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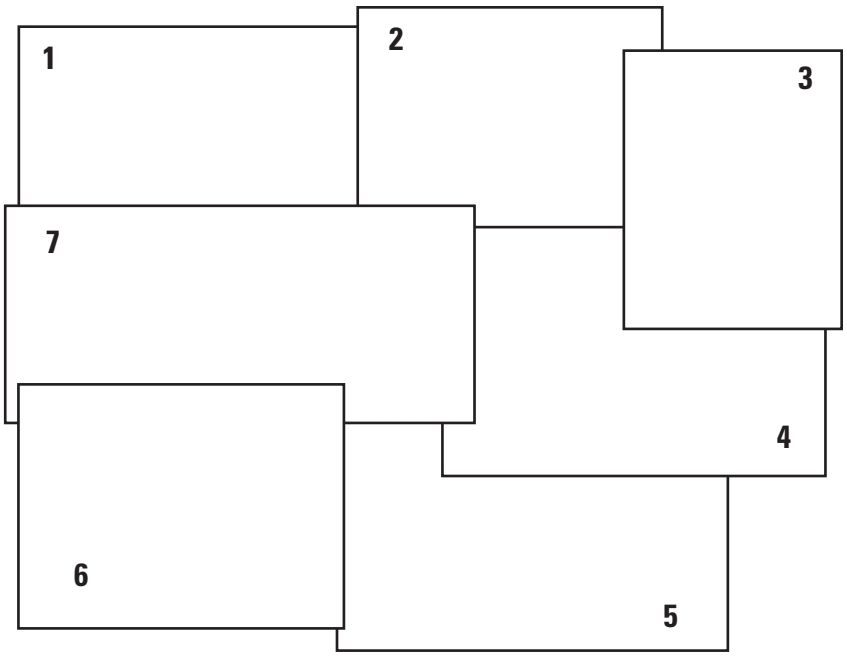
Prepared in cooperation with the California State Water Resources Control Board
A product of the California Groundwater Ambient Monitoring and Assessment (GAMA) Program

Groundwater-Quality Data in Seven GAMA Study Units: Results from Initial Sampling, 2004–2005, and Resampling, 2007–2008, of Wells: California GAMA Program Priority Basin Project

Data Series 795

U.S. Department of the Interior
U.S. Geological Survey

Cover photographs



Cover. **1.** Cotton fields near Fresno, California. (Photograph taken by Justin Kulongoski, U.S. Geological Survey.)

2. Almond orchard near near Fresno, California. (Photograph taken by Cathy Munday, U.S. Geological Survey.)

3. Tower Bridge over the Sacramento River, Sacramento, California. (Photograph taken by Cathy Munday, U.S. Geological Survey.)

4. Salinas Valley agriculture in Monterey County, California. (Photograph taken by Andrea Altmann, U.S. Geological Survey.)

5. Lake Henshaw in San Diego County, California. (Photograph taken by Barbara Dawson, U.S. Geological Survey.)

6. Vineyards in the North San Francisco Bay area, California. (Photograph taken by George Bennett, V, U.S. Geological Survey.)

7. Looking northeast from Griffith Park. Downtown Glendale is in the middle ground, and the San Gabriel Mountains are in the background. (Photograph taken July 12, 2006, by Will Bebeck.)

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U.S. Department of the Interior
SALLY JEWELL, Secretary

U.S. Geological Survey
Suzette M. Kimball, Acting Director

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Conversion Factors, Datums, and Abbreviations and Acronyms

Conversion Factors

Inch/foot/mile to SI

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square foot (ft^2)	0.09290	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Radioactivity	
picocurie per liter (pCi/L)	0.037	becquerel per liter (Bq/L)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows: °F=(1.8×°C)+32.

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows: °C=(°F–32)/1.8.

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L). One milligram per liter is equivalent to 1 part per million (ppm); 1 microgram per liter is equivalent to 1 part per billion (ppb); 1 nanogram per liter (ng/L) is equivalent to 1 part per trillion (ppt). Isotopic constituents are given in delta notation ($\delta^{i}E$) as the ratio of a heavier isotope of an element (^{i}E) relative to the more common lighter isotope of that element, relative to a standard reference material, expressed as per mil; 1 per mil is equivalent to 1 part per thousand.

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Abbreviations and Acronyms

AL-US	U.S. Environmental Protection Agency action level
APE	Alternate Place Entry program (USGS)
CAS	Chemical Abstract Service (American Chemical Society Registry Number®)
CSU	combined standard uncertainties
E	estimated or having a high degree of uncertainty
GAMA	Groundwater Ambient Monitoring and Assessment Program
GPS	global positioning system
HAL-US	U.S. Environmental Protection Agency lifetime health advisory level
LRL	laboratory reporting level
LSD	land-surface datum
LT-MDL	long-term method detection level
MCL-CA	California Department of Public Health maximum contaminant level
MCL-US	U.S. Environmental Protection Agency maximum contaminant level
MDL	method detection limit
MRL	minimum reporting level
na	not available
NAVD 88	North American Vertical Datum of 1988
nc	not collected
NFM	National Field Manual (USGS)
NL-CA	California Department of Public Health notification level
nv	no value in category
NWIS	National Water Information System (USGS)
PBP	Priority Basin Project
PCFF	Personal Computer Field Form program designed for USGS sampling
QA	quality assurance
QC	quality control
RL	reporting level
RSD	relative standard deviation
RSD5-US	U.S. Environmental Protection Agency risk-specific dose at a risk factor of 10^{-5}
SMCL-CA	California Department of Public Health secondary maximum contaminant level
SMCL-US	U.S. Environmental Protection Agency secondary maximum contaminant level
SRL	study reporting level
ssL_c	sample-specific critical level

Well Identifier Prefixes

COS	Prefix for well in the Cosumnes Basin study area of the Northern San Joaquin Basin study unit
ESJ	Prefix for well in the Eastern San Joaquin Basin study area of the Northern San Joaquin Basin study unit
KING	Prefix for well in the Kings study area of the Southeast San Joaquin Valley study unit
KWH	Prefix for well in the Kaweah study area of the Southeast San Joaquin Valley study unit
MSMB	Prefix for well in the Monterey Bay study area of the Monterey Bay and Salinas Valley study unit
MSPR	Prefix for well in the Paso Robles study area of the Monterey Bay and Salinas Valley study unit
MSSC	Prefix for well in the Santa Cruz study area of the Monterey Bay and Salinas Valley study unit
MSSV	Prefix for well in the Salinas Valley study area of the Monterey Bay and Salinas Valley study unit
NAM	Prefix for well in the North American study area of the Southern Sacramento Valley study unit
NSFVOL	Prefix for well in the Volcanic Highlands study area of the North San Francisco Bay study unit
NSFVP	Prefix for well in the Valley and Plains study area of the North San Francisco Bay study unit
NSFWG	Prefix for well in the Wilson Grove Formation Highlands study area of the North San Francisco Bay study unit
NSFWGFP	Prefix for well on a flow path in the Wilson Grove Formation Highlands study area of the North San Francisco Bay study unit
NSJ-QPC	Prefix for well in the Uplands Basin study area of the Northern San Joaquin Basin study unit
SAM	Prefix for well in the South American study area of the Southern Sacramento Valley study unit
SDALLV	Prefix for well in the Alluvial Basins study area of the San Diego Drainages study unit
SDHDRK	Prefix for well in the Hard Rock study area of the San Diego Drainages study unit
SDTEM	Prefix for well in the Temecula Valley study area of the San Diego Drainages study unit
SDTEMFP	Prefix for well on a flow path in the Temecula Valley study area of the San Diego Drainages study unit
SDWARN	Prefix for well in the Warner Valley study area of the San Diego Drainages study unit

Well Identifier Prefixes—Continued

SOL	Prefix for well in the Solano study area of the Southern Sacramento Valley study unit
SSV-QPC	Prefix for well in the Uplands study area of the Southern Sacramento Valley study unit
SUI	Prefix for well in the Suisun-Fairfield study area of the Southern Sacramento Valley study unit
TLR	Prefix for well in the Tulare Lake study area of the Southeast San Joaquin Valley study unit
TRCY	Prefix for well in the Tracy Basin study area of the Northern San Joaquin Basin study unit
TULE	Prefix for well in the Tule study area of the Southeast San Joaquin Valley study unit
ULASF	Prefix for well in the San Fernando study area of the San Fernando–San Gabriel study unit
ULASG	Prefix for well in the San Gabriel study area of the San Fernando–San Gabriel study unit
YOL	Prefix for well in the Yolo study area of the Southern Sacramento Valley study unit

Organizations

BQS	Branch of Quality Systems (USGS)
CDPH	California Department of Public Health
CDPR	California Department of Pesticide Regulation
CDWR	California Department of Water Resources
LLNL	Lawrence Livermore National Laboratory, Livermore, California
MWH	Montgomery Watson Harza Laboratory
NAWQA	National Water-Quality Assessment Program (USGS)
NELAP	National Environmental Laboratory Accreditation Program
NFQA	National Field Quality Assurance Program (USGS)
NRP	National Research Program (USGS)
NWQL	National Water Quality Laboratory, Denver, Colorado (USGS)
SWRCB	State Water Resources Control Board (California)
TML	Trace Metal Laboratory, Boulder, Colorado (USGS)
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
Weck	Weck Laboratories, Inc., City of Industry, California

Selected chemical names

$CaCO_3$	calcium carbonate
CO_3^{2-}	carbonate
DBCP	1,2-dibromo-3-chloropropane
EDB	1,2-dibromoethane
HCl	hydrochloric acid
HCO_3^-	bicarbonate
MTBE	methyl *tert*-butyl ether
NDMA	*N*-nitrosodimethylamine
PCE	perchloroethene, tetrachloroethene
1,2,3-TCP	1,2,3-trichloropropane
TCE	trichloroethene
TDS	total dissolved solids
THM	trihalomethane
VOC	volatile organic compound

Units of Measure

L	liter
mg	milligram
mg/L	milligrams per liter
mi	mile
mL	milliliter
µg/L	micrograms per liter
pCi/L	picocuries per liter
pmc	percent modern carbon
$\delta^i E$	delta notation, the ratio of a heavier isotope of an element (^iE) to the more common lighter isotope of that element, relative to a standard reference material, expressed as per mil
>	greater than
<	less than
≤	less than or equal to
%	percent
*	concentration greater than benchmark level
**	concentration greater than upper benchmark level

Groundwater-Quality Data in Seven GAMA Study Units: Results from Initial Sampling, 2004–2005, and Resampling, 2007–2008, of Wells: California GAMA Program Priority Basin Project

By Robert Kent, Kenneth Belitz, and Miranda S. Fram

Abstract

The Priority Basin Project (PBP) of the Groundwater Ambient Monitoring and Assessment (GAMA) Program was developed in response to the Groundwater Quality Monitoring Act of 2001 and is being conducted by the U.S. Geological Survey (USGS) in cooperation with the California State Water Resources Control Board (SWRCB). The GAMA-PBP began sampling, primarily public supply wells in May 2004. By the end of February 2006, seven (of what would eventually be 35) study units had been sampled over a wide area of the State. Selected wells in these first seven study units were resampled for water quality from August 2007 to November 2008 as part of an assessment of temporal trends in water quality by the GAMA-PBP.

The initial sampling was designed to provide a spatially unbiased assessment of the quality of raw groundwater used for public water supplies within the seven study units. In the 7 study units, 462 wells were selected by using a spatially distributed, randomized grid-based method to provide statistical representation of the study area. Wells selected this way are referred to as grid wells or status wells. Approximately 3 years after the initial sampling, 55 of these previously sampled status wells (approximately 10 percent in each study unit) were randomly selected for resampling. The seven resampled study units, the total number of status wells sampled for each study unit, and the number of these wells resampled for trends are as follows, in chronological order of sampling: San Diego Drainages (53 status wells, 7 trend wells), North San Francisco Bay (84, 10), Northern San Joaquin Basin (51, 5), Southern Sacramento Valley (67, 7), San Fernando–San Gabriel (35, 6), Monterey Bay and Salinas Valley Basins (91, 11), and Southeast San Joaquin Valley (83, 9).

The groundwater samples were analyzed for a large number of synthetic organic constituents (volatile organic compounds [VOCs], pesticides, and pesticide degradates), constituents of special interest (perchlorate, *N*-nitrosodimethylamine [NDMA], and 1,2,3-trichloropropane [1,2,3-TCP]), and naturally-occurring inorganic constituents (nutrients, major and minor ions, and trace elements). Naturally-occurring isotopes (tritium, carbon-14, and stable isotopes of hydrogen and oxygen in water) also were measured to help identify processes affecting groundwater quality and the sources and ages of the sampled groundwater. Nearly 300 constituents and water-quality indicators were investigated.

Quality-control samples (blanks, replicates, and samples for matrix spikes) were collected at 24 percent of the 55 status wells resampled for trends, and the results for these samples were used to evaluate the quality of the data for the groundwater samples. Field blanks rarely contained detectable concentrations of any constituent, suggesting that contamination was not a noticeable source of bias in the data for the groundwater samples. Differences between replicate samples were mostly within acceptable ranges, indicating acceptably low variability in analytical results. Matrix-spike recoveries were within the acceptable range (70 to 130 percent) for 75 percent of the compounds for which matrix spikes were collected.

This study did not attempt to evaluate the quality of water delivered to consumers. After withdrawal, groundwater typically is treated, disinfected, and blended with other waters to maintain acceptable water quality. The benchmarks used in this report apply to treated water that is served to the consumer, not to untreated groundwater. To provide some context for the results, however, concentrations of constituents measured in these groundwater samples were compared with benchmarks established by the U.S. Environmental Protection Agency (USEPA) and California Department of Public Health (CDPH). Comparisons between data collected for this study and benchmarks for drinking water are for illustrative purposes only and are not indicative of compliance or non-compliance with those benchmarks.

