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SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF SANTA CLARA

SANTA MARIA VALLEY WATER CONSERVATION DISTRICT, a public entity, Plaintiff, vs. CITY OF SANTA MARIA, et al., Defendants. AND RELATED CROSS-ACTIONS AND ACTIONS CONSOLIDATED FOR ALL PURPOSES	SANTA MARIA GROUNDWATER LITIGATION, LEAD CASE No. CV 770214 (Consolidated with CV 784900, 784921, 784926, 785509, 785511, 785515, 785522, 785936, 786971, 787150, 787151, 787152, 990738, 990739) **NOTICE OF FILING 2008 ANNUAL MONITORING REPORT FOR NORTHERN CITIES MANAGEMENT AREA**

PLEASE TAKE NOTICE that the attached 2008 Annual Monitoring Report for the Northern Cities Management Area is hereby filed with this Court in accordance with the requirements of the Judgment dated January 25, 2008 and the Settlement Stipulation dated June 30, 2005.

Dated: April 30, 2009

NOSSAMAN LLP

By: *Henry Weinstock*
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2008 Annual Monitoring Report
Northern Cities Management Area

Prepared for

The Northern Cities

By

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April 2009

Annual Report
for the
Northern Cities Management Area

April 2009

This report was prepared by the staff of Todd Engineers under the supervision of professionals whose signatures appear hereon. The findings or professional opinions were prepared in accordance with generally accepted professional engineering and geologic practice.

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1. Introduction

This Annual Report is a joint effort of the Northern Cities, namely the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach and the Oceano Community Services District (CSD). The Northern Cities and local landowners have actively and cooperatively managed surface water and groundwater resources for more than 30 years. This is recognized in the 2002 Settlement Agreement among the Northern Cities, Northern Landowners, and Other Parties, and in the 2005 Settlement Stipulation for the Santa Maria groundwater basin adjudication, which were adopted by the Superior Court of California, County of Santa Clara, in its Judgment After Trial, entered January 25, 2008 (herein "Judgment"). **Figure 1** shows the four Northern Cities relative to the Santa Maria groundwater basin.

The Judgment approves the June 30, 2005 Stipulation agreed upon by numerous parties, including the Northern Cities, and orders the stipulating parties to comply with each and every term of the Stipulation. The 2002 Settlement Agreement is affirmed as part of the Judgment and its terms incorporated into the Stipulation, except for the provisions regarding continuing jurisdiction, groundwater monitoring, reporting, and the Technical Oversight Committee that are superseded by the respective provisions of the Stipulation.

As specified in the Judgment, the Northern Cities conducts groundwater monitoring in the Northern Cities Management Area. As shown in **Figure 2**, the Northern Cities Management Area (NCMA) represents the northernmost portion of the Santa Maria Groundwater Basin. Adjoining the NCMA to the southeast is the Nipomo Mesa Management Area, while the Santa Maria Valley Management Area encompasses the remainder of the groundwater basin.

The Northern Cities Monitoring Program, in accordance with requirements of the Judgment, collects and analyzes data pertinent to water supply and demand, including:

- Land and water uses in the basin
- Sources of supply to meet those uses
- Groundwater conditions (including water levels and water quality).

The Monitoring Program obtains pertinent information on an annual basis through data requests to agencies, as-needed field work, and online research. Data are compiled into a comprehensive database, the Northern Cities Management Area Database (NCMA DB) and analyzed. Results of the data compilation and analysis for calendar year 2008 are documented and discussed in this Annual Report.

2. Climate Conditions

Climatological and hydrologic (stream flow) data for the NCMA are regularly compiled into the NCMA database. **Appendix A** includes climate data analyzed in this section.

2.1 Precipitation

Historical rainfall data have been compiled on a monthly basis for the NOAA Pismo Beach station for 1949 to 2005, while precipitation data from 2005 to present are available from a County-operated rain gage in Oceano. **Figure 3** is a composite graph combining data from the two stations and illustrating annual rainfall totals from 1949 through 2008 (on a calendar year basis). Annual average rainfall is approximately 17 inches; as indicated both 2007 and 2008 have been dry years.

The seasonal distribution of rainfall is illustrated in **Figure 4** on a calendar year basis for both average conditions and for 2008. Most rainfall typically occurs from November through April; 2008 was marked by substantial rainfall in January and below-normal rainfall in all other months.

2.2 Evapotranspiration

The California Irrigation Management Information System (CIMIS) has maintained weather stations in Nipomo and San Luis Obispo since 2006 and 1986, respectively, which record additional climatological data including temperature, wind speed, humidity, and evapotranspiration (ET). Monthly ET is shown in **Figure 4** for 2008 and average conditions at the two stations.

3. Water Demand

In the NCMA, water demand falls into two major categories: urban demand and agricultural demand. Rural demand (including small community water systems, domestic, recreational and agriculture-related businesses) is relatively minor. **Table 1** presents water demands for urban uses, agricultural irrigation, and rural uses.

3.1 Urban Demand

Actual urban water demands are presented in **Table 1** for each of the four cities from 2005 through 2008. These demand values are based on reported Lopez Reservoir and State Water Project (SWP) purchases and groundwater production data, which have been entered into the NCMA database. These water demand values represent the entire service areas of the four cities, including the portions of Arroyo Grande and Pismo Beach that extend beyond the NCMA.

Table 1. Total Demand for Groundwater and Surface Water, AFY

Year	Arroyo Grande	Grover Beach	Pismo Beach	Oceano CSD	Total Urban	Agriculture	Rural
2005	3,415	2,055	2,142	931	8,541	1,941	36
2006	3,324	2,001	2,121	882	8,329	2,264	36
2007	3,593	2,066	2,264	944	8,867	2,588	36
2008	3,531	2,030	2,208	933	8,702	2,588	36

Notes:

Urban water demands based on actual production.
Evaluation of agricultural demand described in Section 3.2.
Evalulation of rural demand described in Section 3.3.

3.2 Agricultural Demand

Agricultural water demand was estimated using the 2007 land use survey by the San Luis Obispo County Agricultural Commission and the 1998 San Luis Obispo County Master Water Plan Update. The land use survey maps provide information on acreage and type of crops in the area. The County Master Water Plan Update includes low, average, and high estimates of irrigation demand by crop for each of the Water Planning Areas (WPAs) in the County. The range in estimated irrigation demands is based upon climactic conditions and irrigation efficiency; double cropping is included for relevant crops. The NCMA agricultural area is in WPA 5; pertinent irrigation demands for each crop type are presented in **Table 2.**

Table 2. Gross Irrigation Requirement for WPA 5 by Crop Group

Crop Type	Low Annual Demand (AF/yr/acre)	Average Annual Demand (AF/yr/acre)	High Annual Demand (AF/yr/acre)
Alfalfa	2.5	2.9	3.3
Nursery	1.4	1.7	2.1
Pasture	2.6	3	3.5
Citrus	1.3	1.6	1.9
Deciduous	2.6	2.9	3.2
Truck (vegetable)	1.2	1.4	1.6
Vineyard	0.9	1.1	1.4

In total, there are approximately 1,600 acres of irrigated agriculture within the NCMA of which approximately four acres are in nursery crops and the remainder is truck crops (e.g., broccoli, onions, strawberries).

For each year from 2005 through 2008, the annual precipitation and evapotranspiration were compared to average conditions to determine if the year in question had a low, average, or high irrigation water demand. For the purpose of this evaluation, irrigation efficiencies in the NCMA were assumed to be average. Therefore, the annual irrigation demand for each crop type is assumed to be dependant only on that year's precipitation and evapotranspiration. The range of agricultural demand estimates are as follows:

- Wet years: 1,941 AF/yr (2005),
- Average years: 2,264 AF/yr (2006),
- Dry years: 2,588 AF/yr (2007 and 2008).

3.3 Rural Demand

Rural water demand includes small community water systems, domestic use, recreational use and agriculture-related business. Small community water systems using groundwater in the NCMA were identified through review of a list of water purveyors compiled in the 2005 San Luis Obispo County Integrated Regional Water Management Plan. These include the Halcyon Water System, Ken Mar Gardens, and Pacific Dunes RV Resort. The Halcyon Water System serves 35 homes in the community of Halcyon, while Ken Mar Gardens provides water supply to 48 mobile homes on South Halcyon Road. The Pacific Dunes RV Resort, with 215 RV sites, provides water supply to a largely transitory population and nearby riding stable. Two mobile home communities, Grande Mobile and Halcyon Estates, were previously served by private wells. However, these wells became unsuitable potable water sources because of high nitrates. In October 2003, the City of Arroyo Grande agreed to provide water to these two communities. In addition, about 25 homes and businesses were identified through inspection of aerial photographs of rural areas within NCMA. It is assumed that the number of private wells is negligible within the service areas of the four Northern Cities. The rural water demand was estimated as shown in **Table 3**.

Table 3. Estimated Rural Water Demand

Groundwater User	No. of Units	Est. Water Demand, AFY per Unit	Est. Water Demand, AFY	Notes
Grande Mobile	34	0.12	4	*1*
Halcyon Estates	25	0.12	3	*1*
Halcyon Water System	35	0.4	14	*2*
Ken Mar Gardens	48	0.12	6	*3*
Pacific Dunes RV Resort	215	0.03	6	*4*
Rural Users	25	0.4	10	*5*
Estimated Use through 2003			43	
Estimated Use 2004-present			36	

1 - Until 2003; water estimate from Patrick O'Reilly, Oceano Gen'l Mngr, 2008.
2 -Water demand/unit based on 2000 and 2005 Grover Beach water use per connection, 2005 UWMP.
3 - Water demand/unit from O'Reilly, 2008 for Grande Mobile and Halcyon Estates.
4 -Water demand/unit assumes 50% annual occupancy and 0.06 AFY per occupied site.

3.4 Changes in Water Demand

Urban water demand has gradually increased (see **Table 1**). Agricultural acreage has decreased slightly in recent years, mostly reflecting infill in the urban area and varies mostly with weather conditions. Acknowledging the variability due to weather conditions (see **Table 1**), agricultural water demand is not expected to change significantly, given the relative stability of agricultural acreage and cropping patterns in the NCMA south of Arroyo Grande Creek. Changes in rural demand have not been significant.

4. Water Supply Sources

This section summarizes NCMA water supply sources, presents groundwater conditions, and discusses threats to water supply.

4.1 Sources of Supply

The NCMA has three major sources of water supply: Lopez Reservoir deliveries, State Water Project deliveries, and groundwater.

4.1.1 Lopez Supply. All four municipalities in the NCMA receive water from Lopez Reservoir, which is operated by Zone 3 of the San Luis Obispo County Flood Control and Water Conservation District (FC&WCD). The safe yield of Lopez Reservoir is 8,730 AFY, which reflects the amount of sustainable water supply during a drought. Of this yield, 4,530 AFY have been apportioned by agreements to contractors, including each of the Northern Cities plus CSA 12 (in the Avila Beach area). Zone 3 entitlements are summarized in **Table 4**.

Table 4. Zone 3 Contractors

Contractor	Water Entitlement AFY
City of Arroyo Grande	2,290
City of Grover Beach	800
Oceano CSD	303
City of Pismo Beach	896
CSA 12 (not in NCMA)	241
Total	4,530
Downstream Releases	*4,200*
Safe Yield of Lopez Reservoir	*8,730*

Source: SLO County FC&WCD, Zone 3 UWMP 2005 Update.

The remaining 4,200 acre-feet per year is reserved for releases to maintain downstream flows in Arroyo Grande Creek and groundwater recharge. Management of the releases to avoid surface flow to the ocean has in the past resulted in an unreleased portion of the 4,200 AFY, which was periodically offered to the contractors as surplus water. Surplus water has been unavailable for a number of years as a result of releases for habitat conservation.

4.1.2 State Water Project. The City of Pismo Beach and Oceano CSD receive water from the California State Water Project (SWP). The San Luis Obispo County FC&WCD serves as the SWP contractor, providing the imported water to local retailers including Pismo Beach and Oceano. Pismo Beach has contractual rights (termed Table A allocation) to 1,240 AFY. Oceano has Table A contractual rights to 750 AFY.

In response to drought conditions, the initial allocation to SWP contractors for 2008 was 25 percent of Table A amounts. However, in 2008 San Luis Obispo County FC&WCD had requested only 4,193 AFY of its entire 25,000 AF allocation and the entire request was approved. Unlike many water agencies across California that have received substantial cutbacks in SWP supply, Pismo Beach and Oceano were able to receive their full allocation.

4.1.3 Groundwater. Each of the Northern Cities has developed groundwater supply by means of respective well fields in the northern portion of the NCMA; NCMA groundwater also supplies agricultural and rural uses. Groundwater use in the NCMA is governed by the Judgment and the 2002 Settlement Agreement, which states that groundwater will continue to be allocated and independently managed by the Northern Parties (Northern Cities, NCMA overlying owners, San Luis Obispo County and FC&WCD). The Settlement Agreement initially allocates 57 percent of groundwater safe yield to agriculture and 43 percent to the cities and confirms that any increase or decrease in groundwater yield will be shared by the cities and landowners on a pro rata basis.

A groundwater safe yield value of 9,500 AFY was cited in the *2002 Groundwater Management Agreement* among the Northern Cities with subdivisions for agricultural irrigation (5,300 AFY), subsurface outflow to the ocean (200 AFY), and urban use (4,000 AFY). The *2002 Agreement's* safe yield allotment for urban use was subdivided as follows:

City of Arroyo Grande	1,202 AFY
City of Grover Beach	1,198 AFY
City of Pismo Beach	700 AFY
Oceano Community Services District	900 AFY

The Management Agreement's subdivision for agriculture is higher than the actual agricultural groundwater use and the amount designated for subsurface outflow is unreasonably low. Maintenance of subsurface outflow is essential to preventing seawater intrusion. While the minimum subsurface outflow needed to prevent seawater intrusion is unknown, the estimated regional outflow in recent years, on the order of 3,000 AFY, apparently has been sufficient.

