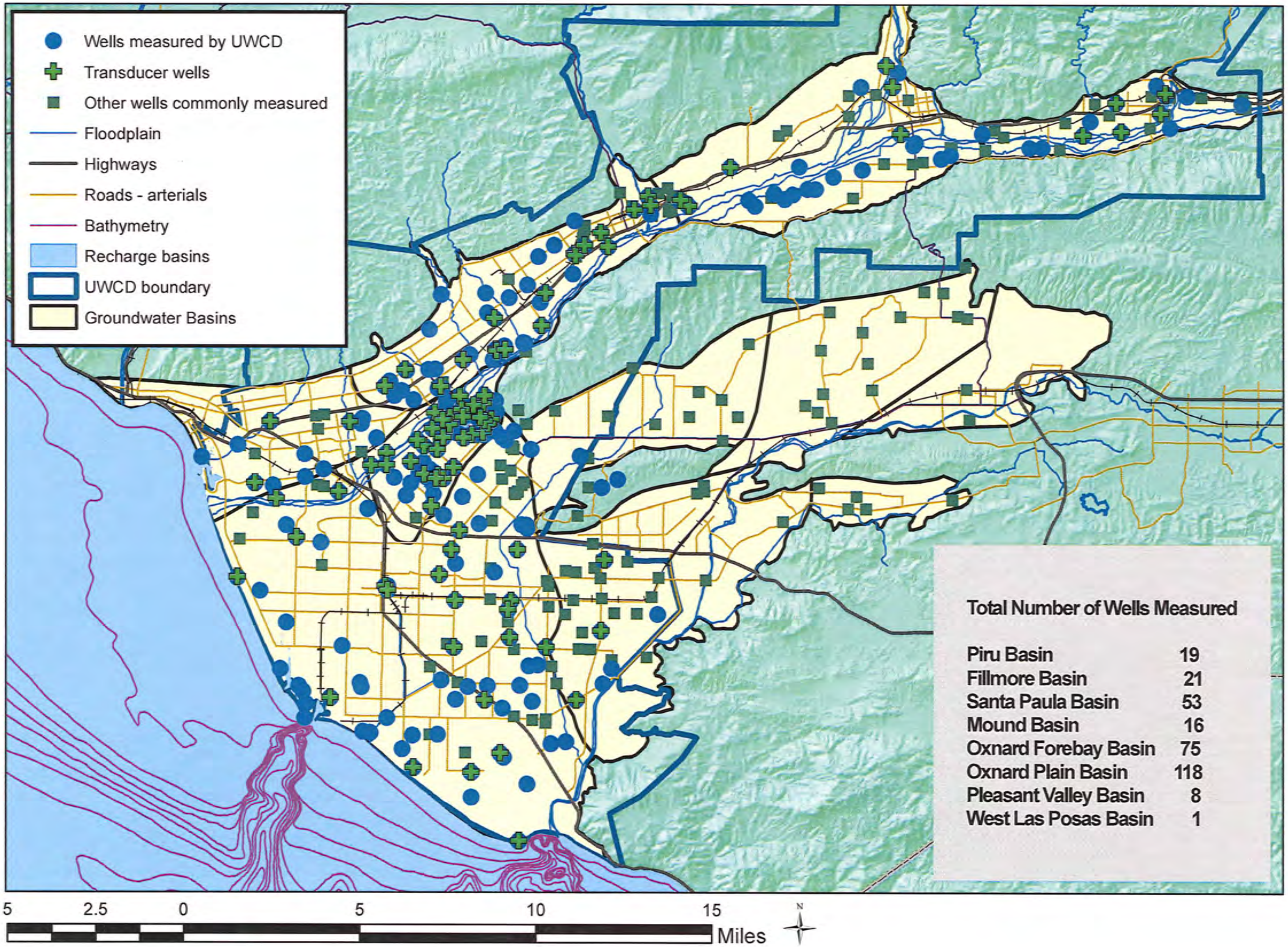


Figure 2.1-2 Wells monitored by United for water levels

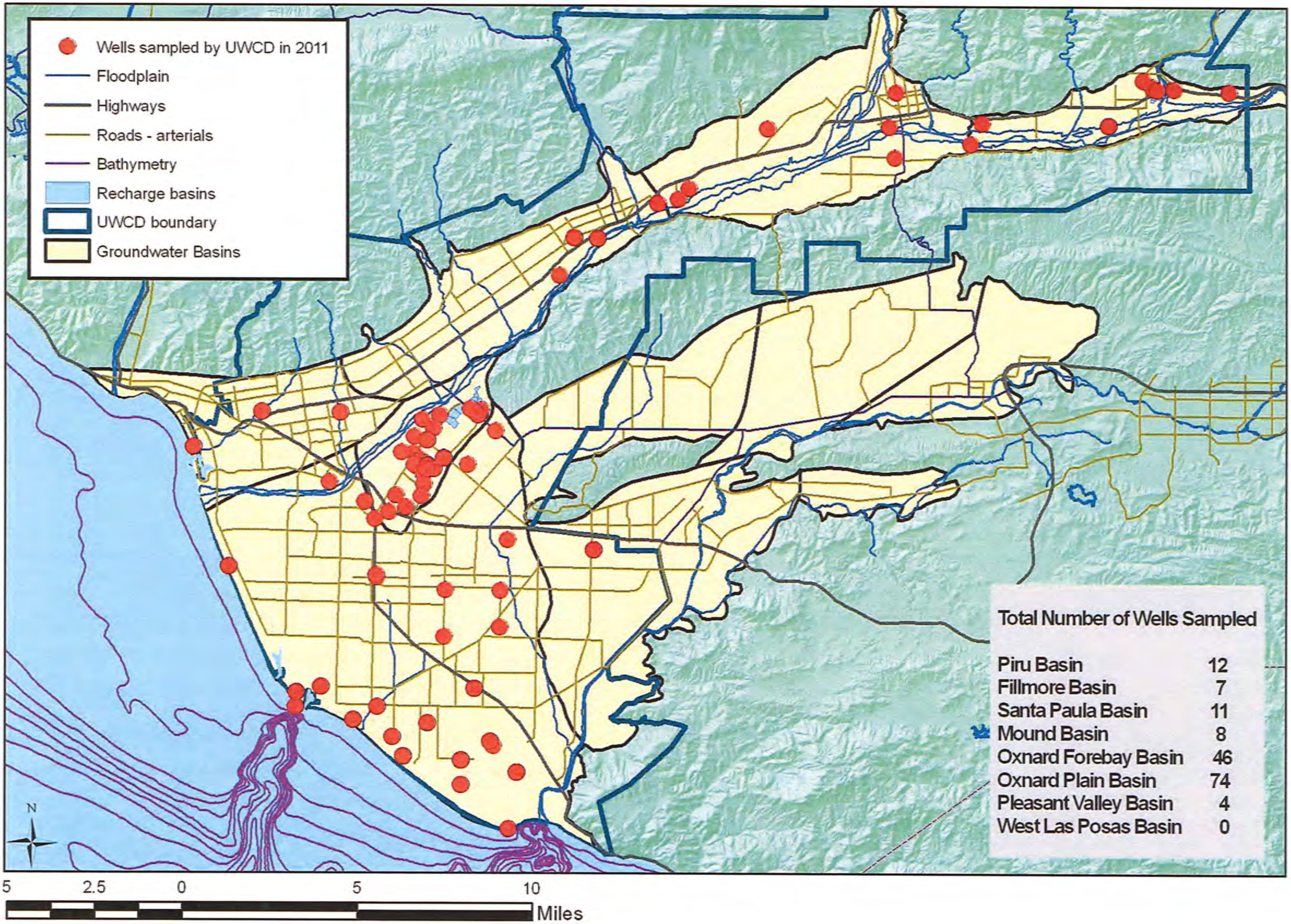


Figure 2.1-3. Wells sampled by United for water quality

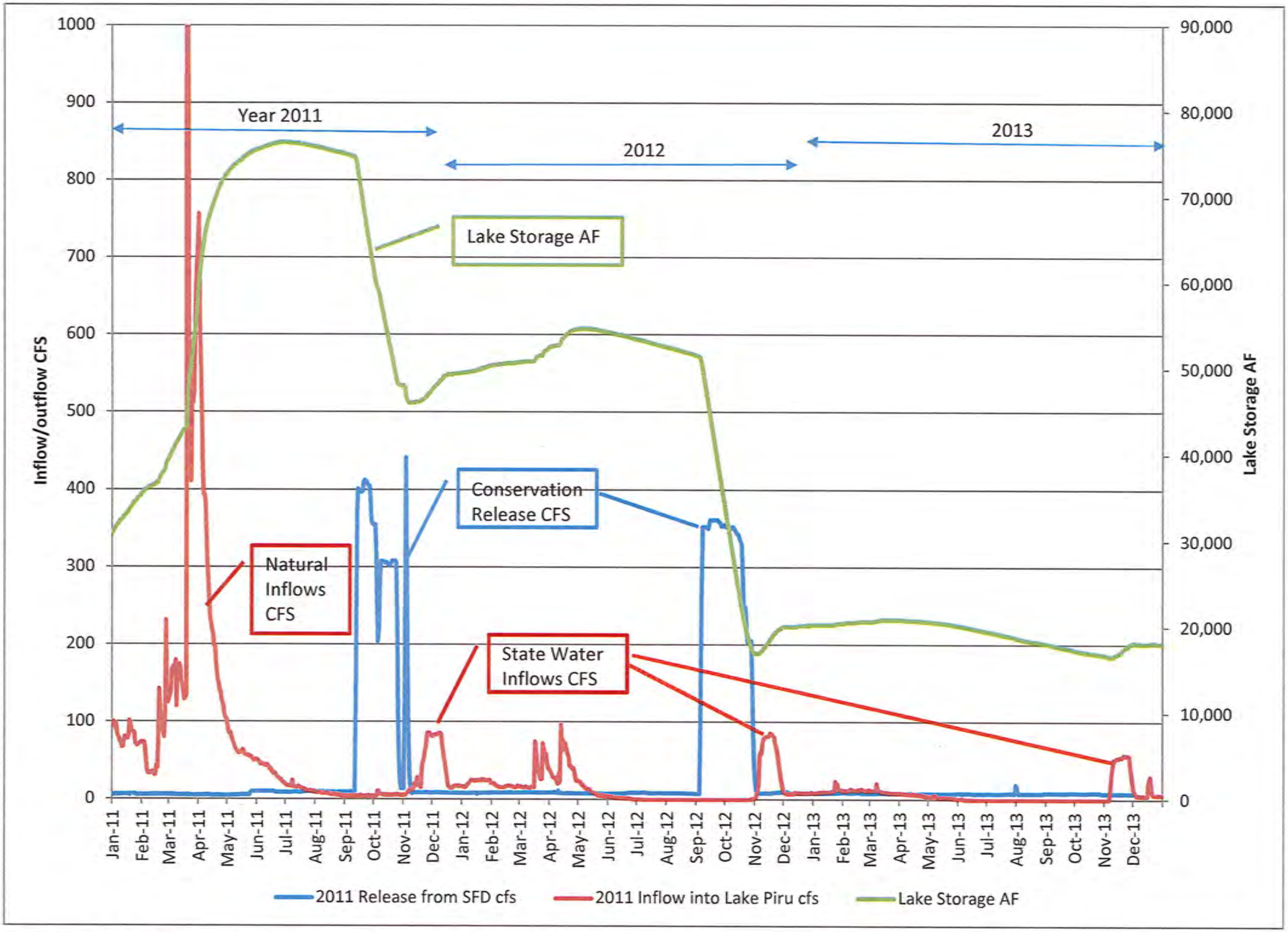


Figure 2.2-1. Basic Hydrology at Lake Piru from 2011 through 2013

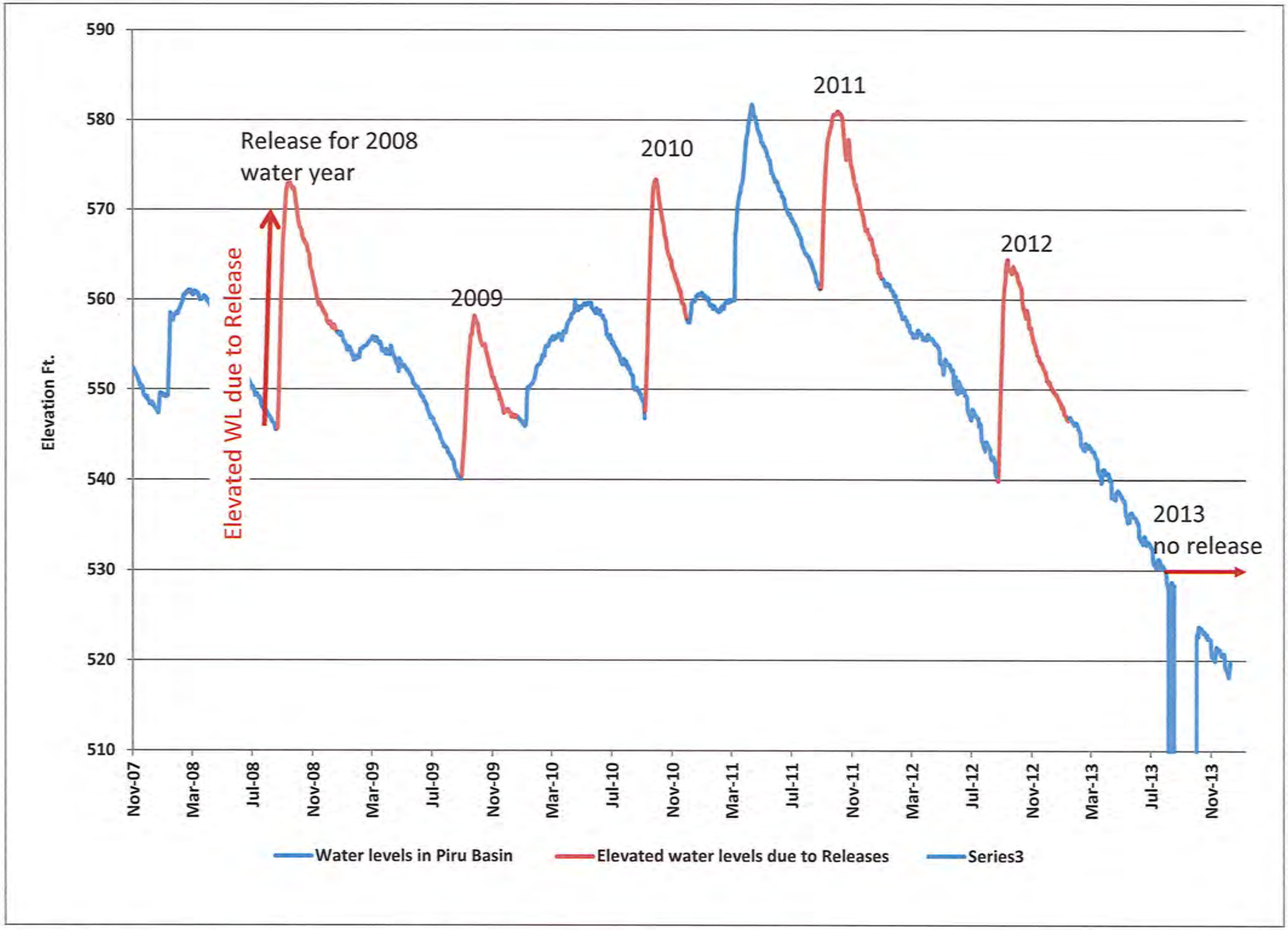


Figure 2.2-2. Groundwater response in the Piru basin from the conservation release at SFD (well 04N18W31D07S & -D04S)

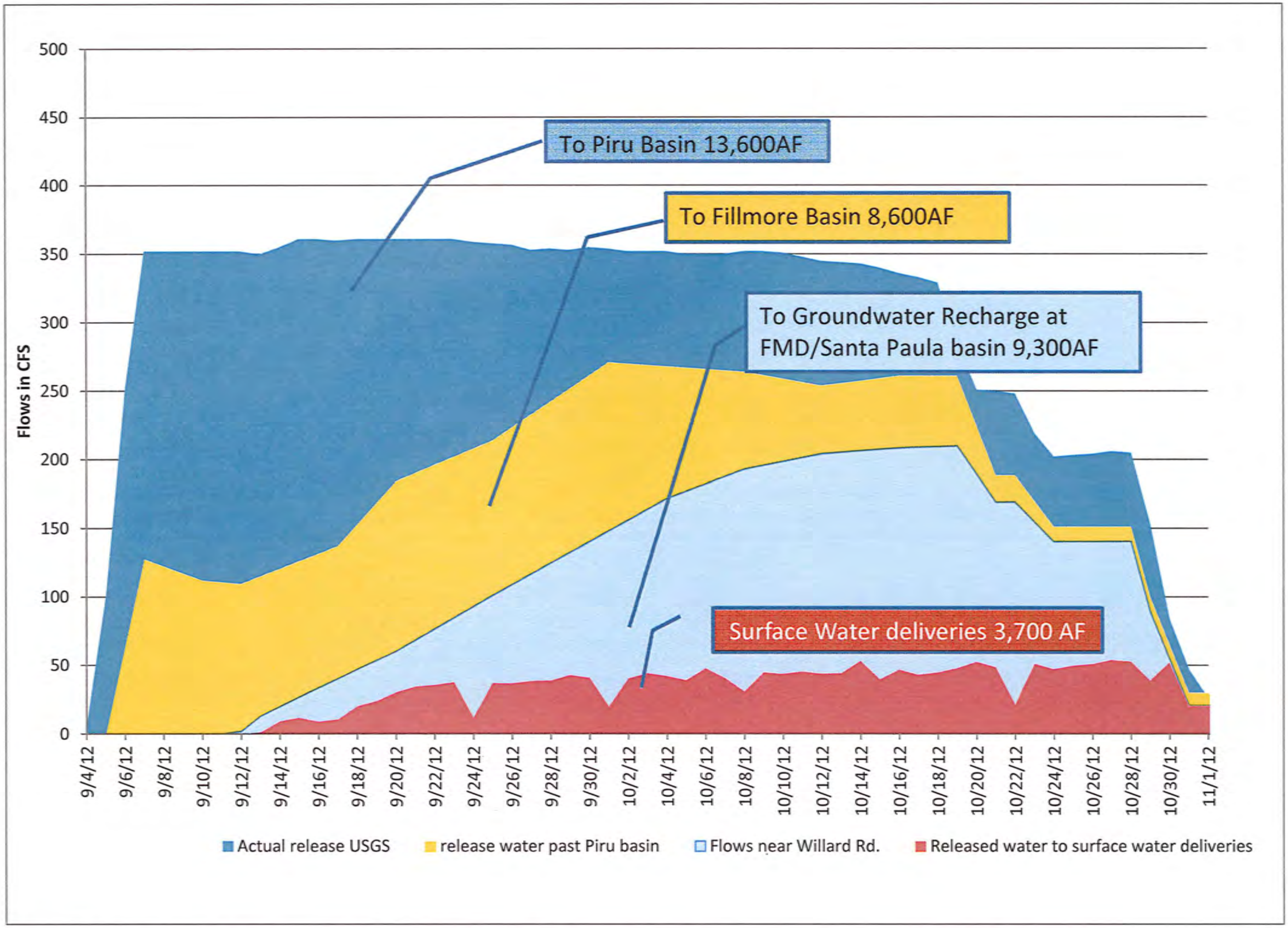


Figure 2.2-3. Benefits of the direct percolation of the 2012 Lake Piru conservation release (35,200 AF)

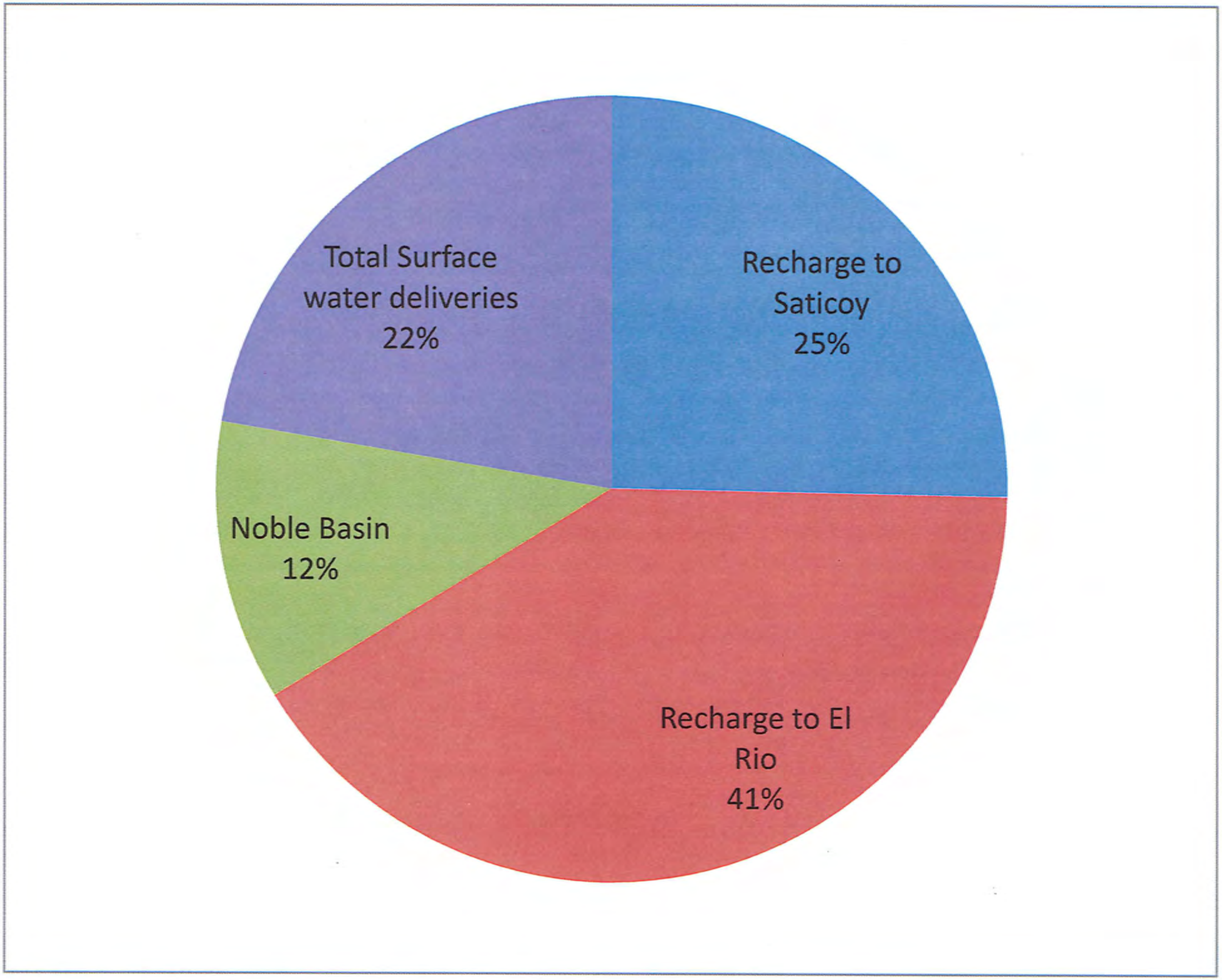
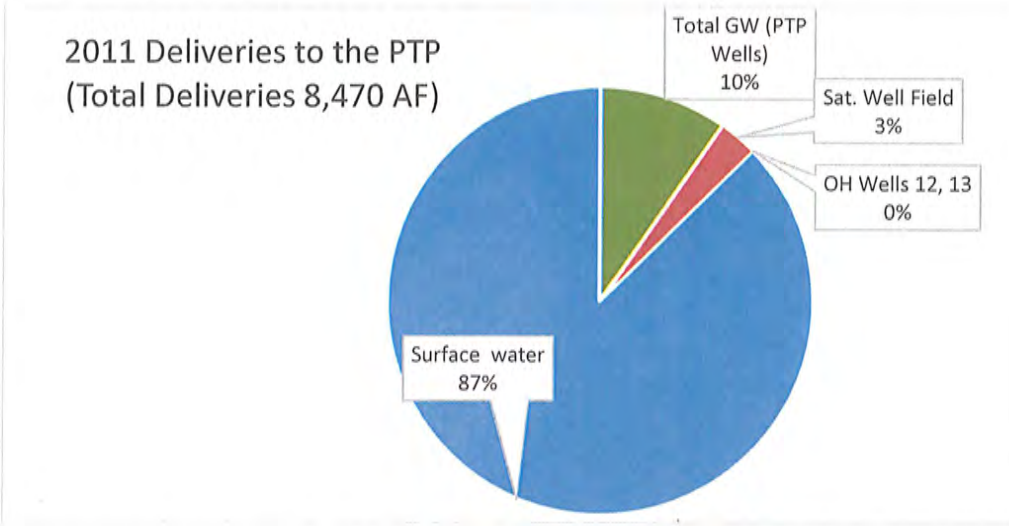
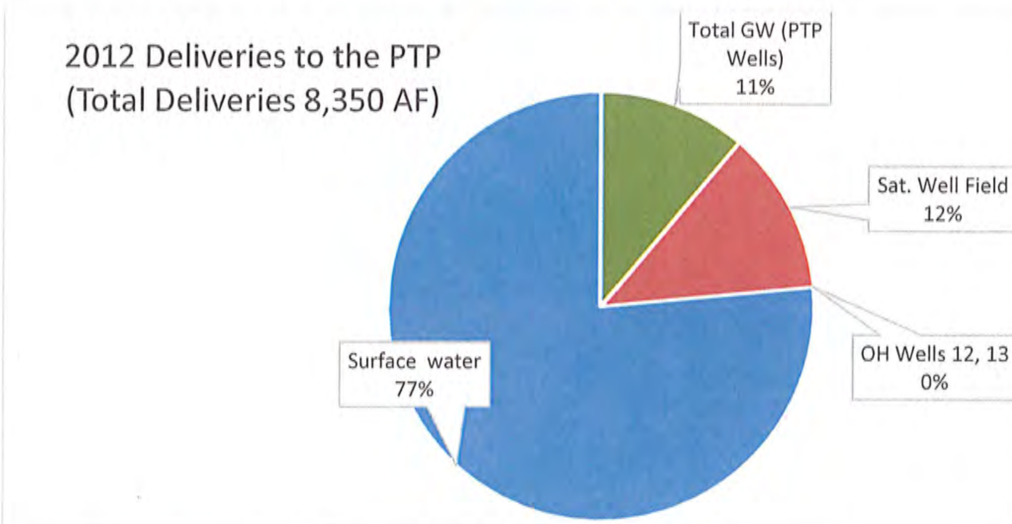


Figure 2.2-4. Distribution of water diverted at Freeman Diversion, 2011





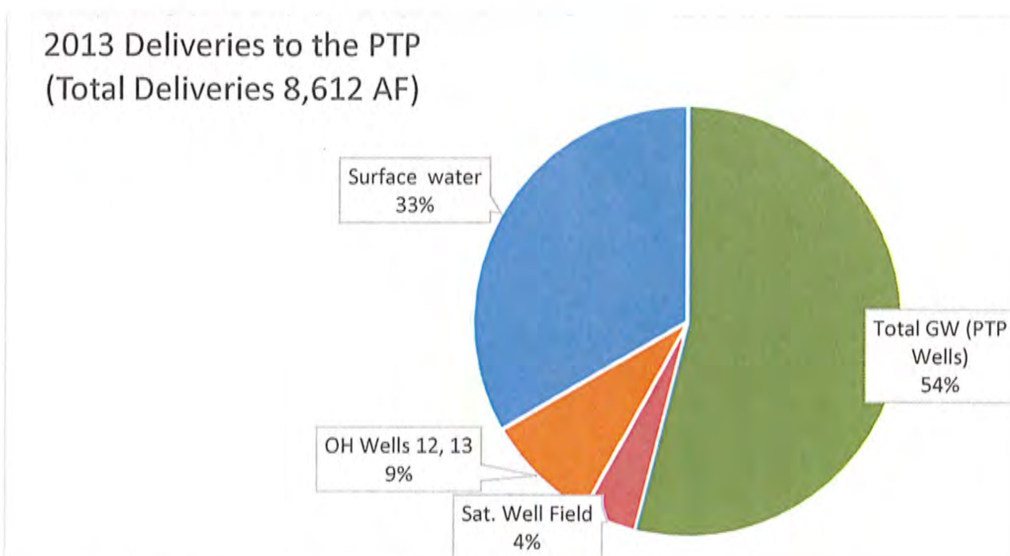


Figure 2.2-5. Source water of the PTP deliveries

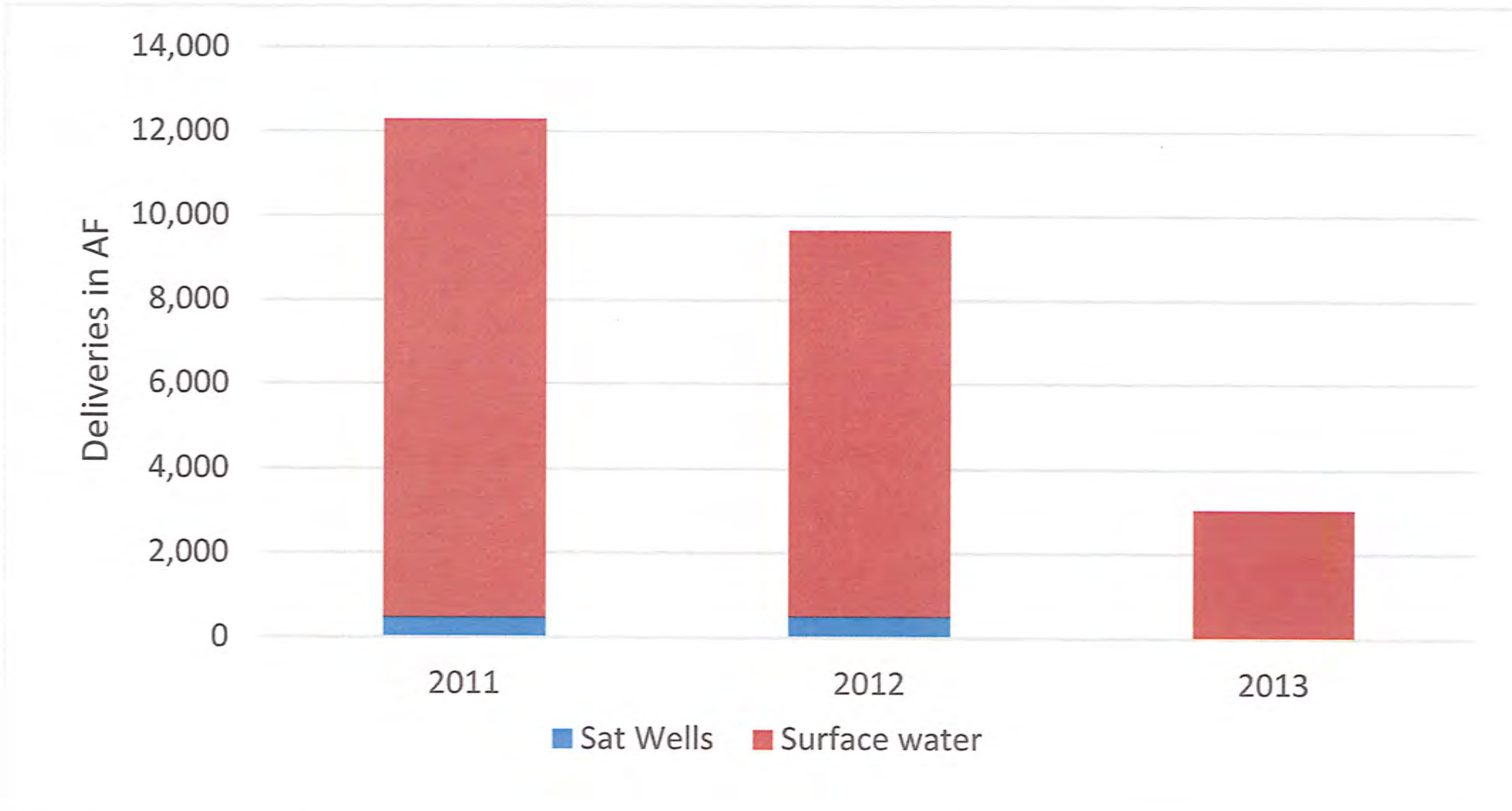


Figure 2.2-6. Source water of the Pleasant Valley County Water District deliveries