Most constituents that were detected in groundwater samples from the trend wells were found at concentrations less than drinking-water benchmarks. Four VOCs—trichloroethene, tetrachloroethene, 1,2-dibromo-3-chloropropane, and methyl *tert*-butyl ether—were detected in one or more wells at concentrations greater than their health-based benchmarks, and six VOCs were detected in at least 10 percent of the samples during initial sampling or resampling of the trend wells. No pesticides were detected at concentrations near or greater than their health-based benchmarks. Three pesticide constituents—atrazine, deethylatrazine, and simazine—were detected in more than 10 percent of the trend-well samples during both sampling periods. Perchlorate, a constituent of special interest, was detected more frequently, and at greater concentrations during resampling than during initial sampling, but this may be due to a change in analytical method between the sampling periods, rather than to a change in groundwater quality. Another constituent of special interest, 1,2,3-TCP, was also detected more frequently during resampling than during initial sampling, but this pattern also may not reflect a change in groundwater quality. Samples from several of the wells where 1,2,3-TCP was detected by low-concentration-level analysis during resampling were not analyzed for 1,2,3-TCP using a low-level method during initial sampling. Most detections of nutrients and trace elements in samples from trend wells were less than health-based benchmarks during both sampling periods. Exceptions include nitrate, arsenic, boron, and vanadium, all detected at concentrations greater than their health-based benchmarks in at least one well during both sampling periods, and molybdenum, detected at concentrations greater than its health-based benchmark during resampling only. The isotopic ratios of oxygen and hydrogen in water and tritium and carbon-14 activities generally changed little between sampling periods, suggesting that the predominant sources and ages of groundwater in most trend wells were consistent between the sampling periods.

Introduction

About one-half of the water used for public and domestic drinking-water supply in California is groundwater (Kenny and others, 2009). To assess the quality of ambient groundwater in aquifers used for public drinking-water supply and to establish a baseline groundwater-quality monitoring program, the California State Water Resources Control Board (SWRCB) in cooperation with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory (LLNL) implemented the Groundwater Ambient Monitoring and Assessment (GAMA) Program in 2000 (California State Water Resources Control Board, 2012, website at http://www.waterboards.ca.gov/gama/). The main goals of the GAMA Program are to improve groundwater monitoring and to increase the availability of groundwater-quality data to the public. The GAMA Program currently consists of four projects: (1) the GAMA Priority Basin Project (PBP), conducted by the USGS (U.S. Geological Survey, 2011, California Water Science Center website at http://ca.water.usgs.gov/gama/); (2) the GAMA Domestic Well Project, conducted by the SWRCB; (3) GAMA Special Studies Project, conducted by LLNL; and (4) GeoTracker GAMA, conducted by the SWRCB. The GAMA-PBP primarily focuses on the deep part of the groundwater resource, which is typically used for public drinking-water supply. The GAMA Domestic Well Project generally focuses on the shallow aquifer systems, which may be particularly at risk as a result of surficial contamination. The GAMA Special Studies Project focuses on using research methods to help explain the source, fate, transport, and occurrence of chemicals that can affect groundwater quality. GeoTracker GAMA is an online interface serving data from the GAMA Program and other efforts to the public (http://geotracker.waterboards.ca.gov/).

The GAMA Program was initiated by the SWRCB in 2000 and later expanded by the Groundwater Quality Monitoring Act of 2001 (State of California, 2001a, b; Sections 10780–10782.3 of the California Water Code, Assembly Bill 599). The GAMA-PBP assesses groundwater quality in key groundwater basins that account for more than 90 percent of all groundwater used for public supply in the State. For the GAMA-PBP, the USGS, in collaboration with the SWRCB, developed the monitoring plan to assess groundwater basins through direct and other statistically reliable sampling approaches (Belitz and others, 2003; California State Water Resources Control Board, 2003). Additional partners in the GAMA-PBP include the California Department of Public Health (CDPH), California Department of Water Resources (CDWR), California Department of Pesticide Regulation (CDPR), local water agencies, and well owners (Kulongoski and Belitz, 2004). Participation in the GAMA-PBP is entirely voluntary.

The GAMA-PBP is unique in California because it includes many chemical analyses that are not otherwise available in the statewide water-quality monitoring datasets. Groundwater samples collected for the GAMA-PBP are typically analyzed for approximately 300 chemical constituents using analytical methods with lower detection limits than required by the CDPH for regulatory monitoring of water from drinking-water wells. These analyses will be useful for providing an early indication of changes in groundwater quality. In addition, the GAMA-PBP analyzes samples for a suite of constituents more extensive than required by CDPH and for a suite of chemical and isotopic tracers for understanding hydrologic and geochemical processes. This understanding of groundwater composition is useful for identifying the natural and human factors affecting water quality. Understanding the occurrence and distribution of chemical constituents of significance to water quality is important for the long-term management and protection of groundwater resources.

The range of hydrologic, geologic, and climatic conditions in California were considered in this statewide assessment of groundwater quality. Belitz and others (2003) partitioned the State into 10 hydrogeologic provinces, each with distinctive hydrologic, geologic, and climatic characteristics: Cascades and Modoc Plateau, Klamath Mountains, Northern Coast Ranges, Central Valley, Sierra Nevada, Basin and Range, Southern Coast Ranges, Transverse Ranges and selected Peninsular Ranges, Desert, and San Diego Drainages (fig. 1). These 10 hydrogeologic provinces include groundwater basins and subbasins designated by the CDWR (California Department of Water Resources, 2003). Groundwater basins and subbasins generally consist of relatively permeable, unconsolidated deposits of alluvial origin. Eighty percent of California's approximately 16,000 active and standby drinking-water wells listed in the

Figure 1. Hydrogeologic provinces of California and the locations of the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.

statewide database maintained by the CDPH (hereinafter referred to as CDPH wells) are located in groundwater basins and subbasins within the 10 hydrogeologic provinces. Groundwater basins and subbasins were prioritized for sampling on the basis of the number of CDPH wells in the basin, with secondary consideration given to municipal groundwater use, agricultural pumping, the number of formerly leaking underground fuel tanks, and the number of square-mile sections with registered pesticide applications (Belitz and others, 2003). Of the 472 basins and subbasins designated by the CDWR, 116 basins and subbasins, defined as the priority basins, contained 90 percent of the CDPH wells in basins. The remaining 356 basins and subbasins were defined as low-use basins. The 116 priority basins and subbasins, selected low-use basins, and selected areas outside of the defined groundwater basins were selected and grouped into 35 GAMA study units, representing approximately 95 percent of the CDPH wells in California.

The data collected in each study unit is used for three types of water-quality assessments: (1) status—assessment of the current quality of the groundwater resource; (2) understanding—identification of the natural and human factors affecting groundwater quality; and (3) trends—detection of changes in groundwater quality over time (Kulongoski and Belitz, 2004). The assessments are intended to characterize the quality of groundwater in the primary aquifer systems of the study units, not the treated drinking water delivered to consumers by water purveyors. The primary aquifer systems are defined as parts of aquifers corresponding to the depths of the perforation intervals of wells listed in the CDPH databases for the study units. The CDPH database lists wells used for public drinking-water supplies and includes wells from systems classified as community (such as cities, towns, and mobile-home parks), non-transient, non-community (such as those in schools, workplaces, and restaurants), and transient, non-community (such as campgrounds, parks, and highway rest areas). Collectively, the CDPH refers to these wells as "public-supply" wells. Groundwater quality in shallow or very deep parts of the aquifer systems may differ from that in the primary aquifer systems. In particular, shallow groundwater may be more vulnerable to surface contamination. As a result, samples from shallow wells (such as many private domestic wells and environmental monitoring wells) can have greater concentrations of constituents (such as volatile organic compounds [VOCs] and nitrate) from anthropogenic sources than samples from wells screened in the underlying primary aquifer systems (for example, Landon and others, 2010).

All published and quality-assurance/quality-control (QA/QC) approved analytical data collected for the GAMA Program are stored in the web-based Geotracker Database (California State Water Resources Control Board, 2009, website at https://geotracker.waterboards.ca.gov/gama/). The Geotracker Database also stores groundwater-quality data and related reports collected by other State agencies, such as the CDPH, CDWR, and CDPR, and data collected by the SWRCB and Regional Boards from environmental monitoring wells at contaminated and (or) remediated sites.

This report presents water-quality data collected in seven GAMA-PBP study units that were initially sampled from July 2004 to December 2005 and then were resampled from August 2007 to November 2008 to evaluate temporal trends. Data are presented from initial sampling, as well as from resampling for trends in the San Diego Drainages, North San Francisco Bay, Northern San Joaquin Basin, Southern Sacramento Valley, San Fernando–San Gabriel, Monterey Bay and Salinas Valley Basins, and Southeast San Joaquin Valley study units. Data for additional parameters, evaluation of the QC data, and detailed descriptions of these seven GAMA study units can be found in published USGS Data-Series Reports for each study unit (Wright and others, 2005; Kulongoski and others, 2006; Bennett and others, 2006; Dawson and others, 2008; Land and Belitz, 2008; Kulongoski and Belitz, 2007; and Burton and Belitz, 2008, respectively).

Purpose and Scope

The purposes of this report are to (1) describe the study design and study methods; (2) present the results of QC measurements, and (3) present the results of resampling for an assessment of trends in the first seven GAMA study units. Groundwater samples were analyzed for organic and inorganic constituents, field parameters, and chemical tracers for groundwater source and age. The chemical data presented in this report were evaluated by comparison to State and Federal drinking-water standards. The health-based and non-health-based benchmarks considered for this report are those established by the U.S. Environmental Protection Agency (USEPA) and (or) the CDPH. The data presented in this report are intended to characterize the quality of untreated groundwater resources within the study units and to provide a means to evaluate whether or not the groundwater quality is changing over time. Discussion of the occurrence of the constituents detected in groundwater samples and factors influencing the distribution can be found in published USGS Scientific Investigation Reports for these GAMA-PBP study units (Wright and Belitz, 2011; Kulongoski and others, 2010; Bennett and others, 2010; Bennett and others, 2011; Land and others, 2012; Kulongoski and Belitz; 2011; and Burton and others, 2012, respectively).

Study Units

Detailed information on the hydrogeologic settings of the seven GAMA-PBP study units discussed in this report, along with descriptions of data collection and analytical results from the first round of sampling of these study units can be found in published USGS Data-Series Reports referenced throughout this report. Only brief descriptions of the study units are presented here.

San Diego Drainages Study Unit

The San Diego Drainages study unit (figs. 1, 2) covers approximately 3,900 square miles (mi^2) in San Diego, Orange, and Riverside Counties and is located in the San Diego Drainages hydrogeologic province (Belitz and others, 2003). The San Diego Drainages study unit consists of four study areas (fig. 2). The Temecula Valley study area lies within the boundaries of the Temecula Valley Groundwater Basin as defined by the CDWR (California Department of Water Resources, 2004a). The Warner Valley study area lies within the boundaries of the Warner Valley Groundwater Basin as defined by the CDWR (California Department of Water Resources, 2004b). The Alluvial Basins study area consists of the 12 CDWR-defined alluvial basins within the San Diego Drainages study unit that have at least one public supply well (California Department of Water Resources, 2003; 2004c, d). The Hard Rock study area consists of areas within the San Diego Drainages hydrogeologic province that are outside of CDWR-defined groundwater basins and within a radius of 3 kilometers (km) of a CDPH well. Descriptions of the hydrogeologic settings of the San Diego Drainages study unit, its groundwater basins, and its individual study areas are given by Wright and others (2005).

North San Francisco Bay Study Unit

The North San Francisco Bay study unit (figs. 1, 3) covers approximately 1,000 mi^2, mostly in Napa, Sonoma, and Marin Counties, and lies within the Northern Coast Ranges hydrogeologic province (Belitz and others, 2003). For the purpose of this study, the seven CDWR-defined groundwater basins that lie within the North San Francisco Bay study unit were grouped into three study areas (fig. 3). The Valley and Plains study area includes most of the alluvial-filled basins in the study unit. The Volcanic Highlands study area includes the hilly to mountainous areas of Pliocene volcanic deposits. The Wilson Grove Formation Highlands study area is characterized by gently rolling hills, broad valleys, and rounded hilltops and lies closer to the coast than the other two study areas. The hydrogeologic settings of the North San Francisco Bay study unit, its groundwater basins, and its individual study areas are described by Kulongoski and others (2006).

Northern San Joaquin Basin Study Unit

The Northern San Joaquin Basin study unit (figs. 1, 4) covers approximately 2,079 mi^2 in San Joaquin, Alameda, Amador, Calaveras, Contra Costa, Sacramento, and Stanislaus Counties, and lies within the Central Valley hydrogeologic province (Belitz and others, 2003). The study unit consists of three CDWR-defined groundwater subbasins located within the San Joaquin Valley Groundwater Basin: the Eastern San Joaquin subbasin (California Department of Water Resources, 2006a), the Tracy subbasin (California Department of Water Resources, 2006b), and the Cosumnes subbasin (California Department of Water Resources, 2006c). For the purpose of this study, the Northern San Joaquin Basin study unit was divided into four study areas (fig. 4). The Tracy Basin study area lies within the boundaries of the Tracy subbasin. The Cosumnes Basin study area covers about half of the area within the boundaries of the Cosumnes subbasin. The Eastern San Joaquin Basin study area covers about two-thirds of the Eastern San Joaquin subbasin. The Uplands Basin study area is defined as those portions of the Eastern San Joaquin and Cosumnes subbasins that represent the exposed areal extent of semiconsolidated deposits of Pliocene and Pleistocene age west of the consolidated bedrock of the Sierra Nevada Mountains. The hydrogeologic settings of the Northern San Joaquin Basin study unit, its groundwater basin and subbasins, and its individual study areas are described by Bennett and others (2006).