The 2002 Settlement Agreement provides that the various urban parties' allocations can be increased when land is converted from agricultural uses to urban uses, referred to as an agricultural conversion credit. Agricultural credits for the cities of Arroyo Grande and Grover Beach are 112 AFY and 209 AFY, respectively, for a total of 321 AFY.

4.1.4 Developed Water. Developed water is defined in the Settlement Agreement as including Lopez supply (addressed in the previous section), return flows, and recharge from storm water percolation ponds.

In the NCMA, return flows (from Lopez and SWP supplies) and recharge from existing storm water percolation ponds are recognized as existing inflows to groundwater. Accordingly, these developed water sources already are accounted in the safe yield allotment. **Figure 5** illustrates the estimated infiltration from return flows from 1992 through 2008 plus estimated recharge from storm water ponds.

The estimated recharge values should be updated and refined as new storm water ponds are installed and as additional information on pond size, infiltration rates, and tributary watershed area becomes available. In 2008, the cities of Arroyo Grande, Grover Beach, and Pismo Beach prepared storm water management plans and currently are coordinating efforts to address local storm water quality issues. Grover Beach has recently implemented development standards that require on-site retention of storm water for new (and in some cases new and existing) impervious surface areas on a property undergoing development. Grover Beach also is planning installation of a flow meter on the storm drain discharging to its Mentone storm water basin.

Substantial efforts to increase storm water recharge (for example, construction of storm water recharge basins) would augment the groundwater yield and thereby could warrant provision of recharge credits, similar to the agricultural credits already recognized by the Northern Cities. Potential provision of recharge credits would be based on a mutually accepted methodology to evaluate the recharge benefits of storm water detention projects. This would involve quantification of storm water runoff amounts, determination that the storm water otherwise would be lost to the groundwater basin, and documentation that the storm water would effectively recharge productive aquifers.

4.1.5 Water Use by Supply Source. Table 5 summarizes the water supplies currently available to the four Northern Cities in terms of Lopez entitlements, SWP allocations, groundwater allotments, and agricultural credits. Currently, Arroyo Grande has an agreement to purchase 100 AFY of Oceano CSD supplies from groundwater or Lopez. The category of "Other Supplies" includes groundwater from beyond the NCMA.

Table 5. Available Urban Water Supplies

	Lopez Entitlement, AFY	SWP Allocation, AFY	Groundwater Allotment, AFY	Ag Credit, AFY	Transfers, AFY	Other Supplies, AFY	Total, AFY
Arroyo Grande	2,290	0	1,202	112	100	100	3,804
Grover Beach	800	0	1,198	209	0	0	2,207
Oceano CSD	303	750	900	0	-100	0	1,853
Pismo Beach	896	1,240	700	0	0	0	2,836
Total	4,289	1,990	4,000	321	0	100	
							10,700

Figure 6 illustrates the water use by supply source for each Northern City since 1992. The graphs reveal changes in water supply availability and use over time, including the onset of SWP water in 1997 (see Oceano graph) and the unavailability of Lopez Reservoir surplus flows after 2001.

Figure 7 shows total NCMA water use by supply source: Lopez, SWP, and groundwater. As shown, the full amount of Lopez supply (4,289 AFY) is currently used. In 2001 through 2003, SWP supplies (1,850 AFY) were used to a maximum extent, but use subsequently decreased to just over 1,000 AFY, mostly reflecting a partial shift by Pismo Beach from SWP to groundwater supply (see **Figure 6**). In this figure, the groundwater use includes not only urban use, but also estimated agricultural and rural uses. As shown, total estimated groundwater use in some years has exceeded 6,000 AFY and approached 7,000 AFY in 2004. With an estimated safe yield of 9,500 AFY, the remaining groundwater represents outflow to the ocean, an unknown but major portion of which is needed to repel seawater intrusion.

4.2 Groundwater Conditions

The NCMA groundwater monitoring program includes compilation of groundwater elevation data from San Luis Obispo County and water quality data from the California Department of Public Health (DPH, formerly Department of Health Services or DHS). These data have been collected for 2008 and incorporated into the NCMA DB along with historic data records. Analysis of these data is summarized below in accordance with the July 2008 *Northern Cities Monitoring Program*.

4.2.1 Groundwater Levels. Groundwater elevation data have been used to monitor annual effects of groundwater use, groundwater recharge, and changes in groundwater storage. Approximately 145 wells within the NCMA have been monitored by the County at some time in the past. The County currently monitors 38 wells on a semi-annual basis (April and October), including five "sentry wells" located along the coast. The County monitors more than 70 additional wells in southern San Luis Obispo County. Groundwater elevation data are presented in **Appendix B.**

A subset of key wells within the NCMA was selected for preparation of hydrographs and evaluation of water level changes. Wells were selected based on the following criteria:

- Part of the County's current monitoring program,
- Detailed location information available,
- Geographically distributed,
- Well depth known and/or well log available,
- Long and relatively complete record.

It should be noted that many of the monitored wells are production wells that were not designed for monitoring purposes and are screened in various zones. Moreover, many of the wells are active production wells or located near active wells and thus are subject to incomplete recovery or drawdown effects that result in non-static (too low) measurements. As a result, the data cannot easily be identified as representing static groundwater levels in specific zones (e.g., unconfined or deep confined). Hence, the data should be considered as providing a general representation of groundwater conditions.

Figure 8 shows contoured groundwater elevations for the October 2008 monitoring event. Groundwater elevations were highest in the eastern portion of the NCMA near Arroyo Grande and Highway 101. Groundwater elevations were below mean sea level (0 foot contour) in the north-central portion of the NCMA with the deepest elevations at about -10 feet msl. The deepest groundwater elevations were taken in active well fields and may be lower than true static conditions. The area below mean sea level in October 2008 extended to the coast, indicating a potential for seawater intrusion, which is discussed in Section 4.3.2. It encompassed the municipal well fields with the major portion of NCMA urban pumping, representing a relatively broad and shallow pumping trough exacerbated by drought conditions.

Hydrographs for the key wells are shown on **Figure 9**, which illustrates long term changes in groundwater levels in the NCMA, with two hydrographs from wells located just east of the NCMA in the Nipomo Mesa Management Area. The locations of the wells represented by the hydrographs are shown on the map in **Figure 9**. Noting that these hydrographs represent localized conditions at each well, most of the hydrographs indicate that groundwater elevations have historically varied over a range of about 20 feet above mean sea level and in the case of two inland wells, 40 feet.

The upper and middle left portions of **Figure 9** shows paired hydrographs for four wells located in the October 2008 pumping trough. (It should be noted that these wells are in active municipal well fields and true static conditions may be higher.) Although the data sets are incomplete, the hydrographs show that groundwater elevations in these wells have generally been above mean sea level. This indicates that the broad extent of the October 2008 pumping trough is a relatively recent phenomenon. Most of the hydrographs in **Figure 9** show that groundwater elevations have declined since 2006 (a wet year); this is a result of drought and increased pumping (see **Figure 7**).

Hydrographs for the five sentry well clusters were also generated, as shown on **Figure 10**. Each of the sentry well locations contains multiple wells with different completion depths. These wells have long records of groundwater elevations, which provide a useful means of detecting potential seawater intrusion. A discussion of these hydrographs as they pertain to seawater intrusion is presented in Section 4.3.2.

Changes in groundwater elevations from October 2007 to October 2008 were evaluated in the preparation of this report. Overall, water elevations fell by a few feet during water year 2008. An estimation of the change in groundwater storage—the net volume of water added or removed from the basin over the year—was attempted using elevation changes from 2007 to 2008. However, available data are not sufficient to produce a reliable groundwater storage change map. Additional groundwater level monitoring sites are being identified to provide such data.

4.2.2 Water Quality. Water quality is a key element of water supply. Contaminants from anthropogenic sources or seawater intrusion can potentially impact the basin, reducing the available water supply. Currently the sole source of consolidated water quality information for the area is the DPH. The Northern Cities and other community systems in the NCMA regularly submit water quality data to the DPH. These data are then uploaded to a state-wide water quality database. Data from DPH have been incorporated into the NCMA DB. Locations of the wells with water quality data are not released by DPH, but some well locations are available from the individual water systems.

Historically water quality concerns within the NCMA have focused on nitrate from agricultural and wastewater sources and on seawater intrusion. Known areas of high nitrate concentrations have been documented as far back as the 1950's. For this Annual Report, a comparison of available water quality data to applicable water quality standards has been completed. The applicable standards are summarized in **Table 6** and include federal and state drinking water standards, agricultural and livestock watering standards, and the Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives. The comparison indicates that historical exceedances of water quality standards primarily occurred for chloride, iron, manganese, nitrate, nitrite, selenium, sodium, sulfate, and total dissolved solids (TDS). In 2008, exceedances were limited to those shown on **Table 7**. With regard to primary (health-related) drinking water standards, the constituents of concern are nitrate and selenium in some wells. The concentrations of these constituents are reduced through blending of water supplies such that water delivered to customers meets all drinking water standards.

To identify water quality trends that may indicate seawater intrusion, time concentration plots were prepared of TDS and chloride from selected wells. These time concentration graphs are shown on **Figures 11** and **12**. These data do not appear to indicate sustained trends in either TDS or chloride. Time concentration plots of nitrate concentrations from selected locations are shown on **Figure 13**. **Figure 13** shows that nitrate concentrations are generally below the primary maximum contaminant level (MCL) of 45 milligrams per liter (mg/L, or parts per million) and are either stable or decreasing.

Table 6. Water Quality Goals and Standards

Constituents of Concern	Drinking Water Standards Maximum Contaminant Levels (MCLs)				Other Standards			
	California DPH		USEPA		California DPH			RWQCB Basin Plan Median Groundwater Quality Objectives
	Primary	Secondary	Primary	Secondary	Public Health Goal (PHG)	Action Level (AL)	Agricultural Water Quality Limits	
MAJOR CATIONS:								
calcium	–	–	–	–	–	–	–	–
magnesium	–	–	–	–	–	–	–	–
sodium	–	–	–	–	–	–	69	90
potassium	–	–	–	–	–	–	–	–
MAJOR ANIONS:								
chloride	–	250	–	250	–	–	106	95
sulfate	–	250	500	250	–	–	–	250
bicarbonate	–	–	–	–	–	–	–	–
carbonate	–	–	–	–	–	–	–	–
MINOR IONS:								
hydroxide (as CaCO3)	–	–	–	–	–	–	–	–
iron	–	0.3	–	0.3	–	–	0.5	–
manganese	–	0.05	–	0.05	–	0.5	0.2	–
fluoride*	2	–	4	2	1	–	1	–
nitrate as NO3 –	45	–	–	–	–	–	–	–
nitrate as nitrogen	–	–	10	–	10	–	–	5.7
nitrite (NO2 –) as nitrogen	1	–	1	–	1	–	–	–
nitrate + nitrite as nitrogen	10	–	10	–	–	–	–	–
PHYSICAL								
apparent color (units)	–	15	–	15	–	–	–	–
conductivity (micromohs/cm)	–	900	–	–	–	–	700	–
odor (TON @ 60oC)	–	3	–	3	–	–	–	–
total alkalinity (as CaCO3)	–	–	–	–	–	–	–	–
total dissolved solids (TDS)	–	500	–	500	–	–	450	710
total hardness (as CaCO3)	–	–	–	–	–	–	–	–
turbidity (NTU)	1/5**	5	1/5**	–	–	–	–	–
pH (standard units)	–	–	–	6.5 to 8.5	–	–	6.5 to 8.4	–
TRACE IONS:								
aluminum	1	0.2	–	0.050 to 0.2	0.6	–	5	–
antimony	0.006	–	0.006	–	0.02	–	–	–
arsenic	0.05	–	0.01	–	0.000004	–	0.1	–
barium	1	–	2	–	0.7	–	–	–
beryllium	0.004	–	0.004	–	0.001	–	0.1	–
boron	–	–	–	–	–	1	0.700/0.750†	0.15
cadmium	0.005	–	0.005	–	0.005	0.00007	–	–
chromium	0.05	–	0.1		0.005	–	–	–
cobalt	–	–	–	–	–	–	–	–
copper	1.3	–	1.3	1	0.17	–	0.2	–
lead	1.015	–	0.015	–	0.002	–	5	–
lithium	–	–	–	–	–	–	–	–
mercury	0.002	–	0.002	–	0.0012	–	–	–
molybdenum	–	–	–	–	–	–	–	–
nickel	0.1	–	–	–	0.012	–	0.2	–
selenium	0.05	–	0.5	–	–	–	0.002	–
silver	–	–	–	0.1	–	–	–	–
thallium	0.002	–	0.002	–	0.0001	–	–	–
vanadium	–	–	–	–	–	0.05	0.1	–
zinc	–	5	–	5	–	–	2	–
VOCs:								
1,1,1-trichloroethane	–	–	0.2	–	–	–	–	–
1,2-trichloro-1,2,2-trifluoroethar	–	–	1.2	–	–	–	–	–
1,1,2-trichloroethane	–	–	0.005	–	–	–	–	–
1,1-dichloroethane	–	–	0.005	–	–	–	–	–
1,1-dichloroethene	–	–	0.006	–	–	–	–	–