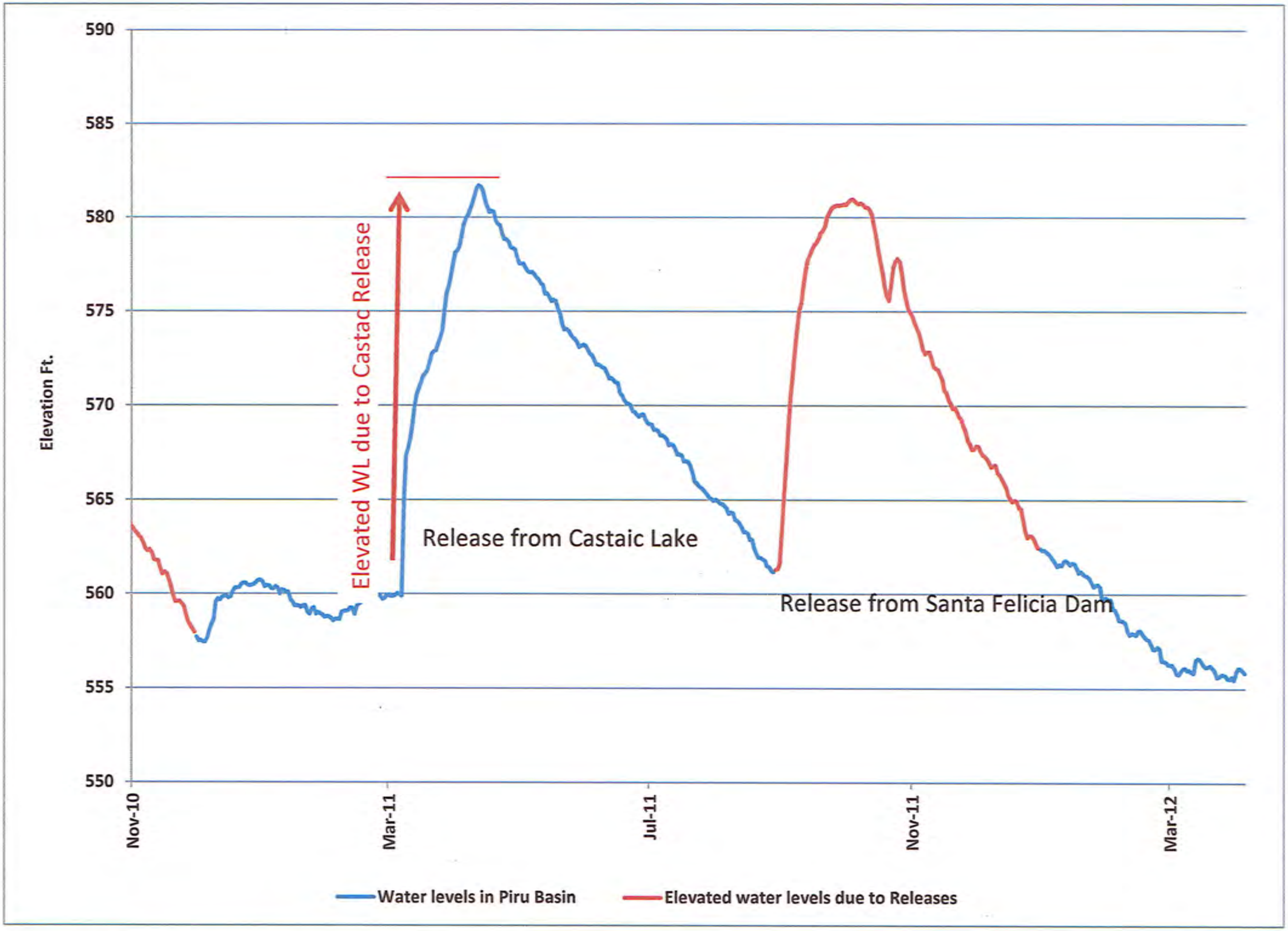


Figure 2.2-7. Groundwater response in the Piru basin to Castaic Lake floodflow release (well 04N18W31D07S)

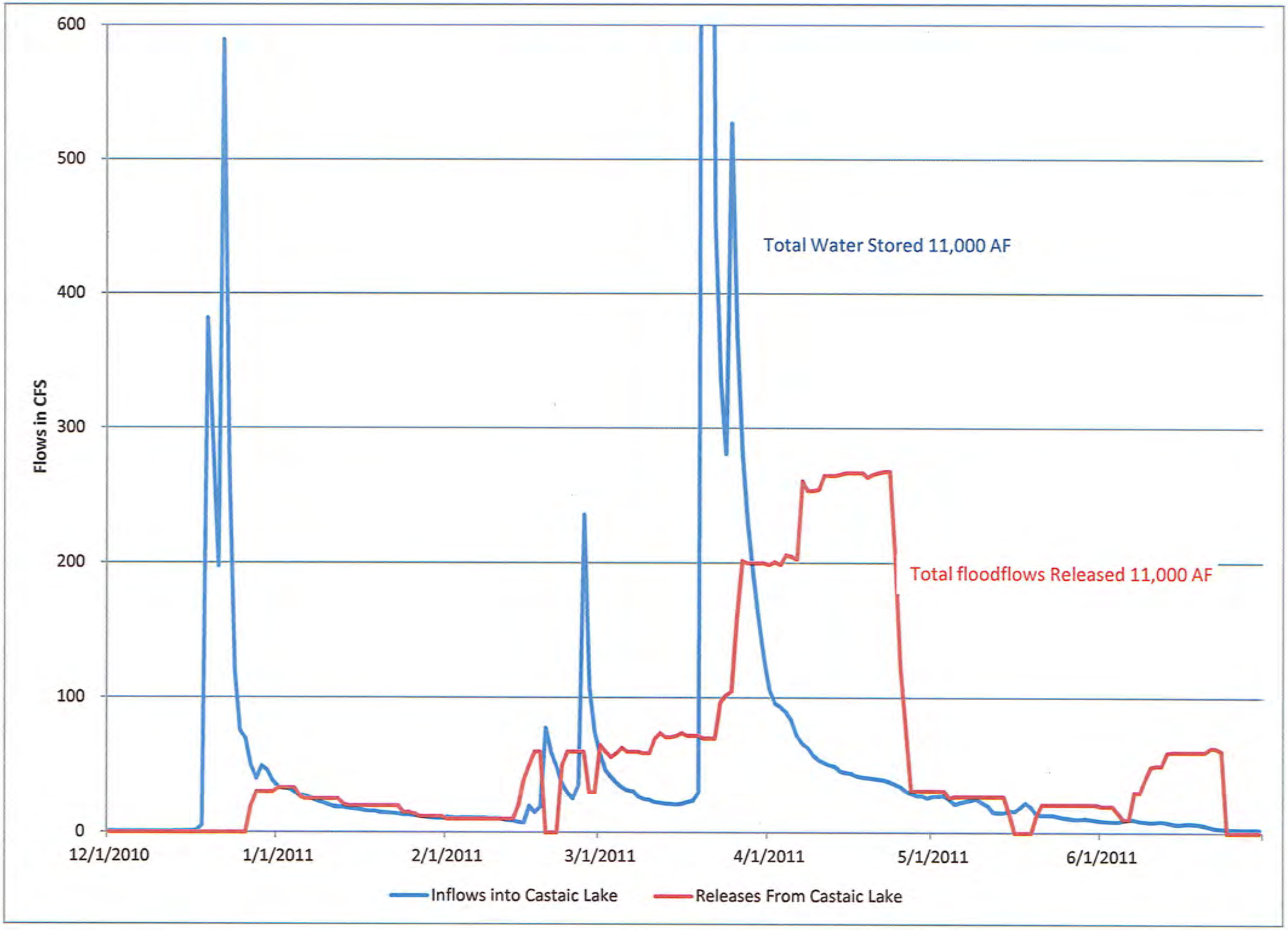


Figure 2.2-8. Conservation release from Castaic Lake for downstream water users

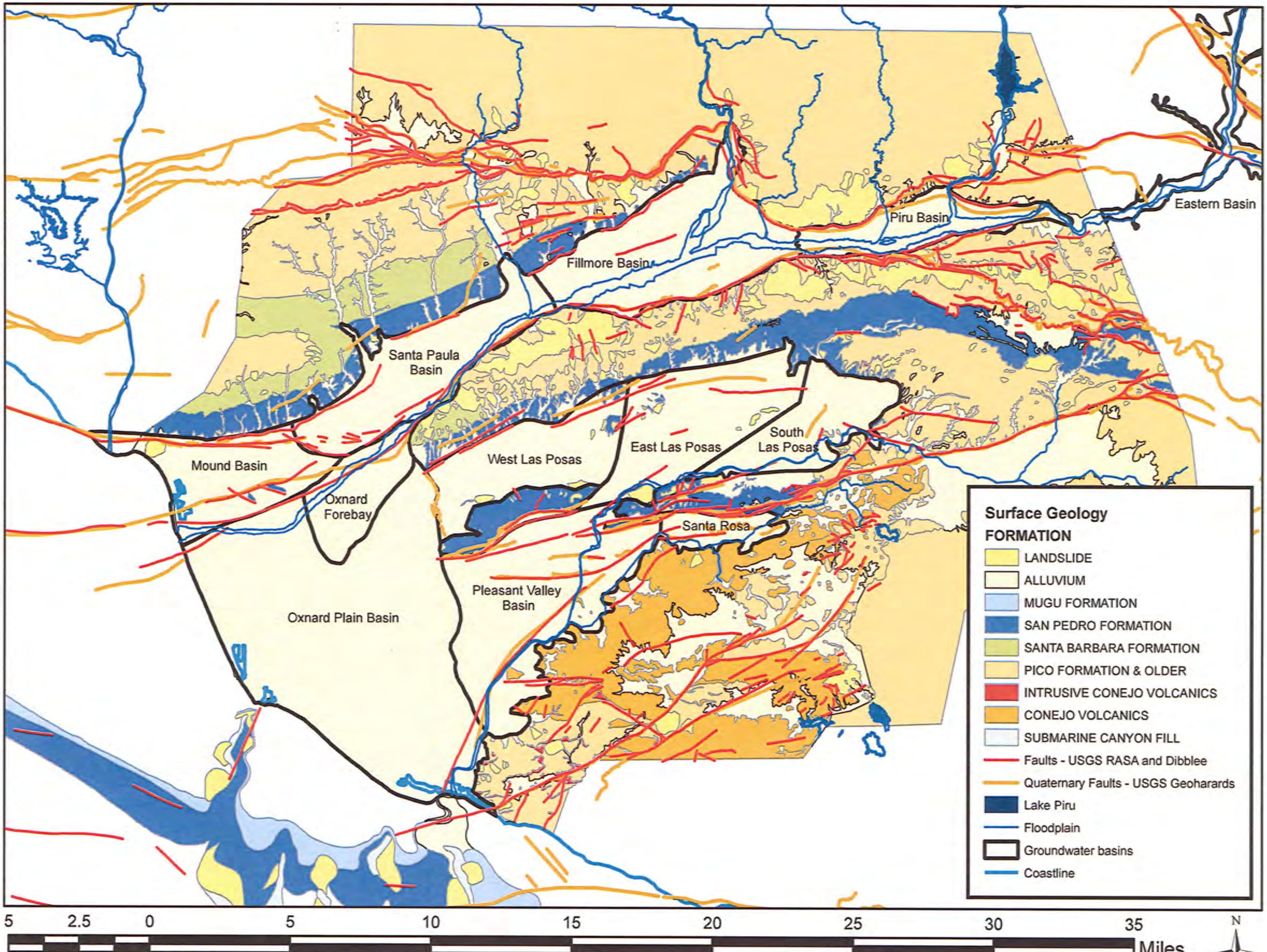


Figure 3.1-1. Surface geology and faults

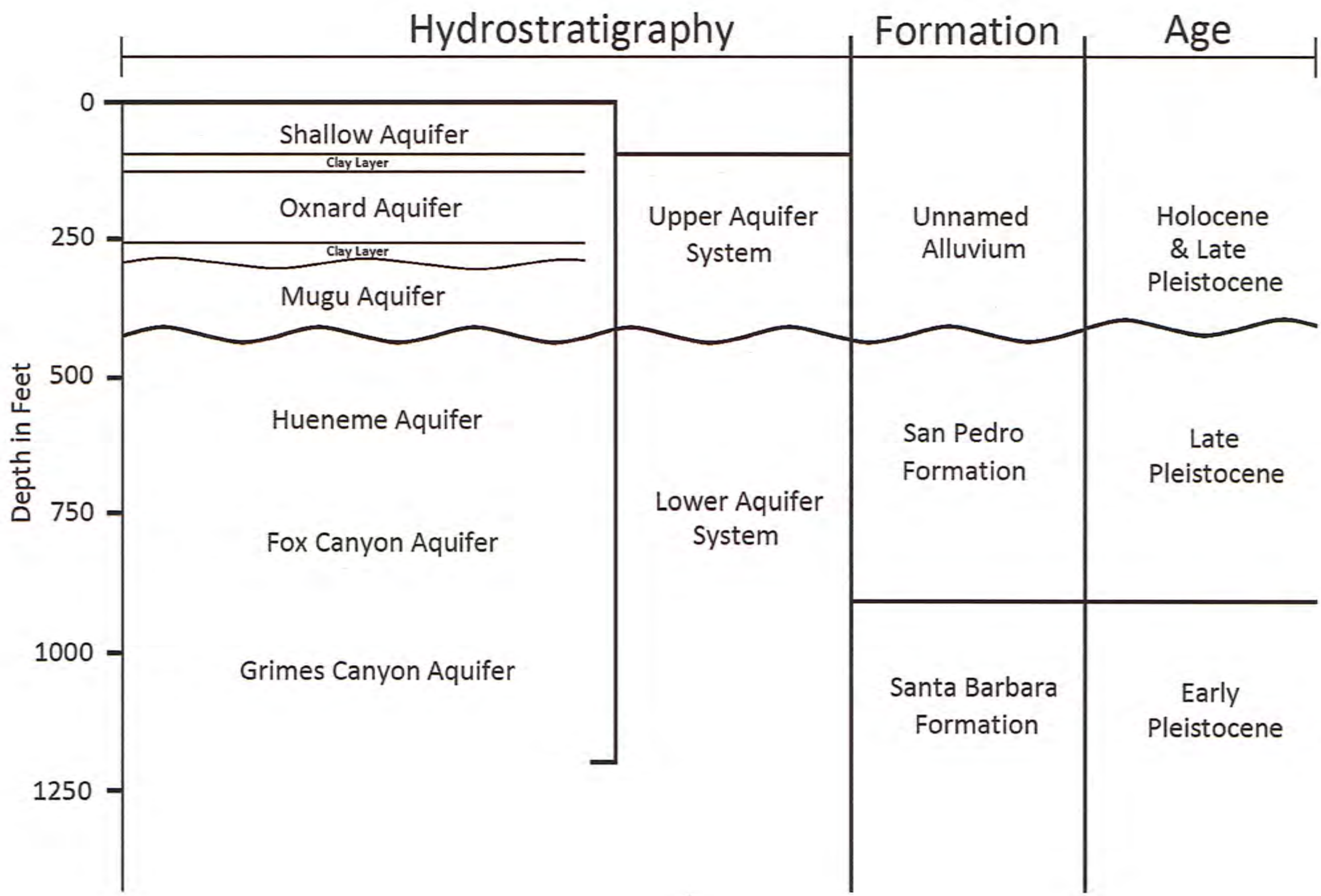


Figure 3.2-1. Schematic of UAS and LAS aquifer systems

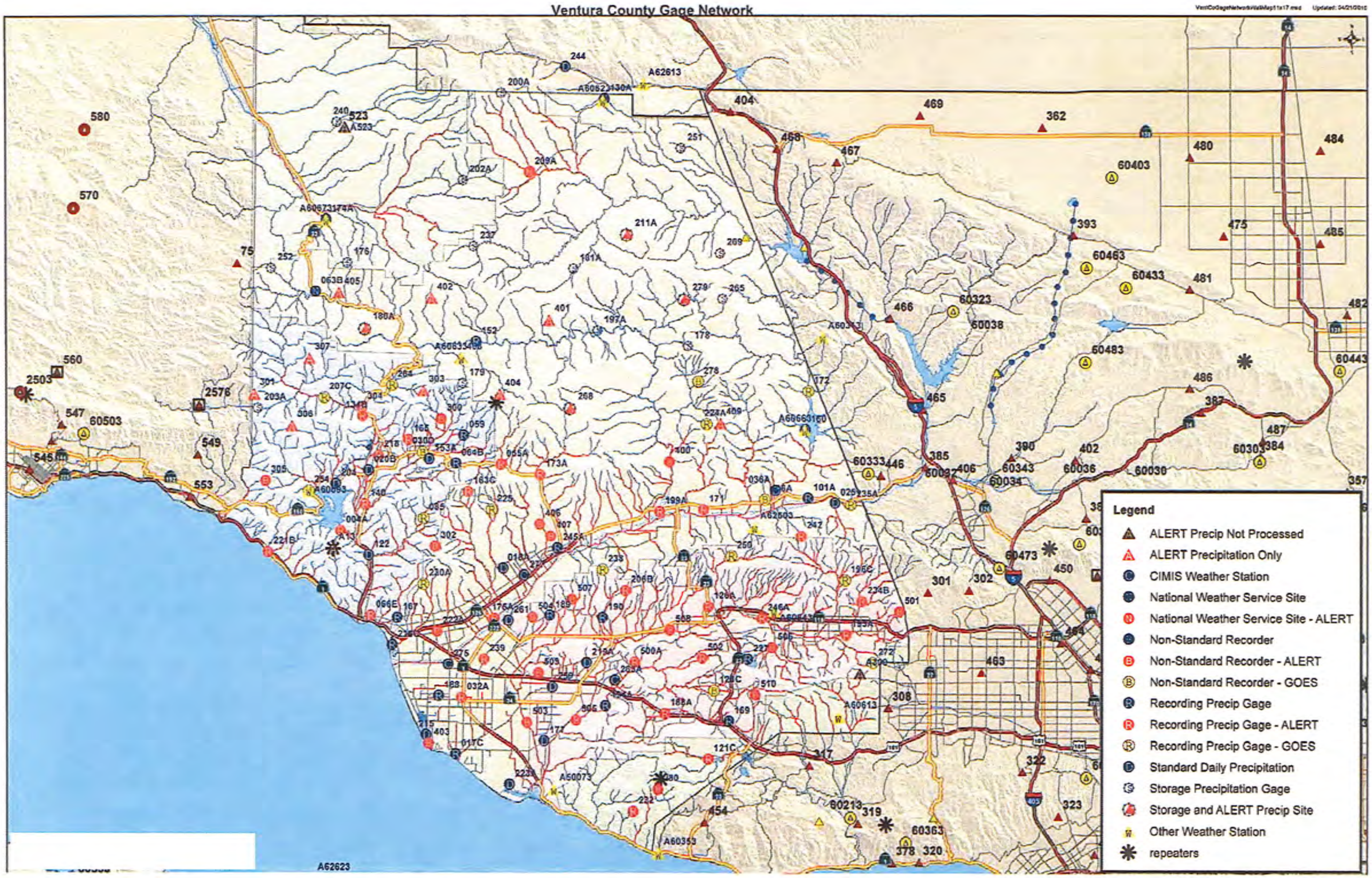


Figure 4.1-1. Regional rainfall gages

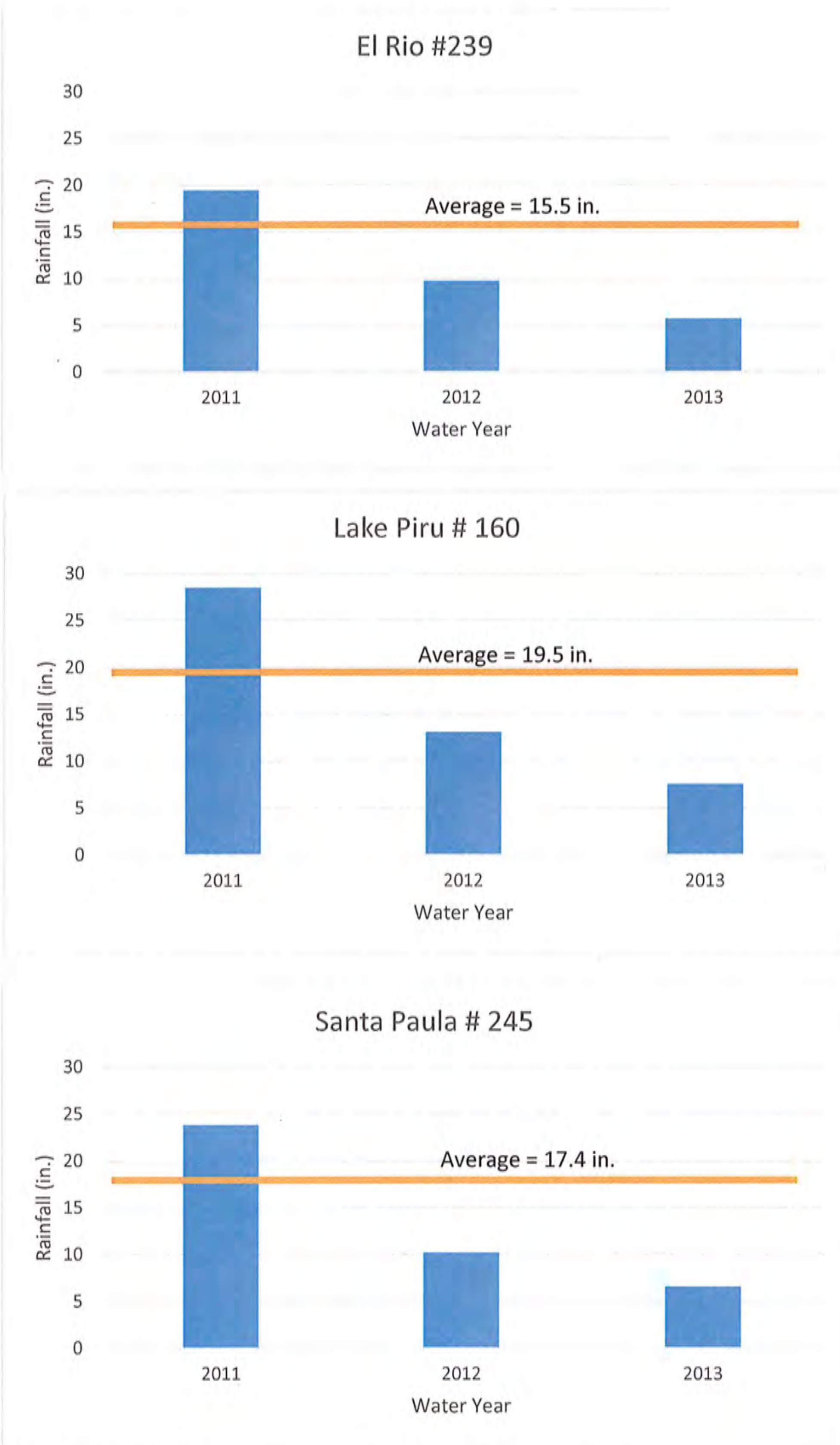


Figure 4.1-2. Rainfall at the District's three rainfall gages

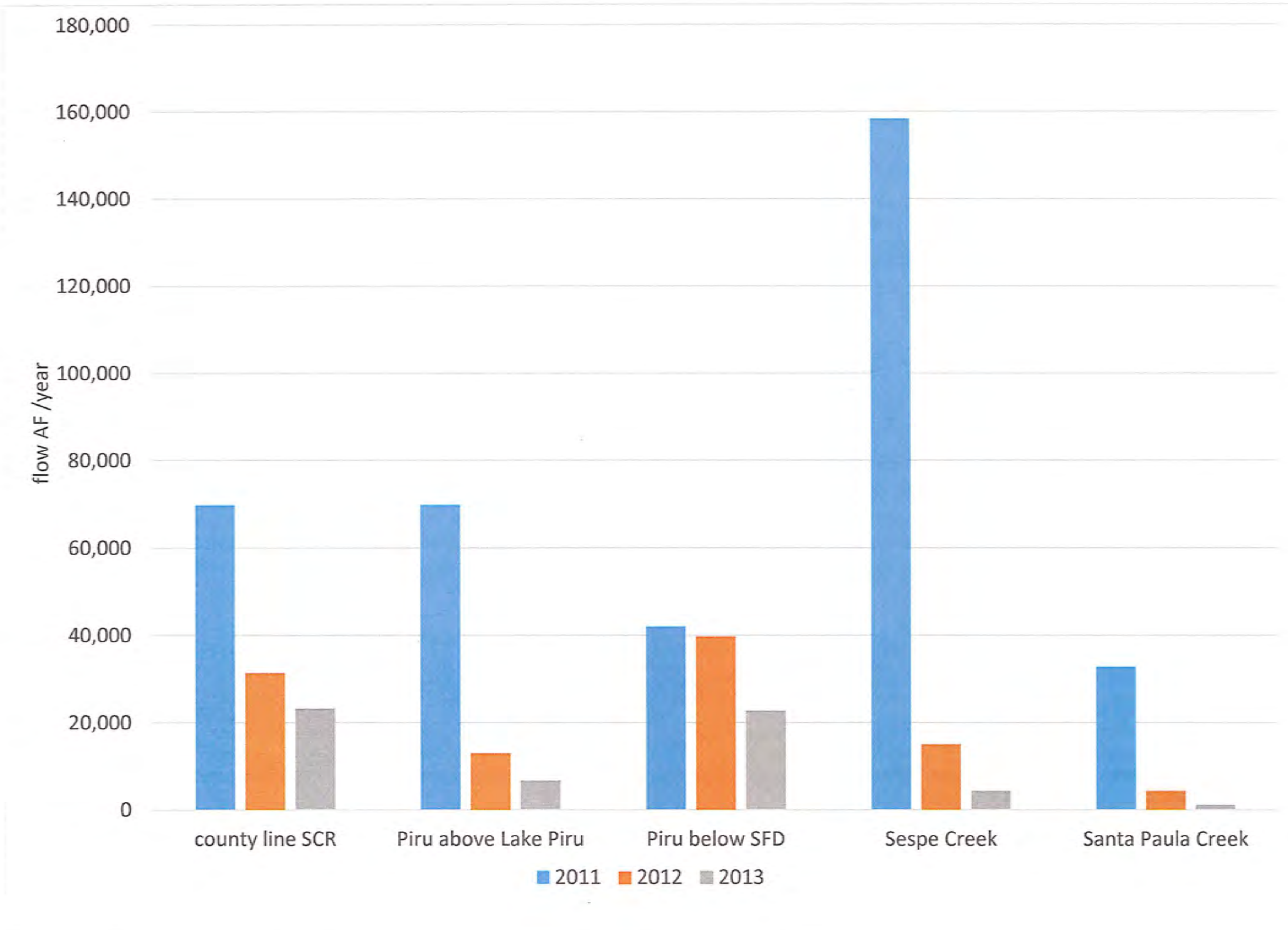


Figure 4.2-1. Total discharge measured at the USGS station (water year)

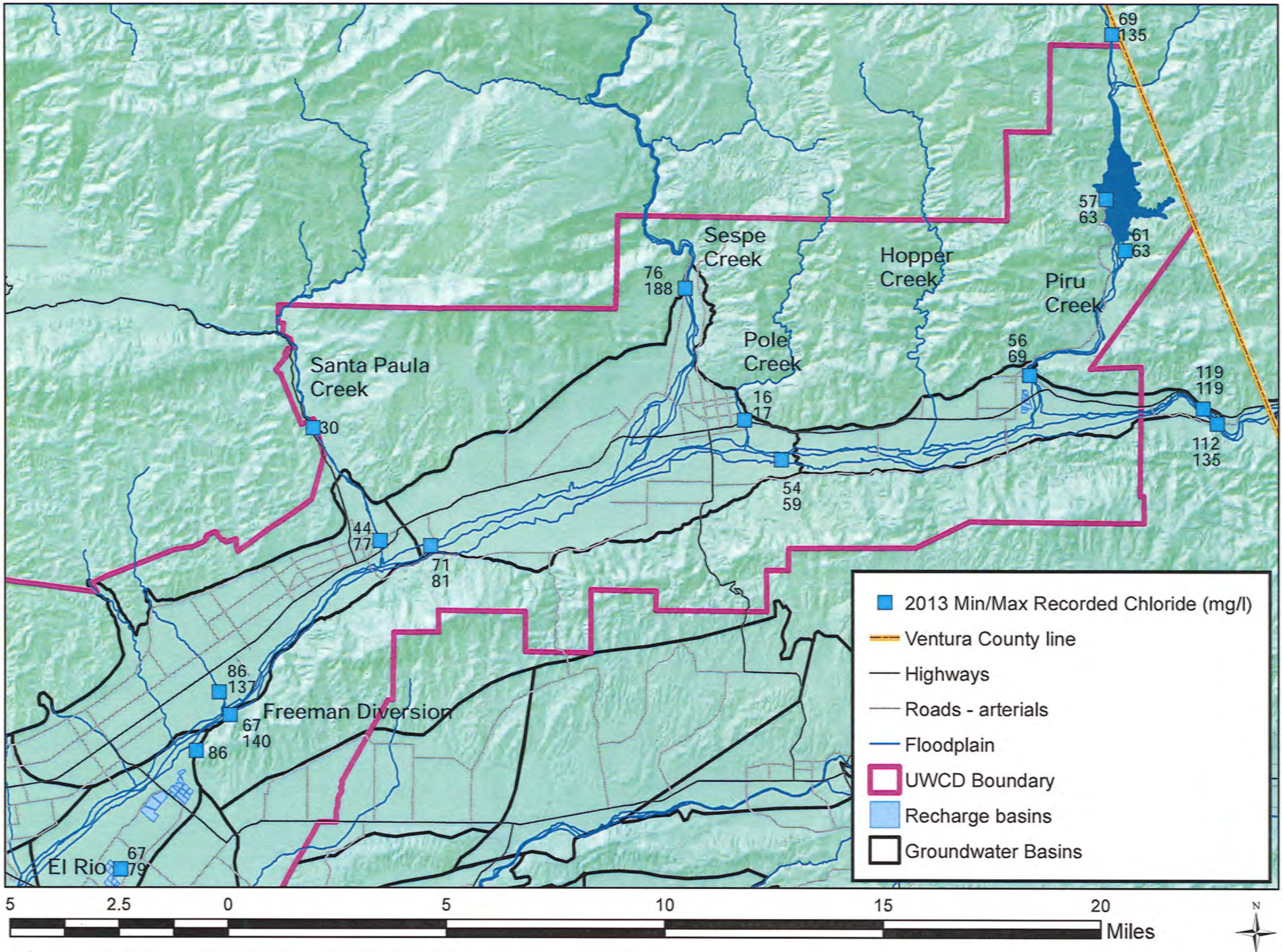


Figure 4.2-2 Recorded 2013 surface water chloride (max-min)