Southern Sacramento Valley Study Unit

The Southern Sacramento Valley study unit (figs. 1, 5) covers approximately 2,100 mi^2 in Placer, Sacramento, Solano, Sutter, and Yolo Counties. It lies mostly within the Central Valley hydrogeologic province, and partly within the Northern Coast Ranges hydrogeologic province (Belitz and others, 2003). The study unit consists of the CDWR-defined Suisun-Fairfield Groundwater Basin (California Department of Water Resources, 2003) and four CDWR-defined groundwater subbasins located within the Sacramento Valley Groundwater Basin: the North American subbasin (California Department of Water Resources, 2006d), the South American subbasin (California Department of Water Resources, 2004e), the Solano subbasin (California Department of Water Resources, 2004f), and the Yolo subbasin (California Department of Water Resources, 2004g). For the purpose of this study, the Southern Sacramento Valley study unit was divided into six study areas (fig. 5). The North American study area covers about two-thirds of the North American subbasin. The South American study area covers about three-quarters of the South American subbasin. The Solano study area lies within the boundaries of the Solano subbasin. The Suisun-Fairfield study area lies within the boundaries of the Suisun-Fairfield Groundwater Basin. The Yolo study area lies within the boundaries of the Yolo subbasin. The Uplands Basin study area is defined as those portions of the North American and South American subbasins that represent the exposed areal extent of semiconsolidated deposits of Pliocene and Pleistocene age west of the consolidated bedrock of the Sierra Nevada Mountains. The hydrogeologic settings of the Southern Sacramento Valley study unit, its groundwater basins and subbasins, and its individual study areas are described by Dawson and others (2008).

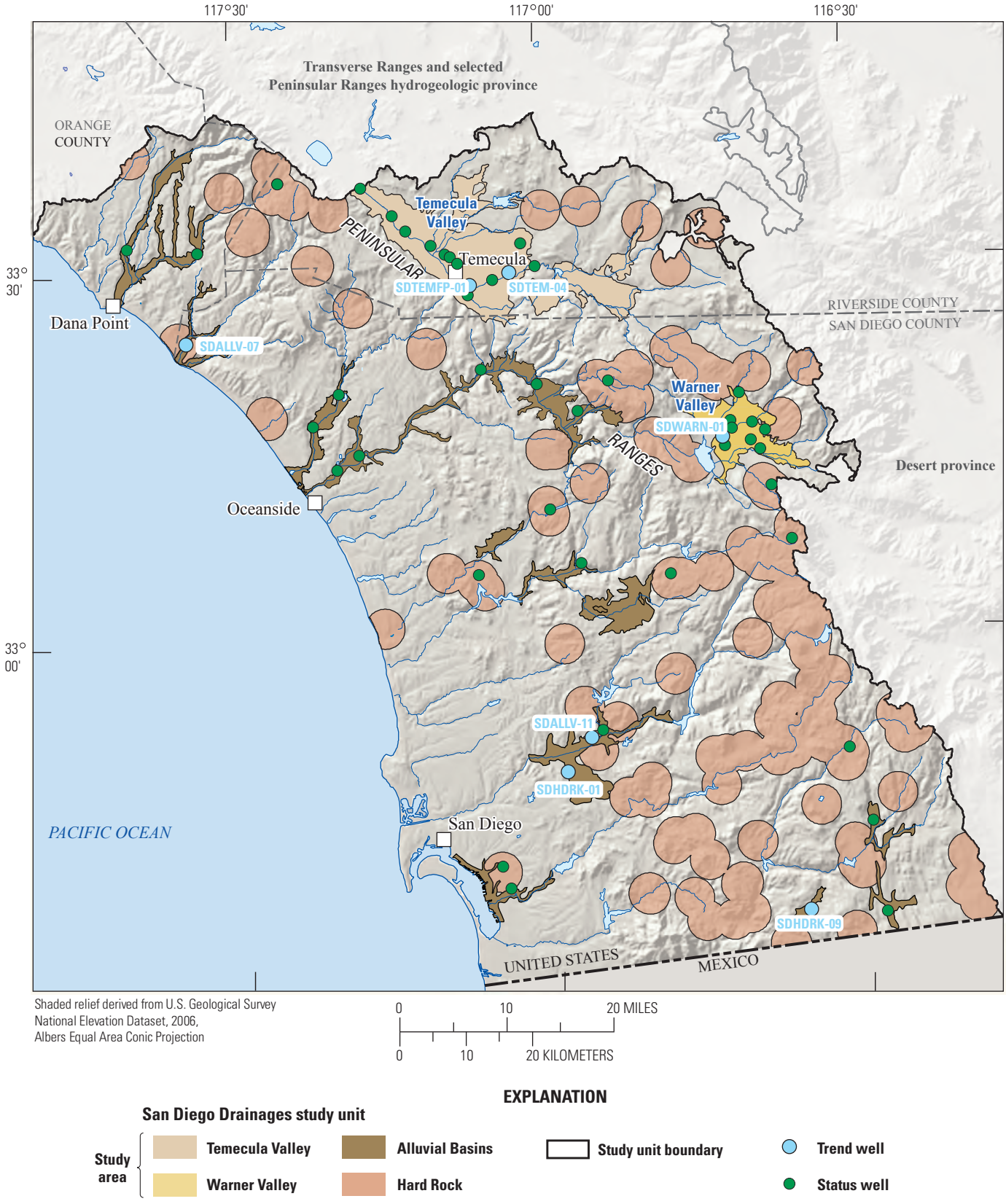

Figure 2. San Diego Drainages Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

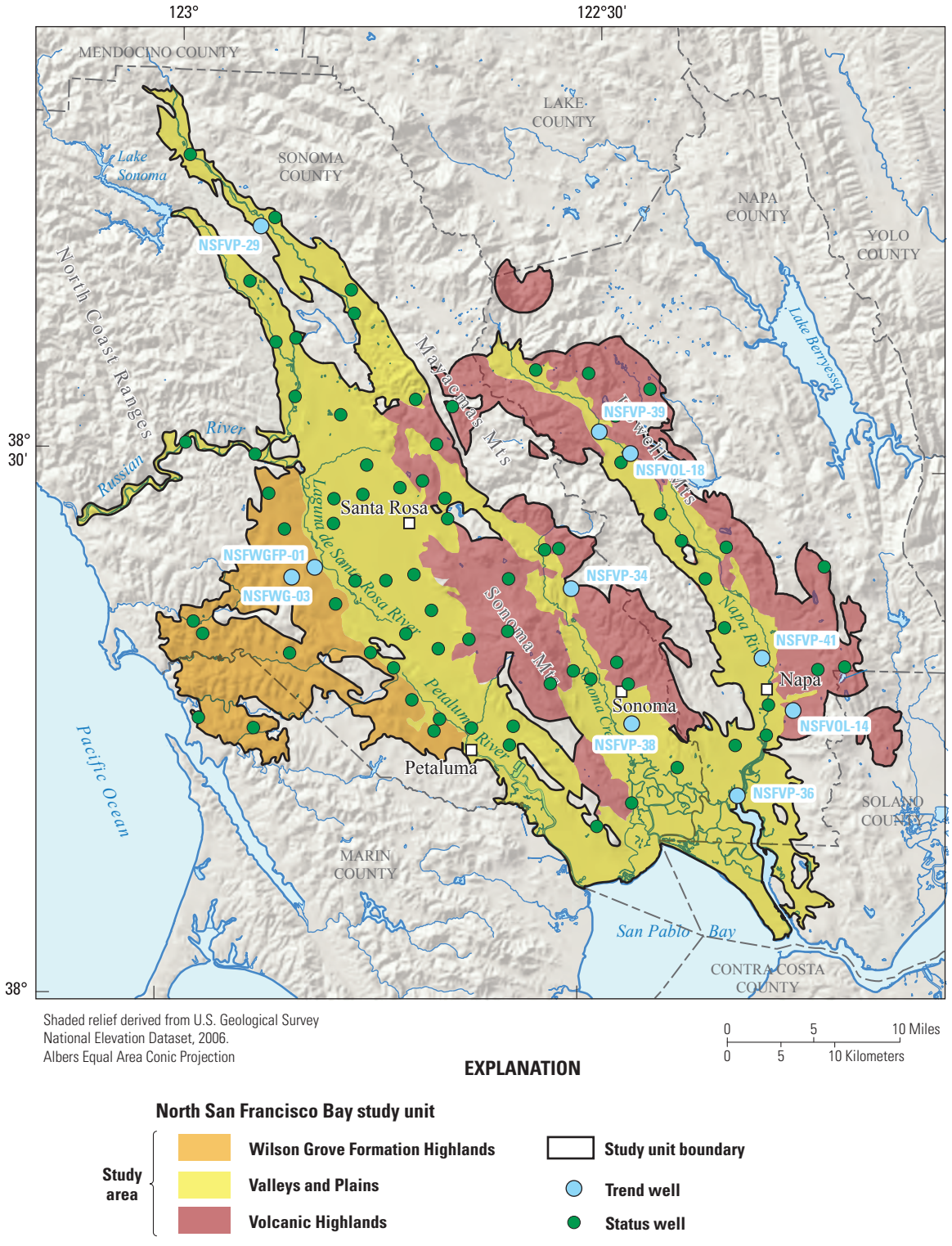

Figure 3. North San Francisco Bay Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

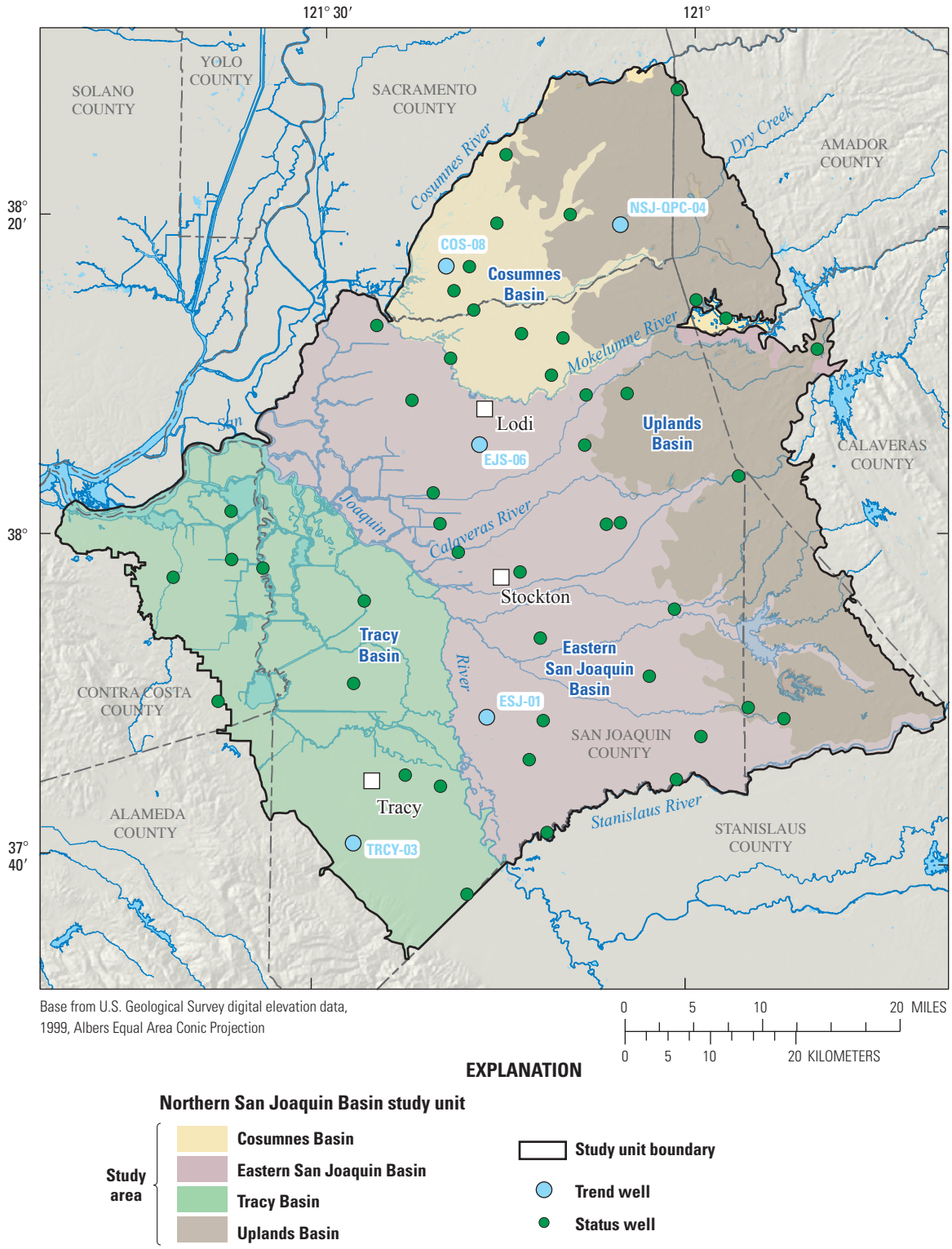

Figure 4. Northern San Joaquin Basin Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