Constituents of Concern	Drinking Water Standards Maximum Contaminant Levels (MCLs)				Other Standards			
	California DPH		USEPA		California DPH			RWQCB Basin Plan Median Groundwater Quality Objectives
	Primary	Secondary	Primary	Secondary	Public Health Goal (PHG)	Action Level (AL)	Agricultural Water Quality Limits	
1,2,3-trichlorobenzene	–	–	0	–	–	–	–	–
1,2,4-trichlorobenzene	–	–	0.005	–	–	–	–	–
1,2-dichlorobenzene	–	–	0.6	–	–	–	–	–
1,2-dichloroethane	–	–	0.0005	–	–	–	–	–
1,2-dichloropropane	–	–	0.005	–	–	–	–	–
1,3-dichlorobenzene	–	–	0.6	–	–	–	–	–
chlorobenzene	–	–	0.07	–	–	–	–	–
di(2-ethylhexyl)phthalate	–	–	0.004	–	–	–	–	–
dichlorodifluoromethane	–	–	1	–	–	–	–	–
PCE	–	–	0.005	–	–	–	–	–
TCE	0.005	–	0.005	–	0.00006	–	–	–
trans-1,2-dichloroethene	–	–	0.01	–	–	–	–	–
trichlorofluoromethane	–	–	0.15	–	–	–	–	–
vinyl chloride	–	–	0.0005	–	–	–	–	–
BTEX:	–	–		–	–	–	–	–
MTBE	–	–	0.013	–	–	–	–	–
Benzene	–	–	0.001	–	–	–	–	–
Toluene	–	–	0.15	–	–	–	–	–
Ethylbenzene	–	–	0.7	–	–	–	–	–
Total xylenes	–	–	1.75	–	–	–	–	–
OTHER:								
MBAS (Surfactants)	–	500	–	500	–	–	–	–
perchlorate	–	–	–	–	–	0.006	0.006	–

Notes:

All concentrations in milligrams per liter (mg/L) or parts per million (ppm) except where noted.
Dash (–) indicates no current standard or no available information.
USEPA = U.S. Environmental Protection Agency.
California DPH = California Department of Public Health (formerly Department of Health Services, DHS)
MBAS = Methylene Blue Active Substances.
NTU = Nephalometric Turbidity Units.
TON = Threshold Odor Number.
* Optimal fluoride level and (range) vary with average of maximum daily temperature:

50.0 to 53.7 degrees F – 1.2 (1.1 to 1.7) mg/L; 53.8 to 58.3 degrees F – 1.1 (1.0 to 1.7) mg/L
58.4 to 63.8 degrees F – 1.0 (0.9 to 1.5) mg/L; 63.9 to 70.6 degrees F – 0.9 (0.8 to 1.4) mg/L
70.7 to 79.2 degrees F – 0.8 (0.7 to 1.3) mg/L; 79.3 to 90.5 degrees F – 0.7 (0.6 to 1.2) mg/L

** Systems that use conventional or direct filtration may not exceed 1 NTU at any time or 0.3 NTU for 95th percentile value; systems that use other "alternative" filtration systems may not exceed 5 NTU at any time or 1 NTU for 95th percentile value.

† USEPA recommended agricultural limit for boron is 0.750 mg/L.
References:
Current USEPA and California DPH drinking water standards from California

Table 7. Summary of Samples Exceeding Water Quality Standards in 2008

Constituent	Report Units	Minimum Water Quality Standard	Source of Goal	Number of Samples Exceeding Water Quality Standard
MAJOR CATIONS:				
Sodium	MG/L	69	CDPH Agricultural WQ Limits	1
MAJOR ANIONS:				
Chloride	MG/L	95	RWQCB Basin Plan Median Groundwater Quality Objectives	3
Sulfate	MG/L	250	RWQCB Basin Plan Median Groundwater Quality Objectives and CDPH & USEPA Secondary	1
MINOR IONS:				
Iron	UG/L	300	RWQCB Basin Plan Irrigation Supply, CDPH Agricultural WQ Limits, and CDPH & USEPA Secondary	7
Manganese	UG/L	50	CDPH & USEPA Secondary	47
Nitrate (As No3)	MG/L	45	CDPH Primary	22
Nitrate + Nitrite (As N)	MG/L	10	CDPH & USEPA Primary	2
PHYSICAL PROPERTIES:				
Odor Threshold @ 60 C	TON	3	CDPH & USEPA Secondary	1
Total Dissolved Solids	MG/L	450	CDPH Agricultural WQ Limits	3
Total Dissolved Solids	MG/L	1,000	RWQCB Basin Plan Median Groundwater Quality Objectives	1
TRACE IONS:				
Arsenic	UG/L	0.004	CDPH PHG	1
Selenium	UG/L	50	CDPH Primary	20

Detections

Total Trihalomethanes	UG/L			3

Notes:

The water quality standard or goal selected for each constituent is the one with the lowest allowable concentration.

Acronyms: PHG = public health goal; AL = action level; WQ = water quality

4.3 Threats to Water Supply

Threats to NCMA water supply are State-wide and local. State-wide threats include State-wide drought, climate change, and Sacramento-San Joaquin Delta issues that affect the amount and reliability of SWP deliveries. Local threats to NCMA water supply similarly include drought and climate change that affect the amount and reliability of Lopez and local groundwater supply. There is a potential for seawater intrusion if adequate preventive measures are not taken, as discussed in Section 4.3.3.

4.3.1Threats to SWP Supply. California has experienced below-average precipitation and runoff since autumn 2006. State-wide runoff in 2007 and 2008 amounted to only 53 and 58 percent of average, respectively, and storage in SWP reservoirs was reduced. In response, the Department of Water Resources decreased its SWP allocations to contractors in both years. In addition to drought conditions, SWP pumping capacity was reduced as the result of a May 2007 federal court ruling to protect Delta smelt. The threat to local SWP users—Oceano and Pismo Beach—did not materialize in 2008, as San Luis Obispo County's allocation was approved in full. Nonetheless, in the future, the Delta's fragile ecosystem, uncertain precipitation patterns and reduced snowmelt will further reduce California's water supply reliability with potential ramifications for Oceano and Pismo Beach.

4.3.2 Potential Seawater Intrusion. The NCMA is underlain by a coastal aquifer system that slopes gently offshore and extends for many miles under the ocean, with each aquifer zone including an interface between freshwater and seawater. While the location of the freshwater-seawater interface(s) is not known, there has been historically and is currently an estimated net outflow of freshwater from the basin to the ocean. The existence of a net outflow is indicated by previous water balance studies and by the presence of onshore groundwater elevations above sea level that indicate a groundwater gradient and flow toward the ocean.

Groundwater elevations near the coast are measured in the sentry wells on a semiannual basis (April and October). Each sentry well has multiple ports to monitor water levels at different elevations. The water levels in all ports have been examined relative to one another (to assess vertical groundwater gradients) and to mean sea level. Hydrographs of groundwater elevations for each sentry well are presented on **Figure 10**. The sentry well hydrographs show a variable vertical hydraulic gradient over time; the elevations in the shallowest ports are sometimes higher and sometimes lower than those in the intermediate and deepest ports.

The hydrographs for the three sentry wells in the northern developed portion of the NCMA (see **Figure 10**) generally indicate a seasonal pattern, with relatively high groundwater levels in the spring and low levels in the autumn.

As of April 2008, groundwater elevations in the sentry wells were generally above mean sea level (msl) with the exception of the deep port 30F3 in well 32S/13E 30F1-3 (see **Figure 10**), which indicated a groundwater elevation of -0.56 feet msl. In October 2008, groundwater elevations were below sea level in two of the fourteen sentry well ports: the deep port 30N2 in well 32S/13E 30N1-3 and the deep port 30F3 in well 32S/13E 30F1-3. In port 30N2, the groundwater elevation declined from its recent historical range (+2 to +10 feet msl) to mean sea level by October 2007, recovered to nearly +5 feet msl by April 2008, and then decreased to nearly -2 feet msl in October 2008.

In port 30F3, groundwater elevations were at or below mean sea level on a seasonal basis from autumn 1986 through 1998. Sampling of the sentry wells by the Department of Water Resource in 1996, near the end of this period, indicated no seawater intrusion. Subsequently, groundwater elevations in port 30F3 were mostly above sea level from 1998 through 2006, and as much as five feet below mean sea level in autumn 2007 and autumn 2008.

Preliminary data for April 2009 indicate that groundwater elevations in port 30N2 are more than 5 feet above mean sea level and elevations in port 30F3 are less than one foot below sea level.

Review of **Figure 8** (the October 2008 groundwater elevation map), shows the location of the two sentry wells on the coastal end of the broad October 2008 groundwater level depression. Although this broad depression is shallow and relatively transitory in nature, the low groundwater elevations in these two ports indicate a local potential for seawater intrusion as of October 2008.

At this time, the location of the freshwater/seawater interfaces in the various aquifer zones is not known. The shallow and transitory nature of the pumping depression, historical maintenance of net subsurface outflows from the NCMA, and general configuration of local aquifer zones extending far offshore suggests that the saltwater interfaces also are offshore. Available groundwater quality data do not show trends suggesting that seawater has intruded onshore, but the data are scarce and available only from wells that are located inland.

4.3.3 Measures to Avoid Seawater Intrusion. In response to the potential for seawater intrusion, the Northern Cities have developed a water quality sampling program for the sentry wells to be initiated in 2009. The Northern Cities have already moved ahead with surveying of wellhead measuring points to ensure accurate groundwater level measurements. The Northern Cities also are developing mutual strategies to reduce coastal groundwater pumping and increase use of other available water supplies. Additional management activities are summarized in Section 6.

5. Comparison of Demand and Supply

This section provides a comparison of water demand and supply for the four Northern Cities and agricultural and rural land uses for current conditions (2008).

For the purposes of this discussion, estimated agricultural and rural water demands are combined, approximating 2,600 AFY for 2008. These demands are supplied by groundwater, which is governed by the Judgment. As discussed in Section 4.1.3, the historical groundwater allotment for agriculture is 5,300 AFY of the safe yield value of 9,500 AFY. With agricultural/rural demands in the general range of 2,300 to 2,600 AFY, an approximate subsurface outflow to the ocean of 2,700 to 3,000 AFY is maintained, helping prevent seawater intrusion.

Total urban water demand was 8,702 AFY in 2008. Available urban water supplies (Lopez, SWP, and groundwater) currently amount to 10,560 AFY, indicating that total urban supplies are sufficient to meet current urban water demands.

6. Management Activities

The Northern Cities, both individually and jointly, are engaged in water resource management projects, programs, and planning efforts that address water supply and demand issues, particularly provision of long-term sustainable supply. This section provides a brief summary of major 2008 activities.

7.1 Response to Drought

On June 18, 2007, the City of Grover Beach declared a Stage I Water Alert in response to drought conditions. The Stage I Water Alert, as defined in the Grover Beach Urban Water Management Plan, is triggered when rainfall is 65 percent or less than normal. Stage I actions involve voluntary reduction of water consumption. Stage I was in effect throughout 2008 and remains in effect at time of writing.

On August 12, 2008, the City of Arroyo Grande declared a "Severely Restricted Water Supply Condition" acknowledging utilization by Arroyo Grande of 99 percent of its total water supply during the past 12 months. This declaration triggered immediate water conservation actions including specific prohibitions (e.g., washing vehicles without a shut-off nozzle) and expanded water conservation assistance and incentives.

The City of Pismo Beach and Oceano CSD have not declared official similar drought-related water supply limitations, but have continued their water conservation activities.

7.2 Water Supply Planning

Water supply planning activities in 2008 included two agreements between Arroyo Grande and Oceano CSD, completion of the Desalination Funding Study, and a preliminary study of Lopez Reservoir Expansion. Oceano CSD initiated its Water and Sewer Master Plan process, with a draft plan expected in May 2009.

7.2.1 Arroyo Grande Short- and Long-Term Water Supply Strategies. In November 2004, the Arroyo Grande City Council adopted a two-phased strategy for provision of water supply to meet demands; this strategy consisted of short-term actions for the next ten years and long-term alternatives for permanent water supply. Short-term actions include, for example, water conservation efforts, installation of wells outside the NCMA, provision of a non-City water supply for two mobile home parks in the NCMA, and a temporary water purchase agreement with

Oceano CSD. The City has successfully implemented water conservation measures with the effect of decreasing water use per connection (SLO County, 2008). The City also has installed Well Nos. 9 and 10 and recently contracted for a test well on Pearwood Avenue (all outside the NCMA and Santa Maria groundwater basin).

Consistent with the Water Supply Strategies, the City is moving forward with finding a new, non-City water supply for two mobile home parks in its sphere of influence. These mobile home parks are located within the NCMA between Arroyo Grande and Oceano CSD. As background, in October 2003 the City of Arroyo Grande entered into agreements with Grande Mobile Manor and Halcyon Estates mobile home parks to provide temporary water service. The water supply wells serving the mobile home parks had become unsuitable for domestic supply because of excessive nitrate concentrations. Both mobile home parks are in the County unincorporated area but within Arroyo Grande's sphere of influence. The agreements, established for a five-year period to allow the mobile home parks to secure a permanent water supply, were extended in November 2007 for one year, in December 2008 for three months, and in March 2009 for another six months. As of March 2009, the mobile home park owners reached an agreement with Oceano CSD to annex to their service area. Transfer of the mobile home parks from the Arroyo Grande sphere of influence to the Oceano CSD service area requires LAFCO approval; this process started at time of writing. The water demand of the two mobile home parks is 7 AFY.