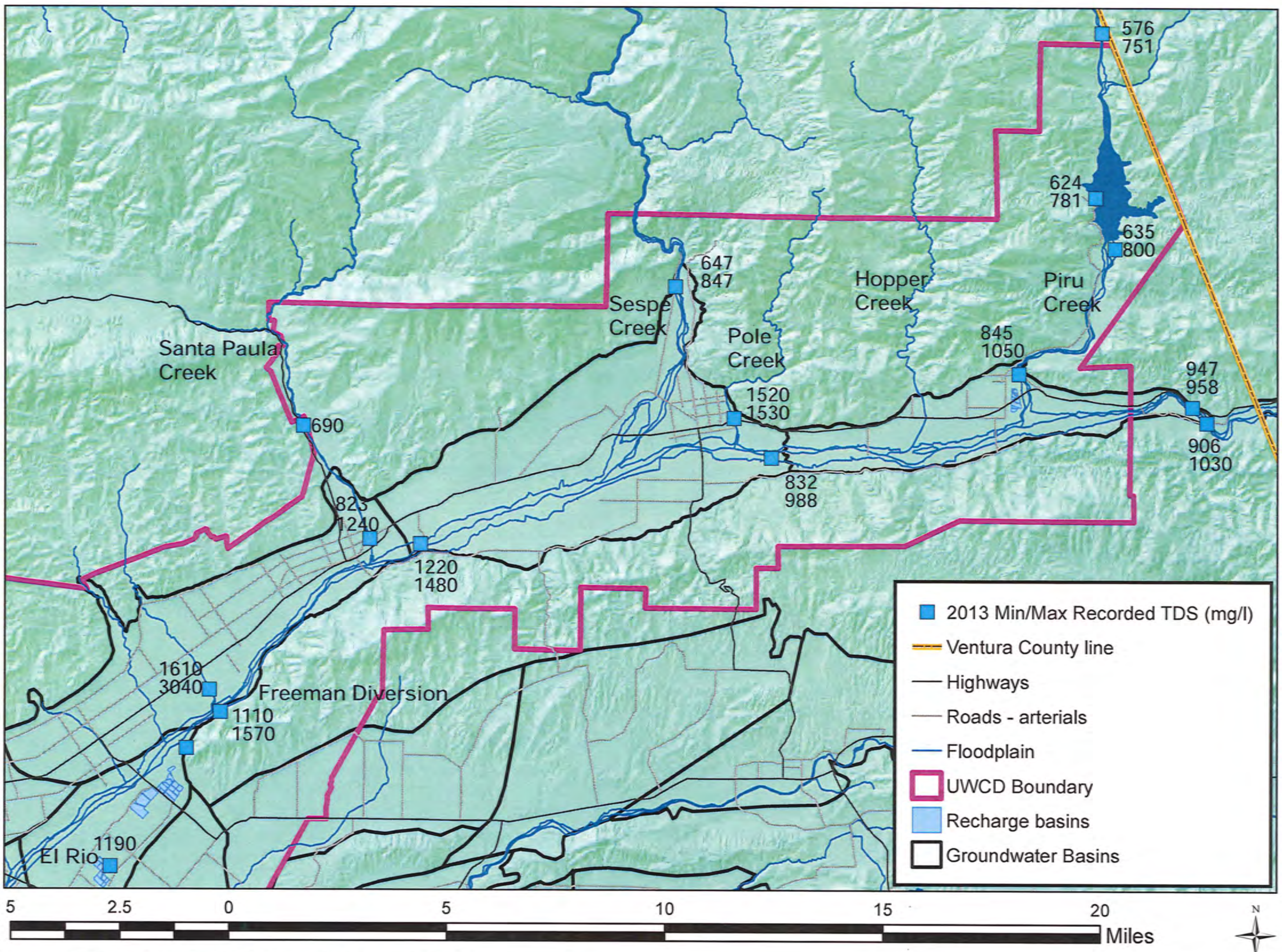


Figure 4.2-3 Recorded 2013 surface water TDS (max-min)

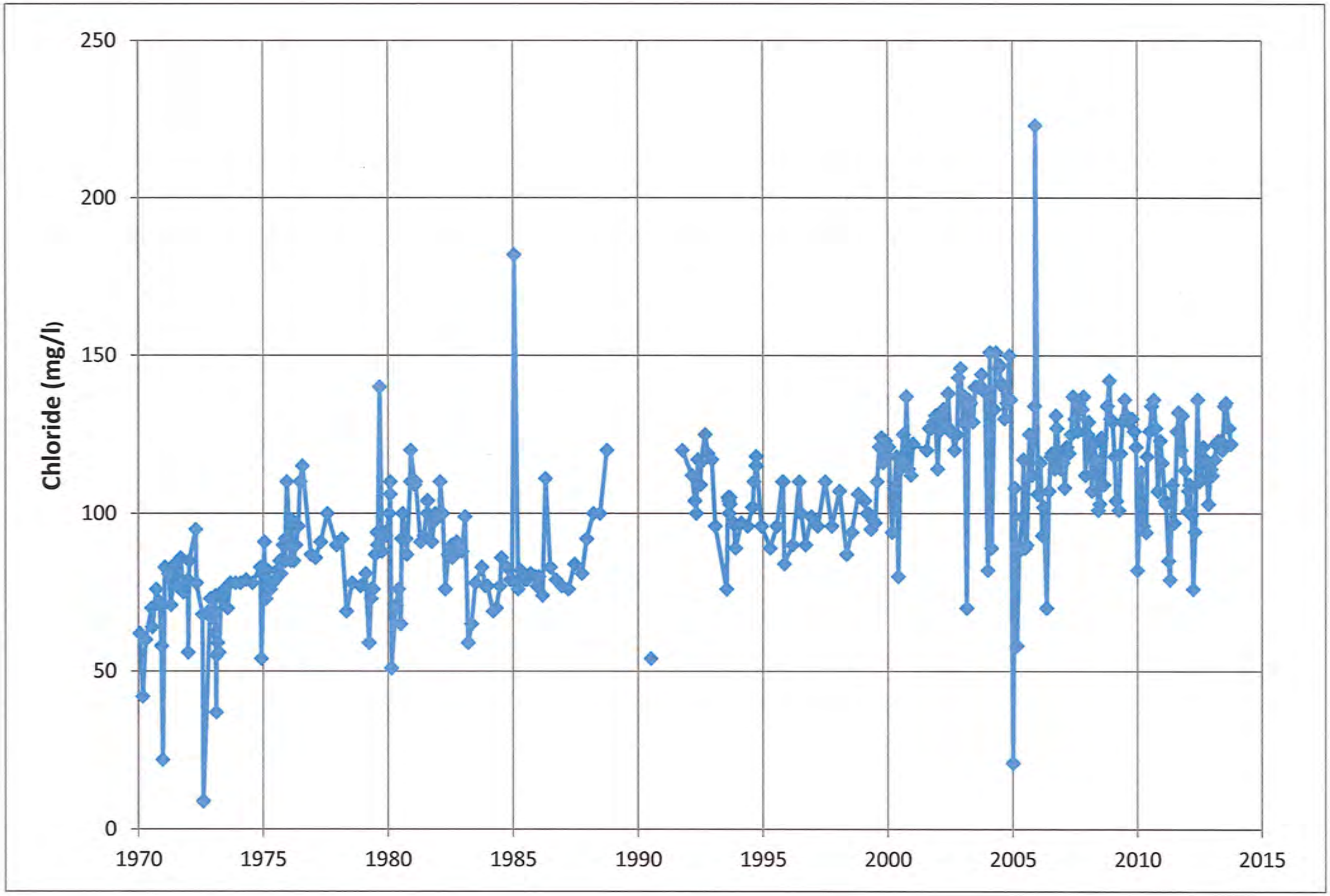


Figure 4.2-4. Historical chloride concentrations in the Santa Clara River near the Ventura-Los Angeles County line

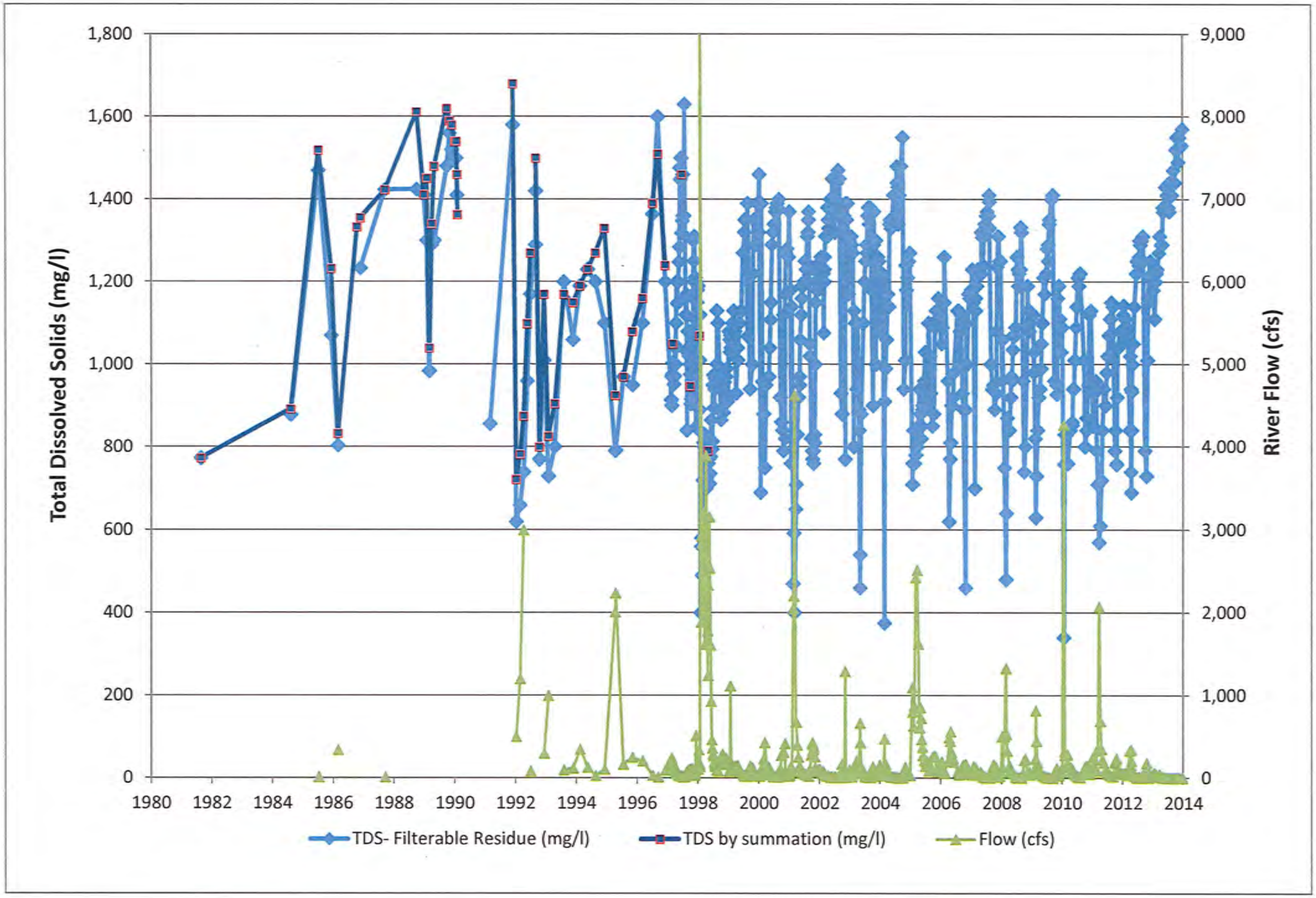


Figure 4.2-5. Historical TDS concentrations in the Santa Clara River at the Freeman Diversion

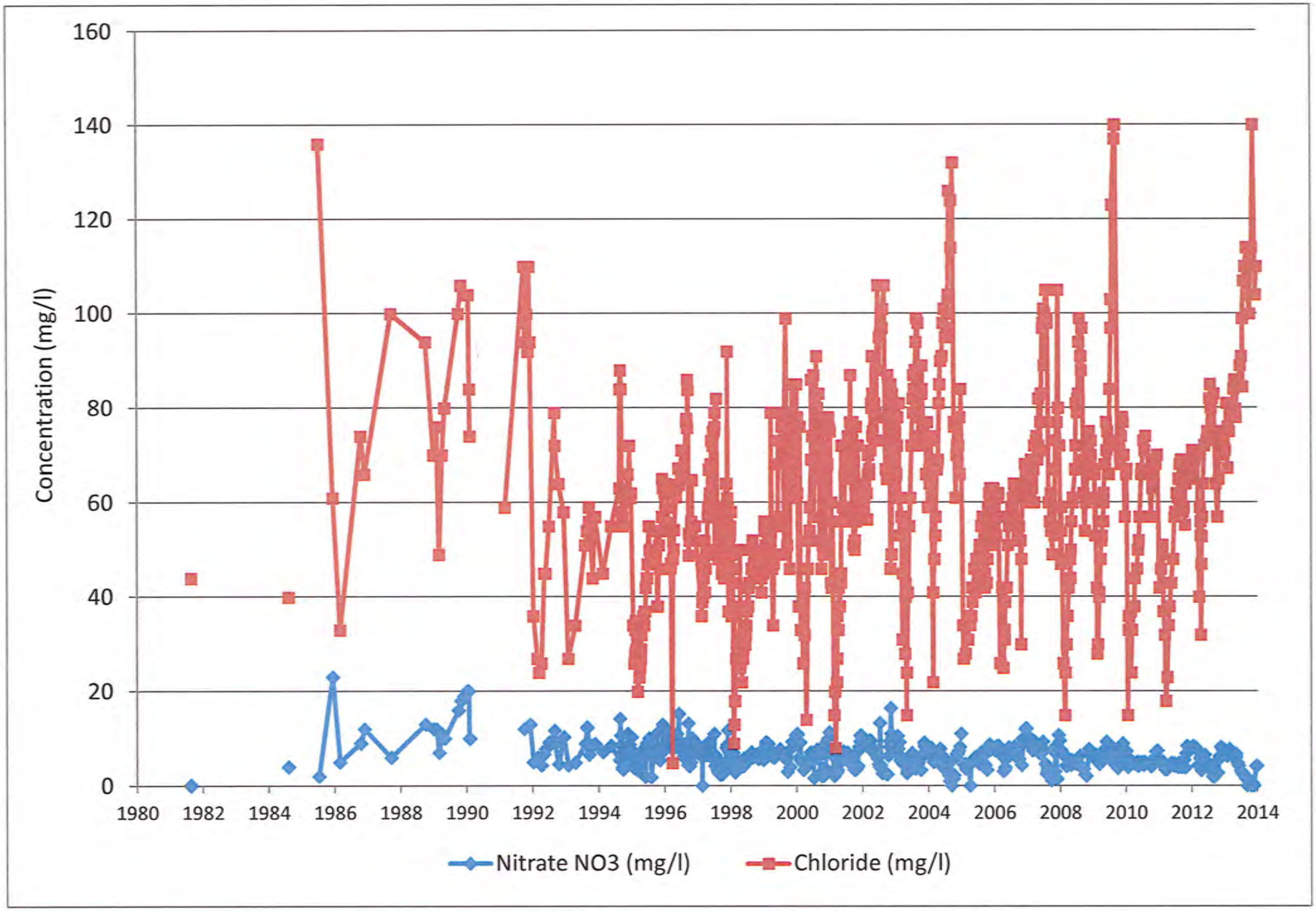


Figure 4.2-6. Historical chloride concentrations in the Santa Clara River at the Freeman Diversion