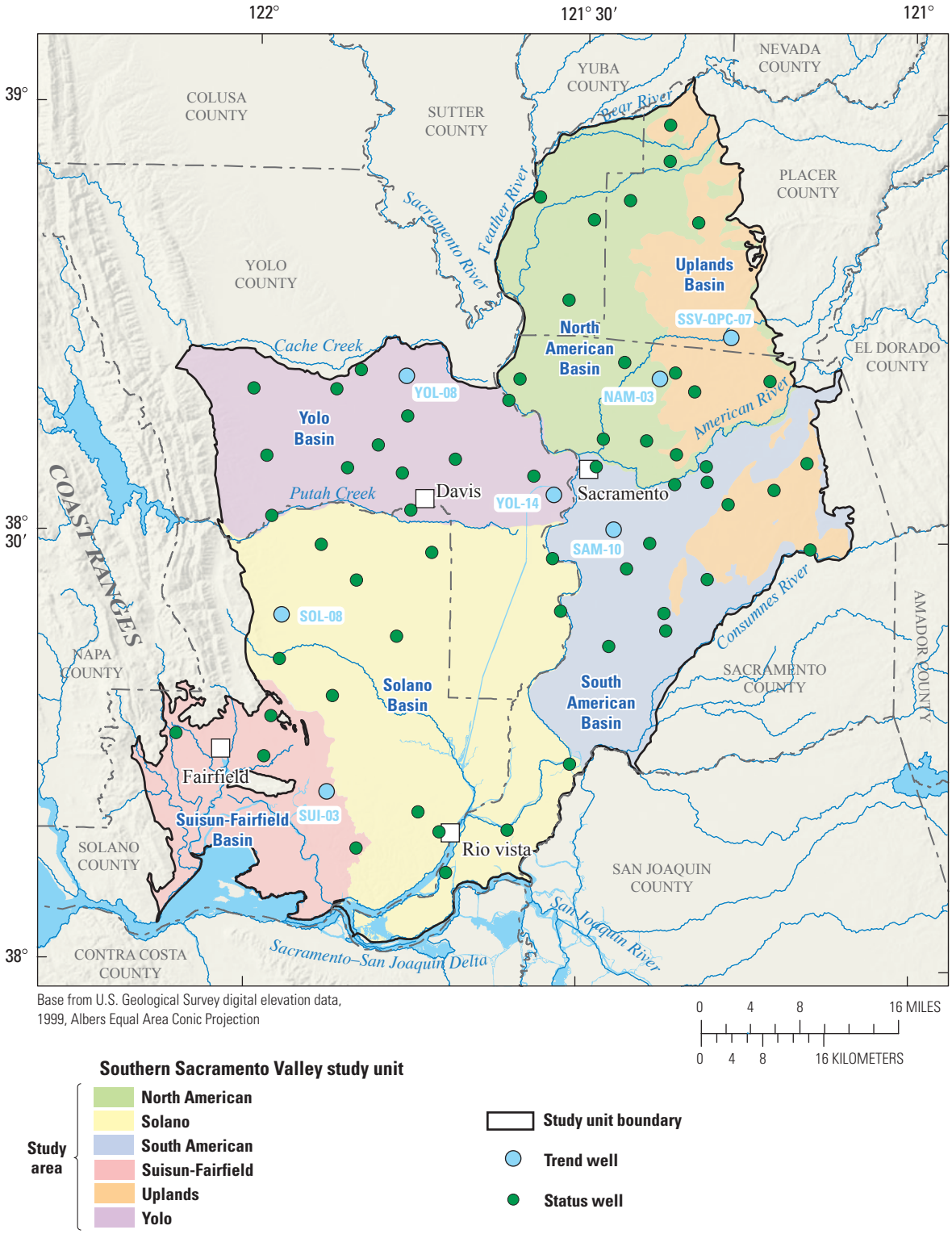

Figure 5. Southern Sacramento Valley Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

San Fernando–San Gabriel Study Unit

The San Fernando–San Gabriel study unit (figs. 1, 6) covers approximately 500 mi^2 in Los Angeles County and lies within the Transverse Range and selected Peninsular Ranges hydrogeologic province (Belitz and others, 2003). The study unit consists of three CDWR-defined groundwater basins: the San Fernando Valley Groundwater Basin (California Department of Water Resources, 2004h), the San Gabriel Valley Groundwater Basin (California Department of Water Resources, 2004i), and the Raymond Groundwater Basin (California Department of Water Resources, 2004j). For the purpose of this study, the San Fernando–San Gabriel study unit was divided into two study areas (fig. 6). The San Fernando study area lies within the boundaries of the San Fernando Valley Groundwater Basin, and the San Gabriel study area combines the boundaries of the San Gabriel Valley and Raymond Groundwater Basins. The hydrogeologic settings of the San Fernando–San Gabriel study unit, its groundwater basins, and its individual study areas are described by Land and Belitz (2008).

Monterey Bay and Salinas Valley Basins Study Unit

The Monterey Bay and Salinas Valley Basins study unit (figs. 1, 7) covers approximately 1,000 mi^2 in Monterey, Santa Cruz, and San Luis Obispo Counties and lies within the Southern Coast Ranges hydrogeologic province (Belitz and others, 2003). The study unit consists of eight CDWR-defined groundwater basins. For the purpose of this study, the Monterey Bay and Salinas Valley Basins study unit was divided into four study areas (fig. 7).

The Santa Cruz study area combines five CDWR-defined groundwater basins: the Felton Area Groundwater Basin (California Department of Water Resources, 2004k), the Scotts Valley Groundwater Basin (California Department of Water Resources, 2006e), the Santa Cruz Purisima Formation Highlands Groundwater Basin (California Department of Water Resources, 2004l), the West Santa Cruz Terrace Groundwater Basin (California Department of Water Resources, 2004m), and the Soquel Valley Groundwater Basin (California Department of Water Resources, 2004n).

The Monterey Bay study area consists of the Carmel Valley Groundwater Basin (California Department of Water Resources, 2004o), the Pajaro Valley Groundwater Basin (California Department of Water Resources, 2006f), and five subbasins of the Salinas Valley Groundwater Basin: the Corral de Tierra Area subbasin (California Department of Water Resources, 2004p), the Langley Area subbasin (California Department of Water Resources, 2004q), the Seaside Area subbasin (California Department of Water Resources, 2004r), the Eastside Aquifer subbasin (California Department of Water Resources, 2004s), and the 180/400-Foot Aquifer subbasin (California Department of Water Resources, 2004t).

The Salinas Valley study area consists of two more subbasins of the Salinas Valley Groundwater Basin: the Upper Valley Aquifer subbasin (California Department of Water Resources, 2004u) and the Forebay Aquifer subbasin (California Department of Water Resources, 2004v).

Finally, the Paso Robles study area consists of the low-lying alluvium-fill portions of the Paso Robles Subbasin (California Department of Water Resources, 2004w) of the Salinas Valley Groundwater Basin. The hydrogeologic settings of the Monterey Bay and Salinas Valley Basins study unit, its groundwater basins and subbasins, and its individual study areas are described by Kulongoski and Belitz (2007).

Southeast San Joaquin Valley Study Unit

The Southeast San Joaquin Valley study unit (figs. 1, 8) covers approximately 3,780 mi^2 in Fresno, Kings, and Tulare Counties and lies within the Central Valley hydrogeologic province (Belitz and others, 2003). The study unit consists of four CDWR-defined subbasins of the CDWR-defined San Joaquin Valley Groundwater Basin: the Kings subbasin, the Kaweah subbasin, the Tule subbasin, and the Tulare Lake subbasin (California Department of Water Resources, 2006g, h, i, and j, respectively). For the purpose of this study, the Southeast San Joaquin Valley study unit was divided into four study areas corresponding with the names and boundaries of the four subbasins (fig. 8). The hydrogeologic settings of the Southeast San Joaquin study unit, its groundwater subbasins, and corresponding study areas are described by Burton and Belitz (2008).

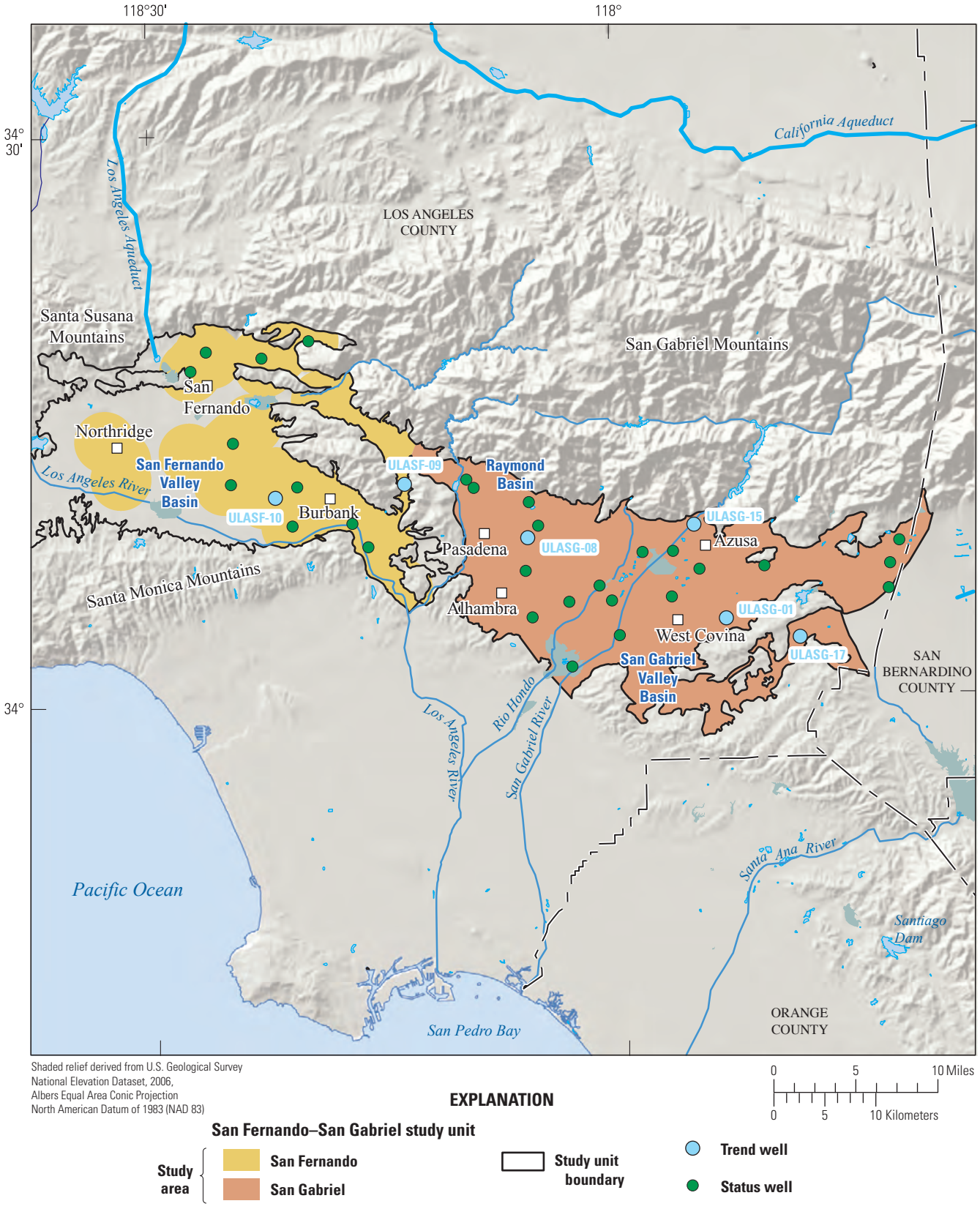

Figure 6. San Fernando–San Gabriel Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

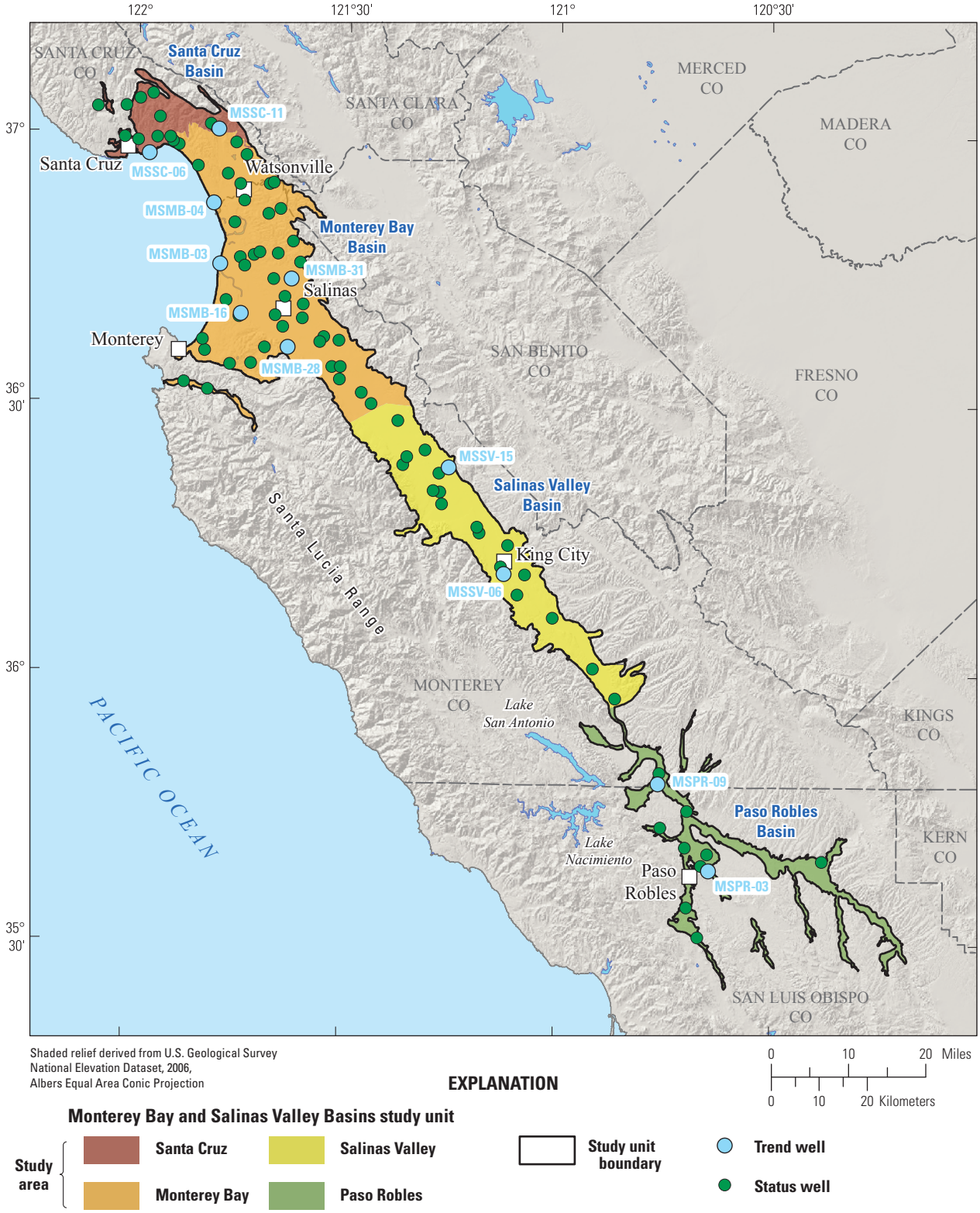

Figure 7. Monterey Bay and Salinas Valley Basins Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