The City of Arroyo Grande on August 12, 2008 renewed negotiations with Oceano CSD to extend a previous 2005 temporary agreement for supplemental water purchase. Arroyo Grande's purpose for the agreement is to ensure that its groundwater and Lopez Reservoir supply allocations are not exceeded while the City is implementing short-term water supply options and exploring long-term alternatives. The agreement was approved by Oceano CSD in December 2008 and by Arroyo Grande in January 2009. The terms of the five-year agreement include the purchase by Arroyo Grande of as much as 100 acre-feet per year (AFY) of Lopez Reservoir water or groundwater. The agreement represents no transfer of rights or entitlements to water.

Long-term water supply strategies, explored with one or more of the other Northern Cities and County, include import of water from the Nacimiento Water Project, water recycling, desalination, and increased capacity of Lopez Reservoir. The first two options were not the subject of major studies in 2008 and the Nacimiento Water Project appears to be too costly; desalination and Lopez Reservoir expansion are summarized below.

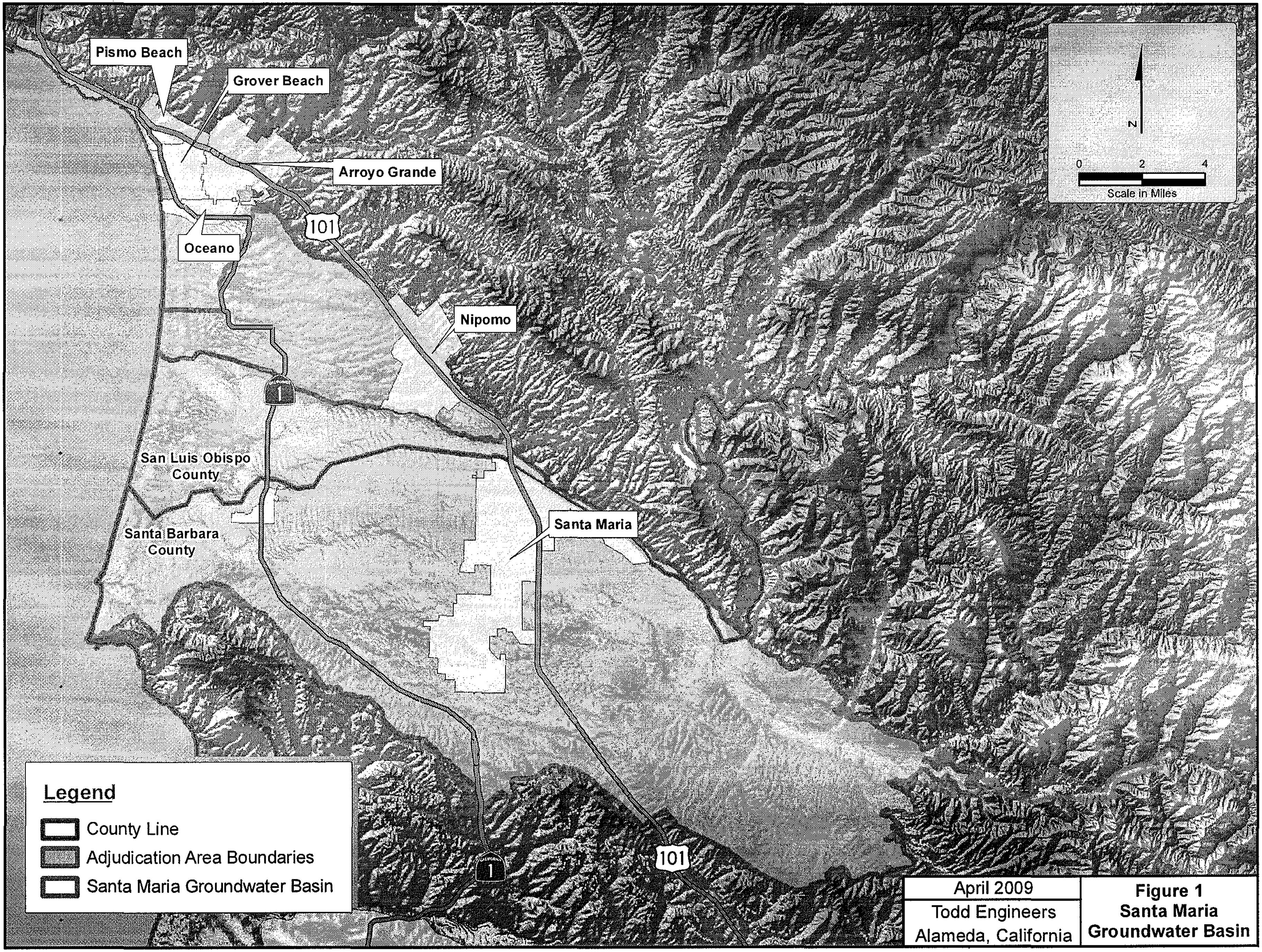
7.2.2 South San Luis Obispo County Desalination Funding Study. The City of Arroyo Grande, City of Grover Beach, and Oceano CSD secured a Proposition 50 grant for an evaluation of seawater desalination as a supplemental drought-proof water supply. The Desalination Funding Study was completed in October 2008. It used the initial February 2006 Desalination Study as a basis, and focused on utilizing the existing South San Luis Obispo County Sanitation District's (SSLOCSD) wastewater treatment plant site to take advantage of the existing ocean outfall, while having the plant located near the ocean seawater source. The February 2006 study concluded that desalination was a viable water supply and that further detailed study was warranted. Each of the three involved Northern Cities identified their desired allocation of the estimated 2,300 AFY from the desalination facility as follows:

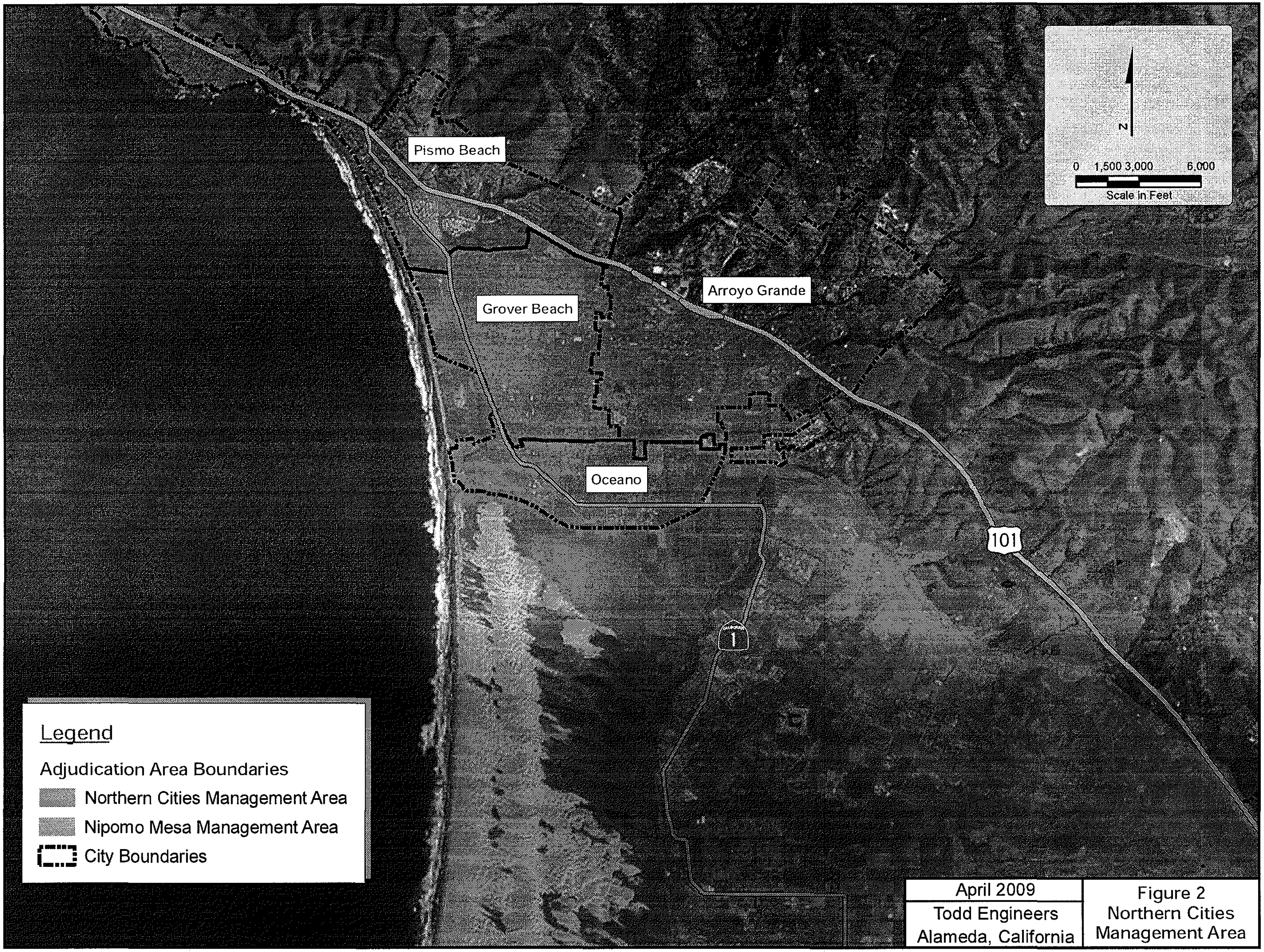
- City of Arroyo Grande, 750 AFY
- City of Grover Beach, 800 AFY
- Oceano CSD, 750 AFY.

The Desalination Funding Study evaluated raw water supply options, the desalting treatment process, treatment plant layout, brine disposal and outfall, product water delivery, environmental considerations, permitting and approvals, and project costs, including costs with and without participation by Oceano CSD. Next steps would include agreements among participating agencies, initiation of CEQA compliance, and design and pilot studies.

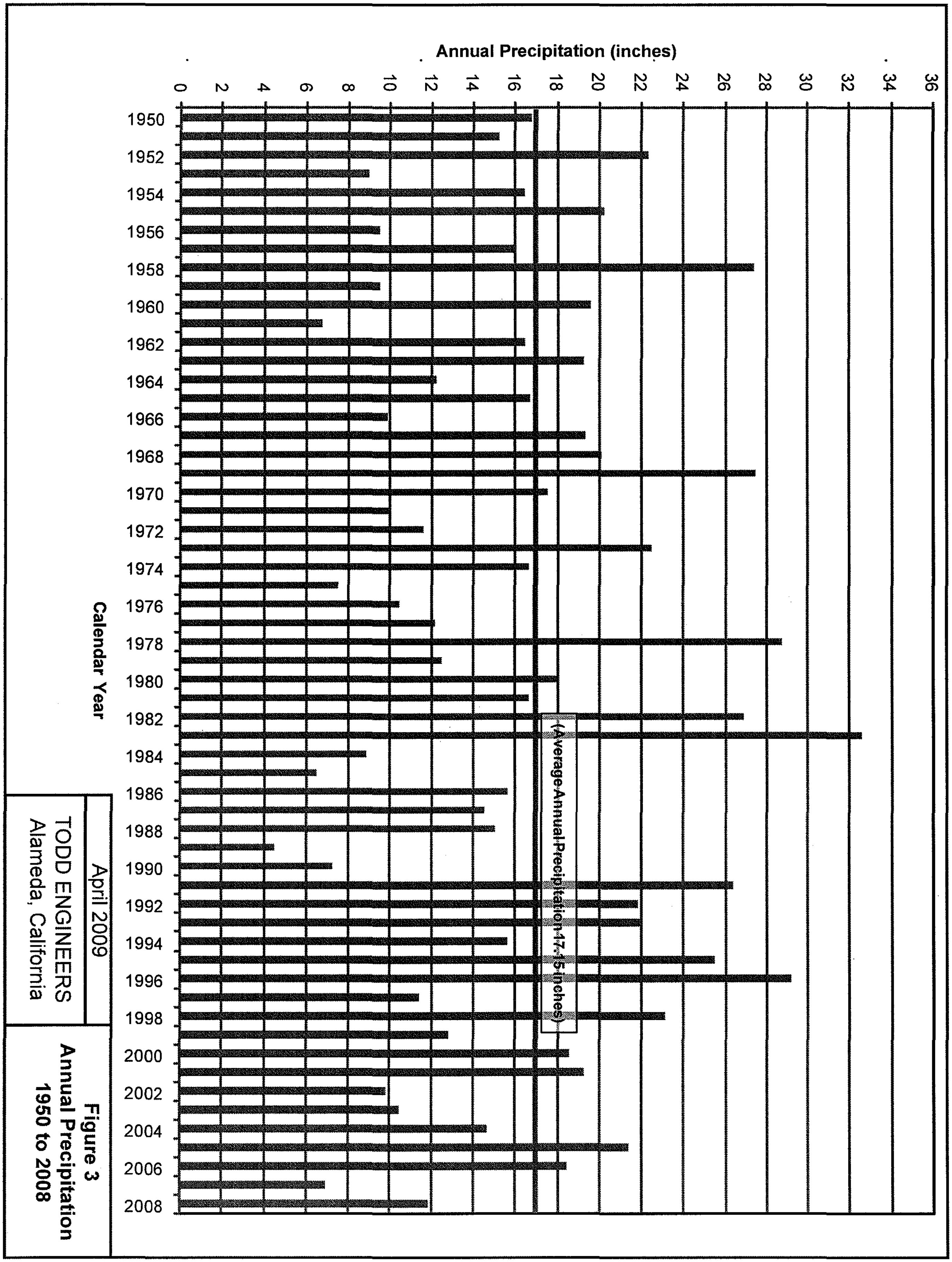
7.2.3 Lopez Reservoir Expansion. In 2008, San Luis Obispo County sponsored a preliminary assessment of the concept of installing gates at the Lopez Dam spillway. The proposed 3-foot raise would increase the maximum storage capacity of Lopez Lake from 49,400 to 52,250 AF and also result in additional water yield. The estimated additional yield ranges from 671 to 916 AFY, assuming a constant pipeline diversion of 4,530 AFY (consistent with Zone 3 contractor entitlements) and downstream releases needed to maintain groundwater levels (minimum 4,200 AFY) or to maintain fish flows consistent with the Arroyo Grande Creek Habitat Conservation Plan (HCP). The Reservoir Expansion study also provided preliminary costs and a description of major implementation activities. Next steps would include assessment of dam safety, evaluation of project benefits (including identification of participating parties), identification of alternatives, engineering feasibility studies, environmental review, permitting, design, and construction. The study notes that, while the engineering and construction is relatively limited in scope, the project involves development of a water supply from a live stream. Accordingly, environmental review and permitting would likely be relatively costly.