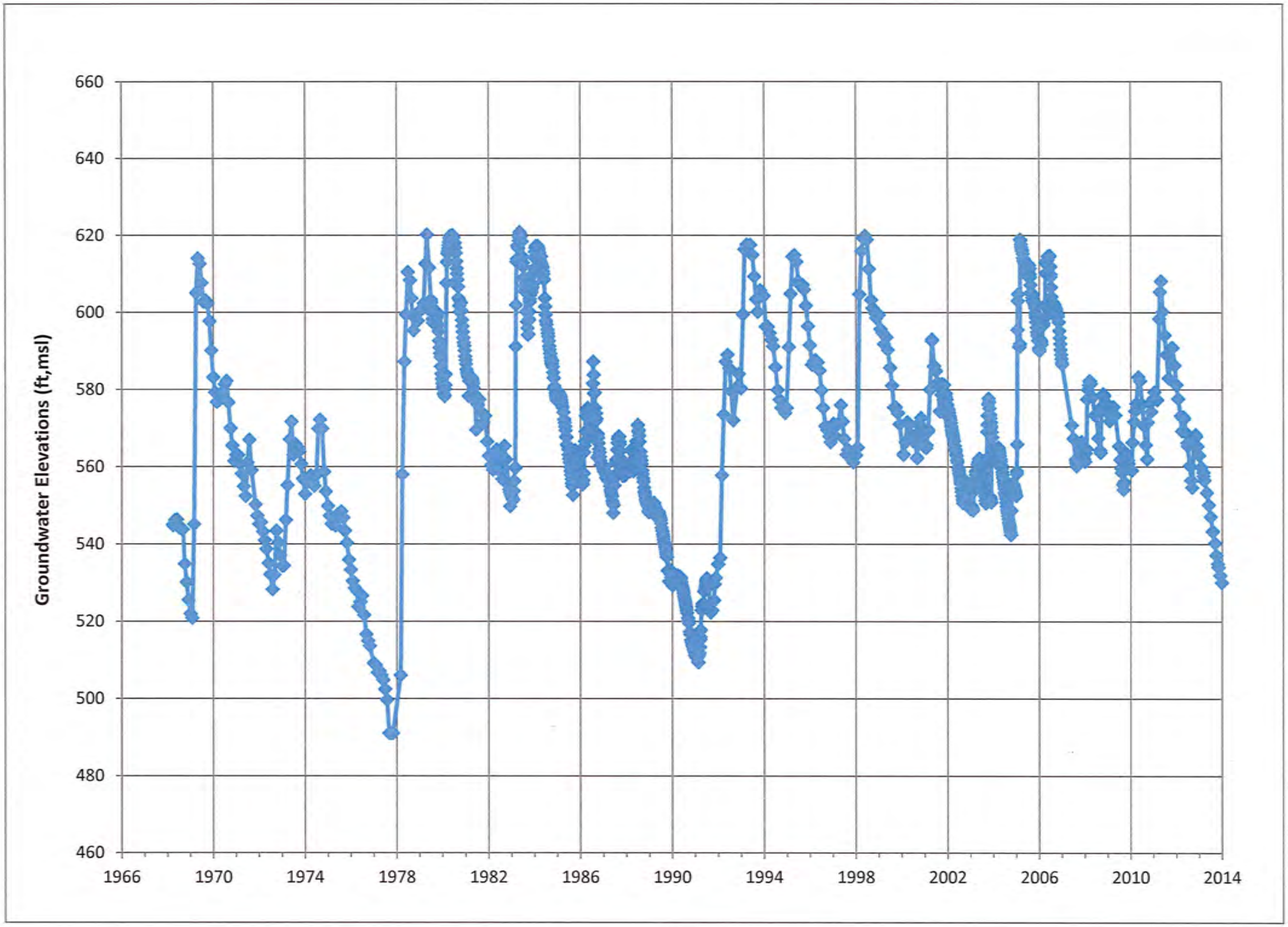


Figure 4.3-1. Historical groundwater elevations in Piru basin key well

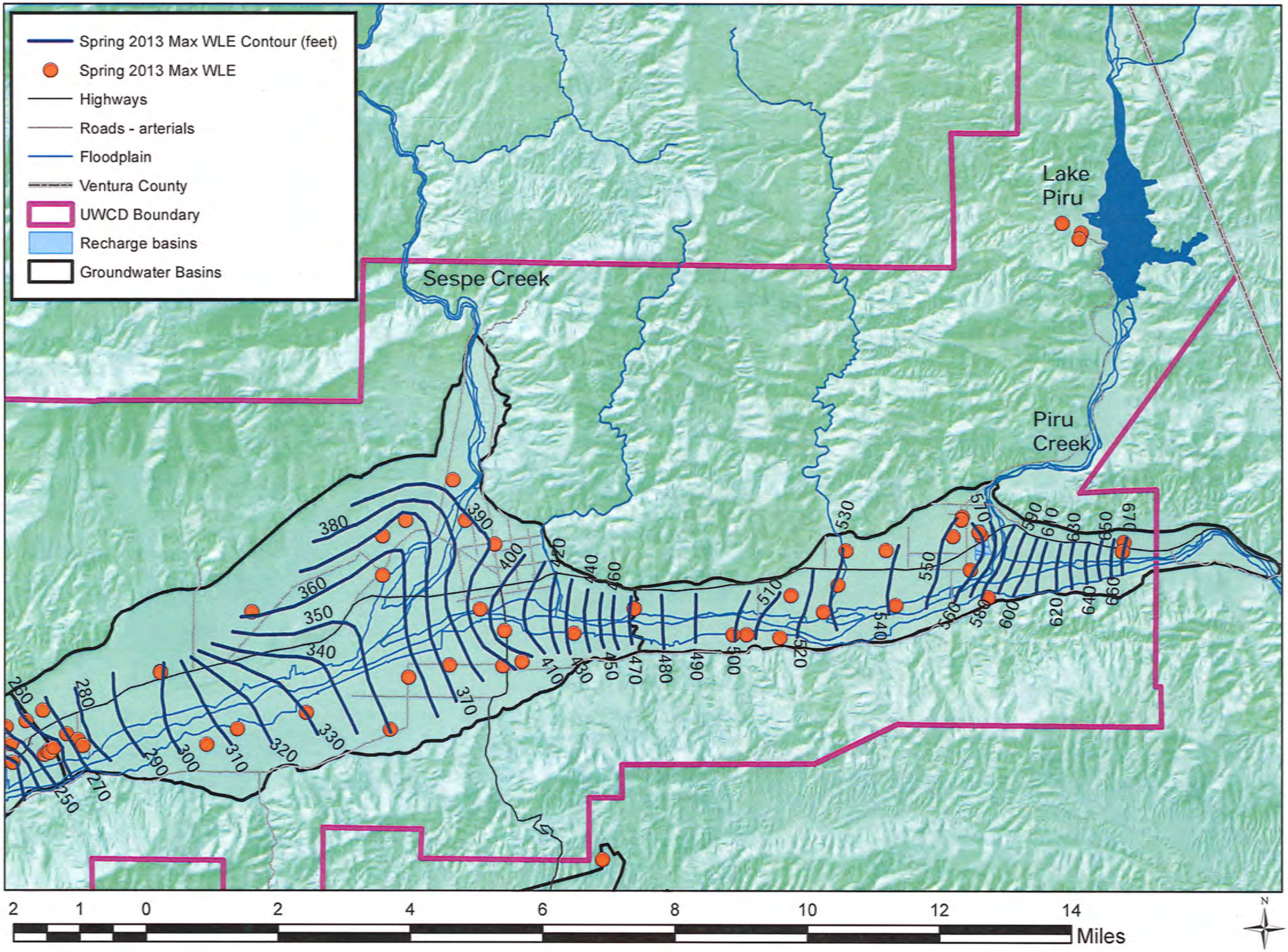


Figure 4.3-2. Piru and Fillmore basin groundwater elevations, spring 2013

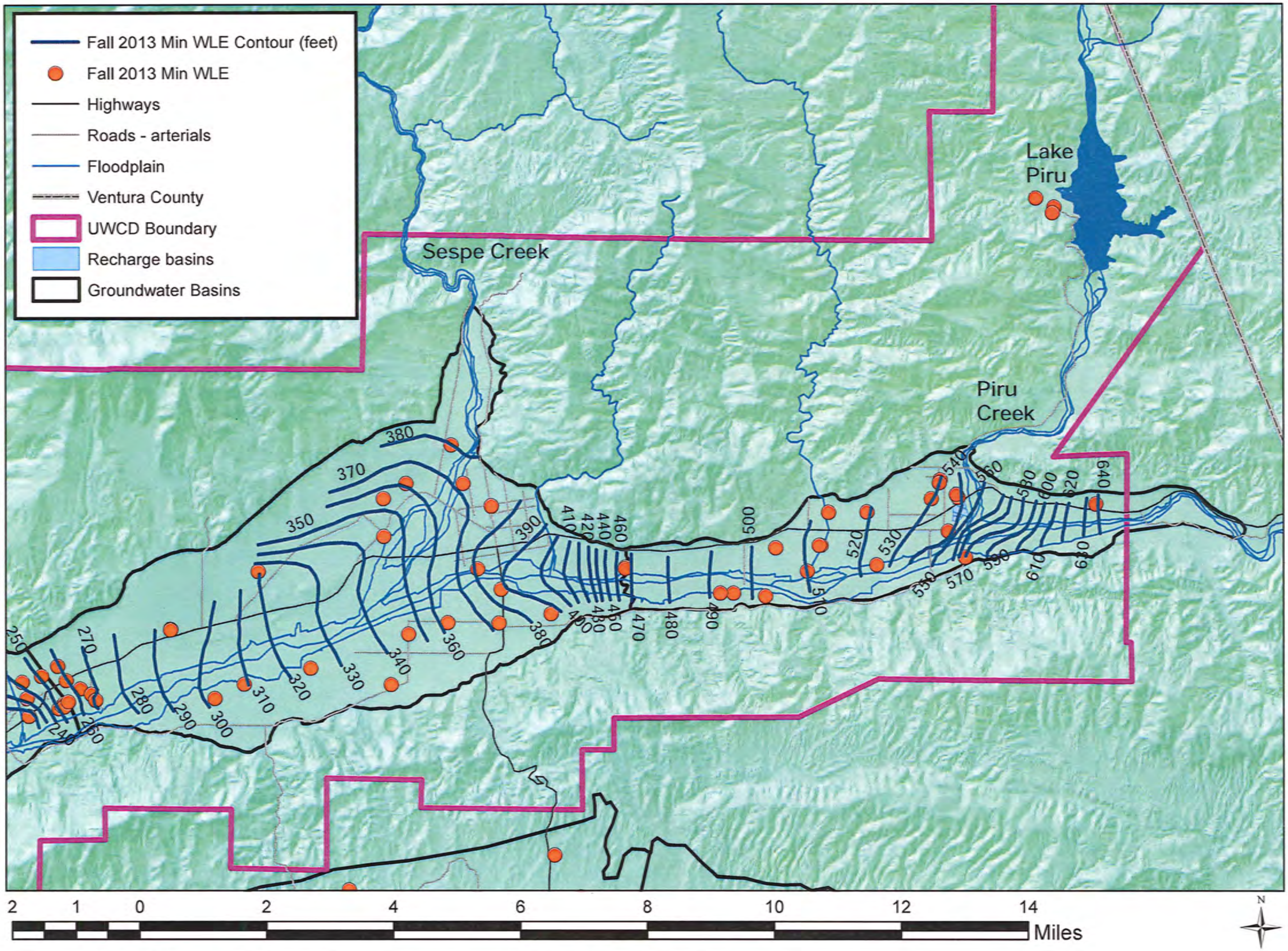


Figure 4.3-3. Piru and Fillmore basin groundwater elevations, fall 2013

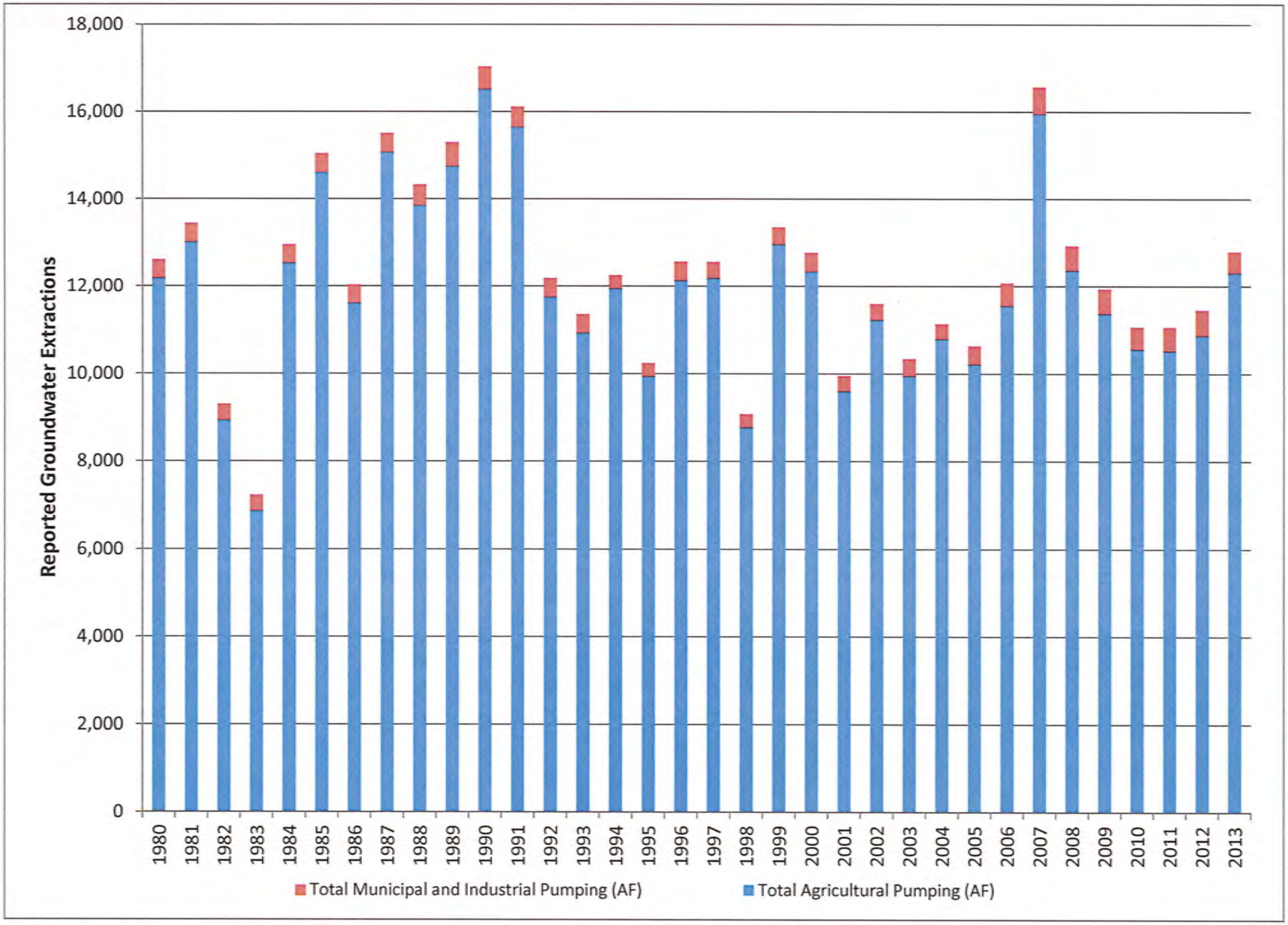


Figure 4.3-4. Historical reported groundwater extractions for the Piru basin

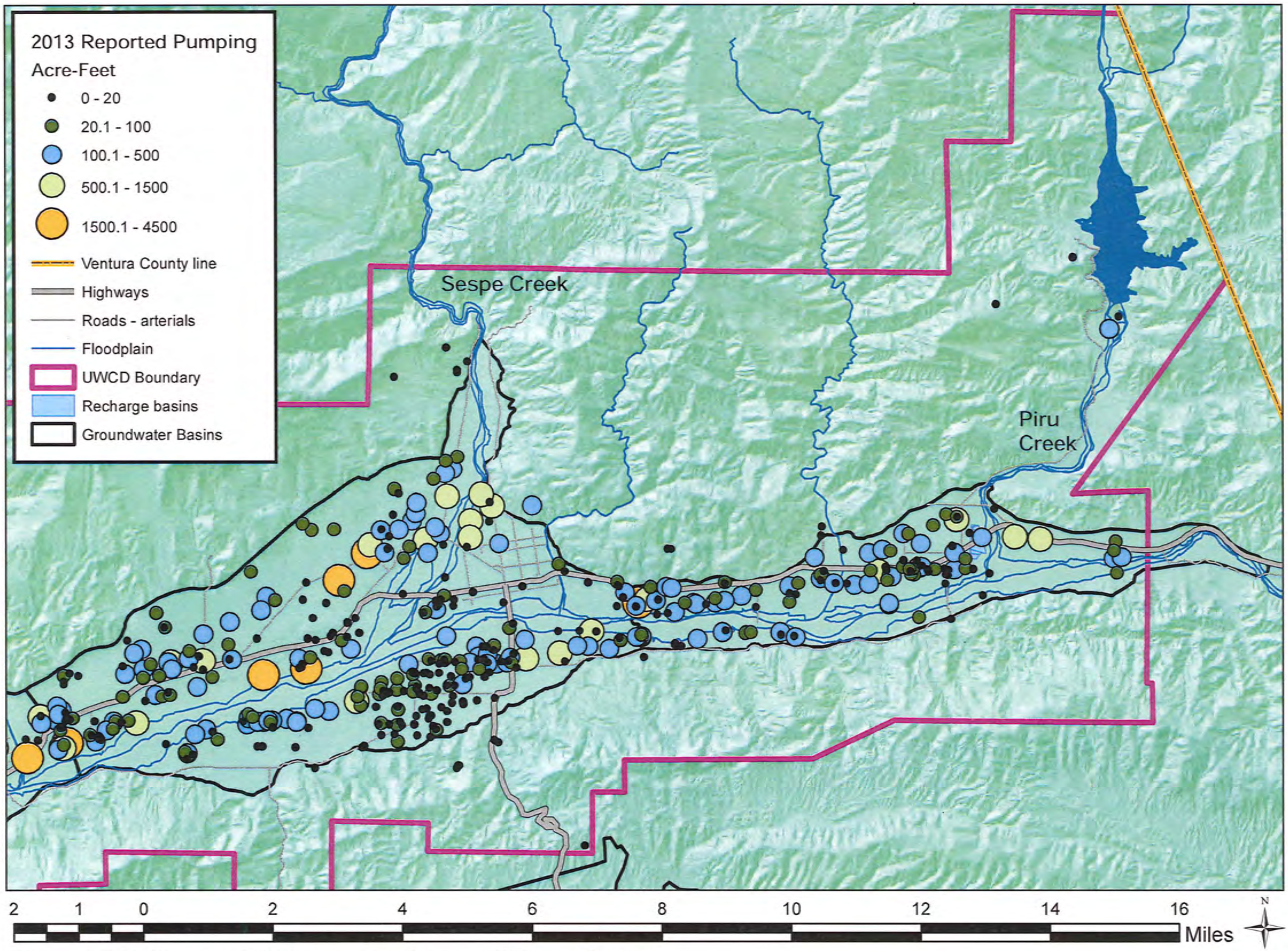


Figure 4.3-5. Reported 2013 pumping, Piru and Fillmore basins

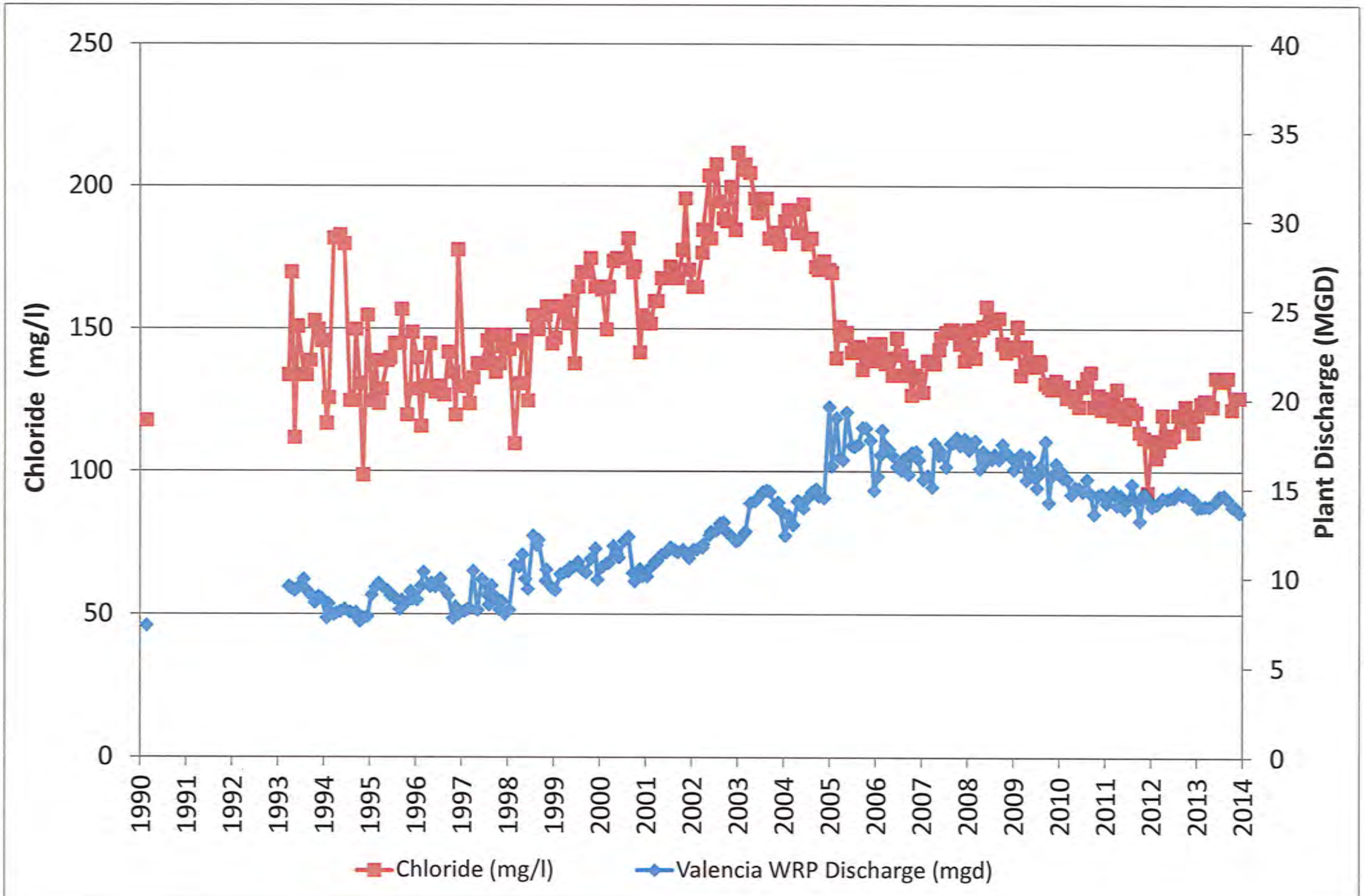


Figure 4.3-6. Historical chloride and discharge volumes at Valencia WRP

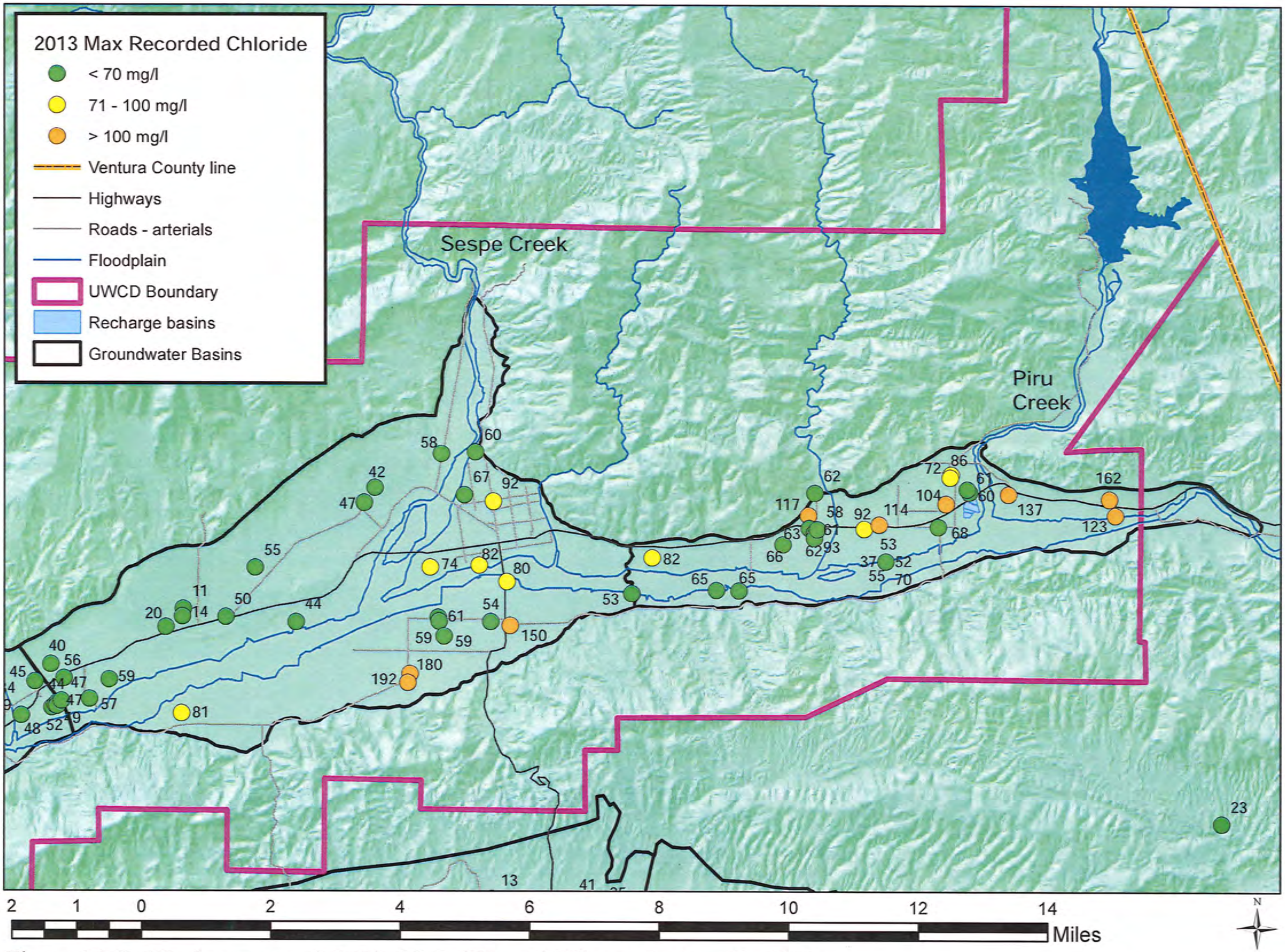


Figure 4.3-7. Maximum recorded chloride in Piru and Fillmore basin wells, 2013

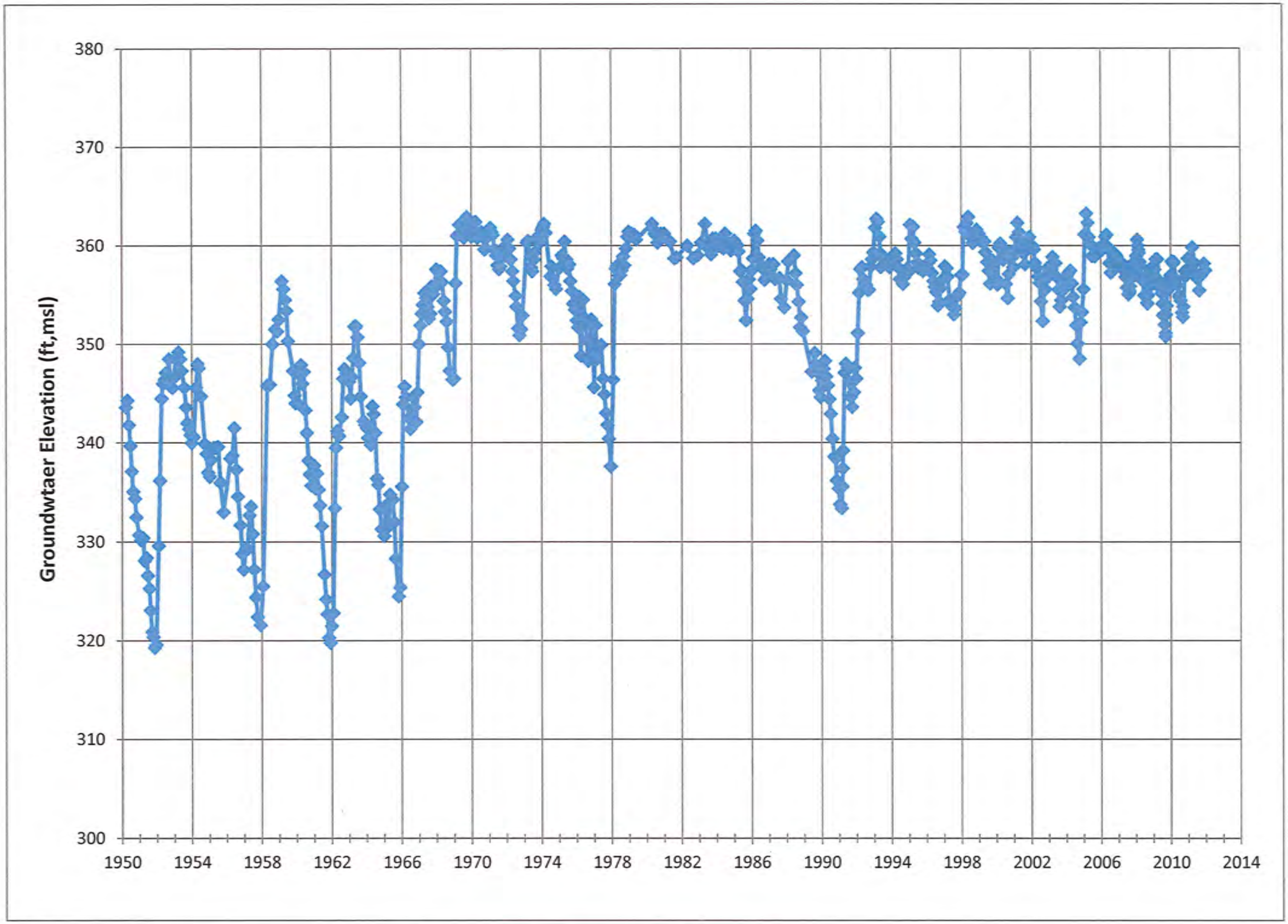


Figure 4.3-8. Historical groundwater elevations in Fillmore basin key well

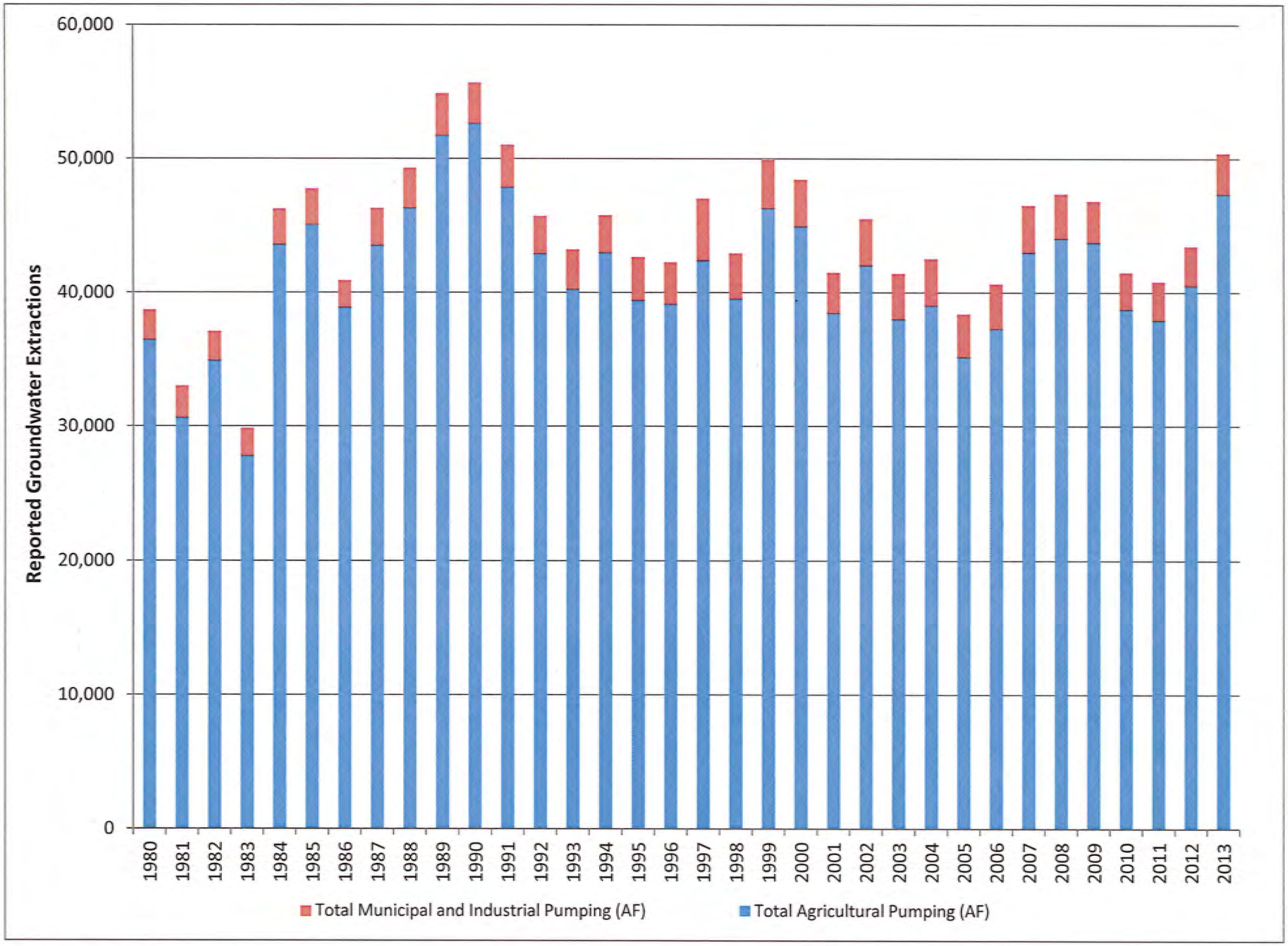


Figure 4.3-9. Historical reported groundwater extractions for the Fillmore basin

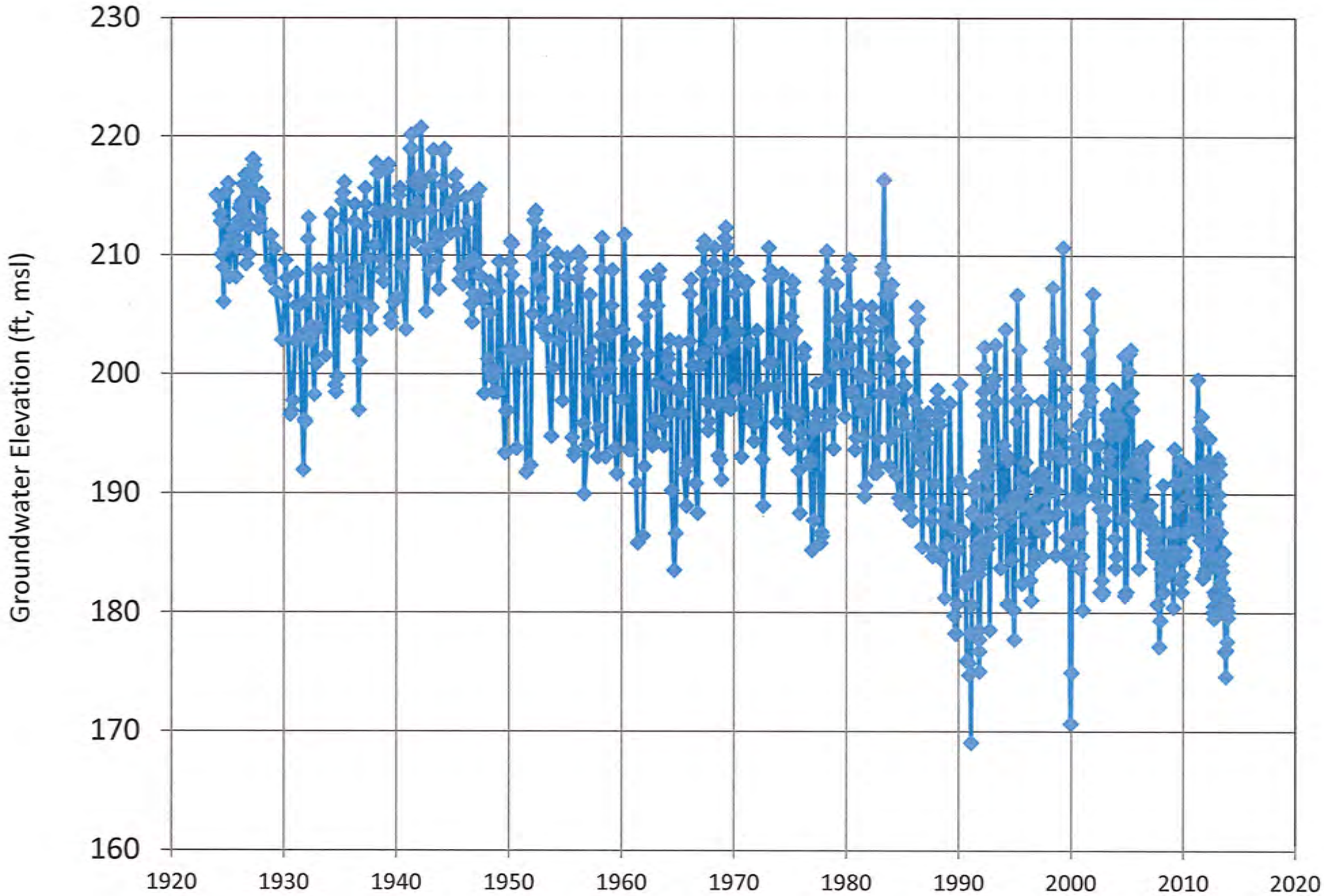


Figure 4.3-10. Historical groundwater elevations in Santa Paula basin key well

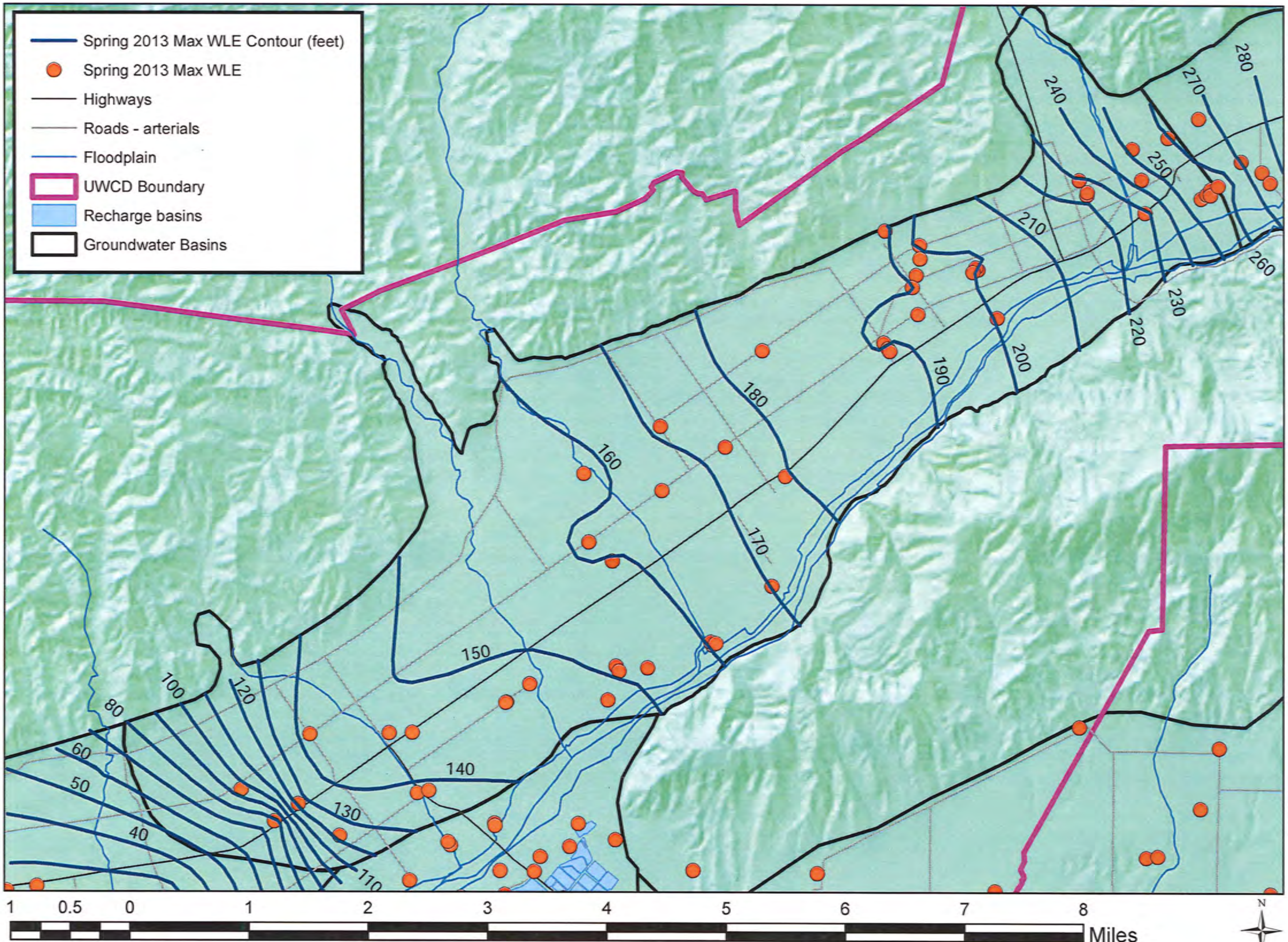


Figure 4.3-11. Santa Paula basin groundwater elevations, spring 2013

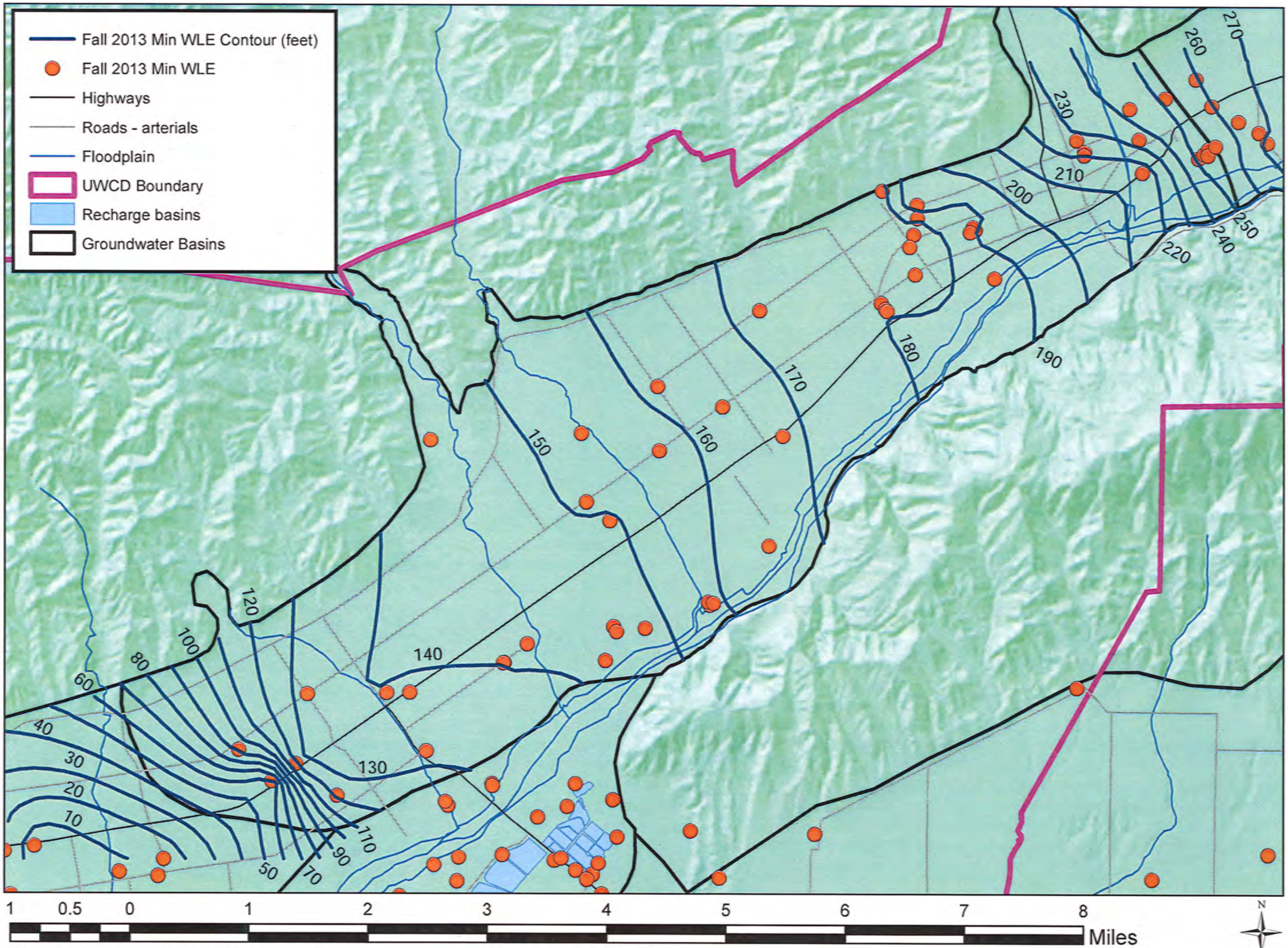


Figure 4.3-12. Santa Paula basin groundwater elevations, fall 2013

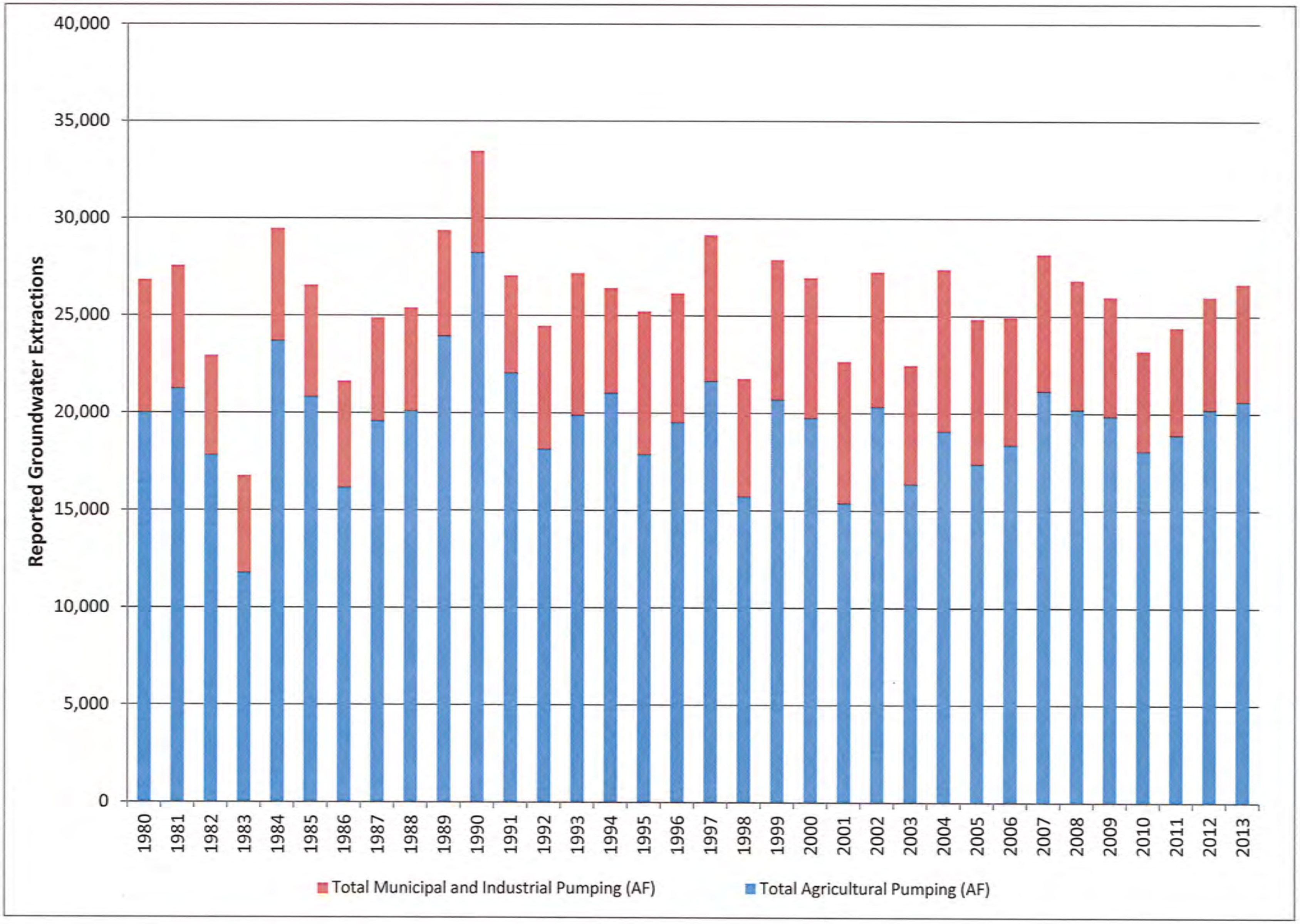


Figure 4.3-13. Historical reported groundwater extractions for the Santa Paula basin