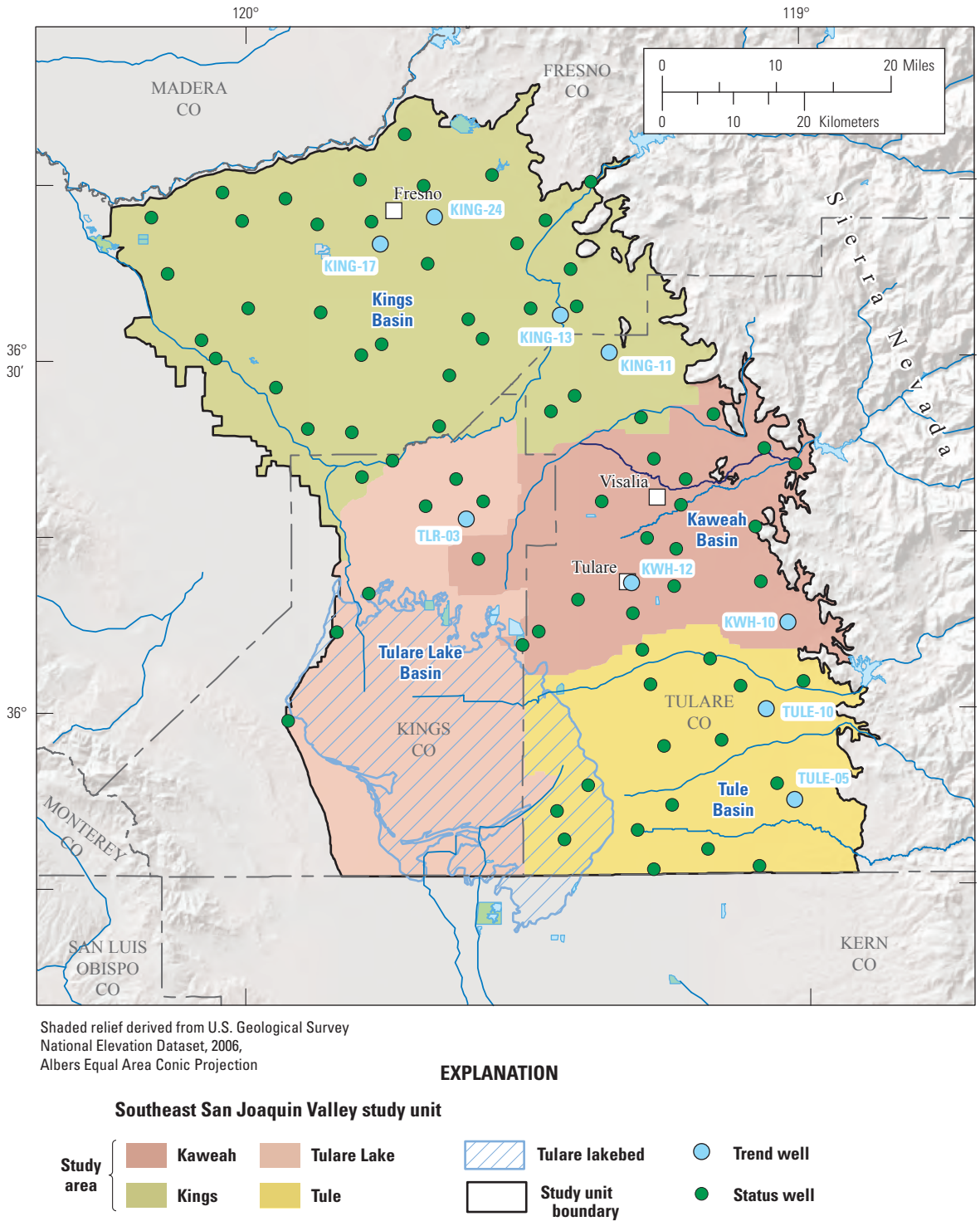

Figure 8. Southeast San Joaquin Valley Groundwater Ambient Monitoring and Assessment (GAMA) study unit with locations of study areas, status wells, and trend wells.

Methods

Methods used for the GAMA-PBP were selected to achieve the following objectives: (1) collect groundwater samples that are statistically representative of the primary aquifer system in each study unit; (2) collect samples in a consistent manner; (3) analyze samples by using proven and reliable laboratory methods; (4) assure the quality of the groundwater data; and (5) maintain data securely and with relevant documentation.

The initial sampling was designed to provide a spatially unbiased assessment of the quality of raw groundwater used for public water supplies within the seven study units. Each study area was divided into equal-area grid cells. A total of 570 grid cells were defined in the 27 study areas making up the 7 study units, and the number of grid cells per study area ranged from 10 cells to 60 cells. The CDPH wells within each cell were assigned random ranks, and the highest ranked well that met basic sampling criteria and for which permission to be sampled could be obtained was sampled. For some cells having no available CDPH wells, an irrigation or a domestic well having a perforation interval similar to that of CDPH wells in the area was sampled. One well was sampled in each of 462 grid cells; the remaining cells contained no wells that were appropriate for sampling and accessible. Wells selected to be sampled in this manner are referred to as grid wells, or status wells, because they are sampled to evaluate the status of groundwater quality in the study unit. In this report, they are referred to as status wells.

Fifty-five status wells were selected for resampling as part of trends analysis. These wells are referred to as trend wells and are a subset of status wells. The basic method for selecting trend wells was to randomly rank the grid wells in each study area and then sample the highest ranked wells. At least 10 percent of the status wells in each study area were resampled (trend wells). Methods for the selection of trend wells evolved during trend sampling of the first seven GAMA-PBP study units. After the first few study units, information on well depth and well construction was required in order for a well to be selected as a trend well, and additional criteria were used to ensure an approximately even spatial distribution among the trend wells. Table 1 lists the 55 trend wells by study unit and provides the GAMA alphanumeric identification number, along with the paired sampling dates, land-surface altitude, and construction information (when available) for each well. The wells are identified by the GAMA identification numbers assigned when they were first sampled by the GAMA-PBP.

Fifty-eight wells were sampled in the San Diego Drainages study unit from May through July 2004 (Wright and others, 2005). Fifty-three of these wells were status wells. The other five wells were sampled as part of a flow-path study in the Temecula Valley study area (SDTEMFP-01 through SDTEMFP-05) and are considered to be "understanding wells." After the publication of Wright and others (2005), six additional grid wells were re-classified as "understanding wells" (Wright and Belitz, 2011), including SDHDRK-01 (presently known as SDHRKU-01) which had been selected and sampled as a trend well. Resampling of the San Diego Drainages study unit occurred in September 2007. Seven trend wells were sampled from the four study areas in this study unit (table 1): two each from the Alluvial Basins, Hard Rock, and Temecula Valley study areas, and one from the Warner Valley study area (fig. 2). One of the trend wells selected from the Temecula Valley study area (SDTEMFP-01) was one of a series of wells that were sampled to evaluate changes in groundwater quality along a flow path (understanding wells).

Ninety-seven wells were sampled in the North San Francisco Bay study unit from August through November 2004 (Kulongoski and others, 2006). Eighty-four of these wells were status wells (the remaining 13 wells were understanding wells). Resampling of the North San Francisco Bay study unit took place during August and November 2007. Ten trend wells were sampled from the three study areas in this study unit (table 1): six trend wells from the Valley and Plains study area, two from the Volcanic Highlands study area, and two from the Wilson Grove Formation Highlands study area (fig. 3). One of the trend wells selected from the Wilson Grove Formation Highlands study area (NSFWGFP-01) was one of a series of wells along a flow path that was sampled to evaluate spatial changes in groundwater quality.

Sixty-four wells were sampled in the Northern San Joaquin Basin study unit from December 2004 through February 2005 (Bennett and others, 2006). Fifty-one of these wells were status wells. Resampling of the Northern San Joaquin Basin study unit took place from March 31 through April 3, 2008. Five trend wells were sampled from the four study areas in the study unit (table 1): one trend well each from the Cosumnes Basin, Tracy Basin, and Uplands Basin study areas, and two trend wells from the Eastern San Joaquin Basin study area (fig. 4).

Eighty-three wells were sampled in the Southern Sacramento Valley study unit from March through June 2005 (Dawson and others, 2008). Sixty-seven of these wells were status wells. Resampling of the Southern Sacramento Valley study unit occurred during April 2008. Seven trend wells were sampled from the six study areas in the study unit (table 1): one trend well each from the North American, South American, Solano, Suisun, and Uplands Basin study areas, and two trends wells from the Yolo study area (fig. 5).

Fifty-two wells were sampled in the San Fernando–San Gabriel study unit from May through July 2005 (Land and Belitz, 2008). Thirty-five of these wells were status wells. Resampling of the San Fernando–San Gabriel study unit occurred during June 2008. Six trend wells were sampled from the two study areas in the study unit (table 1): two trend wells from the San Fernando study area and four trend wells from the San Gabriel study area (fig. 6).

Ninety-seven wells were sampled in the Monterey Bay and Salinas Valley Basins study unit from July through September 2005 (Kulongoski and Belitz, 2007). Ninety-one of these wells were status wells. Resampling of the Monterey

Bay and Salinas Valley Basins study unit took place in two distinct periods during August and November 2008. Eleven trend wells were sampled from the four study areas in the study unit (table 1): five trend wells from the Monterey Bay study area and two trend wells each from the Santa Cruz, Paso Robles, and Salinas Valley study areas (fig. 7).

Ninety-nine wells were sampled in the Southeast San Joaquin Valley study unit from October through December 2005 (Burton and Belitz, 2008). Eighty-three of these wells were status wells. Resampling of the Southeast San Joaquin Valley study unit took place in November 2008. Nine trend wells were sampled from the four study areas in the study unit (table 1): four trend wells from the Kings study area, one trend well from the Tulare Lake study area, and two trend wells each from the Kaweah and Tule study areas (fig. 8).

Well locations were verified by using a global positioning system (GPS), 1:24,000-scale USGS topographic maps, well information in USGS and CDPH databases, and information provided by well owners, drillers' logs, and (or) other sources of construction information. Well location and information were recorded in the field by hand on field sheets and electronically on field laptop computers using the Alternate Place Entry (APE) program designed by the USGS. All information was verified and then uploaded into the USGS National Water Information System (NWIS) database. Well owner, well use, and well location are not published.

Sample Collection and Analysis

Samples were collected by following modified USGS National Field Manual (NFM) (U.S. Geological Survey, variously dated) and modified USGS National Water-Quality Assessment (NAWQA) Program (Koterba and others, 1995) sampling protocols. These sampling protocols were followed so that samples representative of groundwater in the aquifer were collected at each site and so that the samples were collected and handled in ways that minimized the potential for contamination. Following these protocols also allows for comparison of data collected by GAMA-PBP throughout California with other USGS projects in California and the Nation. The methods used for sample collection and analysis are described in the appendix section titled "Sample Collection and Analysis."

Various strategies were used to select constituents for resampling for trends in these seven study units. Trend wells were sampled for between 135 and 262 distinct constituents during the 2007–2008 resampling (table 2). Tables 3A–I list the constituents in each constituent class by name and other identifiers, their primary use or source (when relevant), and their reporting and benchmark levels. Tables 3A–D and H also indicate whether or not each constituent was detected during sampling or resampling of these study units and, if so, in which of the study units they were detected. Trend samples were analyzed for 85 VOCs (table 3A), between 63 and 81 pesticides and pesticide degradates (table 3C), perchlorate (table 3H), stable isotopes of hydrogen and oxygen in water (table 3I), and dissolved tritium. Two trend samples collected from wells in the San Diego Drainages study unit (SDTEM-04 and SDWARN-01) were not resampled for pesticides.

Additional analyses were added to this basic set of analyses for selected trend wells in each study unit. Only the additional constituents that were sampled during the 2004–2005 initial sampling and also during the 2007–2008 resampling are reported here.

The additional analyses for selected wells in all seven study units included nutrients (table 3E) and major ions and trace elements (table 3F). Other analyses were added in only one study unit or a few study units. All study units except for the San Diego Drainages and North San Francisco Bay study units added low-level analysis of 1,2,3-trichloropropane (1,2,3-TCP) performed by Weck Laboratories, Inc. (hereinafter referred to as Weck) (table 3H). Samples for the San Fernando–San Gabriel and the Monterey Bay and Salinas Valley Basins study units were analyzed for *N*-nitrosodimethylamine (NDMA) by Weck (table 3H). The Northern San Joaquin Basin and Southeast San Joaquin Valley study units were sampled for 1,2-dibromo-3-chloropropane (DBCP) and 1,2-dibromoethane (EDB) (table 3B). The North San Francisco Bay, Southern Sacramento Valley, and San Fernando–San Gabriel study units were sampled for polar pesticide compounds (table 3D) in addition to the pesticide compounds that were part of the basic set of analyses (table 3C). The North San Francisco Bay and San Fernando–San Gabriel study units also were sampled for oxidized and reduced species of arsenic and iron (table 3G). The San Fernando–San Gabriel study unit also was sampled for 14 pharmaceutical compounds, but these results are discussed only briefly and are not included in the tables. Finally, all study units except the San Fernando–San Gabriel and the Southeast San Joaquin Valley study units were sampled for carbon isotopes in selected wells (table 3I).

Two methods were used to analyze for pesticides and pesticide degradates in this study. The first method included a basic set of 63 constituents (Schedule 2003) or an expanded number of compounds (70 for Schedule 2032 or 81 for Schedule 2033), depending on the specific laboratory schedule requested when the sample was submitted to the NWQL (table 3C). NWQL Schedules 2003, 2032, and 2033 all use the same analytical method (Zaugg and others, 1995; Sandstrom and others, 2001). The second analytical method for pesticide compounds (NWQL Schedule 2060) included 59 polar pesticide compounds (table 3D) and caffeine. Five of the pesticide compounds on Schedule 2060 were in common with all of the schedules (2003, 2032, or 2033) of the first method. A sixth compound included on Schedule 2060, carbofuran, was also on the two expanded schedules of the first method (Schedules 2032 and 2033), but was not on Schedule 2003.