FIGURES


Pismo Beach
Grover Beach
Arroyo Grande
101
Oceano
Nipomo
1
San Luis Obispo County
Santa Barbara County
Santa Maria
N
0 2 4
Scale in Miles
1
101
Legend
County Line
Adjudication Area Boundaries
Santa Maria Groundwater Basin
April 2009
Todd Engineers
Alameda, California
Figure 1
Santa Maria
Groundwater Basin

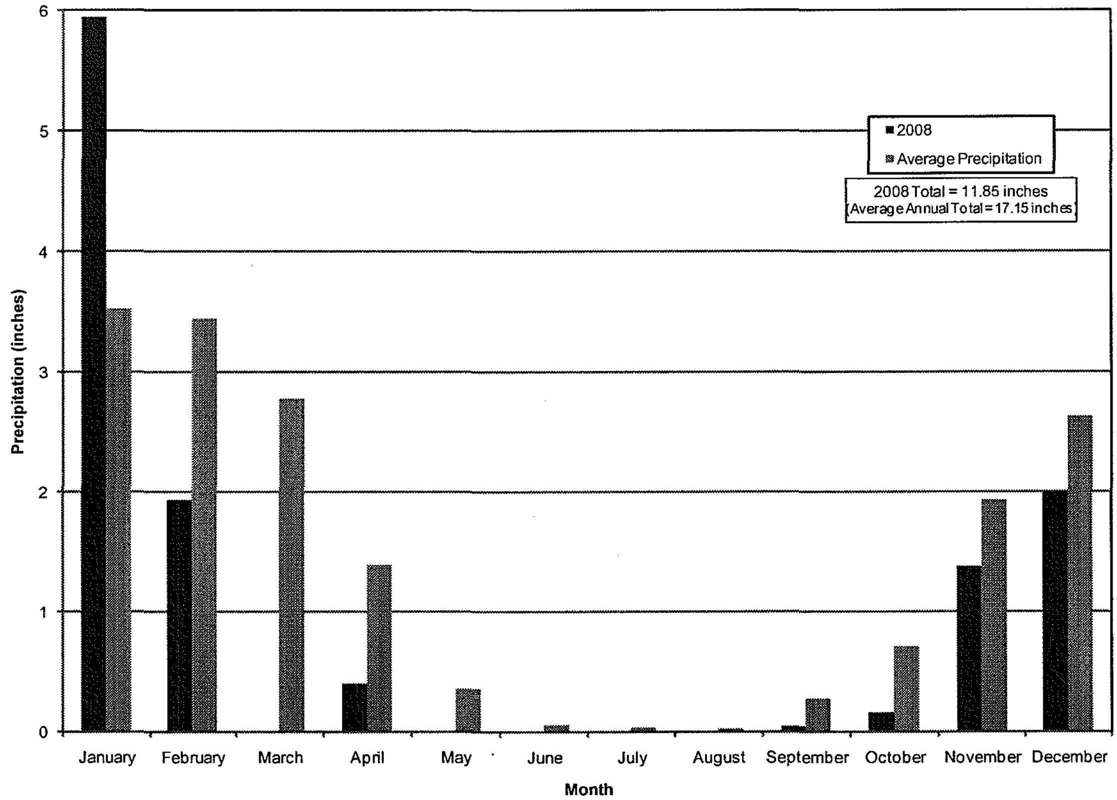


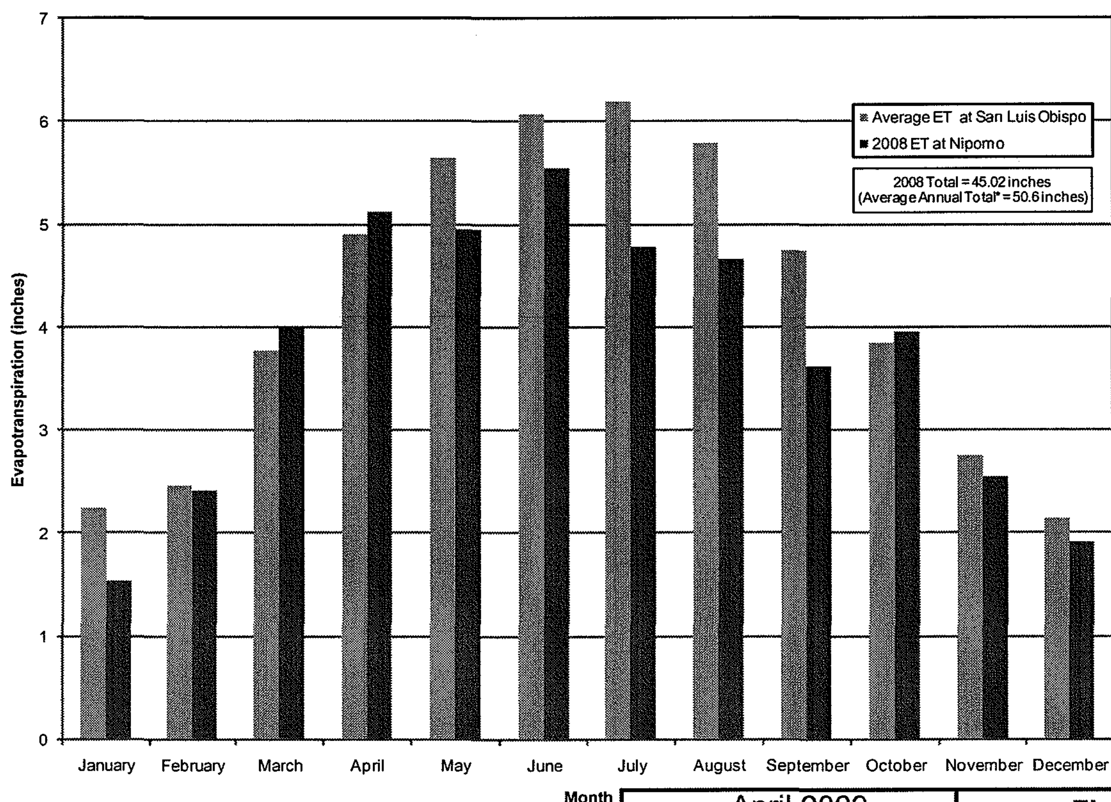
Pismo Beach
Grover Beach
Arroyo Grande
Oceano
101
1
N
0 1,500 3,000 6,000
Scale in Feet
Legend
Adjudication Area Boundaries
Northern Cities Management Area
Nipomo Mesa Management Area
City Boundaries
April 2009
Todd Engineers
Alameda, California
Figure 2
Northern Cities
Management Area



April 2009
TODD ENGINEERS
Alameda, California

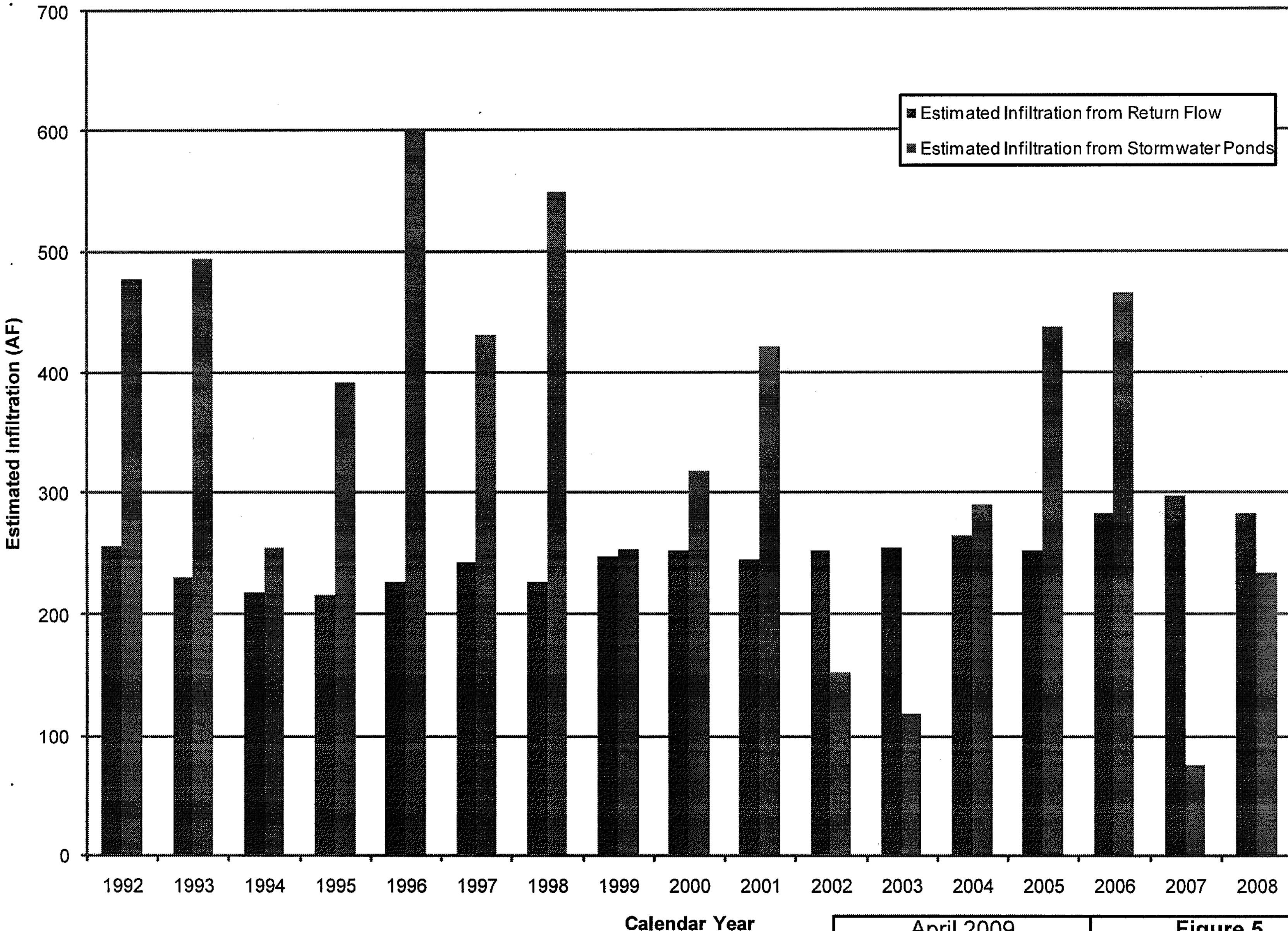
Figure 3
Annual Precipitation
1950 to 2008



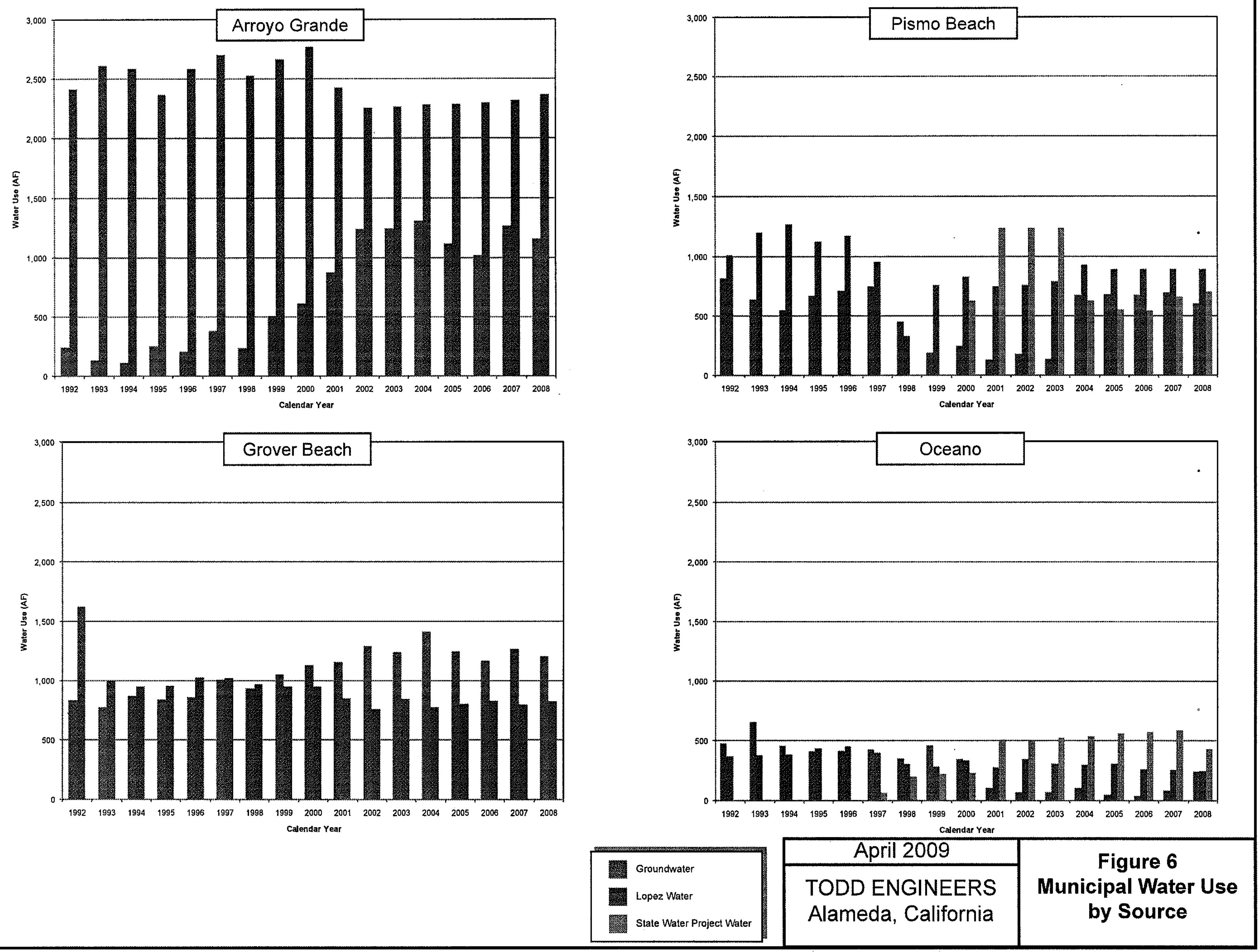


* Average data based upon San Luis Obispo CIMIS gage data from April 1986 through present. The Nipomo CIMIS gage record is limited to 2006 through the present.