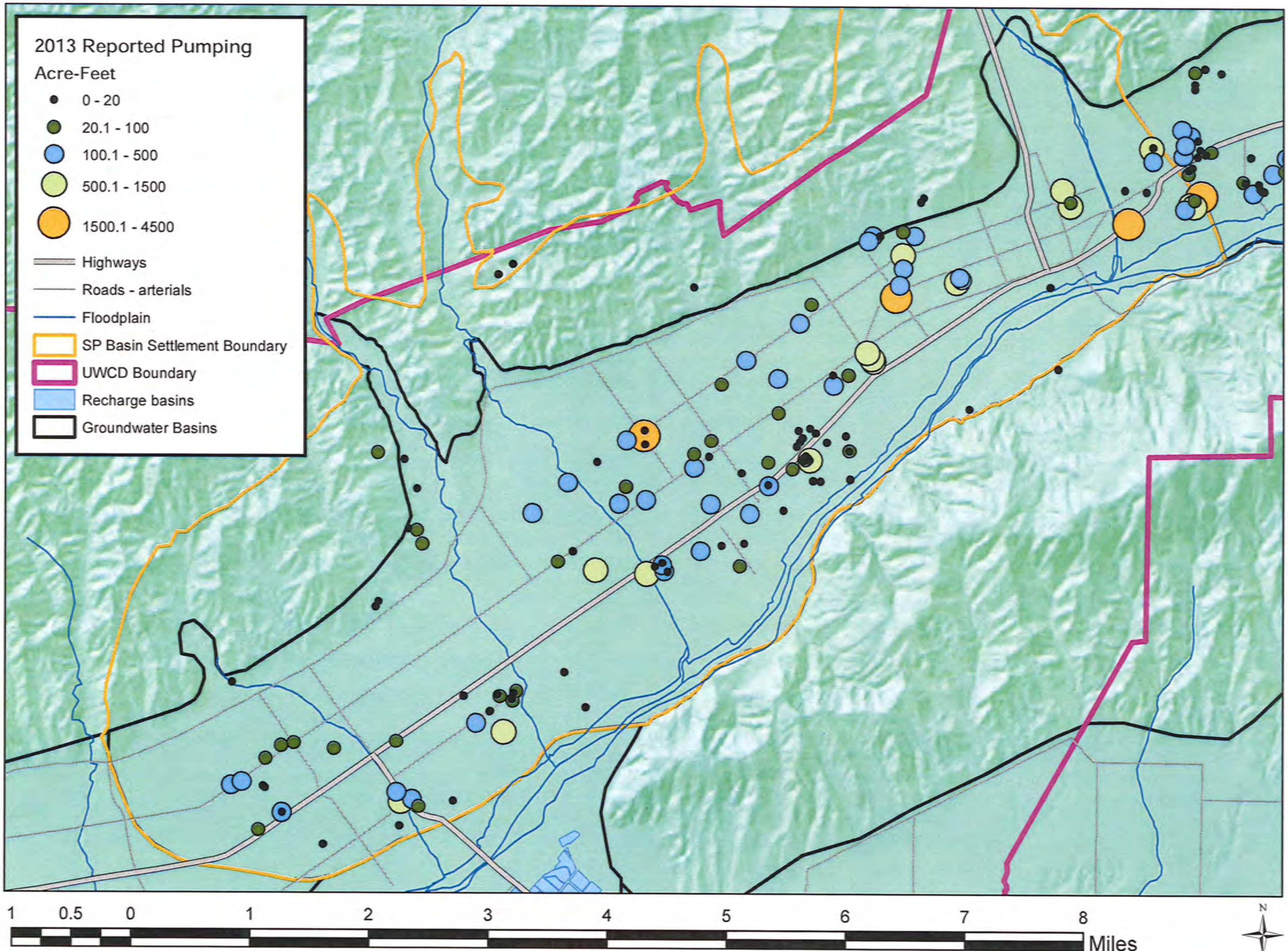


Figure 4.3-14. Reported 2013 pumping, Santa Paula basin

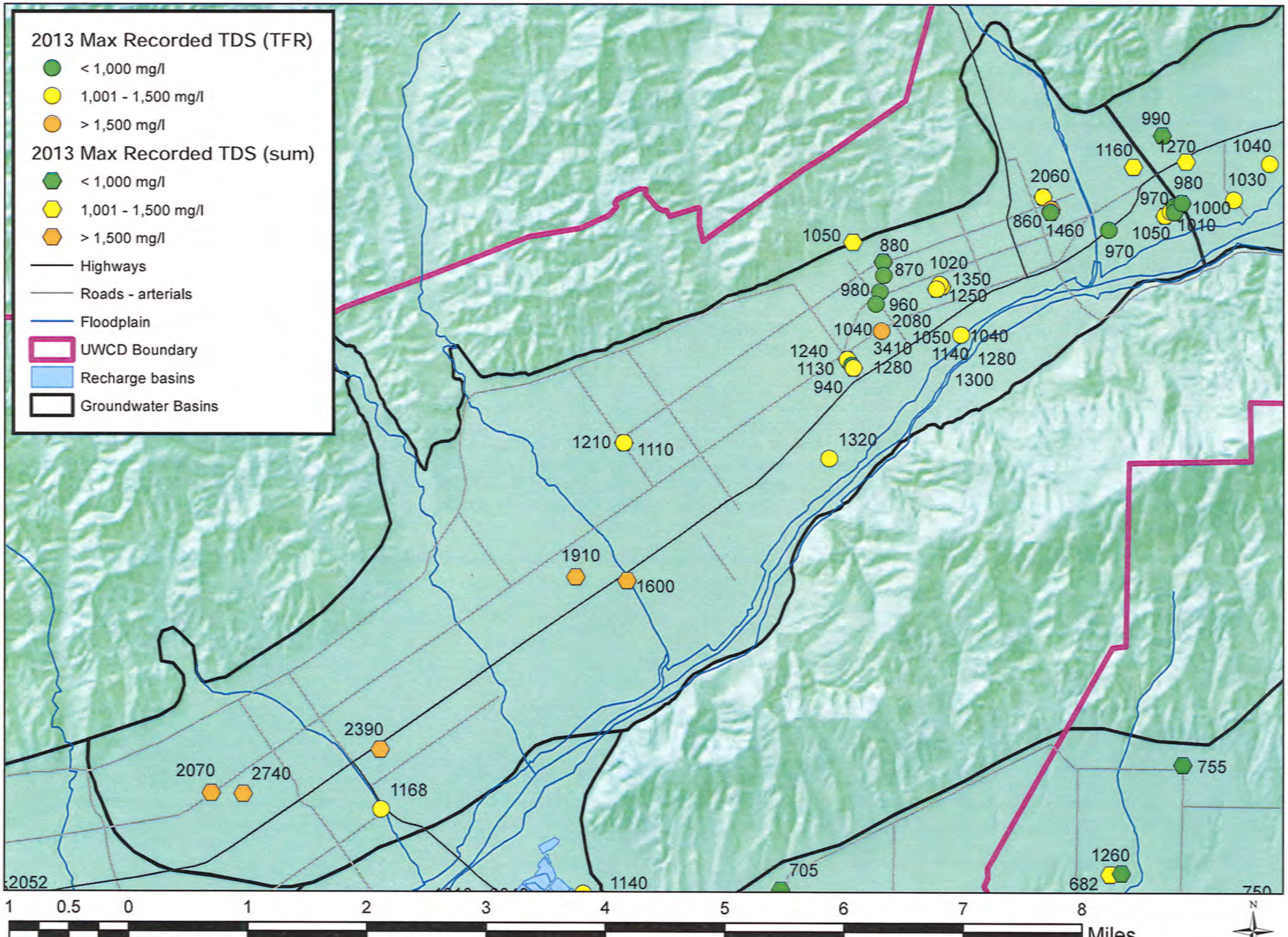


Figure 4.3-15. Maximum recorded TDS in Santa Paula basin wells, 2013

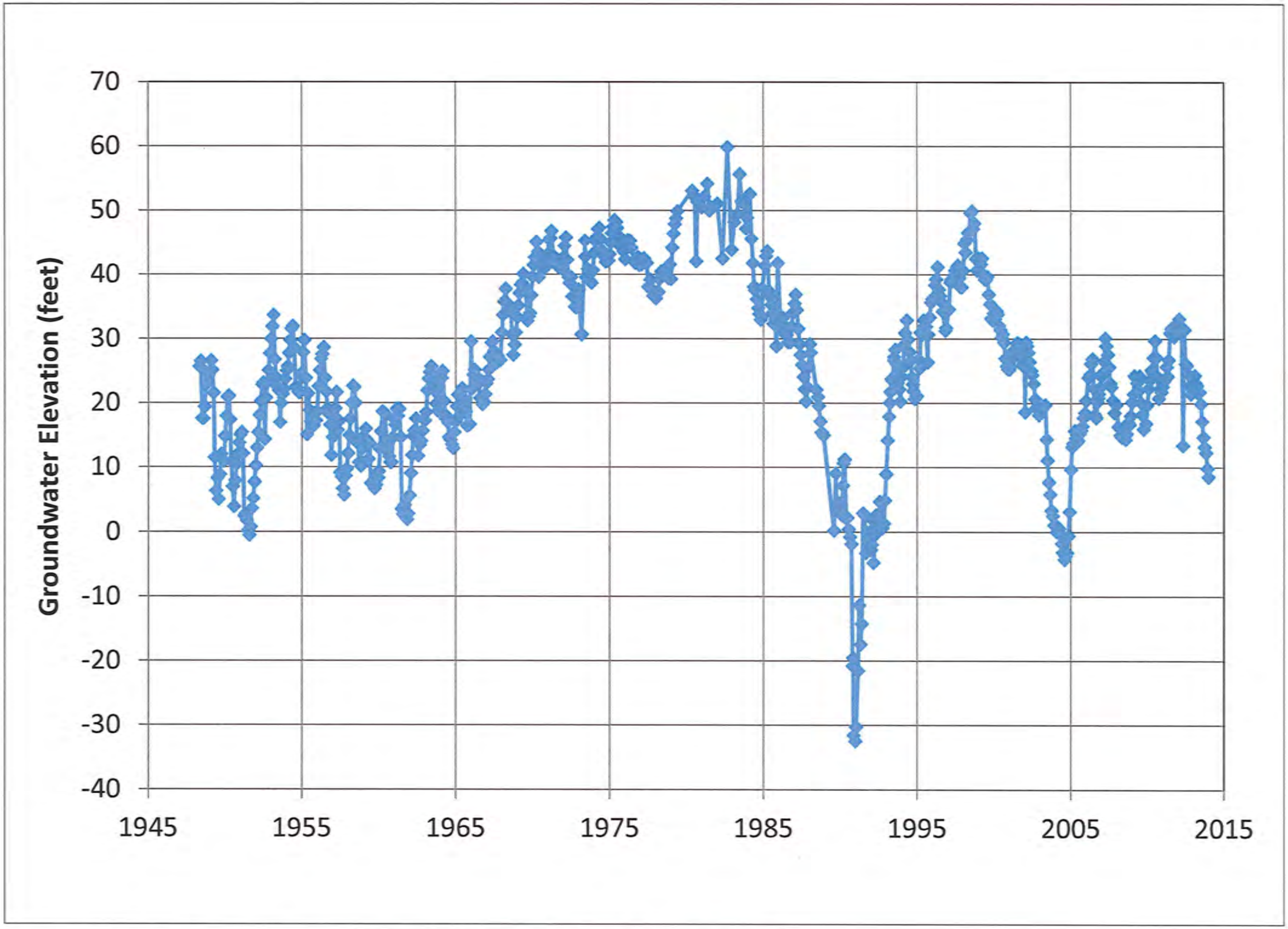


Figure 4.3-16. Historical groundwater elevations in Mound basin key well

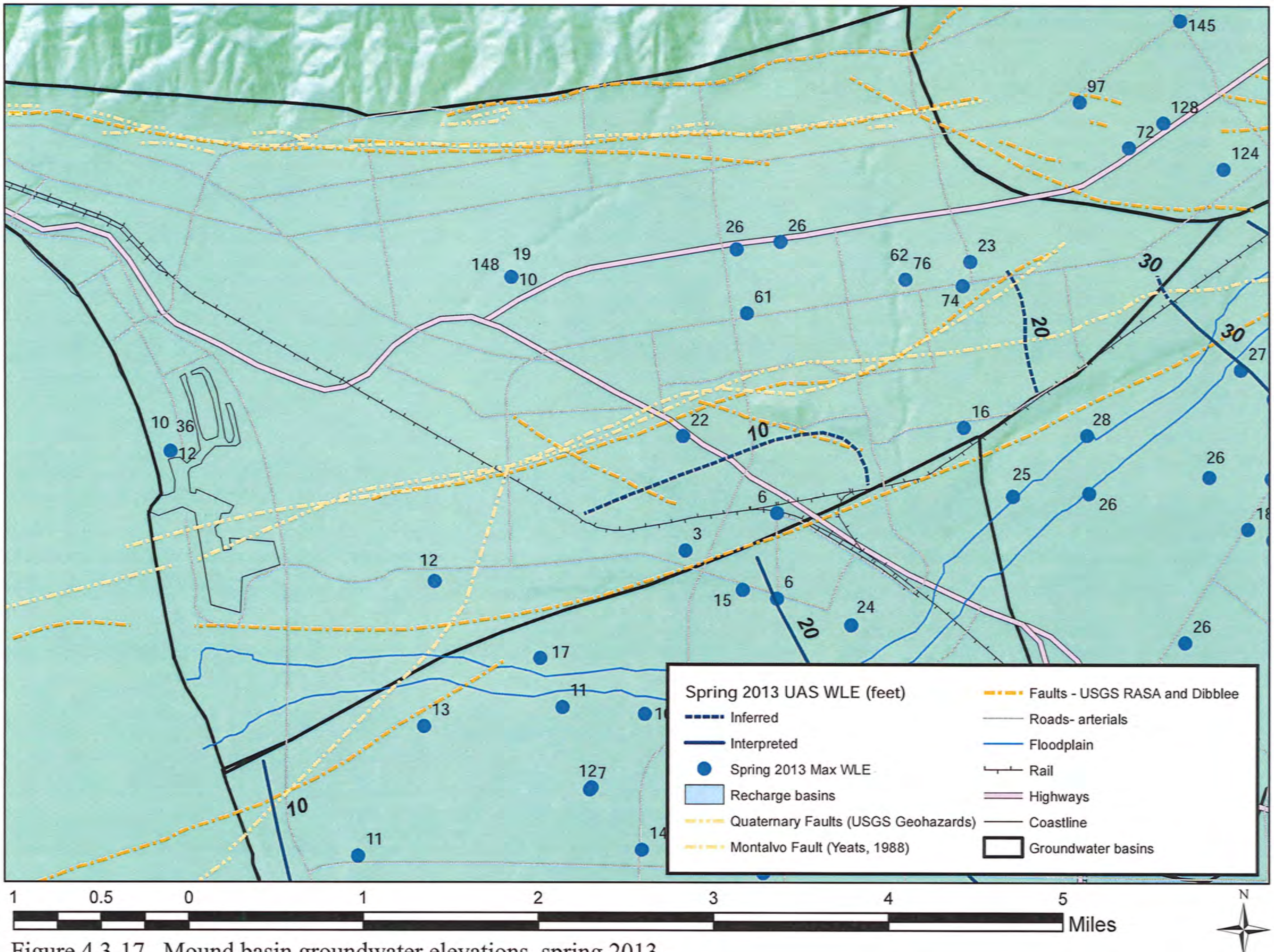


Figure 4.3-17. Mound basin groundwater elevations, spring 2013

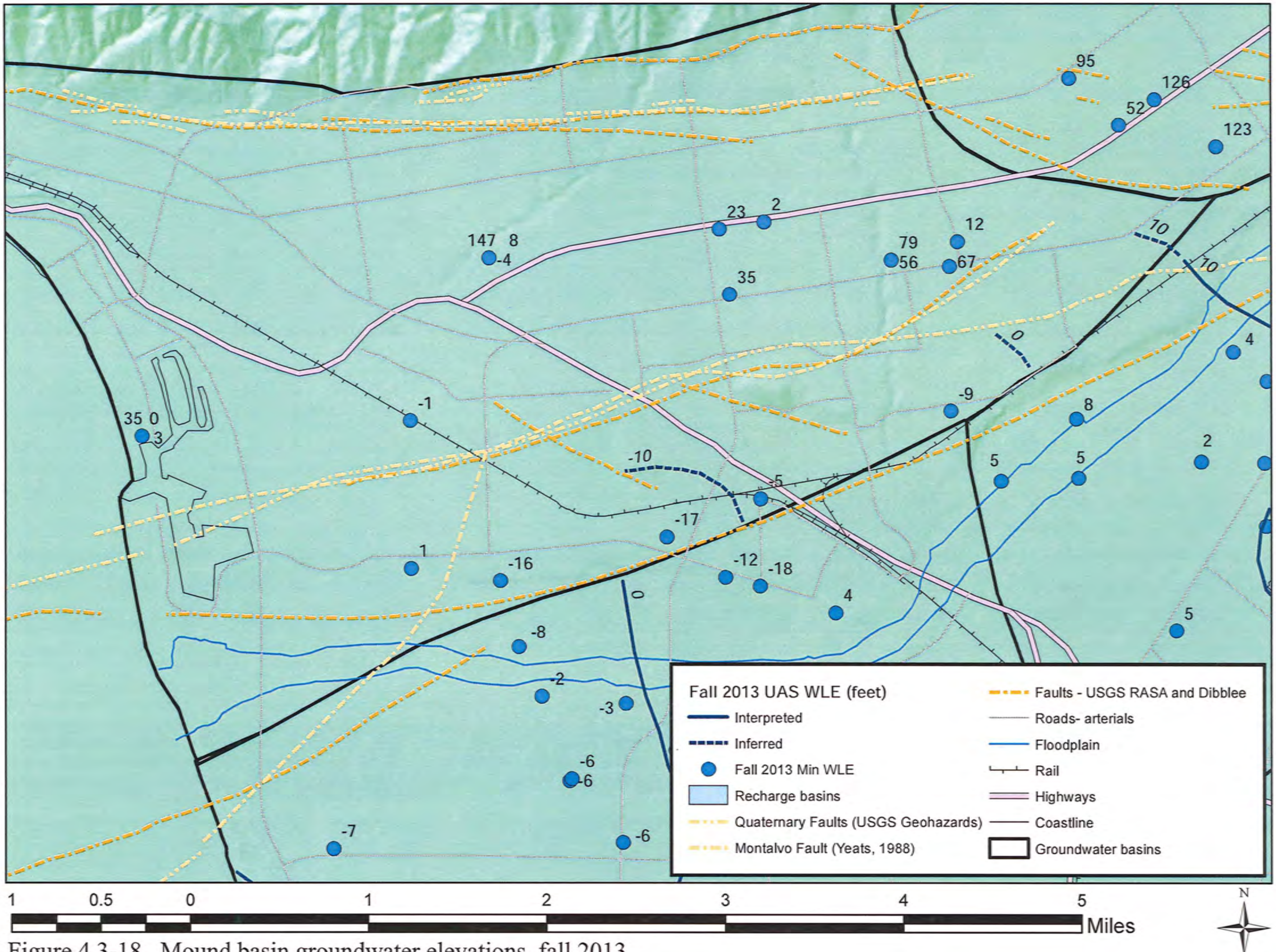


Figure 4.3-18. Mound basin groundwater elevations, fall 2013

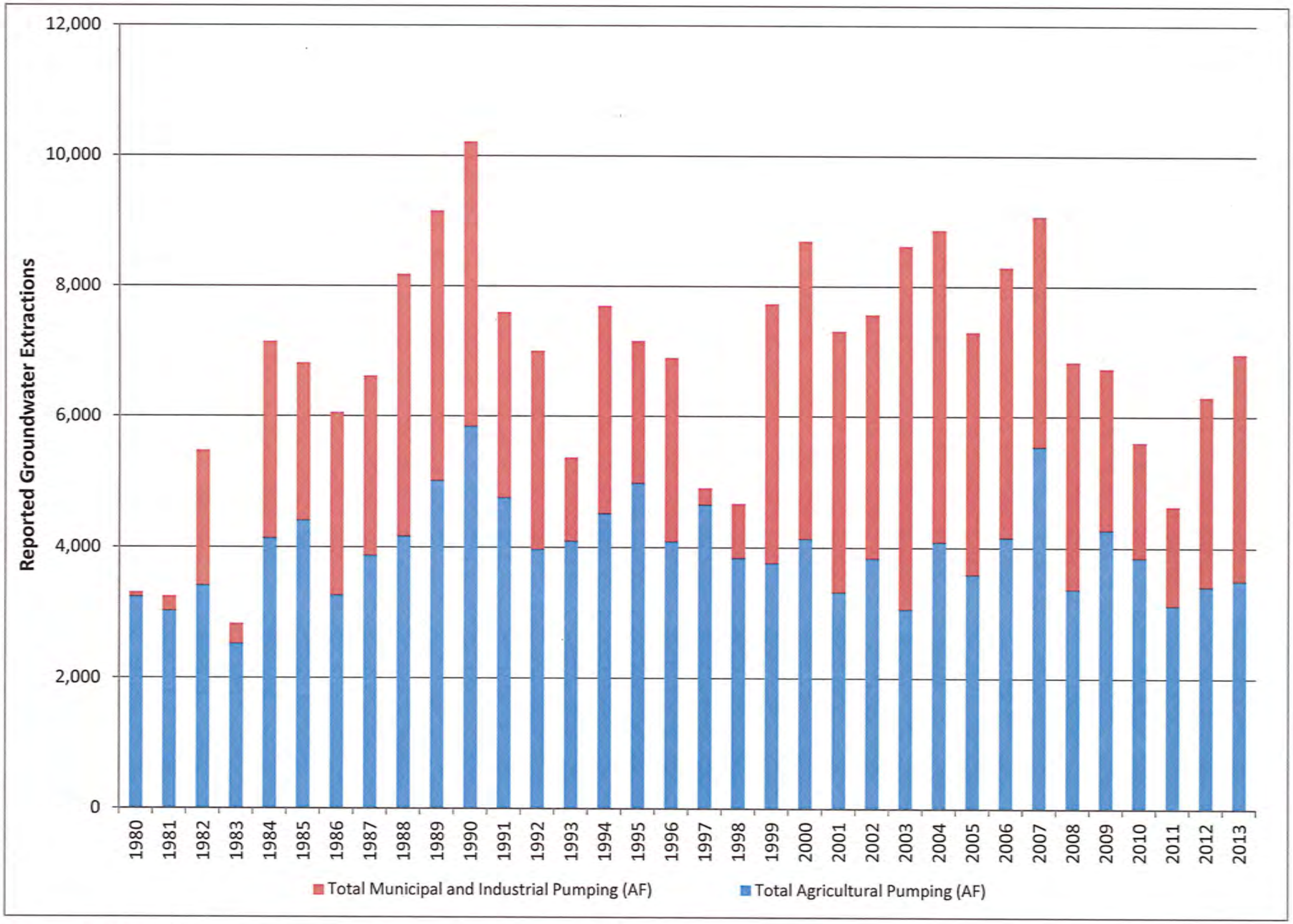


Figure 4.3-19. Historical reported groundwater extractions for the Mound basin

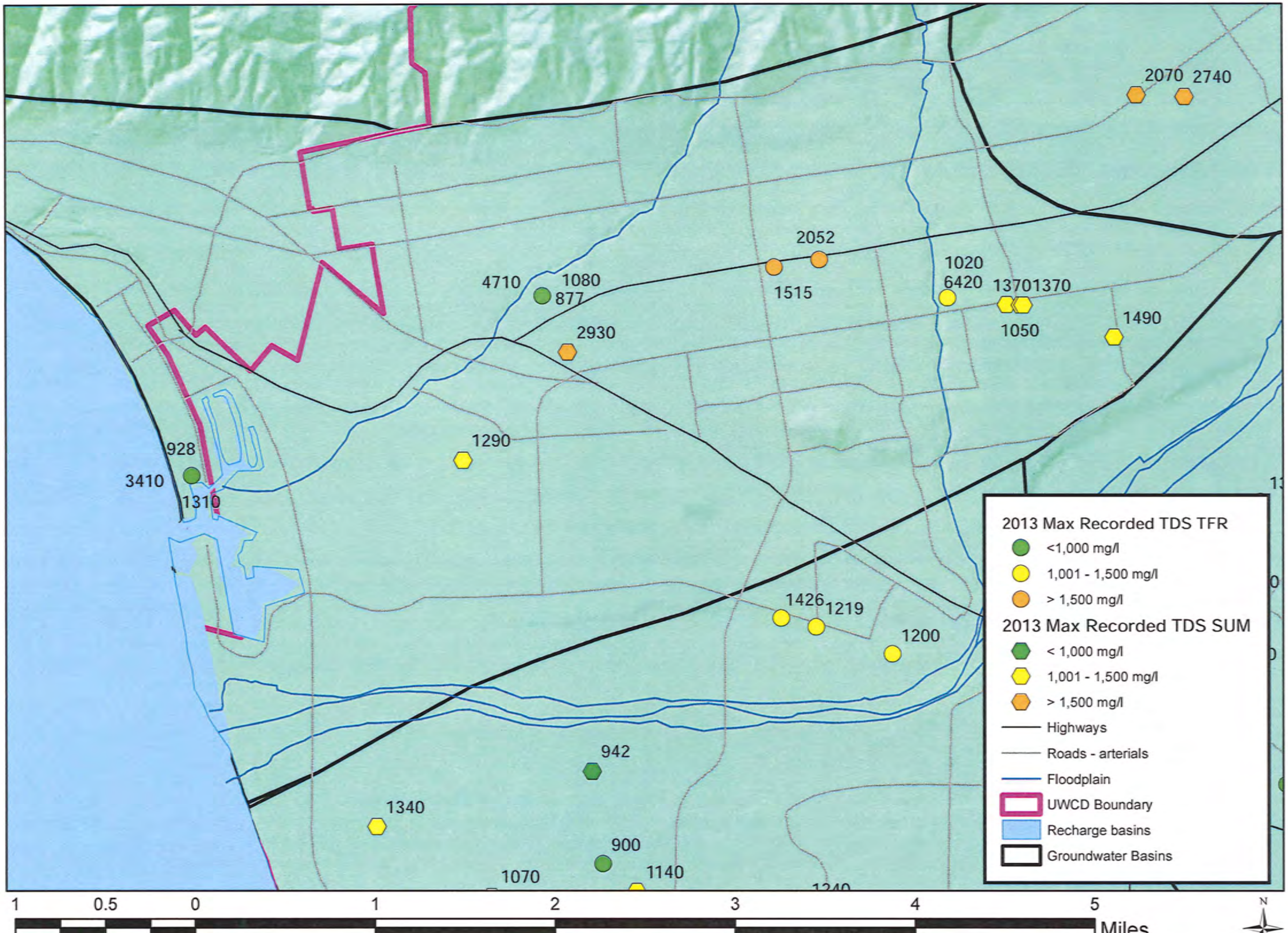


Figure 4.3-20. Maximum recorded TDS in Mound basin wells, 2013

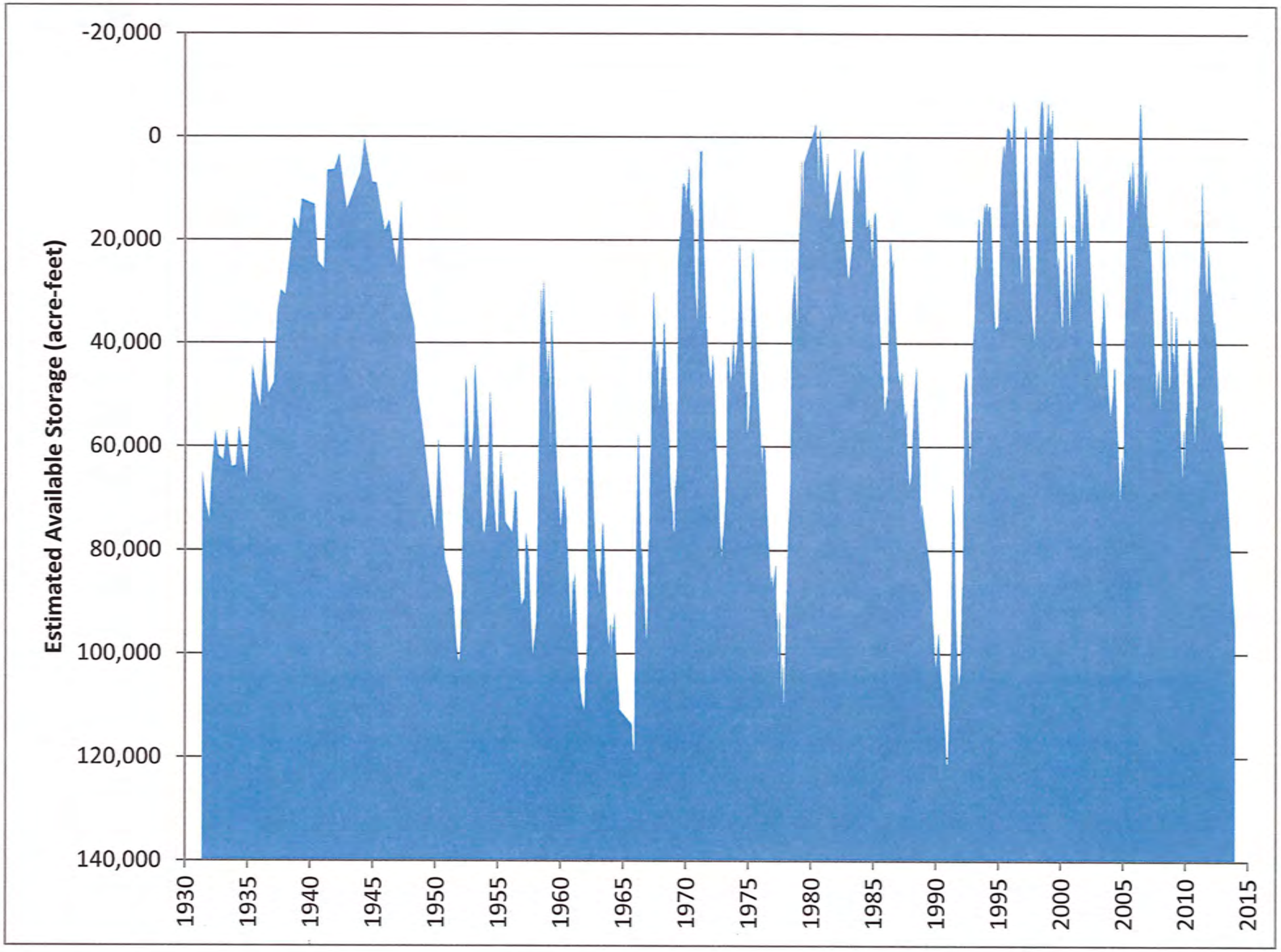


Figure 4.3-21. Historical estimates of available groundwater storage, Oxnard Forebay basin