The samples from all but two of the study units included in this study were analyzed by using basic Schedule 2003. The samples from the Southern Sacramento Valley study unit were analyzed by using Schedule 2032, and the samples from the Southeast San Joaquin Valley study unit were analyzed by using Schedule 2033. All samples discussed in this report were analyzed using one of the schedules employing this method except for one sample from the Southern Sacramento Valley study unit during initial sampling in 2005 (SUI-03) and one sample from the San Diego Drainages study unit (SDTEM-04) during resampling in 2007, which were not analyzed for pesticide compounds. Schedule 2060 was used for 19 samples during initial sampling in 2004–2005 and for 23 samples during resampling in 2007–2008; the use of this analytical method varied widely by study unit (tables 2, 6A–B). For all four schedules, the NWQL reports concentrations below LT-MDLs; these concentrations are reported in tables 6A–B, but are not considered detections for the purpose of calculating detection frequencies.

Duplicate Analyses for Selected Constituents

Fourteen constituents were measured two different ways for some samples for this study. Eight of these constituents were measured by duplicate methods for at least some samples at the USGS National Water Quality Laboratory (NWQL). Atrazine, deethylatrazine, carbaryl, carbofuran, metalaxyl, and tebuthiuron were analyzed by Laboratory Schedules 2003/2032/2033 and 2060; and DBCP and EDB were analyzed by Laboratory Schedules 2020 and 1306. In addition, for some samples, 1,2,3-trichloropropane, arsenic, and iron concentrations were measured by the NWQL, as well as by a laboratory other than the NWQL. Perchlorate was measured by two different outside laboratories—Montgomery Watson Harza Laboratory (hereinafter referred to as MWH) and Weck—for a few samples collected in the San Diego Drainages and North San Francisco Bay study units. The MWH analyses were performed on unfiltered samples, while the Weck analyses were performed on filtered samples. Finally, water-quality indicator measurements of pH and specific conductance were performed onsite by USGS field personnel. The NWQL also measured pH and specific conductance, as part of all samples analyzed for Laboratory Schedule 1948. During initial sampling, a few samples were measured for the additional water-quality indicator alkalinity both in the field and by NWQL. However during resampling, alkalinity was only measured by the NWQL as part of Laboratory Schedule 1948, and therefore is not counted here among constituents receiving duplicate analysis.

Quality-Assurance Procedures

QA procedures used for this study followed the protocols described in the NFM (U.S. Geological Survey, variously dated) and used by the NAWQA Program (Koterba and others, 1995). The QA plan followed by the NWQL, the primary laboratory used to analyze samples for this study, is described in Pirkey and Glodt (1998) and in Maloney (2005).

Quality-Control Samples

QC samples collected during resampling of the first seven GAMA study units included blanks, replicates, and matrix spikes. QC samples were collected at more than 20 percent of the trend wells (13 of the 55 trend wells). During the trend resampling of some study units, additional wells were sampled within the seven study units for reasons other than trend evaluation (wells not included in table 1). Nine additional QC samples were collected from these additional wells. The results from these additional QC samples were used, along with the results from analysis of QC samples collected at the trend wells, to evaluate potential contamination as well as bias and variability of the data that may have resulted from sample collection, processing, storage, transportation, and laboratory analysis. Surrogate spikes were an additional type of QC, and these were added to all of the groundwater samples collected for analyses of organic compounds. QC results are described in the appendix section titled “Quality-Control Results” and are summarized in appendix tables A3–A6.

On the basis of detections in laboratory and field blanks collected during the seven GAMA-PBP study units covered in this report and subsequent study units, the laboratory reporting levels (LRLs) for 6 VOCs (tables 3A, 5) and 11 inorganic constituents (tables 3F, 10) were adjusted in this report using methods described by Fram and others (2012) and Olsen and others (2010) and are greater than those provided by the NWQL. The GAMA Program refers to these adjusted reporting levels as “study reporting levels” (SRLs).

Comparison Benchmarks

Concentrations of constituents detected in groundwater samples were compared with USEPA and CDPH regulatory and non-regulatory drinking-water health-based benchmarks and benchmarks established for aesthetic purposes (California Department of Public Health, 2008a, b; U.S. Environmental Protection Agency, 2006, 2009). The chemical data presented in this report are meant to characterize the quality of the untreated groundwater in the trend wells and are not intended to represent the treated drinking water delivered to consumers by water purveyors. The chemical composition of treated drinking water may differ from untreated groundwater because treated drinking water may be subjected to disinfection, filtration, mixing with other waters, and (or) exposure to the atmosphere prior to its delivery to consumers. Comparisons of untreated groundwater to benchmarks are for illustrative purposes only and are not indicative of compliance or non-compliance with drinking-water regulations. The following benchmarks were used for comparisons:

- **MCL—Maximum Contaminant Level**. Legally enforceable standards that apply to public-water systems and are designed to protect public health by limiting the levels of contaminants in drinking water. MCLs established by the USEPA are the minimum standards with which States are required to comply, and individual States may choose to set more stringent standards. CDPH has established MCLs for additional constituents not regulated by the USEPA, as well as lowered the benchmark concentration for a number of constituents with MCLs established by the USEPA. In this report, a benchmark set by the USEPA and adopted by the CDPH is labeled "MCL-US," and one set by CDPH that is more stringent than the MCL-US is labeled "MCL-CA." Well owners are notified when constituents are detected at concentrations greater than an MCL-US or an MCL-CA benchmark in samples collected for the GAMA-PBP, but these detections do not constitute violations of CDPH regulations.

- **AL—Action Level.** Legally enforceable standards that apply to public-water systems and are designed to protect public health by limiting the levels of copper and lead in drinking water. Detections of copper or lead greater than the action-level benchmarks trigger requirements for mandatory water treatment to reduce the corrosiveness of water to water pipes. The action levels established by the USEPA and CDPH are the same; thus, the benchmarks are labeled "AL-US" in this report.

- **SMCL—Secondary Maximum Contaminant Level.** Non-enforceable standards applied to constituents that affect the aesthetic qualities of drinking water, such as taste, odor, and color, or the technical qualities of drinking water, such as scaling and staining. Both the USEPA and CDPH define SMCLs, but unlike MCLs, SMCLs established by the CDPH are not required to be at least as stringent as those established by the USEPA. SMCLs established by the CDPH are used in this report (SMCL-CA) for all constituents that have SMCL-CA values. The SMCL-US is used for pH because no SMCL-CA has been defined.

- **NL—Notification Level.** Health-based notification levels established by CDPH (NL-CA) for some of the constituents in drinking water that lack MCLs. If a constituent is detected at concentrations greater than its NL-CA, California State law requires timely notification of local governing bodies and recommends consumer notification.

- **HAL—Lifetime Health Advisory Level.** The maximum concentration of a constituent at which its presence in drinking water is not expected to cause any adverse carcinogenic effects for a lifetime of exposure. HALs are established by the USEPA (HAL-US) and are calculated assuming consumption of 2 liters (L) (2.1 quarts) of water per day over a 70-year lifetime by a 70-kilogram (154-pound) adult and that 20 percent of a person's exposure comes from drinking water.

- **RSD5—Risk-Specific Dose.** The concentration of a constituent in drinking water corresponding to an excess estimated lifetime cancer risk of 1 in 100,000. RSD5 is an acronym for risk-specific dose at 10^{-5}. RSD5s are calculated by dividing the 10^{-4} cancer risk concentration established by the USEPA by 10 (RSD5-US).

For constituents with regulatory benchmarks (MCLs or ALs), detections in groundwater samples were compared to the MCL-US, MCL-CA, or AL-US. Constituents with SMCLs were compared with the SMCL-CA. For chloride, sulfate, specific conductance, and TDS, the CDPH defines a "recommended" and an "upper" SMCL-CA; detections of these constituents in groundwater samples were compared with both levels. The SMCL-USs for these constituents correspond to the recommended SMCL-CAs. Detected concentrations of constituents without an MCL or SMCL were compared to the NL-CA. For constituents without an MCL, SMCL, or NL-CA, detected concentrations were compared with the HAL-US. For constituents without an MCL, SMCL, NL-CA, or HAL-US, detected concentrations were compared with the RSD5-US. Note that using this hierarchy to select the comparison benchmark for a constituent with more than one type of established benchmark will not necessarily result in selection of the benchmark with the lowest concentration. For example, for zinc the SMCL-CA is 5,000 micrograms per liter (µg/L) and the HAL-US is 2,000 µg/L, but the comparison benchmark selected by this hierarchy is the SMCL-CA. The comparison benchmarks used in this report are listed in tables 3A–I for all constituents and in tables 4–12 for constituents detected in groundwater samples collected for this trends study. Not all constituents analyzed have established benchmarks available. Detections of constituents at concentrations greater than the selected comparison benchmark are marked with asterisk (*) in tables 4, 5, and 7–11.

Water-Quality Results

Results from analyses of groundwater samples from this study are presented in tables 4–12. During resampling of trend wells, 288 water-quality parameters were measured, including water-quality indicators measured onsite and at the NWQL. However, as noted earlier in "Duplicate Analyses for Selected Constituents," 14 of the constituents were analyzed for some samples by using two different methods. Therefore, although up to 288 water-quality measurements could have been made on each sample collected during resampling for trends, 274 of these measurements are unique water-quality constituents.

Samples collected during the initial sampling of the trend wells were analyzed for additional constituents. The results for constituents not analyzed during resampling are not presented in this report, with one exception. Alkalinity measurements during resampling were made only by the NWQL and not in the field. In contrast, most samples collected during initial sampling were not submitted for determination of alkalinity by the NWQL. Therefore, field-measured alkalinity results from initial sampling are presented for comparison with laboratory alkalinity results from resampling. Indirect estimates of carbonate and bicarbonate concentrations were calculated from the laboratory alkalinity and pH values using the advanced speciation method (http://or.water.usgs.gov/alk/methods.html) with $pK_1 = 6.35$, $pK_2 = 10.33$, and $pK_W = 14$.

Groundwater samples collected from the 55 trend wells during initial sampling in 2004–2005 were analyzed for between 90 and 279 of the total parameters possible (median 172) (table 2). Groundwater samples collected from these wells during resampling in 2007–2008 were analyzed for between 135 and 262 of the parameters (median 219) (table 2). One-hundred and seventy-eight of the constituents were undetected in all samples collected from trend wells during both sampling periods (tables 3A–I). Tables 4–12 present paired results of the samples collected from the 55 trend wells during the two sampling periods for constituents that were detected in at least one sample. Constituents listed in tables 3A–I that were not detected in any samples are not included in tables 4–12, with one exception. NDMA was not detected in any of the samples, but is included in table 7 because the decision to analyze for NDMA in samples from selected wells was often made independently from the other constituents of special interest, and its inclusion in table 7 allows the reader to easily determine which samples were analyzed for NDMA.

Table 4 lists water-quality indicators measured in the field and at the NWQL, and tables 5–12 present the results of groundwater analyses organized by compound classes:

- Organic constituents
  - Volatile organic compounds and gasoline components (table 5)
  - Pesticides and pesticide degradates (tables 6A, B)
- Constituents of special interest (table 7)
- Inorganic constituents
  - Nutrients (table 8)
  - Major and minor ions, silica, and total dissolved solids (table 9)
  - Trace elements (table 10)
  - Arsenic and iron species (table 11)
- Isotopic tracers (table 12)

Water-Quality Indicators

Measurements of dissolved oxygen, pH, specific conductance, alkalinity, and associated parameters (water temperature and bicarbonate and carbonate concentrations) are presented in table 4. Dissolved oxygen, alkalinity, bicarbonate, and carbonate concentrations are used as indicators of natural processes that affect water chemistry. The pH value indicates the acidity of the water. Specific conductance is the measure of electrical conductivity of the water and is proportional to the amount of dissolved solids in the water.

The specific conductance of all samples was measured in the field. Specific conductance was also measured for more than half of the samples by the NWQL as part of Schedule 1948 (table 4). In all cases where specific conductance was measured both in the field and by the laboratory, the field and laboratory measurements were comparable.

During resampling in 2007–2008, 12 wells had specific conductance values greater than the recommended SMCL-CA of 900 microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C), and all study units except the Southeast San Joaquin study unit had at least one well with specific conductance greater than this benchmark (table 4). In addition, two wells in the San Diego Drainages study unit and one well in the Southern Sacramento Valley study unit had specific conductance values greater than the upper SMCL-CA of 1,600 µS/cm at 25 °C. All wells that had specific conductance above the recommended SMCL-CA in 2007–2008 also had specific conductance greater than this recommended benchmark during initial sampling in 2004–2005. However, specific conductance in a well in the Southeast San Joaquin Valley study unit (TULE-05) that had been greater than the recommended SMCL-CA in 2005 was measured at less than this lower benchmark in 2008. Both wells in the San Diego Drainages study unit that had specific conductance values greater than the upper SMCL-CA in 2007 also had values greater than this upper benchmark in 2004. Specific conductance in the well in the Southern Sacramento Valley study unit that was greater than the upper SMCL-CA in 2008 (YOL-14) was between the lower and upper benchmarks in 2005.

The pH of all samples collected during 2007–2008 was measured in the field. The pH of most of these samples was also measured by the NWQL as part of Schedule 1948 (table 4). In contrast, pH was measured in the field and (or) laboratory for only 24 trend wells during the initial sampling in 2004–2005. With few exceptions, pH values were within the SMCL-US acceptable range (>6.5 and <8.5) during both sampling periods (table 4). In most cases where pH was measured in the field and by the laboratory, the field and laboratory measurements were comparable; however, field and laboratory measurements of pH differed substantially for three samples collected during the initial sampling in 2004–2005. For samples collected from a well in the Northern San Joaquin Basin study unit (TRCY-03) and from a well in the San Fernando–San Gabriel study unit (ULASG-08), it appears that the laboratory measurements of pH for the samples collected in 2005 from these wells are unusually low, based on other measurements of pH in samples from these wells. On the other hand, the field measurement of pH for a sample collected in 2005 from a well in the Southern Sacramento Valley study unit (YOL-14) seems suspiciously low when compared to the laboratory measurement of this sample and pH measurements for the sample collected from this well in 2008. In addition, the difference between the values for specific conductance measured in the field and in the laboratory was greater for this 2005 sample than for any other sample represented in this report. Therefore, field measurements may have been recorded for this sample before the well was sufficiently purged.