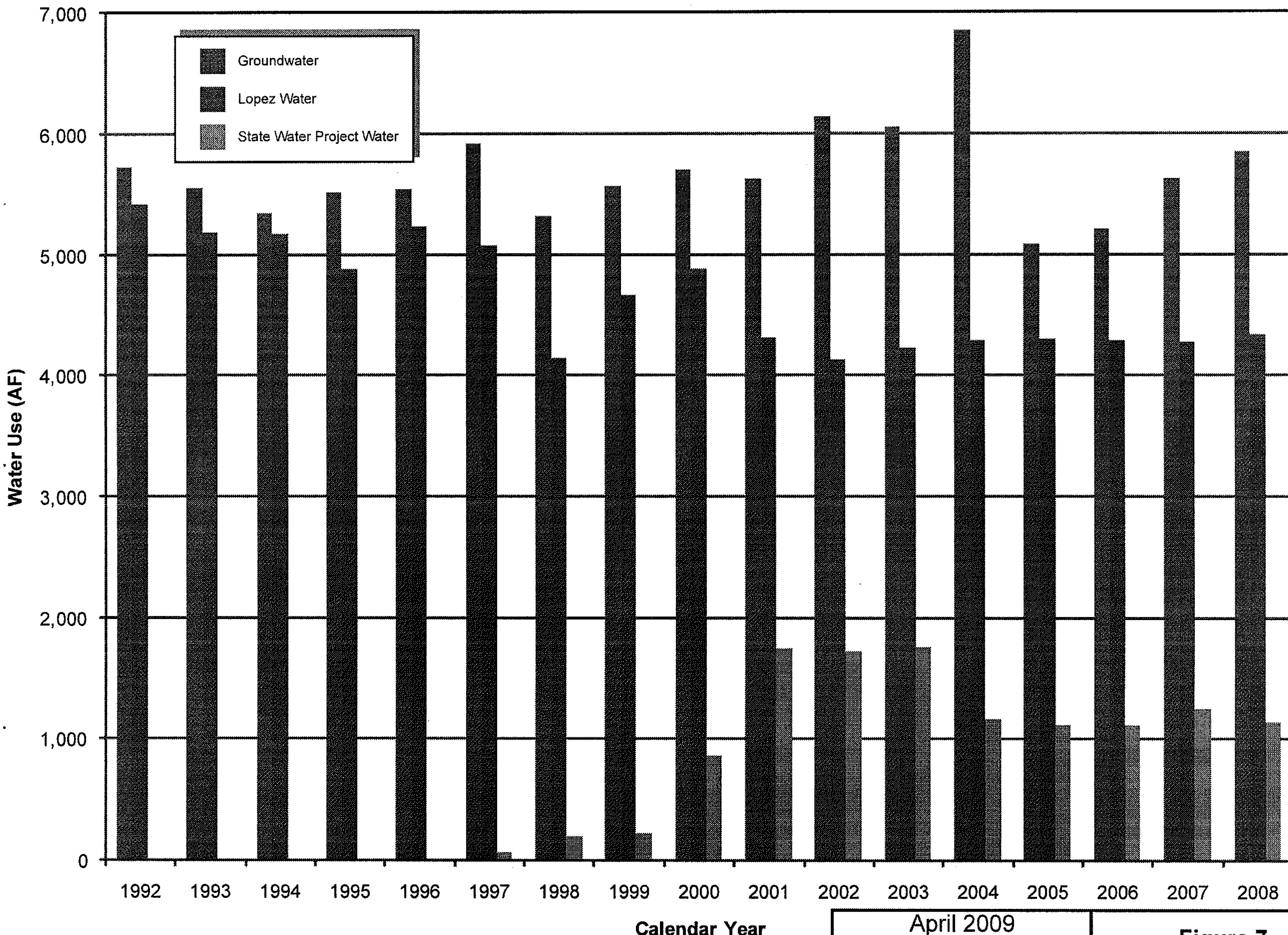
April 2009	Figure 4
TODD ENGINEERS Alameda, California	**Monthly 2008 and Average Precipitation and Evapotranspiration**



April 2009	**Figure 5**
TODD ENGINEERS Alameda, California	**Estimated Infiltration from Return Flow and Stormwater Ponds**



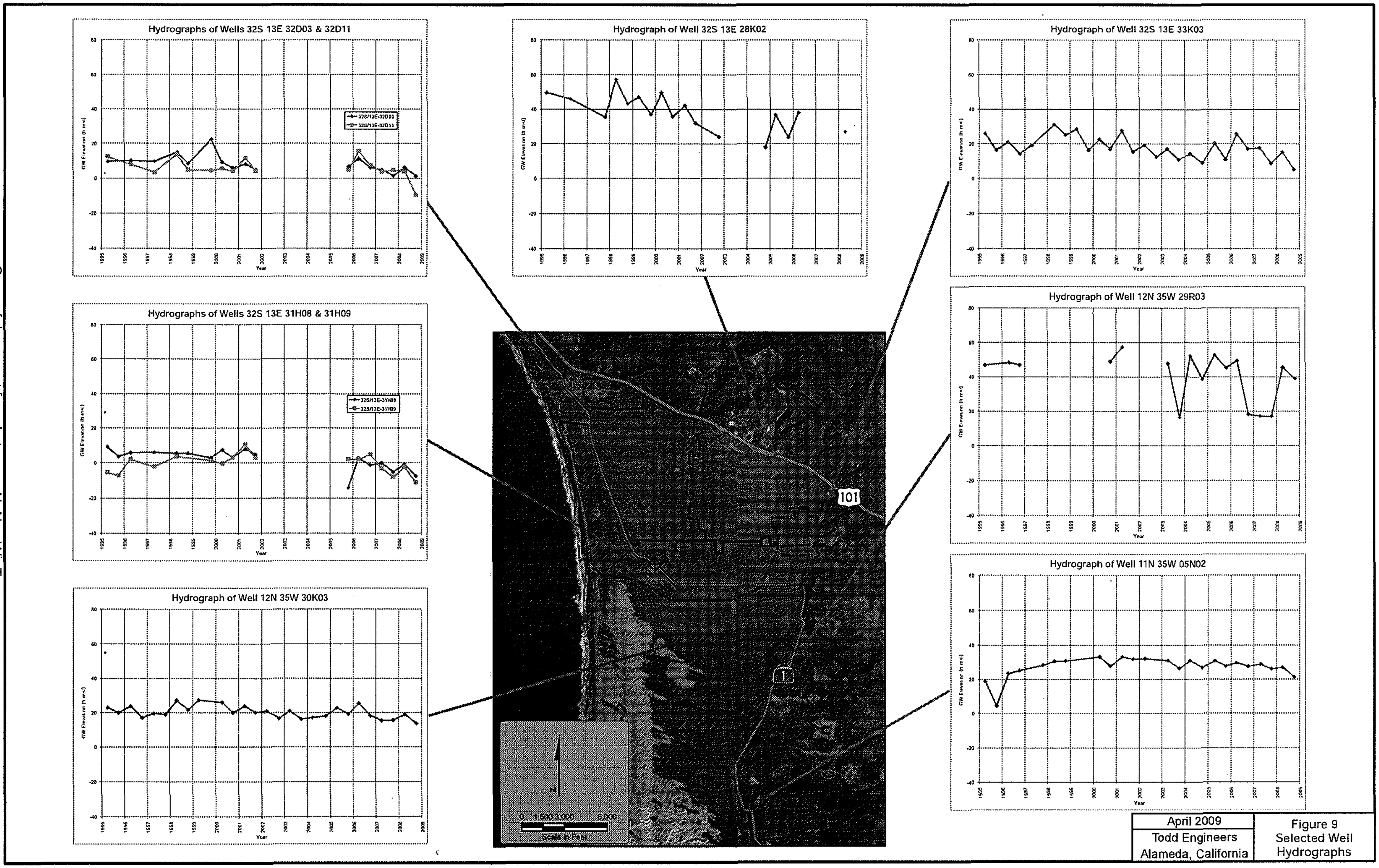
April 2009	**Figure 6**
TODD ENGINEERS Alameda, California	**Municipal Water Use by Source**



April 2009	**Figure 7**
TODD ENGINEERS Alameda, California	**Total Water Use by Source**

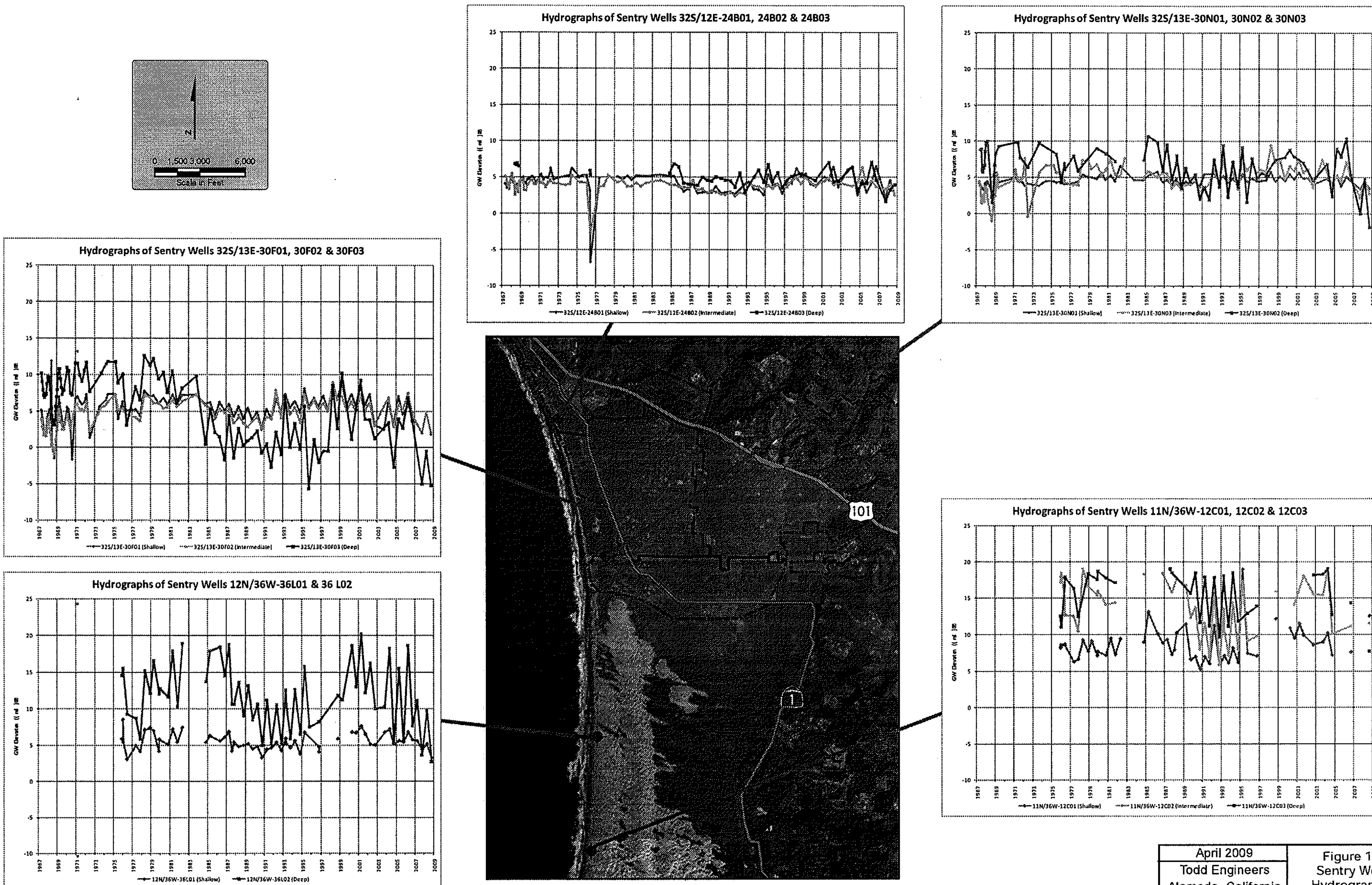
April 2009
Todd Engineers
Alameda, California