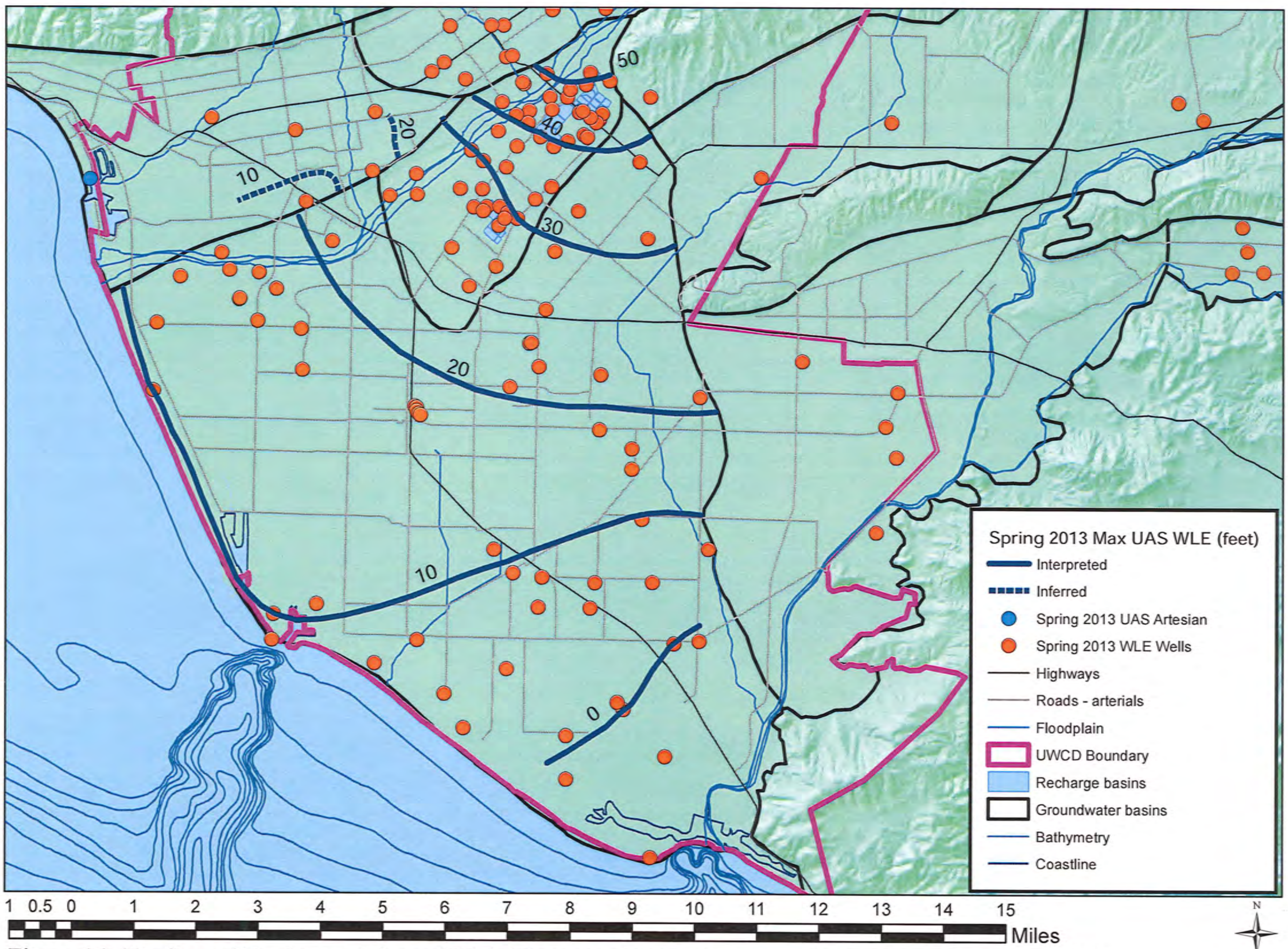


Figure 4.3-22. Oxnard Forebay and Oxnard Plain Upper Aquifer System groundwater elevations, spring 2013

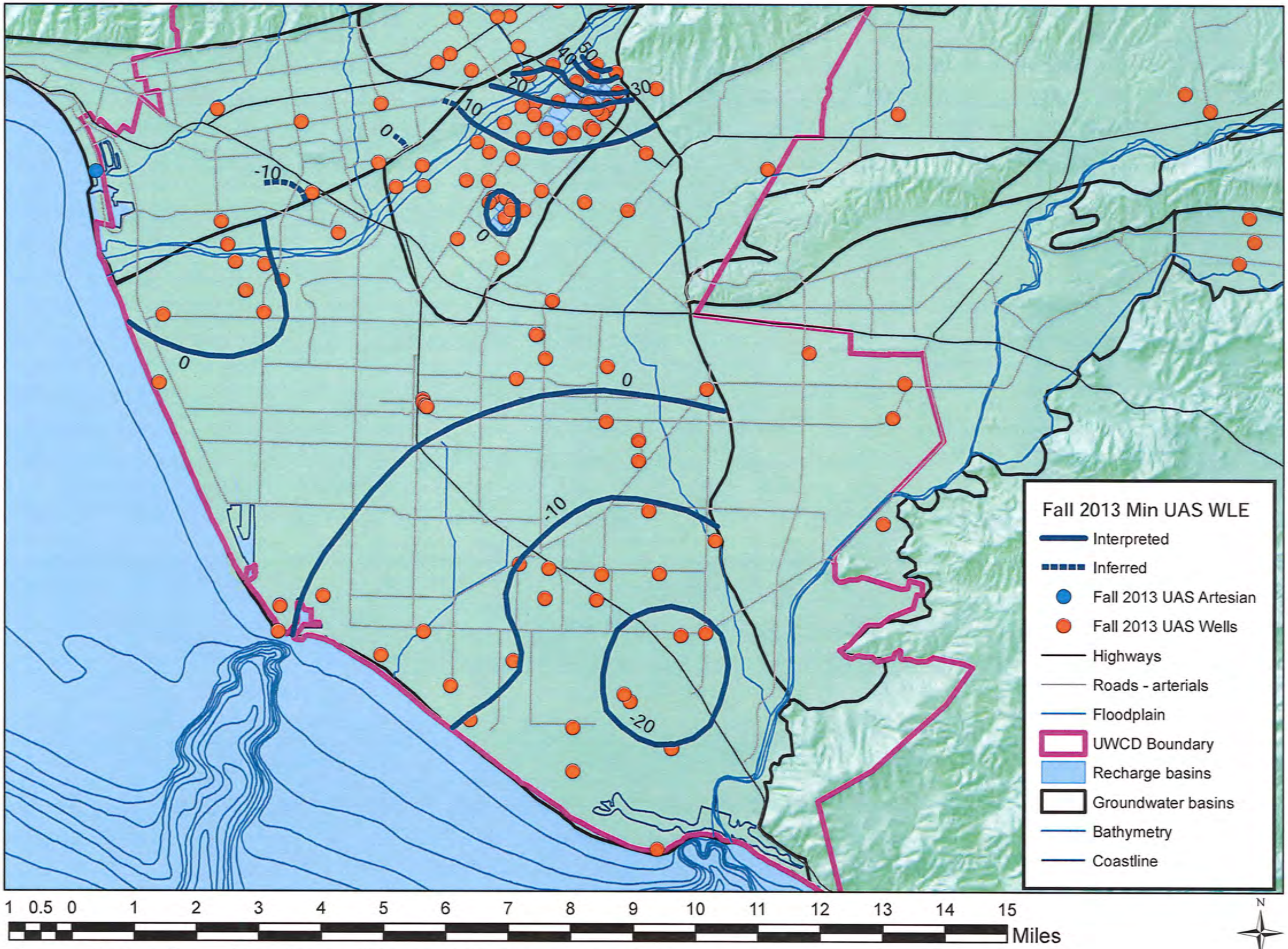


Figure 4.3-23. Oxnard Forebay and Oxnard Plain Upper Aquifer System groundwater elevations, fall 2013

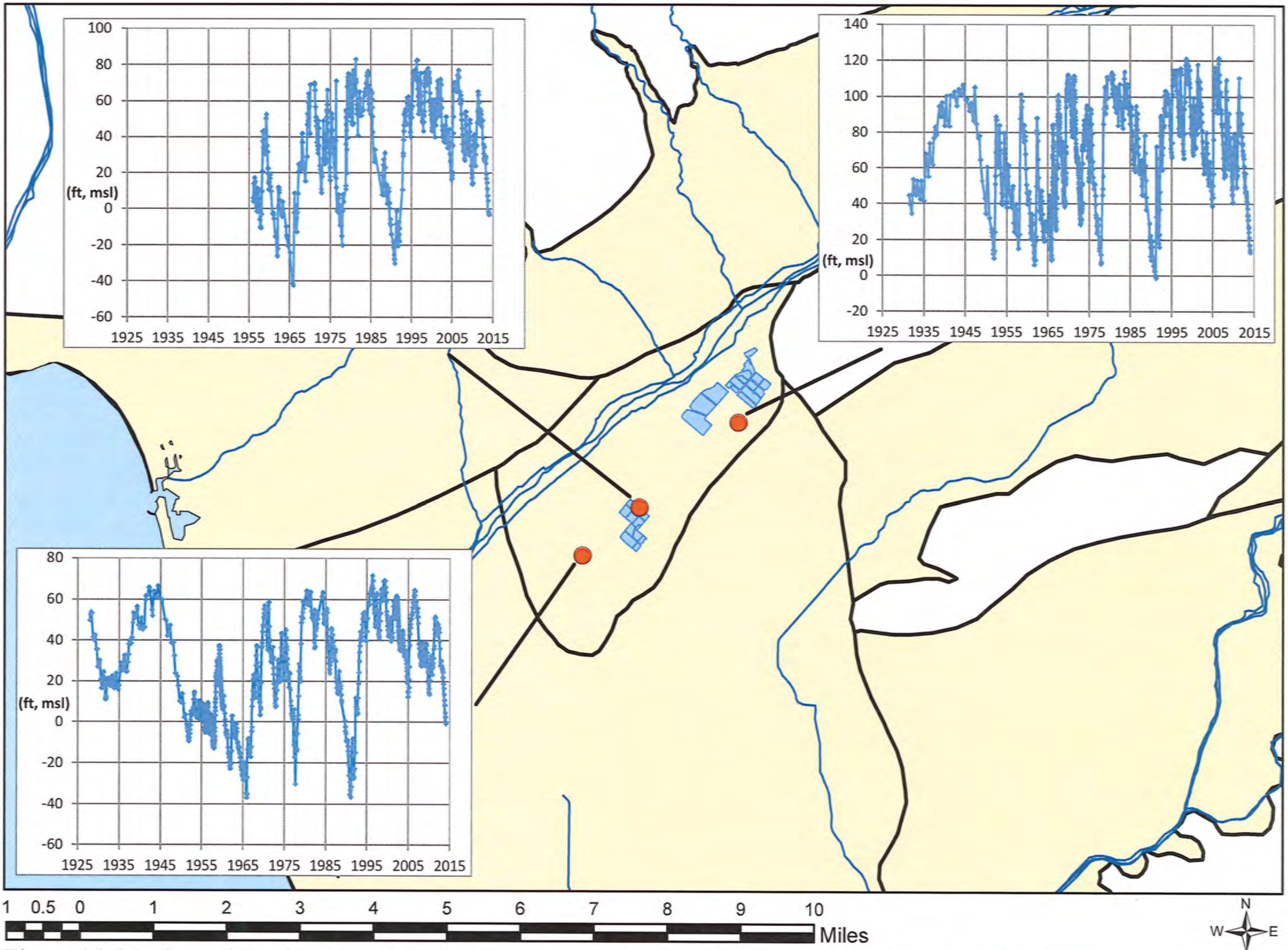


Figure 4.3-24. Oxnard Forebay Upper Aquifer System groundwater elevation hydrographs, selected wells

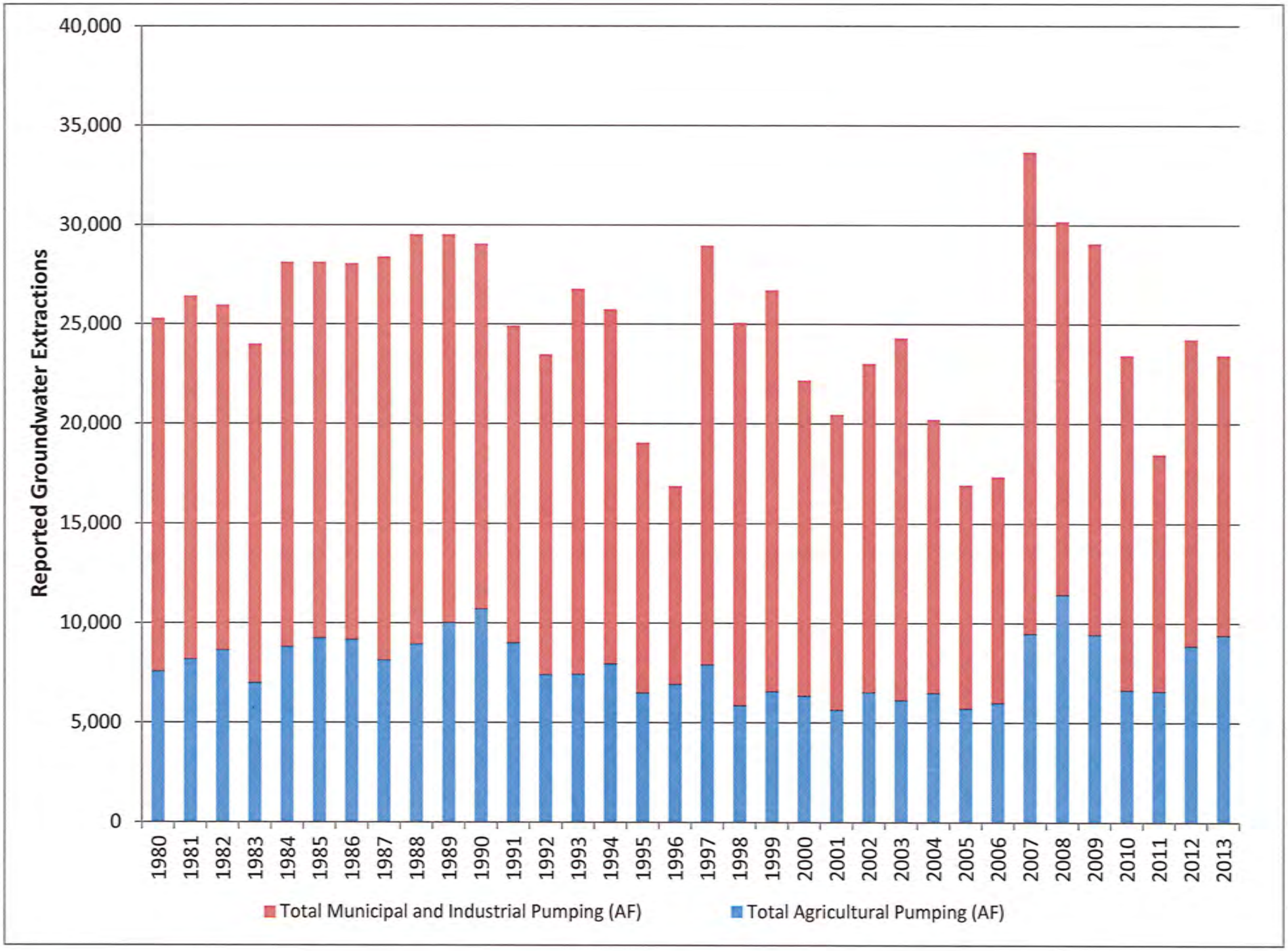


Figure 4.3-25. Historical reported groundwater extractions for the Oxnard Forebay

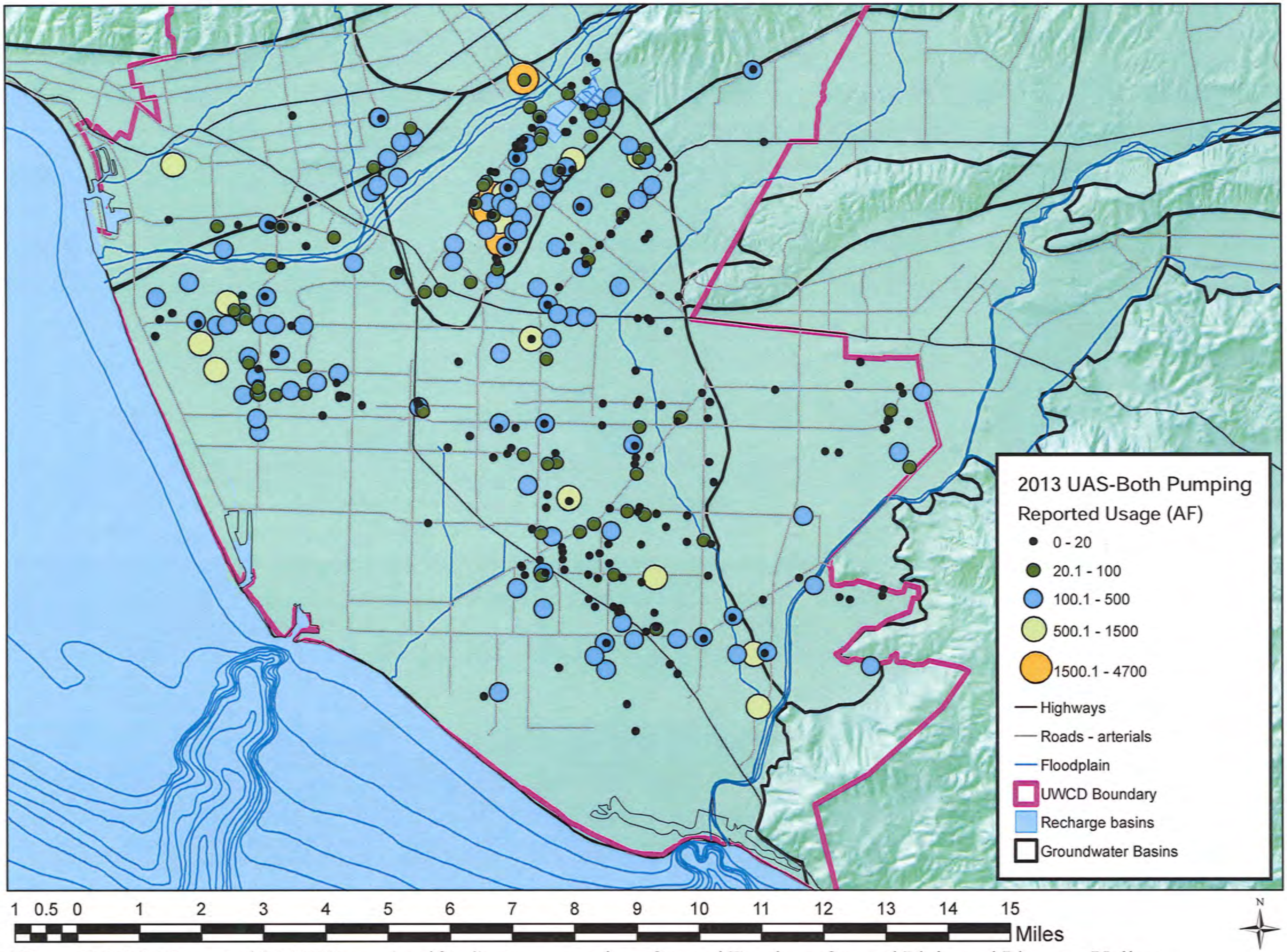


Figure 4.3-26. Reported 2013 Upper Aquifer System pumping, Oxnard Forebay, Oxnard Plain and Pleasant Valley

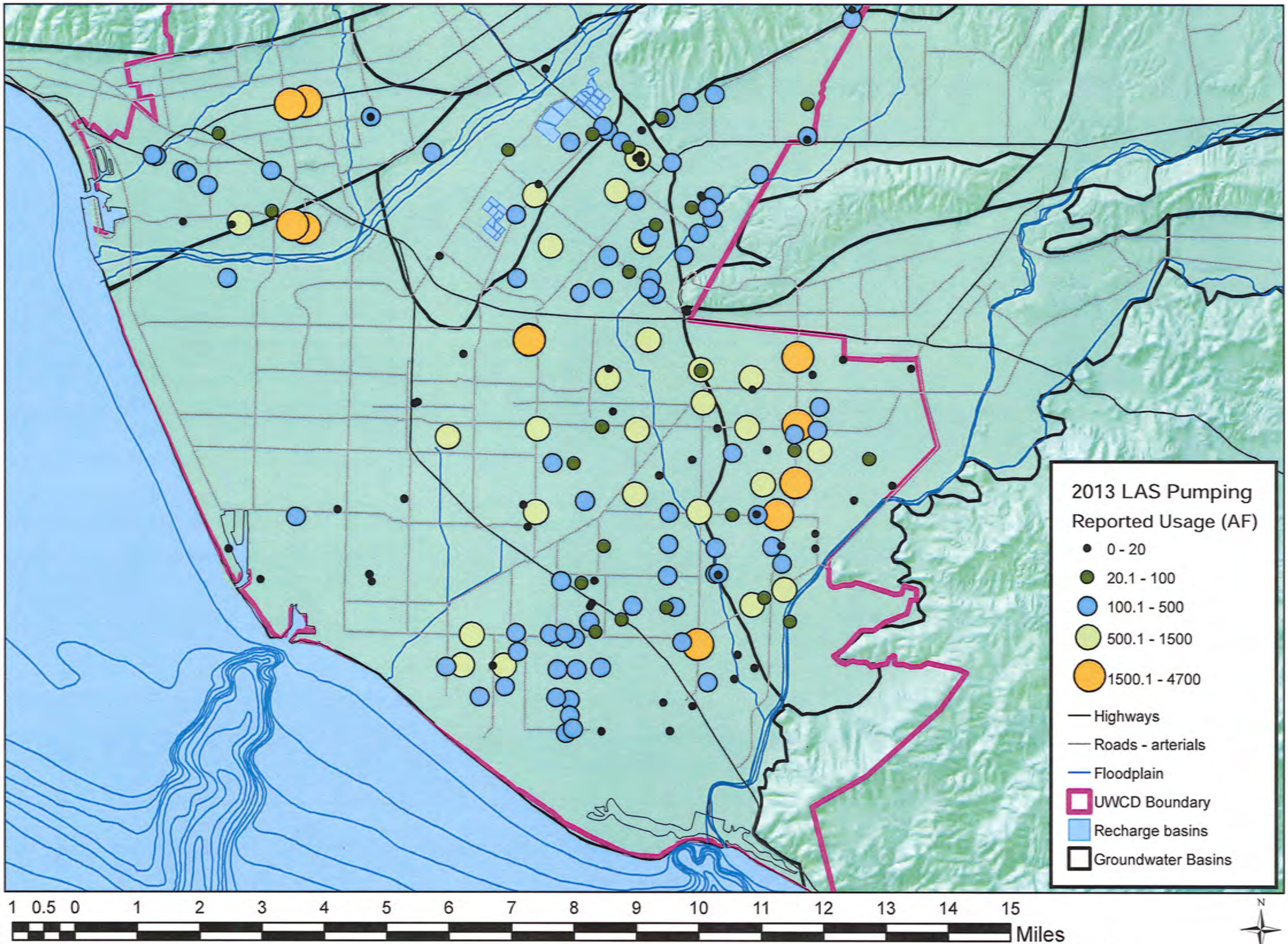


Figure 4.3-27. Reported 2013 Lower Aquifer System pumping, Oxnard Forebay, Oxnard Plain and Pleasant Valley

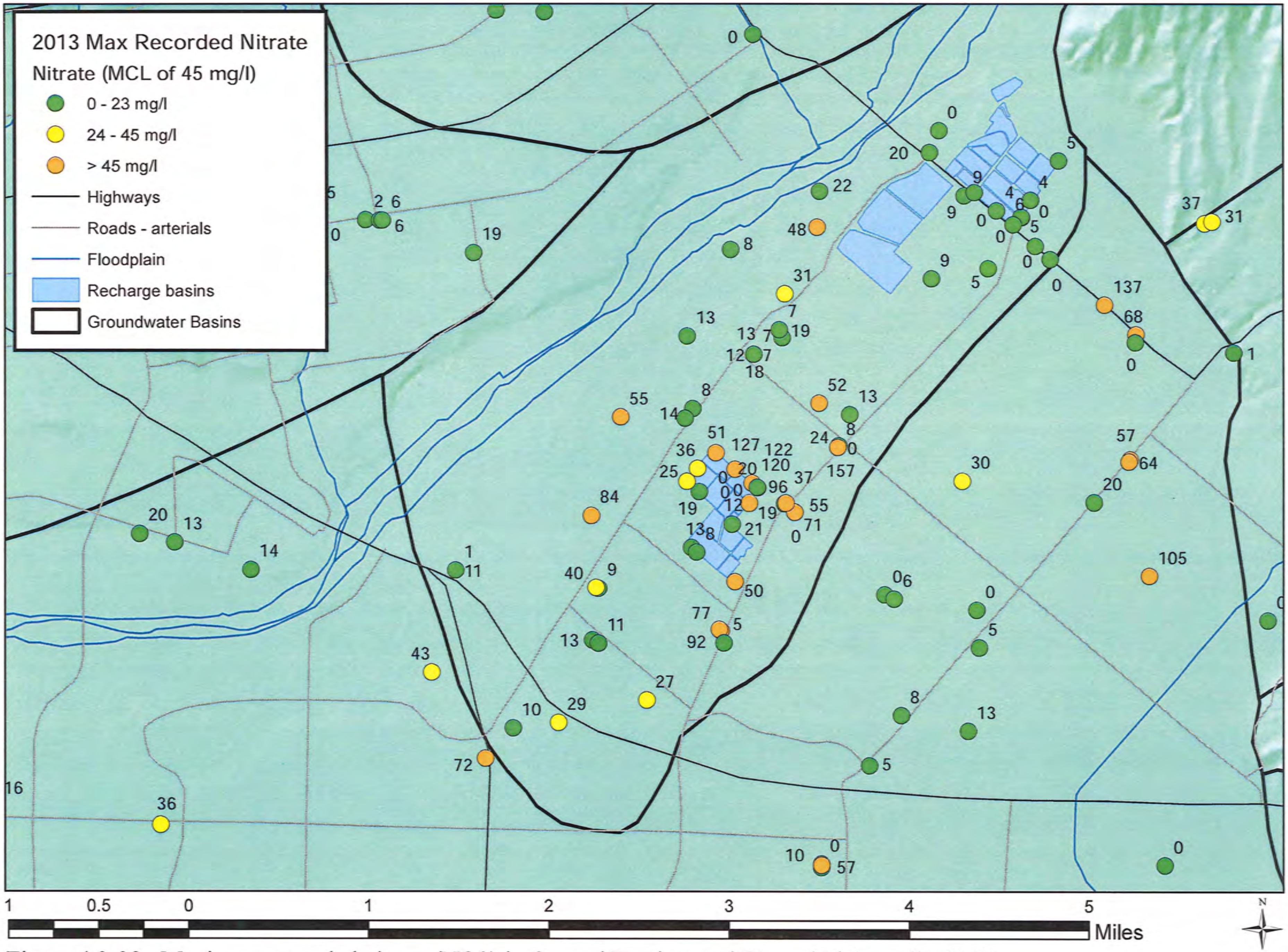


Figure 4.3-28. Maximum recorded nitrate (NO3) in Oxnard Forebay and Oxnard Plain wells, 2013