Organic Constituents

Organic constituents typically are chemicals that enter water through human activities. The two broad categories of organic constituents discussed in this report are volatile organic compounds and pesticides (including pesticide degradates). VOCs are present in paints, solvents, fuels, fuel additives, refrigerants, fumigants, and disinfected water, and are characterized by their tendency to evaporate. VOCs generally persist longer in groundwater than in surface water because groundwater is isolated from the atmosphere. Pesticides are chemicals used to control weeds, insects, fungi, and other pests in agricultural, urban, and suburban settings, and include herbicides, insecticides, and fungicides. Pesticide degradates are the product of the environmental transformations of the parent pesticide, and they can have similar properties to the parent pesticide (Andreu and Pico, 2004).

Volatile Organic Compounds

Of the 85 VOCs analyzed by NWQL Schedule 2020, 25 were detected in at least 1 groundwater sample from the trend wells during initial sampling or resampling. Two of these 25 detected VOCs—DBCP and 1,2,3-TCP—were analyzed, but not detected using Schedule 2020. They were only detected by alternative methods that had lower detection limits than did Schedule 2020 for these compounds (tables 3B, 3H, 5, 7). NWQL Schedule 1306 was used to analyze for low levels of DBCP in the Northern San Joaquin Basin and Southeast San Joaquin Valley study units during resampling in 2008. Low-level analyses for 1,2,3-TCP were performed on samples from all study units by MWH during initial sampling in 2004–2005 and by Weck during resampling in 2007–2008.

Nearly all VOC detections were less than health-based benchmarks, and most were less than one-tenth of the benchmarks. However, the solvents tetrachloroethene (PCE) and trichloroethene (TCE) were detected at concentrations greater than their respective MCLs in samples from two wells, and the fumigant DBCP and the gasoline oxygenate methyl *tert*-butyl ether (MTBE) were detected in samples from one well each at concentrations greater than their respective MCLs (table 5). Concentrations of PCE and TCE that were greater than the MCLs in the sample collected from a trend well in the San Diego Drainages study unit (SDHDRK-01) in 2007 were similar to the concentrations in the sample collected from this well in 2004. In contrast, the concentrations of PCE and TCE that were greater than the MCLs in a sample collected from a trend well in the San Fernando–San Gabriel study unit (ULASG-17) in 2008 were substantially greater than they had been in the sample collected from this well in 2004. The concentration of DBCP greater than the MCL-US in a trend well in the Southeast San Joaquin study unit (KING-24) in 2008 was similar to the concentration detected in this well in 2005. In contrast, the MTBE concentration greater than the MCL-CA in a trend well in the San Diego Drainages study unit (SDALLV-11) in 2004 was more than 10 times the concentration detected in this well in 2007.

Five VOCs were detected in more than 10 percent of the trend wells during both sampling periods. These were the trihalomethanes (byproducts of drinking-water disinfection) chloroform and bromodichlormethane, and the solvents PCE, TCE, and *cis*-1,2-dichloroethene. These five compounds are among the most commonly detected VOCs in groundwater nationally (Zogorski and others, 2006). Carbon tetrachloride, another VOC commonly detected in groundwater nationally (Zogorski and others, 2006), was detected in more than 10 percent of the trend wells during initial sampling in 2004–2005, but was detected in fewer than 10 percent of the trend wells during resampling in 2007–2008. The other 21 VOCs detected in trend well samples were detected in fewer than 10 percent of the wells during both sampling periods (table 5).

In addition to the 25 VOCs considered detected for the purposes of statistical summaries, 6 other VOCs (ethylbenzene, toluene, 1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, *m* + *p*-xylene, and *o*-xylene) were observed in at least 1 trend well at concentrations less than their long-term method detection limits (LT-MDLs) or SRLs (table 5) (see appendix section on Data Reporting). Such concentrations are not considered detections for the purposes of statistical summaries in this report because of the reduced confidence at such low levels. However, these concentrations less than the LT-MDLs or SRLs are reported in table 5 for completeness.

Pesticide Compounds

Of the 132 unique pesticides and pesticide degradates analyzed, 16 were detected in groundwater samples; all detections were at concentrations less than one-tenth of the health-based benchmarks (tables 6A–B). Half (8) of the pesticide compounds that were detected in trend wells were only detected in a single sample during either the initial sampling in 2004–2005 or the resampling in 2007–2008. Thirteen pesticide compounds were detected using Schedule 2003 (or one of its expanded versions—Schedules 2032 or 2033): atrazine, deethylatrazine, dacthal (DCPA), 3,4-dichloroaniline, 3,5-dichloroaniline, *S*-Ethyl depropylthio-carbamate (EPTC), fipronil, desulfinyl fipronil, fipronil sulfide, hexazinone, prometon, simazine, and tebuthiuron. Six pesticide compounds were detected using Schedule 2060: atrazine, deethylatrazine, deisopropylatrazine, diuron, sulfometuron methyl, and tebuthiuron. Three compounds analyzed in common by the two methods were detected by both: atrazine, deethylatrazine, and tebuthiuron (tables 6A–B). Although not a pesticide, caffeine was analyzed by Schedule 2060. Caffeine was detected in samples collected from three trend wells during initial sampling, but was not detected in any of the wells that were resampled using Schedule 2060.

The herbicides atrazine, simazine, and deethylatrazine (a degradate of atrazine) were detected in more than 10 percent of the trend-well samples during both sampling periods, although all three were detected more frequently during initial sampling in 2004–2005. These three compounds are among the most commonly detected pesticide compounds in groundwater nationally (Gilliom and others, 2006). Concentrations of the detected pesticide compounds were similar between the two sampling periods (no obvious trend) and, for compounds analyzed by both methods, the detected concentrations between the two methods were generally similar (tables 6A–B).

Constituents of Special Interest

Perchlorate, NDMA, and 1,2,3-TCP were defined as constituents of special interest at the beginning of the GAMA-PBP in 2004 because they began to be detected in groundwater in the late 1990s after advances in analytical methods resulted in lower detection limits and because they were considered to have the potential to adversely affect drinking-water quality in California (California Department of Public Health, 2008b). An MCL-CA benchmark was established for perchlorate in 2007. Analyses for these constituents were performed by MWH laboratory during initial sampling in 2004–2005 and by Weck and MWH during resampling in 2007–2008.

Perchlorate was analyzed for 36 trend wells during initial sampling in 2004–2005 and at all 55 trend wells during resampling in 2007–2008 (tables 3H, 7). Perchlorate analyses during initial sampling in 2004–2005 were performed by MWH on unfiltered samples, with a reporting level of 0.5 µg/L. Perchlorate analyses during resampling in 2007–2008 were performed by Weck on filtered samples, with a lower reporting level of 0.1 µg/L. Perchlorate was detected at concentrations greater than the MCL-CA of 6 µg/L in two trend wells, both in the San Fernando–San Gabriel study unit (ULASG-01 and ULASG-17) during resampling in 2008 (table 7). Samples from these two wells were not analyzed for perchlorate in 2005, and perchlorate was not detected in any other trend wells at concentrations greater than the MCL-CA during initial sampling in 2004–2005.

Samples collected from the San Fernando–San Gabriel and Monterey Bay and Salinas study units were analyzed for NDMA during resampling in 2007–2008. NDMA was analyzed for in selected wells during initial sampling in 2004–2005 in all seven study units included in this report. NDMA was not detected in any of the samples during either sampling period. NDMA data, which were collected from selected wells in different study units according to study unit design criteria, are included in table 7 to allow the reader to easily determine the wells with samples analyzed for NDMA.

Samples from both sampling periods were analyzed for 1,2,3-TCP as part of NWQL Schedule 2020 with a reporting limit ranging from 0.12 to 0.18 µg/L (table 3A), and it was not detected above the LT-MDL in any sample analyzed by this method (table 5). Because it is a constituent of special interest, a low-level analysis for 1,2,3-TCP, with a reporting level of 0.005 µg/L, was performed for selected samples of all study units included in this report except for the San Diego Drainages study unit (tables 2, 7). A total of 25 trend wells during the initial sampling, and 38 trend wells during resampling, were analyzed for low-level concentrations of 1,2,3-TCP. During initial sampling in 2004–2005, 1,2,3-TCP was detected in one well (KWH-12) in the Southeast San Joaquin Valley study unit (table 7). During resampling in 2007–2008, 1,2,3-TCP was detected in five wells in the Southern Sacramento Valley study unit and in two wells in the Southeast San Joaquin Valley study unit. One of the two Southeast San Joaquin Valley study unit wells in which 1,2,3-TCP was detected during resampling was KWH-12, the same well that had a detection of 1,2,3-TCP during initial sampling.

Inorganic Constituents

Unlike the organic constituents and the constituents of special interest, most of the inorganic constituents are naturally present in groundwater, although their concentrations may be influenced by human activities.

Nutrients

Nutrients (nitrogen and phosphorus) present in groundwater can affect biological activity in aquifers and in surface-water bodies that receive groundwater discharge. Inorganic nitrogen may be present in the form of ammonia, nitrite, or nitrate, depending on the oxidation-reduction state of the groundwater. Analyses for nutrients in GAMA-PBP samples include the determination of these forms of nitrogen, as well as total nitrogen (dissolved) and orthophosphate (the most biologically available form of phosphorus). Less than half (19 out of 55) of the trend wells were sampled for nutrients during initial sampling in 2004–2005 (table 8). During resampling in 2007–2008, 50 trend wells were sampled for nutrients. Samples from five trend wells (all from the San Diego Drainages study unit) were not analyzed for nutrients during resampling.

All concentrations of ammonia and nitrite measured in the trend wells were less than health-based benchmarks during both sampling periods (table 8). Results for these two nitrogen species were similar between the two sampling periods for the 18 trend wells sampled for both periods; most trend-well results for both periods were non-detections for ammonia and nitrite. In contrast, orthophosphate was at greater concentrations for most (16 of the 18) of these wells during resampling than during initial sampling. No Federal or State drinking-water standard, such as an MCL, exists for phosphorus and phosphorus compounds.

In most cases, sample concentrations of nitrite plus nitrate (as nitrogen) consist nearly entirely of nitrate, so this analysis will hereafter be referred to as nitrate. During resampling in 2007–2008, concentrations of nitrate greater than the MCL-US of 10 milligrams per liter (mg/L) were detected in four trend wells sampled in the San Fernando–San Gabriel study unit and in one trend well sampled in the Southeast San Joaquin Valley study unit (table 8). Two of the San Fernando–San Gabriel study unit wells (ULASF-09 and ULASG-08) with nitrate (as nitrogen) greater than 10 mg/L had been sampled for nutrients during initial sampling in 2005. Both wells had similar, but lower nitrate concentrations in 2005 than in 2008. Samples from the other three trend wells with nitrate (as nitrogen) concentrations greater than the MCL-US of 10 mg/L in 2008 were not analyzed for nutrients in 2005 (table 8).

Major and Minor Ions, TDS, and Trace Elements

Benchmarks for major and minor ions, total dissolved solids (TDS), and trace elements in water used for public supply are based on human-health concerns, aesthetic properties (such as taste, color, and odor), or technical properties (such as scaling and staining). The CDPH has established non-health-based secondary benchmarks (SMCL-CAs) based on aesthetic and technical properties for iron, manganese, silver, zinc, chloride, sulfate, and TDS. A health-based MCL-CA has been established for fluoride (a minor ion), and 17 of the 24 trace elements analyzed in this study have health-based benchmarks (MCL-US, MCL-CA, NL-US, AL-US, and HAL-US). Samples from 24 trend wells were analyzed for major and minor ions, silica, TDS, and trace elements during the initial sampling period in 2004–2005; samples from 45 trend wells were analyzed for these constituents during resampling in 2007–2008. The concentrations of the major and minor ions, silica, and TDS are given in table 9. The concentrations of the trace elements are given in table 10.

Chloride concentrations greater than the recommended SMCL-CA benchmark of 250 mg/L were detected in two trend wells during resampling in 2007–2008; one well each from the Southern Sacramento Valley (YOL-14) and the Monterey Bay and Salinas Valley Basins (MSMB-04) study units (table 9). Chloride in the Southern Sacramento Valley trend well was at a concentration similar to what it was during initial sampling in 2005. The chloride concentration in the Monterey Bay and Salinas Valley trend well was greater than the SMCL-CA in 2008, and less than the SMCL-CA in 2005. The chloride concentration in another trend well (NSFVP-36) from the North San Francisco Bay study unit was slightly greater than the benchmark in 2005 (rounded to 250 mg/L in table 9), but the sample from this well in 2007 was not analyzed for major ions.

Sulfate concentrations greater than the recommended SMCL-CA benchmark of 250 mg/L were detected in only one trend well in the Northern San Joaquin Basin study unit (TRCY-03) during resampling in 2008 (table 9). The sulfate concentration in this well during initial sampling in 2005 was just under the recommended SMCL-CA.

Fluoride is the only minor ion with an MCL-CA, and no trend wells had concentrations greater than the MCL-CA during either sampling period.

TDS concentrations greater than the recommended SMCL-CA benchmark of 500 mg/L were detected in samples from 10 trend wells during resampling in 2007–2008; one of these wells (MSPR-09 in the Monterey Bay and Salinas Valley Basins study unit) had a TDS concentration greater than the upper SMCL-CA benchmark of 1,000 mg/L (table 9). In 4 of these 10 trend wells with TDS concentrations greater than the recommended SMCL-CA benchmark during 2007–2008, TDS concentrations were also greater than 500 mg/L during initial sampling. Samples from the other six trend wells were not analyzed for TDS during the initial sampling. In addition to the four trend wells with TDS concentrations greater than the benchmark during both sampling periods, two wells sampled only during the initial sampling period for TDS had concentrations greater than that benchmark.