Figure 8
October 2008 Groundwater Elevation Contours

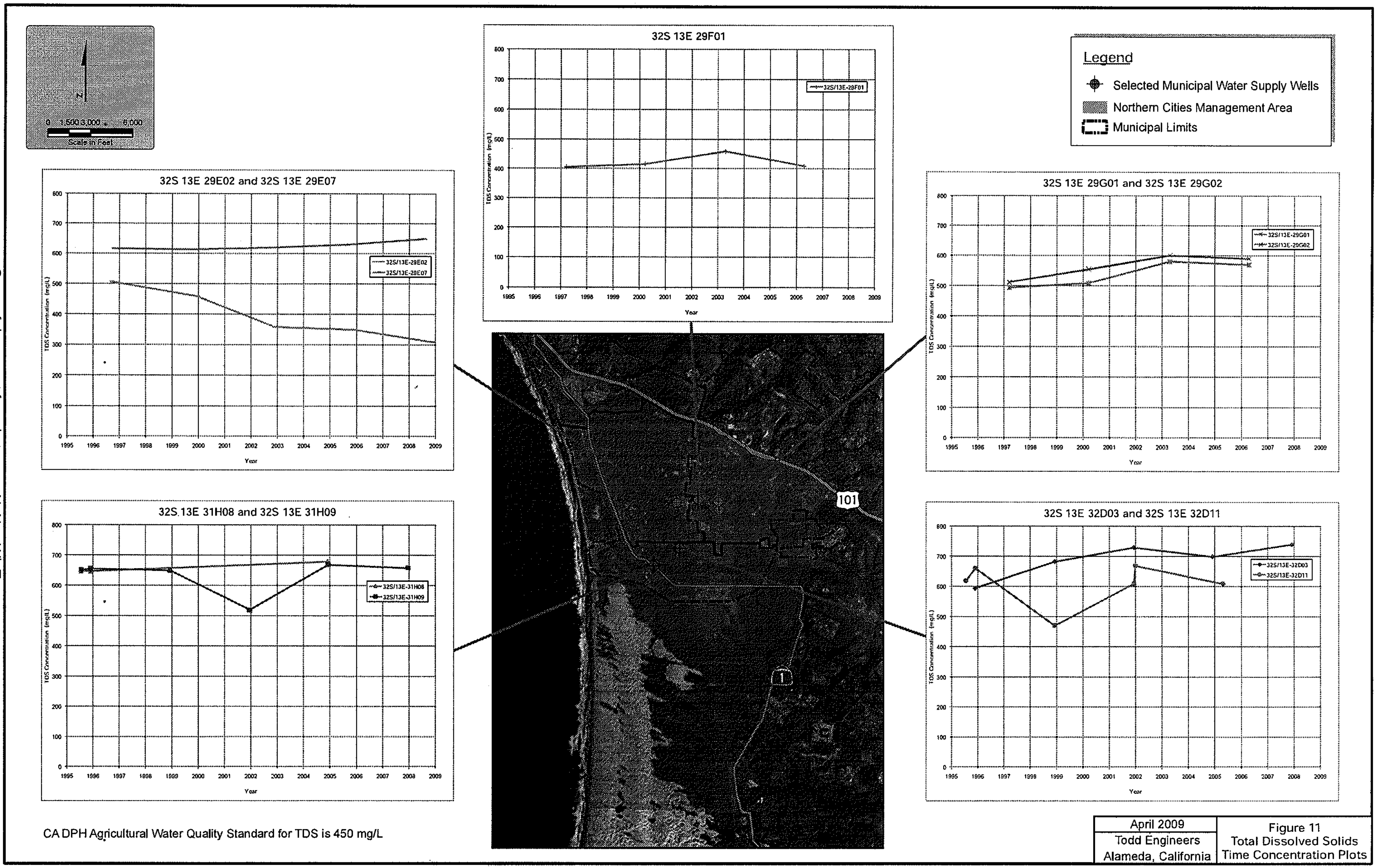


April 2009
Todd Engineers
Alameda, California

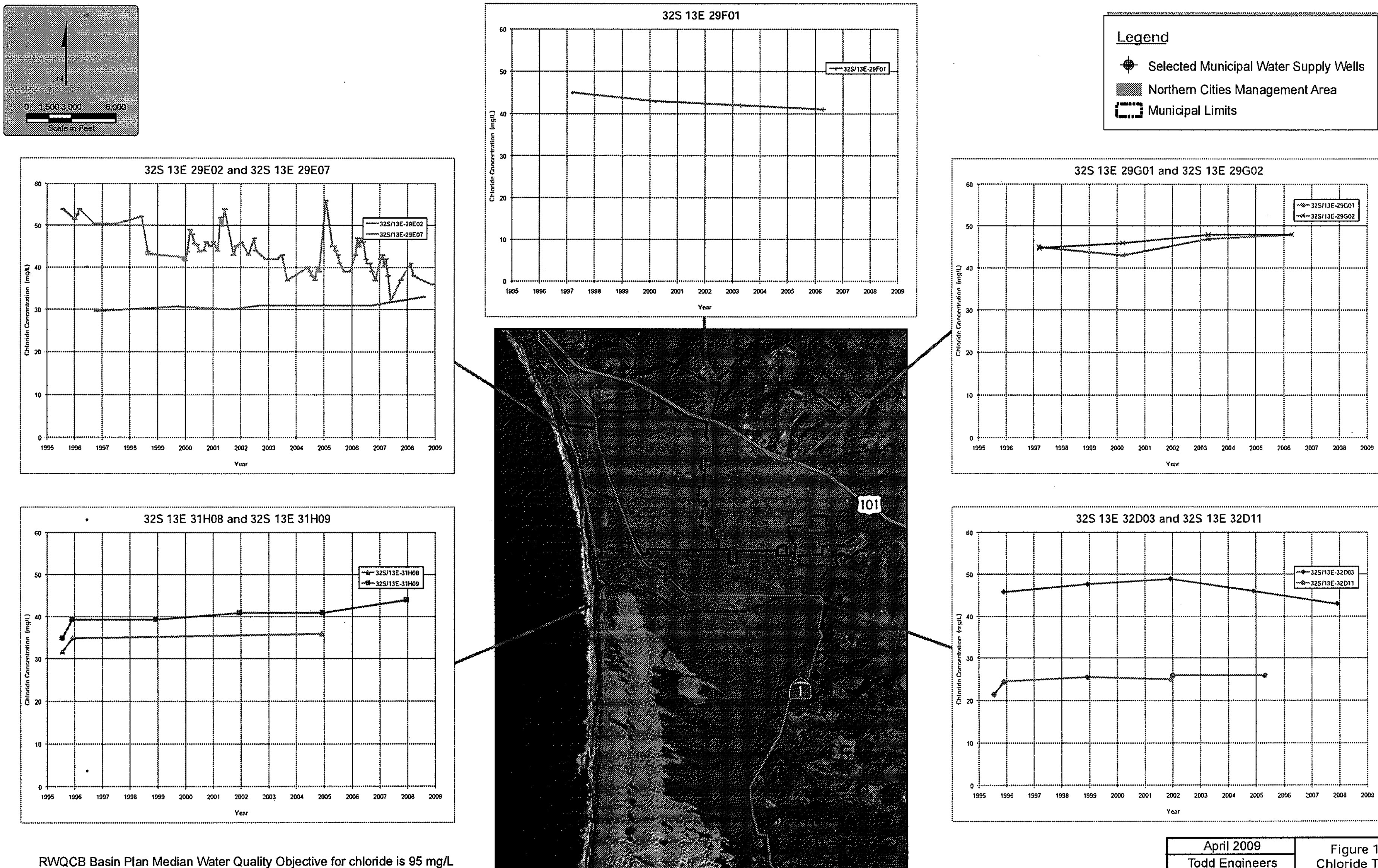
Figure 9
Selected Well Hydrographs



April 2009	Figure 10 Sentry Well Hydrographs
Todd Engineers	
Alameda, California	

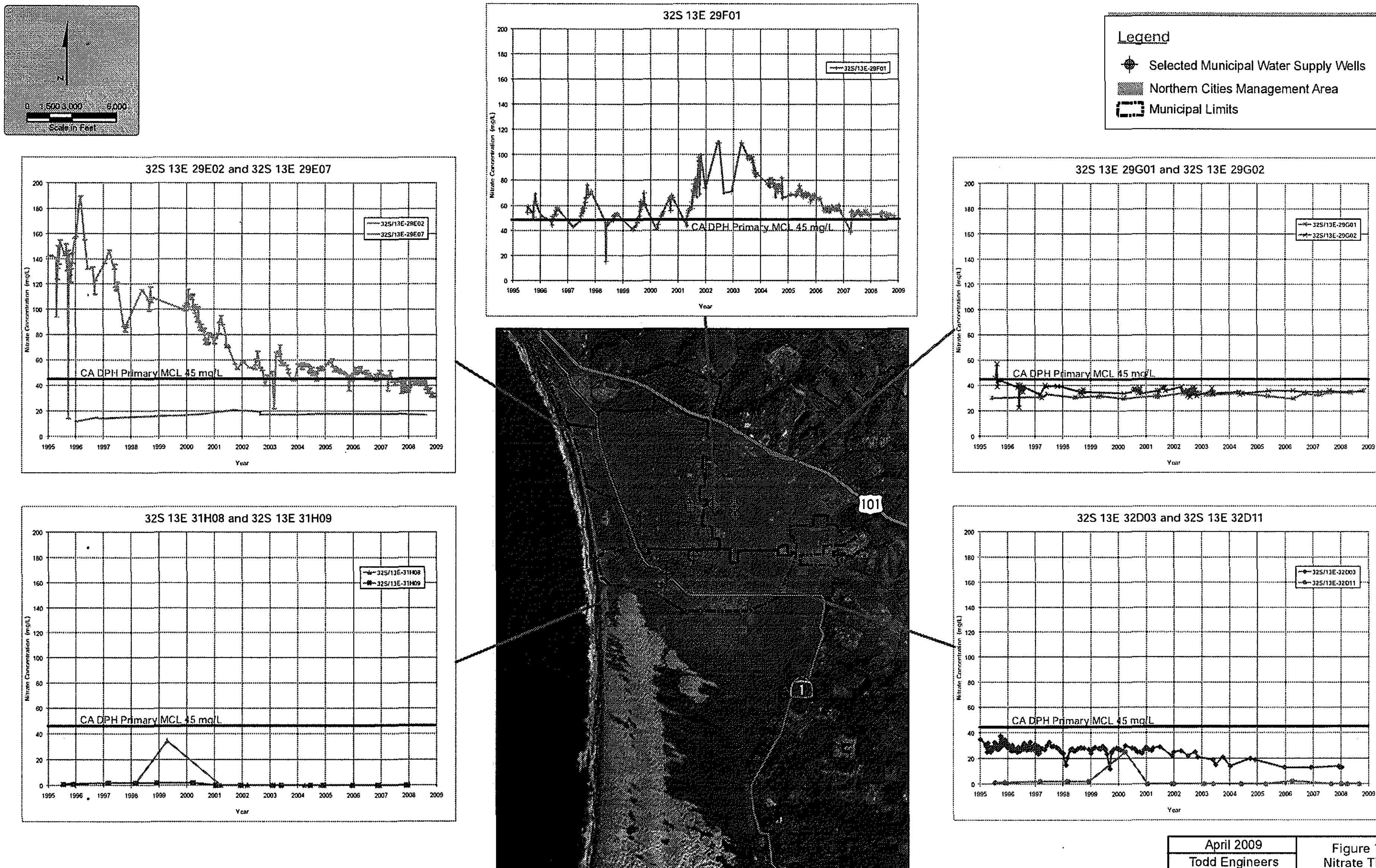


0 1,500 3,000 6,000
Scale in Feet
N
32S 13E 29F01
32S/13E-29F01
32S 13E 29E02 and 32S 13E 29E07
32S/13E-29E02
32S/13E-29E07
32S 13E 29G01 and 32S 13E 29G02
32S/13E-29G01
32S/13E-29G02
32S 13E 31H08 and 32S 13E 31H09
32S/13E-31H08
32S/13E-31H09
32S 13E 32D03 and 32S 13E 32D11
32S/13E-32D03
32S/13E-32D11
TDS Concentration (mg/L)
Year
101
1
Legend
Selected Municipal Water Supply Wells
Northern Cities Management Area
Municipal Limits
CA DPH Agricultural Water Quality Standard for TDS is 450 mg/L
April 2009
Todd Engineers
Alameda, California
Figure 11
Total Dissolved Solids
Time Concentration Plots



RWQCB Basin Plan Median Water Quality Objective for chloride is 95 mg/L

April 2009	Figure 12
Todd Engineers Alameda, California	Chloride Time Concentration Plots



April 2009	Figure 13
Todd Engineers	Nitrate Time
Alameda, California	Concentration Plots