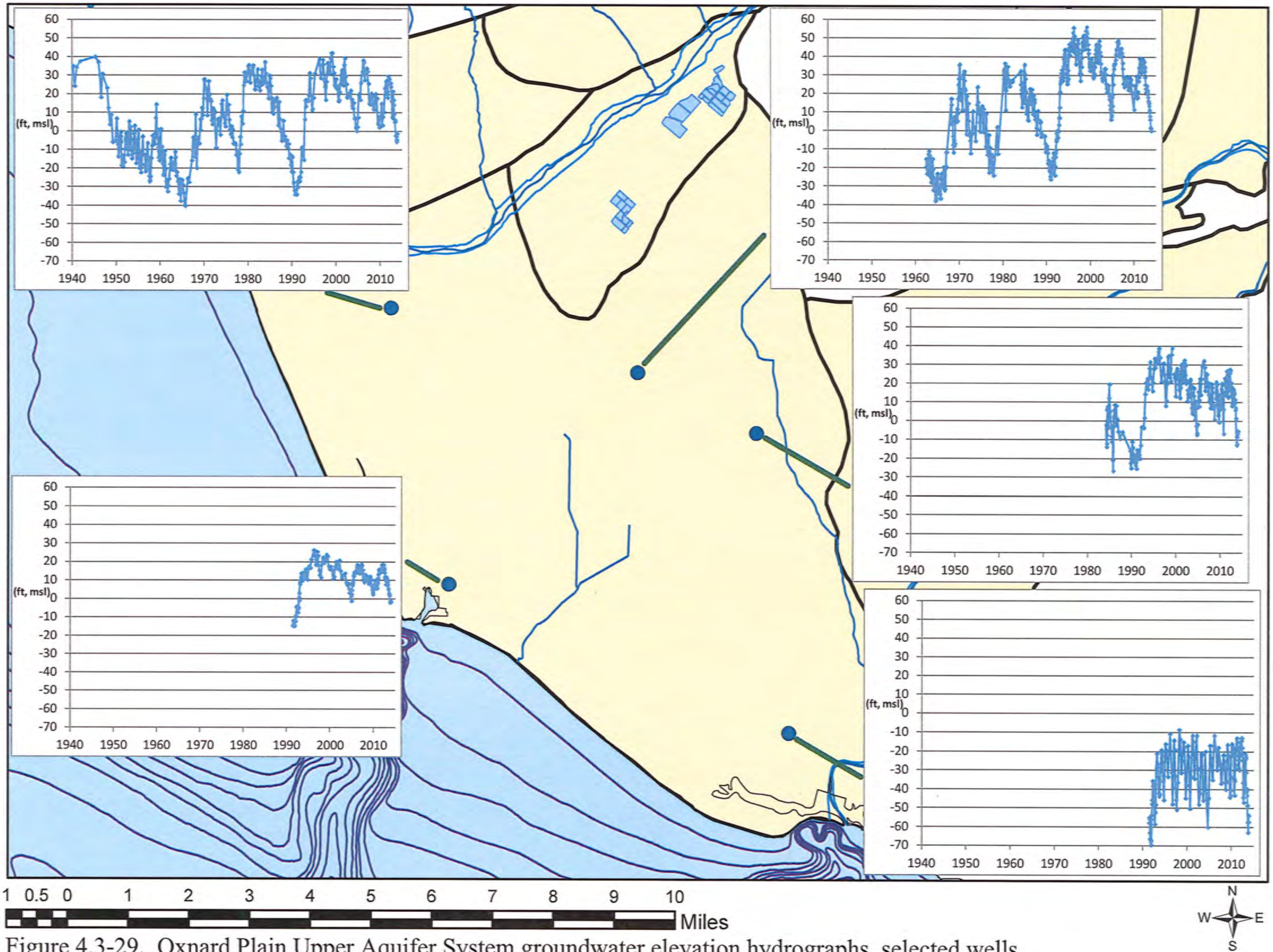


Figure 4.3-29. Oxnard Plain Upper Aquifer System groundwater elevation hydrographs, selected wells

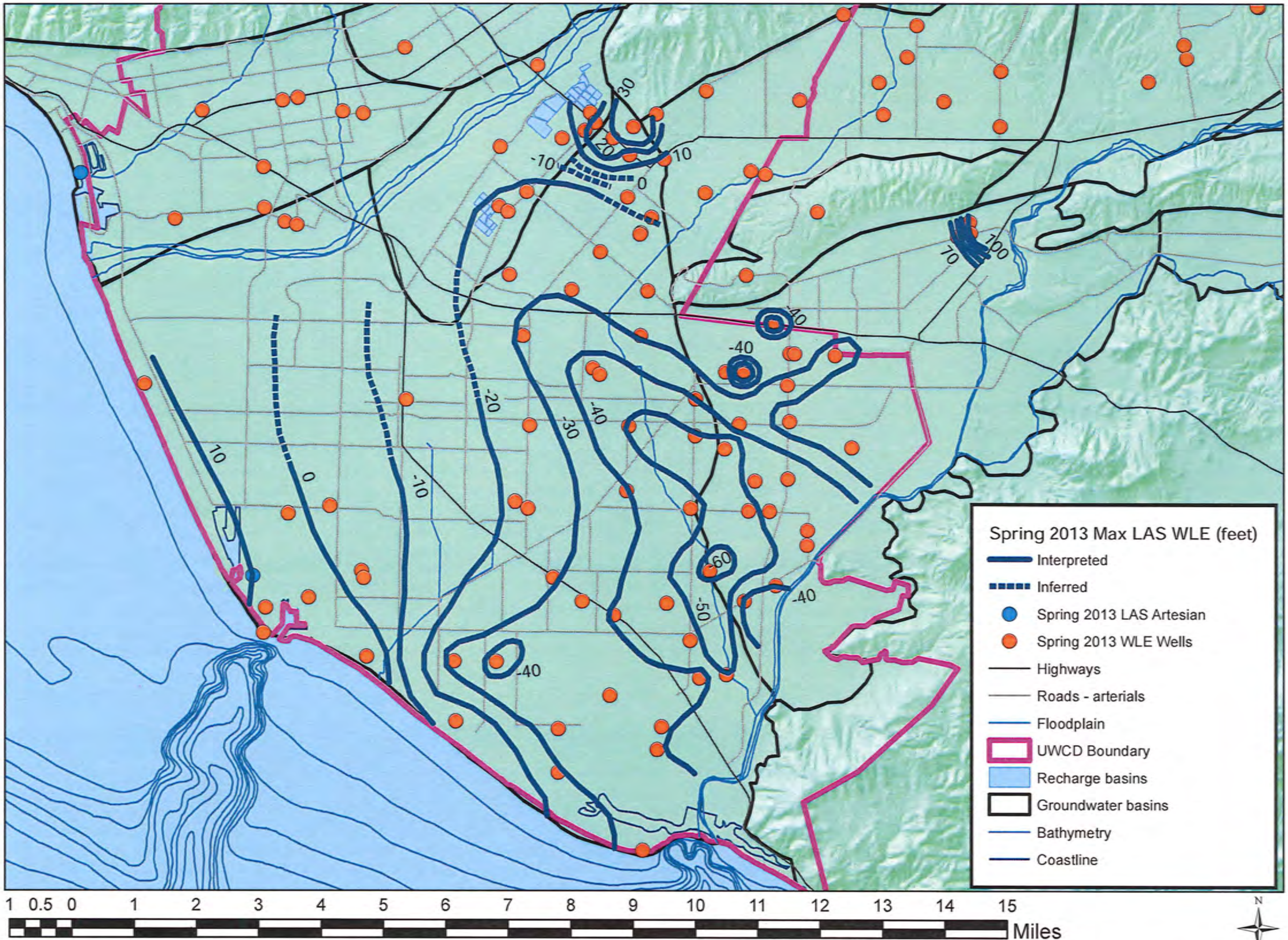


Figure 4.3-30. Oxnard Forebay, Oxnard Plain and Pleasant Valley Lower Aquifer System groundwater elevations, spring 2013

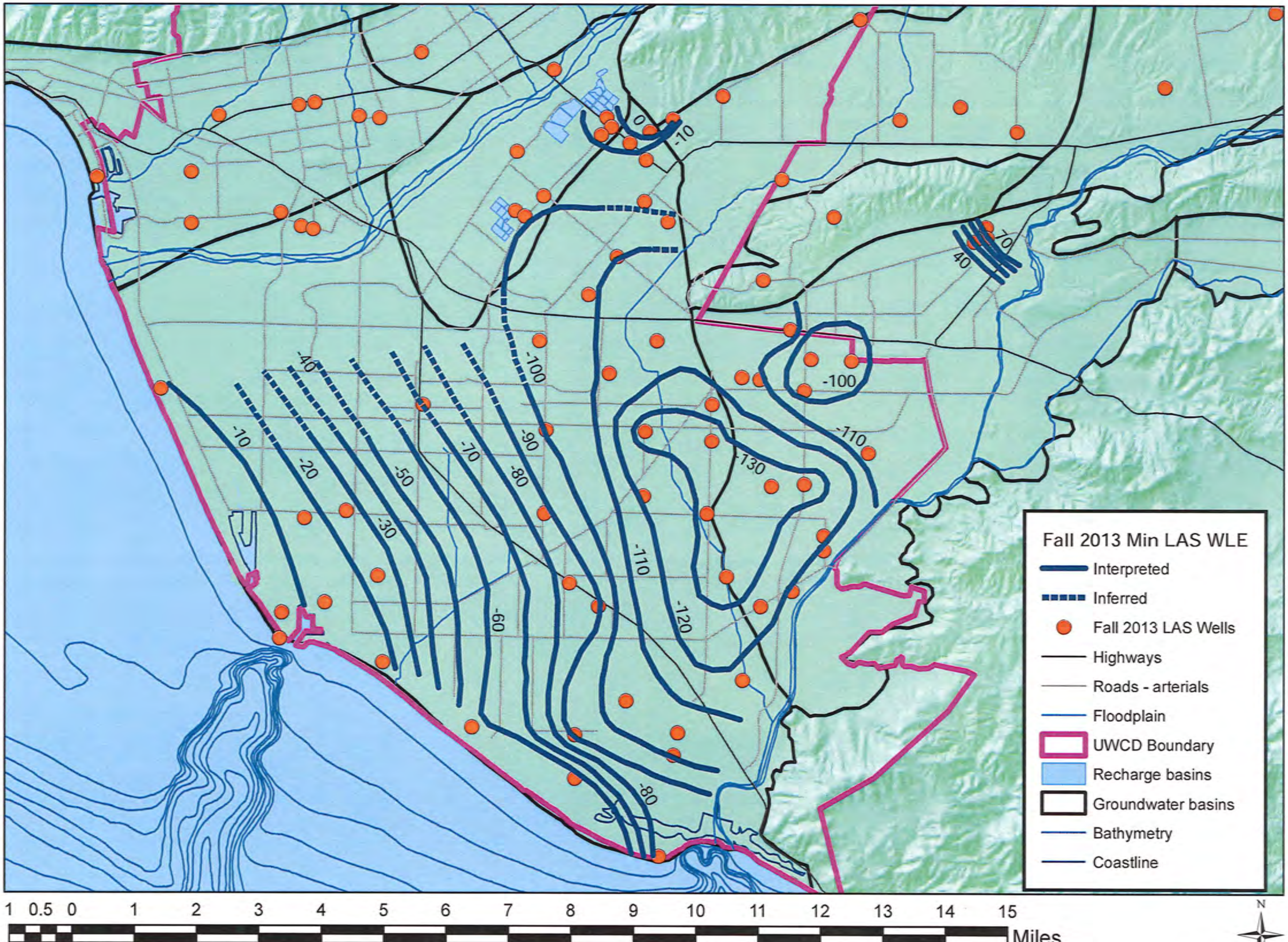


Figure 4.3-31. Oxnard Forebay, Oxnard Plain and Pleasant Valley Lower Aquifer System groundwater elevations, fall 2013

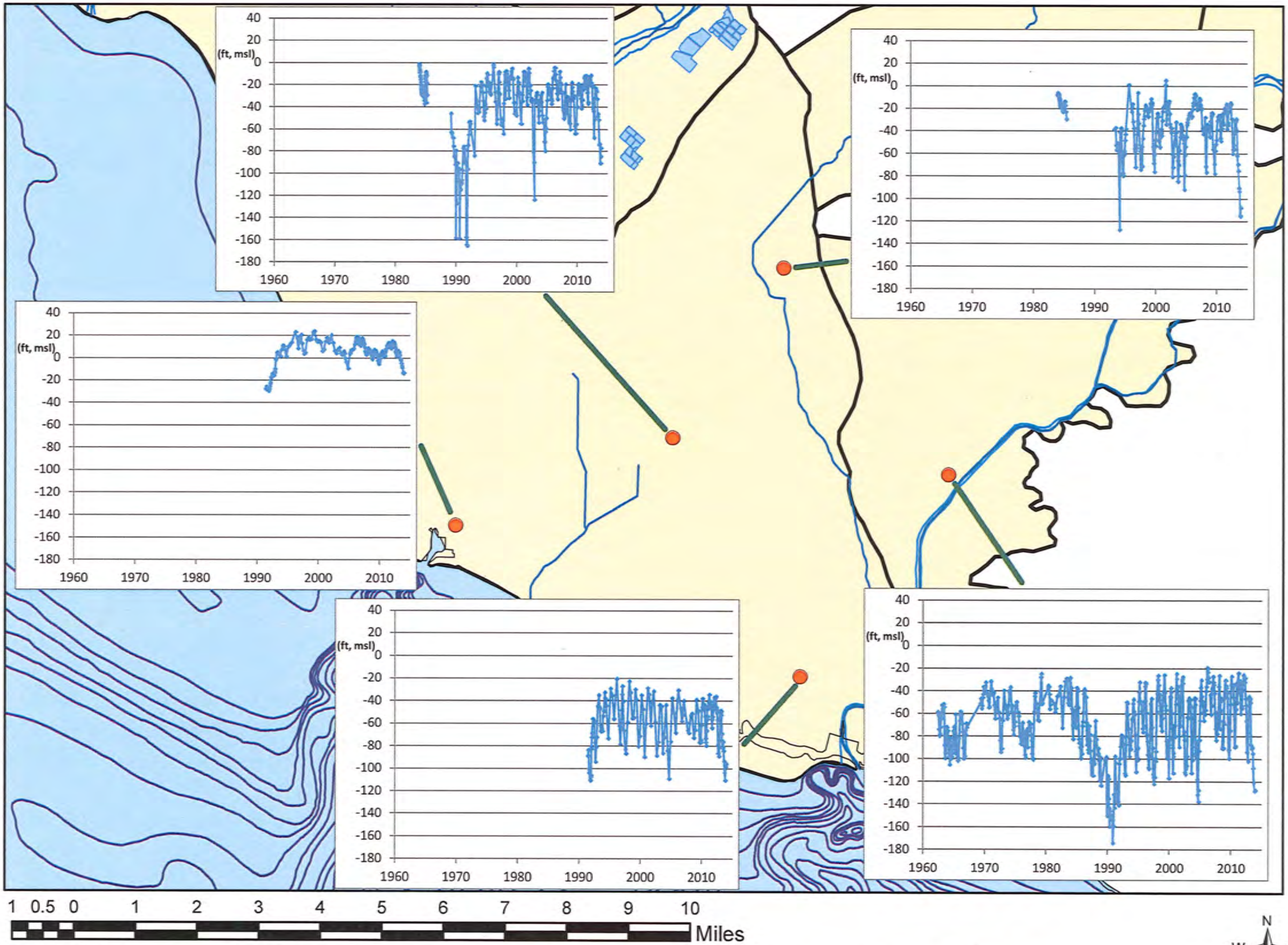


Figure 4.3-32. Oxnard Plain Lower Aquifer System groundwater elevation hydrographs, selected wells

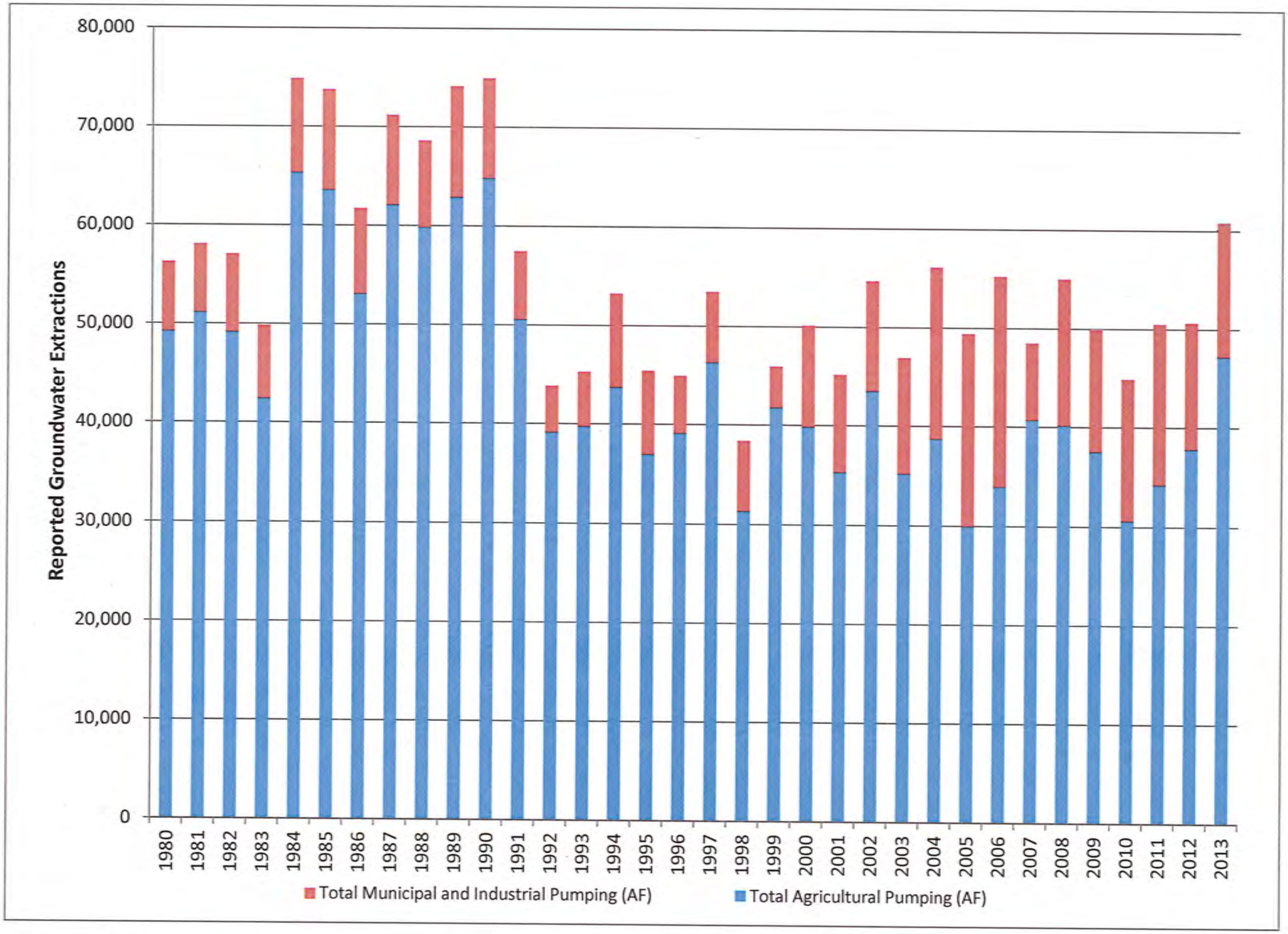


Figure 4.3-33. Historical reported groundwater extractions for the Oxnard Plain

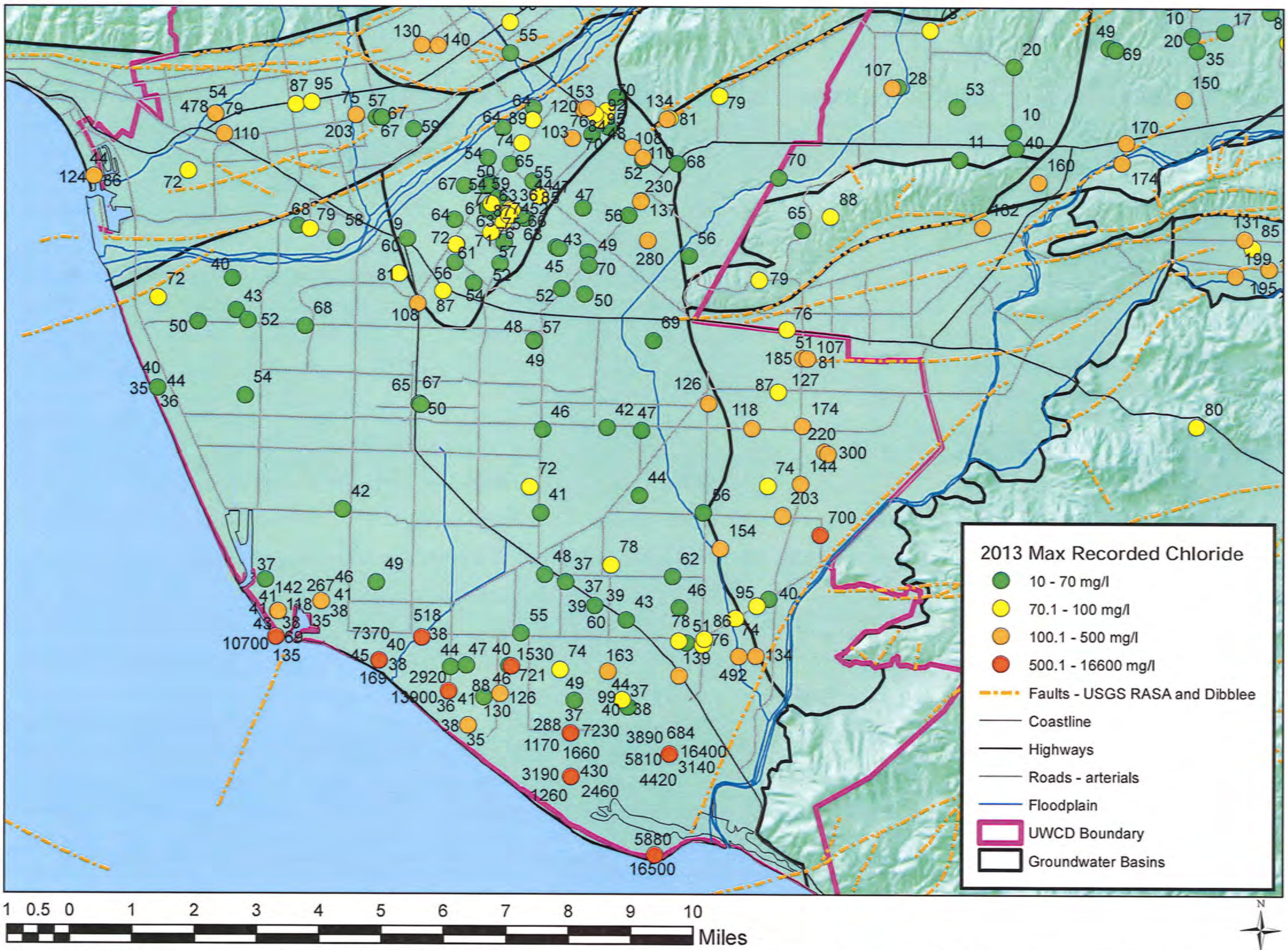


Figure 4.3-34. Maximum recorded chloride for Oxnard Forebay, Oxnard Plain and Pleasant Valley basin wells, 2013

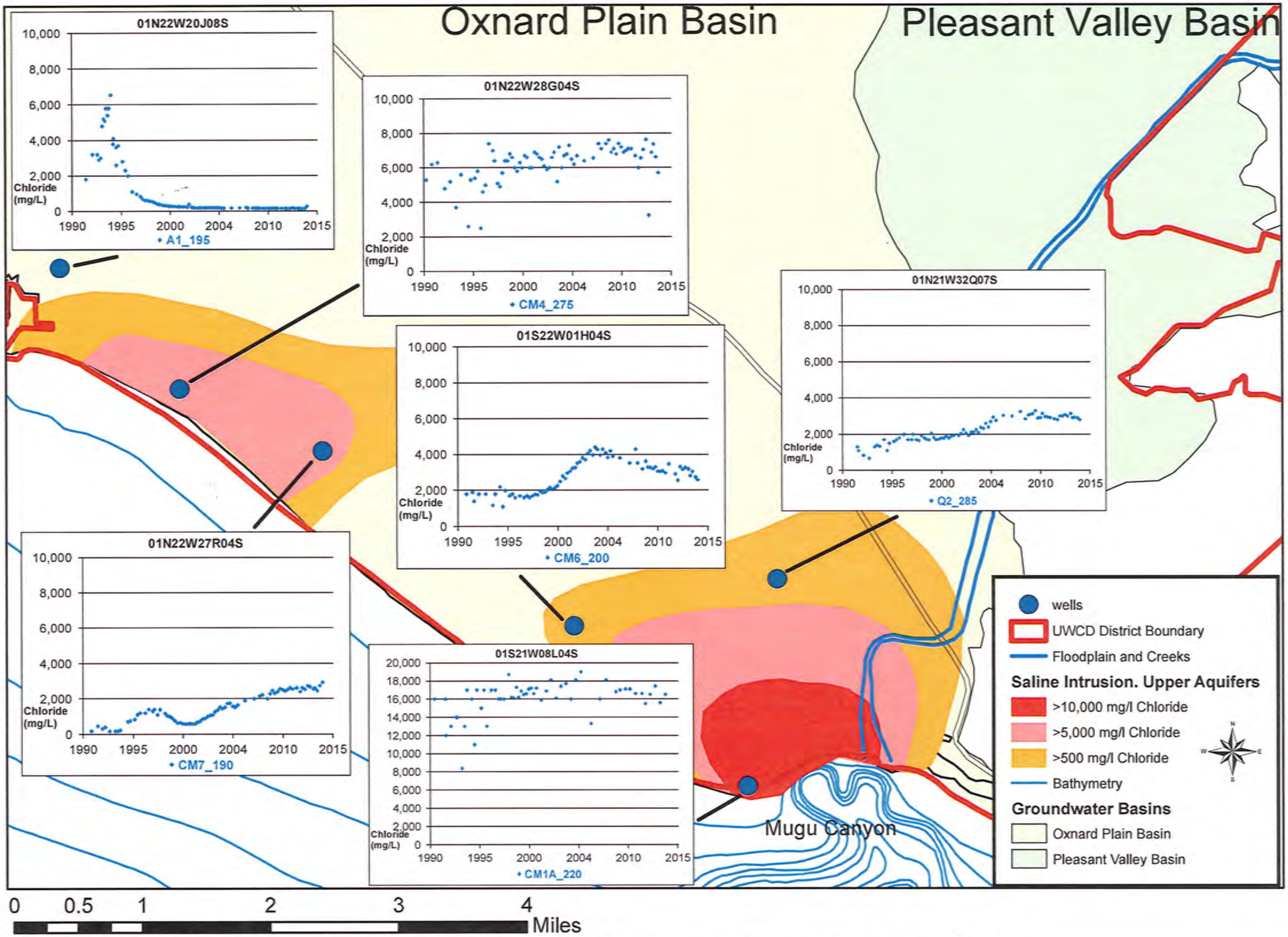


Figure 4.3-35. Chloride time series for selected Upper Aquifer System wells, southern Oxnard Plain

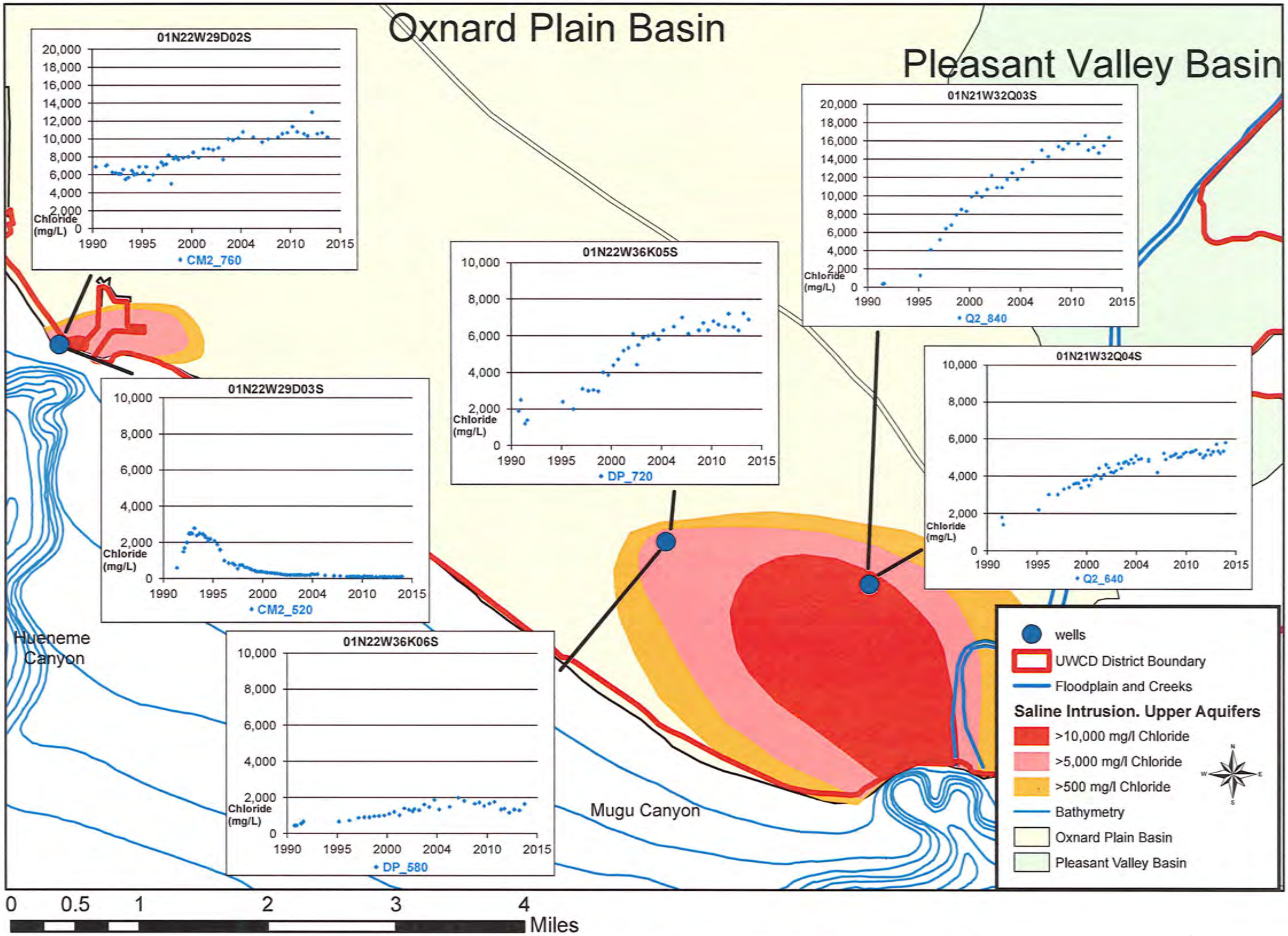


Figure 4.3-36. Chloride time series for selected Lower Aquifer System wells, southern Oxnard Plain