APPENDIX A

Table A-1. Monthly Precipitation Data
All values in inches

Calendar Year	JAN	FEB	MAR	APR	May	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1992	2.92	8.99	3.20	0.05	0.00	0.05	0.73	0.00	0.00	0.81	0.00	5.12	21.87
1993	7.95	6.65	4.02	0.18	0.00	0.22	0.00	0.00	0.00	0.53	2.09	0.37	22.01
1994	2.48	4.41	1.64	0.78	0.00	0.00	0.00	0.02	1.19	1.13	2.67	1.32	15.64
1995	10.80	1.41	7.44	0.94	1.83	0.75	0.00	0.00	0.04	0.08	0.40	1.79	25.48
1996	3.52	8.41	1.68	0.98	0.43	0.00	0.00	0.00	0.03	2.08	4.41	7.67	29.21
1997	7.18	0.07	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.16	0.00	3.99	11.43
1998	2.97	12.42	3.78	0.00	3.62	0.06	0.00	0.00	0.29	0.00	0.00	0.00	23.14
1999	2.59	1.48	4.61	2.39	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.06	12.82
2000	2.89	9.29	1.53	2.75	0.14	0.30	0.00	0.00	0.18	1.48	0.00	0.02	18.58
2001	3.65	5.94	2.98	1.04	0.02	0.04	0.00	0.01	0.01	0.61	3.36	1.59	19.25
2002	1.28	0.42	1.22	0.76	0.10	0.00	0.01	0.02	0.03	0.01	2.12	3.80	9.77
2003	0.29	2.19	1.52	1.27	0.84	0.01	0.00	0.00	0.00	0.22	1.24	2.89	10.47
2004	1.32	4.01	0.70	0.00	0.02	0.00	0.00	0.00	0.00	3.09	2.59	2.93	14.66
2005	4.95	3.79	2.28	1.64	0.00	0.39	0.00	0.00	2.01	0.87	2.76	2.72	21.41
2006	5.35	1.22	4.53	3.78	1.38	0.00	0.00	0.00	0.00	0.00	0.00	2.20	18.46
2007	1.22	1.69	0.28	0.55	0.04	0.00	0.00	0.04	0.00	0.55	0.08	2.44	6.89
2008	5.94	1.93	0.00	0.39	0.00	0.00	0.00	0.00	0.04	0.16	1.38	2.01	11.85

Table A-2. Monthly Evapotranspiration Data from San Luis Obispo CIMIS Station
All values in inches

Calendar Year	JAN	FEB	MAR	APR	May	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1992	2.73	2.60	3.11	6.02	5.51	6.11	6.27	6.44	4.79	3.47	3.00	1.81	51.86
1993	1.69	1.87	3.69	5.85	6.09	6.94	5.69	5.81	4.71	3.73	2.61	2.27	50.95
1994	2.36	2.31	4.03	4.80	5.21	6.89	6.02	6.10	4.38	3.82	2.43	1.90	50.25
1995	1.37	2.40	3.52	4.55	4.53	6.02	6.86	6.41	4.85	4.06	2.72	1.97	49.26
1996	2.11	1.93	3.84	5.40	6.11	6.17	6.72	6.12	4.60	3.90	2.21	1.69	50.80
1997	1.67	2.69	3.96	5.31	6.63	6.23	6.05	6.13	5.53	4.68	2.46	1.71	53.05
1998	1.76	1.74	3.64	4.58	5.15	5.68	7.12	7.08	4.97	4.45	2.81	2.64	51.62
1999	2.99	3.33	3.87	4.47	5.45	5.79	6.69	6.19	4.81	4.47	2.83	2.98	53.87
2000	2.22	1.84	3.18	4.38	5.71	5.72	5.94	5.65	4.45	3.08	2.78	2.32	47.27
2001	2.12	2.22	3.66	4.56	6.41	7.06	5.71	5.83	4.82	3.46	2.02	1.68	49.55
2002	2.22	3.11	3.72	4.42	5.79	6.43	6.78	5.72	4.85	3.38	2.80	1.61	50.83
2003	2.54	2.47	4.33	4.46	5.87	5.30	5.56	5.13	4.94	3.63	2.22	1.61	48.06
2004	2.02	2.04	4.33	5.49	6.59	6.03	5.33	5.02	4.96	3.31	2.17	2.00	49.29
2005	1.82	1.94	3.31	4.75	5.82	5.69	6.08	5.23	4.30	3.51	2.54	2.14	47.13
2006	2.06	2.81	2.66	2.89	5.14	5.75	5.94	5.24	4.35	3.59	2.82	2.44	45.69
2007	2.56	2.17	4.06	4.57	3.85	6.23	6.35	5.86	4.79	4.07	3.00	2.39	49.90
2008	1.91	2.80	4.57	5.59	5.58	6.20	6.05	5.74	4.68	4.55	2.76	2.20	52.63

Table A-2. Monthly Evapotranspiration Data from Oceano CIMIS Station
All values in inches

Calendar Year	JAN	FEB	MAR	APR	May	JUN	July	AUG	SEP	OCT	NOV	DEC	TOTAL
2006						0.58	5.47	4.57	3.49	3.33	2.67	2.15	22.26
2007	2.25	2.29	3.49	4.36	4.74	5.08	5.21	4.66	4.21	3.58	2.24	1.97	44.08
2008	1.53	2.41	3.99	5.12	4.95	5.55	4.78	4.66	3.62	3.96	2.54	1.91	45.02

APPENDIX B

Table B-1. Groundwater Elevations October 2007 through October 2008

Well Number	Well Depth (feet)	Depth to Top of First Perforations (feet)	Ground Surface Elevation (feet MSL)	Hydrograph Well	Sentry Well	Groundwater Elevations (feet MSL) October 2007	April 2008	October 2008
10N/35W-06A01			75	--	--	64.4	65.99	63.6
10N/35W-06A02	20		75	--	--	64.67	66.25	63.88
10N/35W-06A03	118		75	--	--	64.39	65.8	63.67
11N/34W-05J01		56	390	--	--	370.6	373.45	366.6
11N/34W-05K01	180		380	--	--	349.2	350.8	349.7
11N/34W-05K02	350		400	--	--	192.95	254.05	157.15
11N/34W-09P01			376	--	--	267.3	276.3	253.74
11N/34W-17B04		33	310	--	--	213.8	244.1	205.53
11N/34W-17B05	225		310	--	--	214	248	208
11N/34W-18P03		230	373	--	--	243.05	252.85	252.27
11N/34W-19E01			0	--	--	-266		
11N/34W-19Q01	315		306	--	--	36.5	48.05	32.9
11N/34W-20J02			315	--	--	81	81.75	78.15
11N/34W-27D01	135		296	--	--	226.15	225.65	225.3
11N/34W-27E01		200	305	--	--	118.5	123.24	119.47
11N/34W-27P01			287	--	--		189.7	189.8
11N/34W-29Q02			171	--	--	65.8		64.09
11N/34W-29R01	163	112	166	--	--	77.8	80.7	73.4
11N/34W-29R02			171	--	--	67.6	90.08	64.15
11N/34W-29R03			174.8	--	--	79.6	85.6	
11N/35W-02F01	382	352	381	--	--	12.9	29.45	-7.38
11N/35W-02G01	130		400	--	--	305.8	305.5	305.14
11N/35W-02G02	258		400	--	--	182.55	181.45	180.95
11N/35W-03B01		290	320.5	--	--	85.2	85.6	84.92
11N/35W-05G01	165	250	140	--	--	15.1	24.6	16.62
11N/35W-05G02	140		135	--	--	10.1	10.45	2.53
11N/35W-05L01	240	192	109	--	--	-11.9	-5.35	-15.2
11N/35W-05L03			109	--	--	-10.9	-4.3	-13.48
11N/35W-05N02		258	100	YES	--	26.1	26.9	21.25
11N/35W-05R01		220	140	--	--	4.1	10.9	2.54
11N/35W-06J01			101	--	--	21	22.4	19.2
11N/35W-08L01			121	--	--	7.9	13.75	6.19
11N/35W-09K02	356		190.2	--	--	58.35	58.3	56.9
11N/35W-09K04	274		183	--	--	12.2	22.5	14.95
11N/35W-10G01		230	340	--	--	45.4	34.35	4.1
11N/35W-11B01	360	315	385	--	--	43.5	43.5	42.36
11N/35W-11C01	365	210	267	--	--	267	20.3	
11N/35W-11C02		232	285	--	--	4.25	44.15	34.12
11N/35W-11J01	350	257	352	--	--	99.1	99.6	84.35
11N/35W-12E04		326	411	--	--	88.9	92.15	90.75
11N/35W-13C01	500		345	--	--	49.5	54.6	47.9
11N/35W-13D01	400		299	--	--	11.15	22.55	8.1
11N/35W-13E02	430	306	306	--	--	62.9	68.5	55.85
11N/35W-13E03	350	255	306	--	--	65.5	71.6	63.65
11N/35W-24A01			325	--	--	48	61	10
11N/35W-24J01		370	0	--	--	-284		
11N/35W-24L02		440	325	--	--	3	16	-11
11N/35W-24L03			325	--	--	15	35	13
11N/35W-26M03	700		109	--	--	30.8	39.85	37.28
11N/35W-28F02	48		80	--	--	36.05	35.35	36.93
11N/35W-33G01	141		90	--	--	36.3	53.65	
11N/36W-12C01		280	19	YES	YES		10.45	12.55
11N/36W-12C02		450	19	YES	YES		3.38	11.5
11N/36W-12C03		720	19	YES	YES		-0.49	7.72
12N/34W-31F01			441.5	--	--	441.5	339.6	292
12N/35W-27N03		40	161.8	--	--	145.2	139.92	132.12
12N/35W-28J02			181	--	--	133.2	134.4	132.4
12N/35W-29N01		80	29	YES	--	3	8.85	-2.35
12N/35W-29R03		385	250	YES	--	16.9	45.65	39.02
12N/35W-30K02			28	--	--	7.6	11.75	5.3
12N/35W-30K03		40	31	YES	--	15.38	18.78	13.6
12N/35W-30K04			26	--	--	8	10.8	5.34
12N/35W-30M02			21.8	--	--	8.3	7.2	6.8
12N/35W-30M04			22.5	--	--	6.45	1.4	3.84
12N/35W-30P02			26.5	--	--	8.2	12.6	6.12
12N/35W-32G01		260	190	--	--	5	7.4	0.5
12N/35W-33D01			241	--	--	73	81.35	85.3
12N/35W-33E01			260	--	--	109.6	112.4	112.6
12N/35W-33J02		317	300.5	--	--	41.1	40.15	36.8
12N/35W-33J03	407		270	--	--	11.55	10.75	-0.25
12N/35W-33L01		300	305	--	--	7.2	12.2	2.6

Table B-1. Groundwater Elevations October 2007 through October 2008

Well Number	Well Depth (feet)	Depth to Top of First Perforations (feet)	Ground Surface Elevation (feet MSL)	Hydrograph Well	Sentry Well	Groundwater Elevations (feet MSL)		
						October 2007	April 2008	October 2008
12N/35W-33Q02			340	--	--	135	134.05	132.8
12N/35W-34C03		20	159.3	--	--	112.3	128.35	112.3
12N/35W-34G08			190	--	--		158.15	140.3
12N/35W-35K02			205	--	--		160.7	144.27
12N/35W-35P01	220		390.5	--	--	193.72	194.9	195.25
12N/35W-35P03		180	390	--	--	167.1	167.5	166.63
12N/35W-35P04			396	--	--	257.9	263.9	261.87
12N/36W-36L01		227	22	YES	YES	4.4	5.13	3.25
12N/36W-36L02		535	22	YES	YES	3.65	9.8	2.72
32S/12E-24B01	964	48	7.2	YES	YES	2.05	4.55	2.48
32S/12E-24B02	964	120	7.2	YES	YES	3.3	3.88	2.51
32S/12E-24B03	964	270	7.2	YES	YES	1.65	3.25	3.92
32S/13E-12C03		36	271	--	--	244.1	247.25	
32S/13E-12F05		13	251	--	--	223.15	229.8	
32S/13E-12P04		100	240	--	--	213.25	216.45	
32S/13E-13M01	22		219	--	--	208.93	211.8	
32S/13E-14R01			198	--	--		146.6	
32S/13E-14R02		83	198.1	--	--	133.95	148.8	
32S/13E-19Q02	500	150	59	--	--	-19.3	-1.5	5.8
32S/13E-23M07			150	--	--		127.2	
32S/13E-28K02	101	59	86	YES	--		27	
32S/13E-28Q06	120		82	--	--		31	
32S/13E-29E02	180		52	--	--	0	4	-3
32S/13E-29E07			54.3	--	--	-2.5	10.3	4.3
32S/13E-29F01	200	22	250	--	--	179	185	180
32S/13E-29G02	223	103	83	--	--	-4	3	
32S/13E-30F01	802	15	17.3	YES	YES			1.77
32S/13E-30F02	802	75	17.3	YES	YES	1.95	4.9	1.96
32S/13E-30F03	802	305	17.3	YES	YES	-5.05	-0.56	-5.22
32S/13E-30N01	873	15	10.6	YES	YES	3.4	4.4	3.41
32S/13E-30N02	873	175	10.6	YES	YES	0.0	4.75	-1.88
32S/13E-30N03	873	60	10.6	YES	YES	2.2	4.85	2.77
32S/13E-31H08	162	90	30	YES	--	-5.2	-0.85	-7.63
32S/13E-31H09	525	380	30	YES	--	-8.1	-2.45	-11.35
32S/13E-31H10			35	--	--	7.9	8.18	7.16
32S/13E-31H11			35	--	--	6.8	8.02	5.71
32S/13E-31H12			35	--	--	1.85	5.3	-6.62
32S/13E-31H13			35	--	--	1.05	5.2	-2.72
32S/13E-32D03	200	114	82.4	YES	--	1.4	6.15	1.25
32S/13E-32D11	607	305	83.5	YES	--	4.7	3.85	-9.55
32S/13E-33A05		18	80.5	YES	--	48.2	67.75	47.62
32S/13E-33A06			80.5	--	--	26.4	39.75	28.37
32S/13E-33C04			75	--	--		6.08	2.45
32S/13E-33K03	96	64	51	YES	--	8.7	15.25	5.08
32S/13E-33L02			42.1	--	--	7.2	9.2	1.75