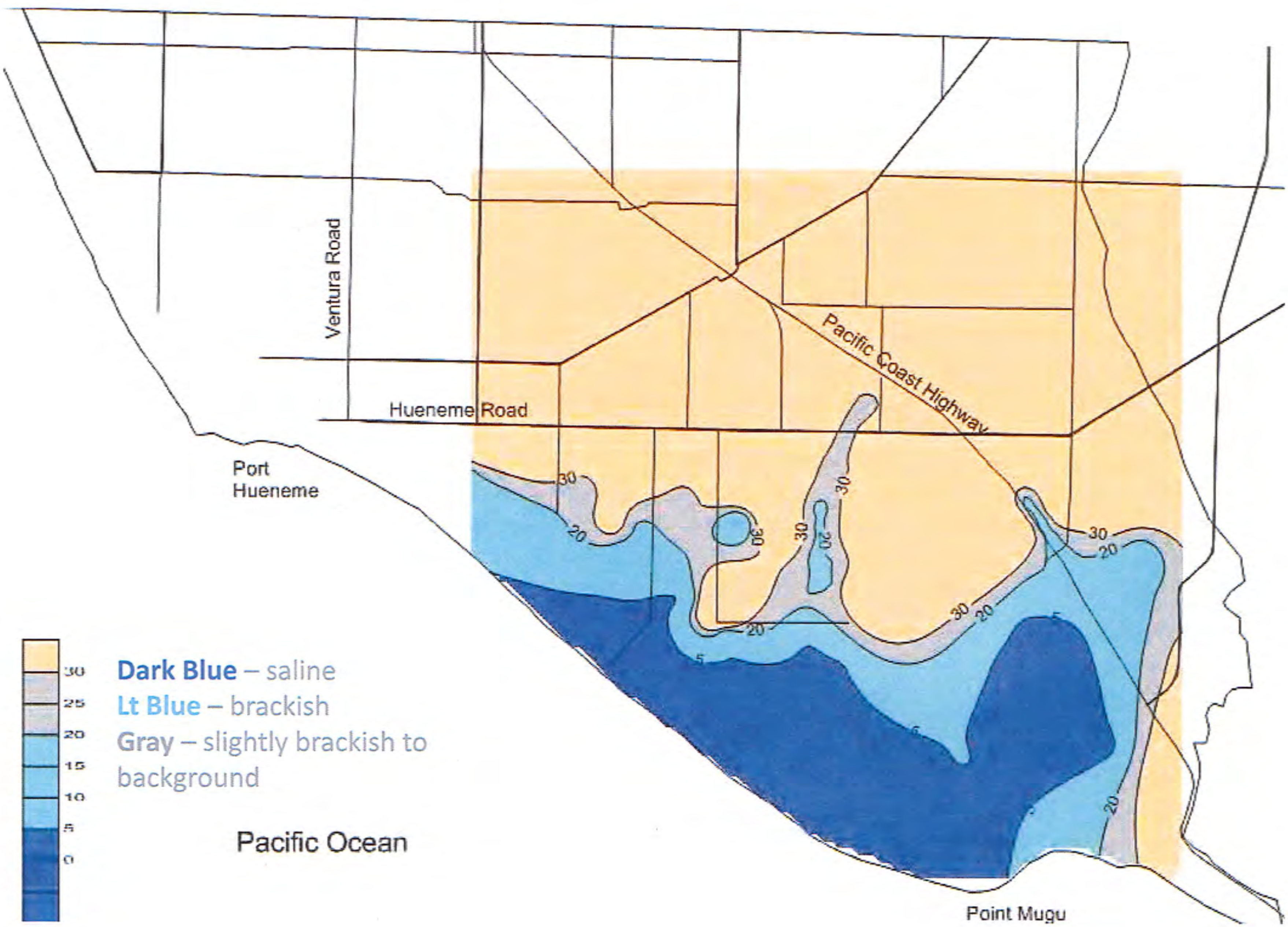


Figure 4.3-37. Geophysical survey (TDEM) of deep Upper Aquifer System (UAS) salinity, southern Oxnard Plain

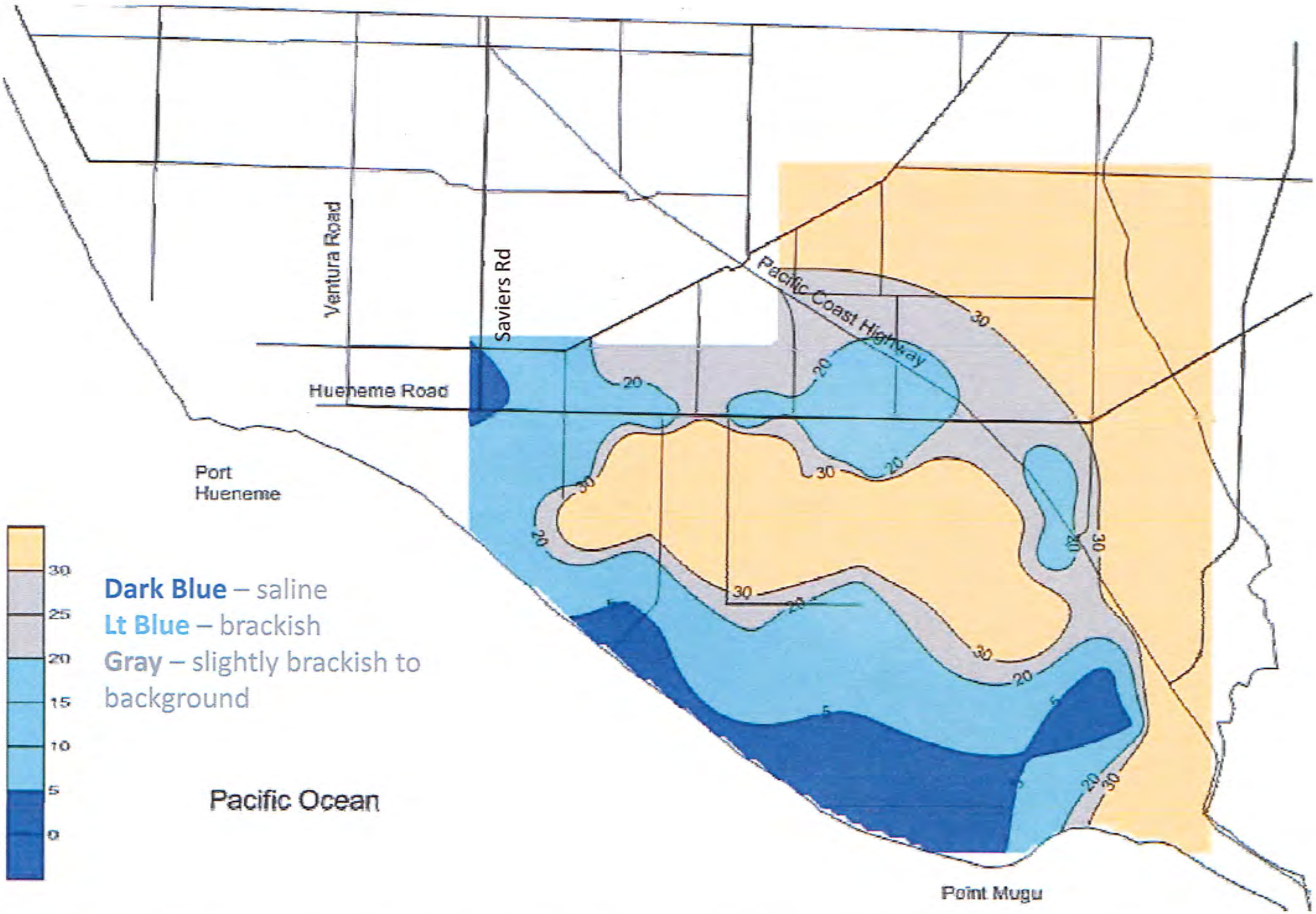


Figure 4.3-38. Geophysical survey (TDEM) of shallow Lower Aquifer System (LAS) salinity, southern Oxnard Plain

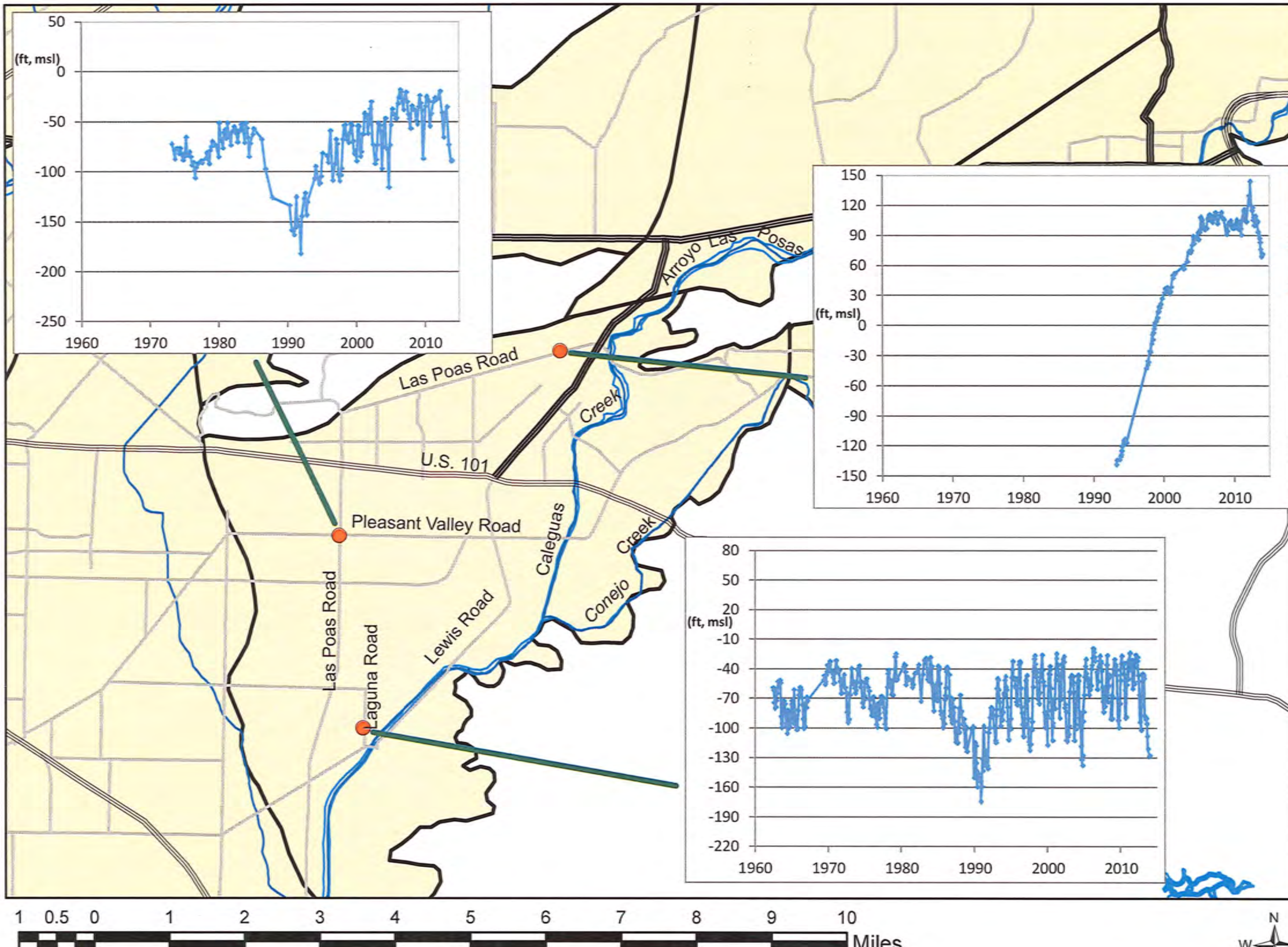


Figure 4.3-39. Pleasant Valley basin Lower Aquifer System groundwater elevation hydrographs, selected wells

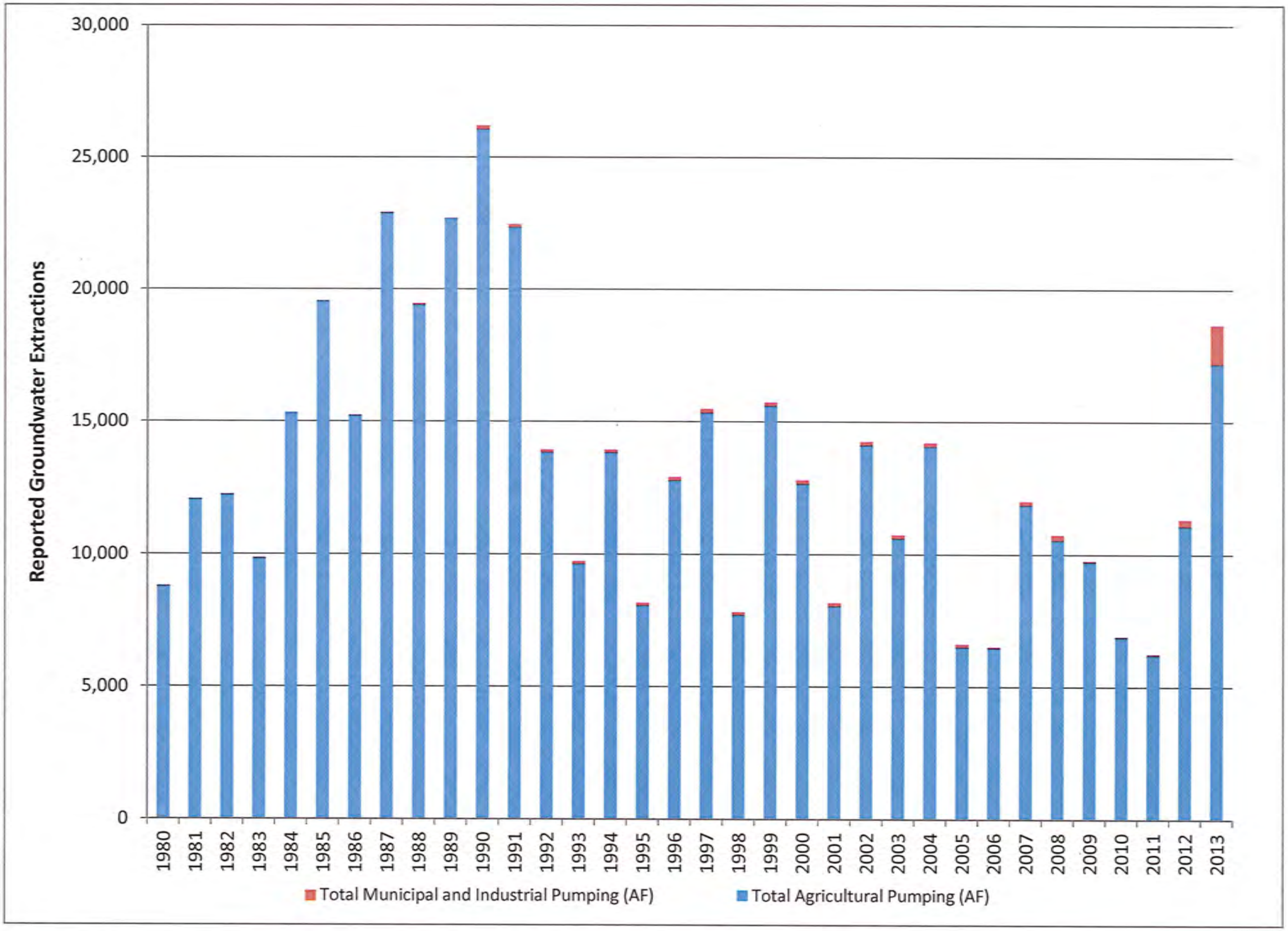


Figure 4.3-40. Historical reported groundwater extractions for Pleasant Valley basin

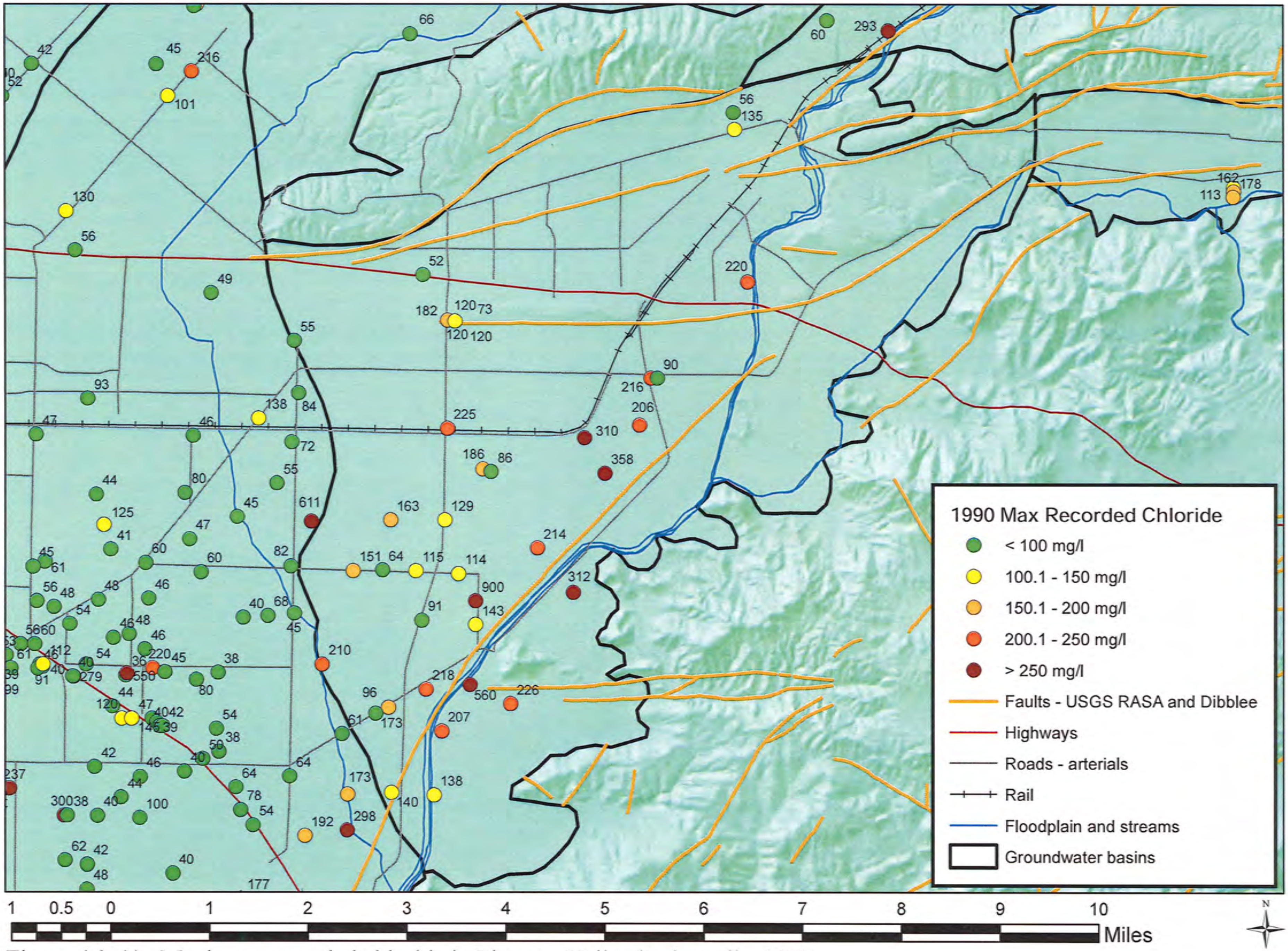


Figure 4.3-41. Maximum recorded chloride in Pleasant Valley basin wells, 1990

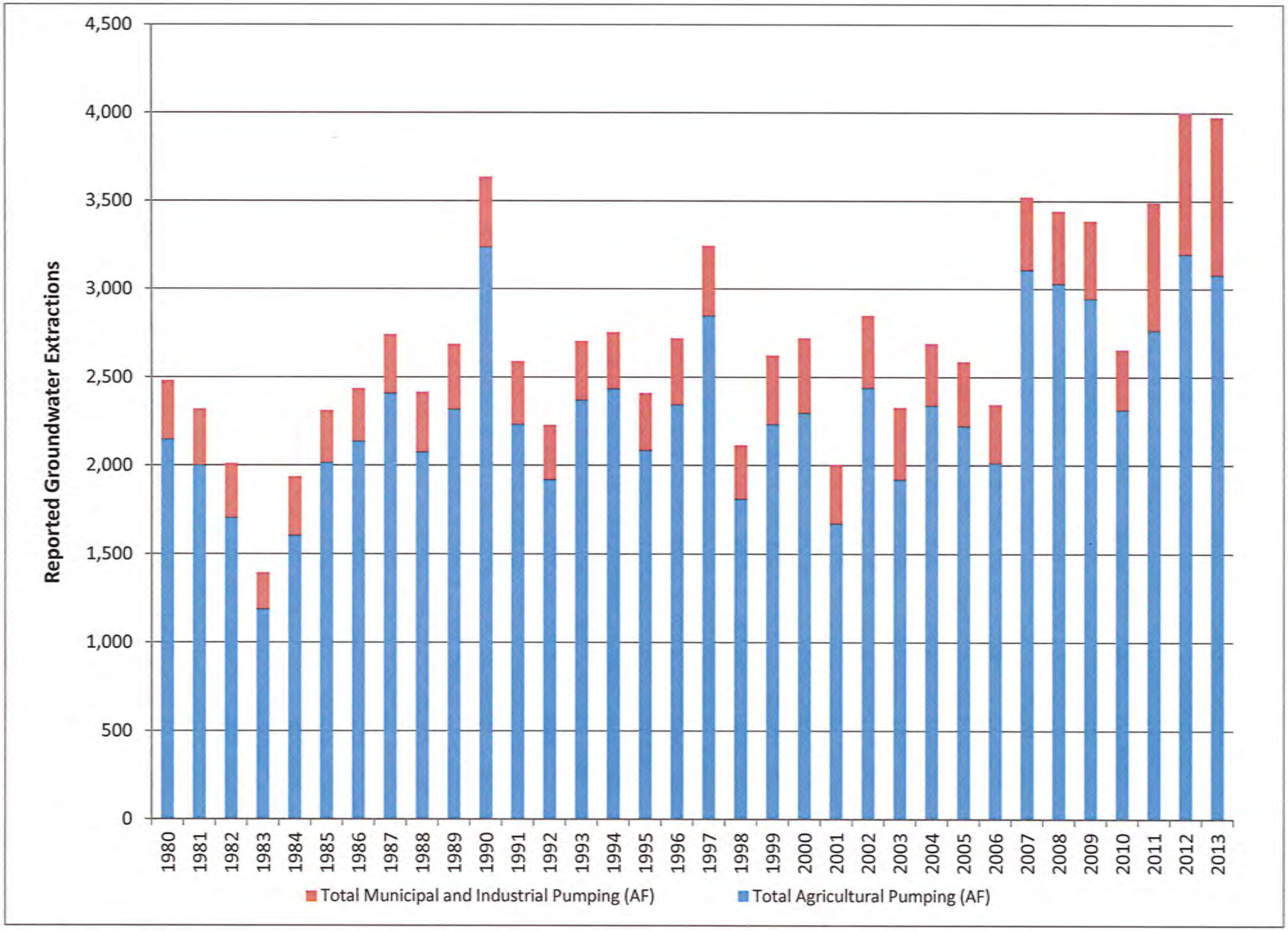


Figure 4.3-42. Historical reported groundwater extractions for West Las Posas basin

8 APPENDIX A. 2013 CONSUMER CONFIDENCE REPORT, O-H SYSTEM

United Water Conservation District

Oxnard-Hueneme Water Delivery System

2013 Consumer Confidence Report

Testing and Results

Last year we conducted thousands of tests for over 180 chemicals and contaminants that could be found in your drinking water. We did not detect any contaminants that would make the water unsafe to drink. This report highlights the quality of water we delivered to our customers last year. Included are details about where your water comes from, what it contains, and how it compares to State standards. For more information about your water, please call our Operations & Maintenance Manager, Mike Ellis at (805) 485-5114.

Public Meetings

Our monthly Board meetings are usually held on the second Wednesday of every month at 1:00 PM in our board room at our "Irv Wilde Headquarters" located at 106 North 8th Street in Santa Paula. Our meetings are open to the public and we would welcome your questions and comments.

About Your Water Supply

United Water's Oxnard-Hueneme Delivery System supplies about 15,000 acre-feet of water per year to several agencies in the Oxnard Plain, including the cities of Oxnard and Port Hueneme, two Naval bases, and several smaller water companies. Those agencies supply our water to over 222,000 people, most of it treated or blended with other supplies. Our water source is 100% local groundwater, pumped from wells near El Rio, north of Oxnard. Water from those wells has its origin in the mountains and valleys of the 1,600 square mile Santa Clara River watershed. The wells are in an aquifer called the Oxnard Forebay. Our water is naturally high in minerals that affect its taste, but is safe to drink. Our groundwater is considered to be "under the influence of surface water," which means we do extensive monitoring of turbidity and other parameters to meet health regulations.

United Water Conservation District
106 North 8th Street
Santa Paula, CA 93060
805/525-4431 Fax 805/525-2661
www.unitedwater.org

Water produced by our wells is naturally filtered through the ground. We use chlorine as a disinfectant to kill bacteria, parasites, and viruses. Then we add chloramines to provide a long-lasting disinfection residual to keep the water safe until it reaches our customers. Due to the longer-lasting residual of chloramines, owners of pet fish must treat their tap water before putting it into aquariums or ponds.

Types of Potential Contamination

In general, sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves, naturally-occurring minerals and, in some cases, radioactive material can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming

Organic chemical contamination, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap is safe to drink USEPA and the California Department of Public Health prescribes regulations that limit the amount of certain contaminants in public drinking water. We treat our water to meet these health regulations. The Department's regulations also establish limits for contaminants in bottled water, which must provide the same protection for public health. Scientists and health experts are continually studying the effects of various chemicals in drinking water to make sure the public water supply is safe.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Definitions

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect to odor, taste and appearance of drinking water.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Detection Limit for Reporting (DLR): The level above which a chemical is to be reported.

NA: Not applicable

ppm: parts per million, or milligrams per litre

ppb: parts per billion, or micrograms per litre

ND: none detected

pCi/L: picocuries per litre (a measure of radioactivity)

µS/cm: a measure of electric conductivity

Turbidity

Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our water treatment. Turbidity is measured in units called NTUs. We achieved 100% compliance with turbidity standards in 2013.

Contaminants Detected in 2013

Contaminant	Units	State MCL [MRDL]	PHG (MCLG) [MRDLG]	Avg	Range	Sam-ple Date	Viola-tion	Typical Sources in Drink-ing Water
Microbiological Contaminants								
Total Coliform bacteria	Absence/ Presence/ 100ml	Systems that col-lect <40 sam-ples/month: no more than 1 posi-tive sample	(0)	Absent	Absent	2013	No	Naturally present in the environ-ment.
Fecal Coliform bacteria and *E.coli*	Absence/ Presence/ 100ml	A routine and repeat sample are total coliform posi-tive, and one of these is fecal or *E.coli positive*	(0)	Absent	Absent	2013	No	Human and animal fecal waste.
Delivered water turbidity	NTU	TT	NA	0.11	0.07-0.25	2013	No	Well corrosion byproducts. Micro-scopic soil particles.
Radioactivity Contaminants								
Gross Alpha	pCi/L	15	(0)	6.34	2.59-8.41	2013	No	Erosion of natural deposits.
Radon	pCi/L	NA	NA	370.25	319-412	2013	No	Decay of natural deposits.
Inorganic Contaminants								
Arsenic	ppb	10	0.004	4	3-5	2013	No	Erosion of natural deposits.
Fluoride	ppm	2.0	1	0.55	0.5-0.6	2013	No	Erosion of natural deposits.
Nitrate (as NO3)	ppm	45	45	17.5	9.9-27.1	2013	No	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural
Selenium	ppb	50	30	15.0	10-20	2013	No	Erosion of natural deposits. Dis-charge from mines, runoff from
Disinfection								
Chloramine Residual (as Cl2)	ppm	[4.0]	[4]	1.93	1.35-2.40	2013	No	Drinking water disinfectant added for treatment.
Disinfection By-Products								
Haloacetic Acids	ppb	60	NA	4.38	ND-7	2013	No	By-product of drinking water disin-fection.
Total Trihalomethanes	ppb	80	NA	22.9	13-31.9	2013	No	By-product of drinking water disin-fection.
Disinfection By-Product								
Total Organic Carbon (TOC)	ppb	TT	NA	1.33	0.8-2.1	2013	No	Various natural and man-made sources.
Secondary Standards								
Chloride	ppm	500	NA	61.5	61-62	2013	No	Leaching from natural mineral
Sodium	ppm	NA	NA	96	96-96	2013	No	Leaching from natural mineral
Specific Conductance	µS/cm	1600	NA	1412.5	1360-1470	2013	No	Runoff/leaching from natural de-posits.
Sulfate	ppm	500	NA	499.2	440-580	2013	No	Runoff/leaching from natural de-
Total Dissolved Solids, TDS	ppm	1,000	NA	1012.5	960-1060	2013	No	Runoff/leaching from natural de-
Total Hardness	ppm	N/A	NA	591.5	574-609	2013	No	Leaching from natural mineral
Unregulated Contaminants								
Boron*	ppb	NA	NA	600	600-600	2013	No	Erosion of natural deposits.

* The notification level for Boron is 1 ppm. There currently is no Maximum Contaminant Level for Boron hovever, the babies of some pregnant women who drink water con-taining boron in excess of the notification level may have an increased risk of developmental effects, based on studies in laboratory animals.

Water Quality Data

The table on page 3 lists all of the drinking water contaminants that we detected during the 2013 calendar year. The presence of these contaminants in the water does not indicate that the water poses a health risk. In addition to the contaminants on the table, we tested for many other chemicals which were not detected at significant levels. Please call us if you would like a copy of the complete list of chemicals we tested for and the test results.

Total Dissolved Solids and Sulfate

Total Dissolved Solids, or TDS, is a measure of the total mineral content of the water. TDS and sulfate are secondary standards related to the taste of the water, and water exceeding the MCL is generally safe for human consumption. Our water exceeds the secondary standards for TDS and sulfate because of naturally occurring minerals in the water.

Source Water Assessment

United Water completed a Source Water Assessment for its drinking water wells in October 2001. The current report is available for public review at our office in Santa Paula. The assessment provides a survey of potential sources of contamination of the groundwater that supplies our wells. Activities that constitute the highest risk to our water are the following: petroleum storage tanks and fueling operations, septic systems, and animal feed lots that are no longer in use. The most recent update for the Surface Water Sanitary Survey was completed in January of 2011 and was submitted to the Department of Health Services.

Cryptosporidium

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes Cryptosporidium, the most commonly-used filtration methods cannot guarantee 100 percent removal. Our monitoring indicates the presence of these organisms in our source water and/or finished water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of Cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life-threatening illness. We encourage immuno-compromised individuals to consult with their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be digested to cause disease, and it may be spread through means other than drinking water.

Radon

Radon is a radioactive gas that you cannot see, taste or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, you may test the air in your home. There are simple ways to fix a radon problem that are not too costly. For additional information, call the National Safety Council's Radon Hotline (800-SOS-RADON).

About Nitrate

Nitrate in drinking water at levels above 45 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness. Symptoms include shortness of breath and blueness of the skin. High nitrate levels may also affect the ability of the blood to carry oxygen in some individuals, such as pregnant women and those with certain specific enzyme deficiencies. Nitrate levels may rise quickly because of rainfall or agricultural activity and groundwater movement. If you are caring for an infant, or are pregnant, you should ask advice from your doctor, or choose to use bottled water for drinking and for mixing formula and juice for your baby.

Immuno-compromised Persons

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants, can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Security of your Water

We have completed a Vulnerability Assessment of our OH water facilities. This work, funded by an EPA grant, has improved the security and safety of our water supply.

Hablamos Español

Para información en español llámenos al (805) 525-4431.