Seventeen of the 24 trace elements analyzed in this study have health-based benchmarks (MCL-US, MCL-CA, NL-US, AL-US, and HAL-US). Concentrations of 13 of the 17 trace elements that have health-based benchmarks were less than these health-based benchmarks in samples collected during both sampling periods (table 10). Arsenic, boron, vanadium, and molybdenum were detected in some trend wells at concentrations greater than their health-based benchmarks.

Arsenic was detected in five trend wells at concentrations greater than its MCL-US of 10 µg/L during resampling in 2008 (table 10). Two of these wells were in the Northern San Joaquin Basin study unit, and the other three were in the Southern Sacramento Valley, the Monterey Bay and Salinas Valley Basins, and the Southeast San Joaquin Valley study units. None of these wells were sampled for trace elements during initial sampling in 2005. Arsenic was detected in one trend well in the North San Francisco Bay study unit (NSFVP-38) at a concentration greater than the MCL-US during initial sampling in 2004; this well was not sampled for trace elements in 2007.

Boron was detected in samples from five trend wells at concentrations greater than its NL-CA of 1,000 µg/L during resampling in 2008 (table 10). Three of these wells were in the Southern Sacramento Valley study unit. The other two wells were in the Northern San Joaquin Basin and Monterey Bay and Salinas Valley Basins study units. Two of the wells in the Southern Sacramento Valley study unit and the well in the Northern San Joaquin Basin study unit with boron concentrations greater than the benchmark in 2008 were also sampled for trace elements in 2005. Boron concentrations in one of the Southern Sacramento Valley trend wells and in the Northern San Joaquin Basin trend well were also greater than the benchmark in 2005. However, the boron concentration in the other Southern Sacramento Valley trend well (YOL-14) in 2005 was substantially lower than its concentration in 2008 and was less than the benchmark. The boron concentration detected in a trend well in the North San Francisco Bay study unit during initial sampling in 2004 (NSFVP-38) was nearly four times the NL-CA; this well was not sampled for trace elements in 2007 (table 10).

Vanadium was detected in two trend wells at concentrations greater than its NL-CA of 50 µg/L during resampling in 2007–2008. One of the wells was in the San Diego Drainages study unit, and the other well was in the Southeast San Joaquin Valley study unit (table 10). Both of these wells were also sampled for trace elements during initial sampling in 2004–2005. The vanadium concentration in the San Diego Drainages trend well in 2004 was nearly identical to its concentration in that well in 2007 and also was greater than the benchmark. The vanadium concentration in the Southeast San Joaquin Valley trend well in 2005 was slightly lower than its concentration in 2008 and just less than the NL-CA.

Molybdenum was detected above its HAL-US in two wells in the Monterey Bay and Salinas Valley Basins study unit during resampling in 2008 (table 10). These two wells were not sampled for trace elements in 2005. Molybdenum was not detected at concentrations above the health-based benchmark in any trend wells that were sampled for trace elements during initial sampling in 2004–2005.

Four trace elements analyzed in this study—iron, manganese, silver, and zinc—have benchmarks that are non-health-based SMCLs established for aesthetic concerns (taste and odor). Samples from six wells had iron concentrations above the SMCL, and samples from ten trend wells had manganese concentrations above the SMCL, during one or both sampling periods (table 10). Iron and manganese are trace elements whose concentrations are affected by the oxidation-reduction state of the groundwater. Precipitation of minerals containing iron or manganese may cause orange, brown, or black staining of surfaces. Relatively high concentrations of manganese often co-occurred with relatively high concentrations of iron. In every case in which the samples from a well had concentrations of iron or manganese above the SMCL and were analyzed for trace elements during both sampling periods, the concentrations of these constituents were above the SMCL for both periods. Silver was not detected in the trend wells during either sampling period, and all detections of zinc were below the SMCL for both sampling periods.

Arsenic and iron can occur as different species depending on the oxidation-reduction state of the groundwater. The oxidized and reduced species have different solubilities in groundwater, and the relative proportions of the oxidized and reduced species of each element can be used in the interpretation of the oxidation-reduction conditions of the aquifer. Concentrations of total dissolved arsenic and iron and the concentrations of the reduced species of each element were analyzed by the USGS National Research Program (NRP) Trace Metal Laboratory (TML), Boulder, Colorado, for samples from 21 trend wells during the initial sampling in 2004–2005 and samples from 14 trend wells during the resampling in 2007–2008 (table 11). The concentrations of the oxidized species can be calculated by difference.

The proportions of reduced to oxidized species between the sampling periods changed little for six of the nine trend wells that were resampled. However, dissolved arsenic in three wells in the North San Francisco Bay study unit (NSFVOL-14, NSFVP-38, NSFWGFP-01) went from being predominantly in the oxidized form, As(V), in 2004 to mostly in the reduced form, As(III), in 2007.

Isotopic Tracers

The isotopic ratios of oxygen and hydrogen in water and tritium and carbon-14 activities may be used as tracers of hydrologic processes. The isotopic ratios of hydrogen and oxygen in water (δ^2H and $\delta^{18}O$) aid in interpretation of the sources of groundwater recharge. These stable isotopic ratios reflect the altitude, latitude, and temperature of precipitation and also the extent of evaporation of the water in surface-water bodies or soils prior to infiltration into the aquifer. The isotopic ratios of hydrogen and oxygen in water were measured for all trend wells during both sampling periods (table 12). These ratios appeared to change little between the sampling periods with one exception; a San Diego Drainages study unit well (SDTEM-04) had a substantially more negative isotopic ratio in 2007 than in 2004.

Tritium and carbon-14 activities also provide information about the age (time since recharge) of the groundwater. Tritium is a short-lived radioactive isotope of hydrogen that is incorporated into the water molecule. Low levels of tritium are continuously produced by interaction of cosmic radiation with the Earth's atmosphere, and a large amount of tritium was produced as a result of atmospheric testing of nuclear weapons between 1952 and 1963. Thus, concentrations of tritium above background generally indicate the presence of water recharged since the early 1950s. All samples from trend wells were analyzed for tritium except for five samples from the Southeast San Joaquin Valley study unit during initial sampling in 2005 (tables 2, 12). Tritium analyses were performed by the USGS Stable Isotope and Tritium Laboratory, Menlo Park, California. The method of reporting uncertainties in tritium activities by this laboratory changed between the initial sampling in 2004–2005 and the resampling in 2007−2008. Therefore, most resampling results for tritium in table 12 are reported as the measured value in picocuries per liter plus or minus (±) the combined standard uncertainty. Results for initial sampling, as well as the earlier resampling results, do not include the combined standard uncertainty.

Of the isotopic tracers analyzed for this study, tritium is the only one with a health-based benchmark—an MCL-CA of 20,000 picocuries per liter (pCi/L). All tritium activities in samples from trend wells during both sampling periods were less than one one-thousandth of this benchmark (table 12). The differences in tritium activities between sampling periods were small for the trend wells.

Carbon-14 is a radioactive isotope of carbon. Low levels of carbon-14 are continuously produced by interaction of cosmic radiation with the Earth's atmosphere and are incorporated into atmospheric carbon dioxide. The carbon dioxide dissolves in precipitation, surface water, and groundwater exposed to the atmosphere, thereby entering the hydrologic cycle. Because carbon-14 decays with a half-life of approximately 5,700 years, low activities of carbon-14 relative to modern values generally indicate presence of groundwater that is several thousand years old. Seventeen trend wells were sampled for carbon-14 during initial sampling in 2004−2005. Twenty-nine trend wells were sampled for carbon-14 during resampling in 2007−2008 (tables 2, 12). In most cases, if a well was sampled for carbon-14 during initial sampling, it was not resampled for carbon-14. Nine trend wells were sampled for carbon-14 during both sampling periods. In eight of these nine wells, the percentages of modern carbon (pmc) were similar for the two sampling periods. However, groundwater from one well in the Monterey Bay and Salinas Valley Basins study unit (MSMB-04) had results of 5.7 pmc in 2005 and 83 pmc in 2008.

Future Work

Reports similar to this one are planned to present data from initial sampling and resampling for trend evaluations of the remaining 28 GAMA-PBP study units not included here. Reports subsequent to these trends data reports will be focused on assessment of the data presented in this report and the other trend data reports by using a variety of statistical, qualitative, and quantitative approaches to evaluate the natural and human factors affecting temporal changes in groundwater quality. Water-quality data contained in the CDPH and USGS databases, and water-quality data available from other State and local water agencies will be compiled, evaluated, and used in combination with the data that is presented in the trends data reports. The results of these future efforts will appear in one or more subsequent reports.

Summary

Data from 55 wells sampled during two sampling periods (2004–2005 and 2007–2008) in seven study units are presented in this report as part of an assessment of temporal trends in groundwater quality being conducted by the California State Water Resources Control Board (SWRCB) Groundwater Ambient Monitoring and Assessment (GAMA) Program's Priority Basin Project (PBP). The GAMA Program was created to provide a comprehensive baseline of groundwater quality in the State, and to evaluate changes over time (trends) in this groundwater quality. The GAMA-PBP was created as a result of the Groundwater Quality Monitoring Act of 2001 (Sections 10780–10782.3 of the California Water Code, Assembly Bill 599) to assess and monitor the quality of groundwater. The GAMA-PBP is being conducted by the USGS in cooperation with the SWRCB and Lawrence Livermore National Laboratory (LLNL).

The GAMA-PBP was designed to provide a spatially unbiased assessment of untreated-groundwater quality within the primary aquifer systems and to facilitate statistically consistent comparisons of untreated-groundwater quality throughout California. The primary aquifer systems are defined as parts of aquifers corresponding to the perforation intervals of wells listed in the California Department of Public Health (CDPH) database for each study unit. The quality of groundwater in shallow or deep water-bearing zones may differ from that in the primary aquifer systems; shallow groundwater may be more vulnerable to surficial contamination.

This study did not attempt to evaluate the quality of water delivered to consumers; after withdrawal from the ground, water typically is treated, disinfected, and blended with other waters to maintain acceptable water quality. The benchmarks used in this report apply to treated water that is served to the consumer, not to untreated groundwater. However, to provide some context for the results, concentrations of constituents measured in these groundwater samples were compared to benchmarks established by the U.S. Environmental Protection Agency (USEPA) and CDPH.

During the initial sampling period (2004−2005) for the 7 study units discussed in this report, 462 wells were selected using a randomized grid approach to achieve a statistically unbiased representation of groundwater used for public drinking-water supplies (grid wells). Fifty-five of these grid wells (approximately 10 percent in each of the 7 study units) were resampled for trends during 2007−2008. The study units, the number of grid wells during initial sampling, and the number of these wells that were resampled for trends in each study unit were as follows: the San Diego Drainages (51 grid wells, 7 trend wells), North San Francisco Bay (84, 10), Northern San Joaquin Basin (51, 5), Southern Sacramento Valley (67, 7), San Fernando–San Gabriel (35, 6), Monterey Bay and Salinas Valley Basins (91, 11), and Southeast San Joaquin Valley (83, 9).

Groundwater samples were analyzed for water-quality indicators, organic constituents, special-interest constituents, inorganic constituents, and isotopic tracers. Seventeen of the constituents were analyzed by using two different methods of analysis, resulting in up to 288 measurements that could have been made on each sample. This report describes the sampling, analytical, and quality-assurance methods used in the study and presents the results of the chemical analyses of the 288 measurements from initial sampling and resampling for trends in the primary aquifer systems.

Quality-control samples (blanks, replicates, and matrix spikes) were collected at more than 20 percent of the wells during resampling for trends, and the results for these samples were used to evaluate the quality of the data for the groundwater samples. Blanks rarely contained detectable concentrations of any constituent. Replicate samples generally were within the acceptable limits of variability, and matrix-spike recoveries were largely within the acceptable range.

Twenty-five volatile organic compounds (VOCs) and 16 pesticide compounds were detected in trend wells. All pesticide detections and nearly all VOC detections were at concentrations less than health-based benchmarks. The VOCs detected at concentrations greater than health-based benchmarks were 1,2-dibromo-3-chloropropane (DBCP), methyl *tert*-butyl ether (MTBE), tetrachloroethene (PCE), and trichloroethene (TCE). The VOCs detected in more than 10 percent of the trend wells during both sampling periods were chloroform, bromodichloromethane, *cis*-1,2-dichloroethene, PCE, and TCE. In addition, carbon tetrachloride was detected in more than 10 percent of the trend wells during the initial sampling period. The pesticide compounds that were detected in more than 10 percent of the trend wells during both sampling periods were atrazine, deethylatrazine, and simazine.

Perchlorate, *N*-nitrosodimethylamine (NDMA), and 1,2,3-trichloropropane (1,2,3-TCP) are constituents of special interest in California. Perchlorate was detected at concentrations greater than health-based benchmarks in two trend wells in the San Fernando–San Gabriel study unit during the resampling period in 2008. NDMA was not detected during either sampling period. 1,2,3-TCP was detected more frequently during resampling; however, more samples were submitted for low-level analysis of 1,2,3-TCP during resampling than during initial sampling.

Most inorganic constituents are naturally present in groundwater but at concentrations less than water-quality benchmarks. Nitrate concentrations were greater than the health-based benchmark in samples from a few trend wells in the San Fernando–San Gabriel and Southeast San Joaquin Valley study units, and these concentrations generally were similar between sampling periods for wells that were sampled for nutrients both times. Arsenic, boron, and vanadium were detected in some trend wells at concentrations greater than their health-based benchmarks during both sampling periods. Similarly, total dissolved solids, iron, and manganese were detected at concentrations greater than secondary maximum

contaminant levels (SMCL-CAs) (non-health-based benchmarks set for aesthetic concerns) in samples from a few wells during both sampling periods. Subsequent reports will present analyses of the data presented in this report using a variety of statistical, qualitative, and quantitative approaches to assess the natural and human factors affecting changes in groundwater quality.

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Table 1. Identification, sampling, and construction information for trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[**GAMA well identification number acronyms:** ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: ft, foot; LSD, land-surface datum; na, not available; NAVD 88, North American Vertical Datum of 1988]

GAMA well identification number	Sample date	Previous sample date	Elevation of LSD (ft above NAVD 88)[1]	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
San Diego Drainages study unit						
SDALLV-07	9/12/2007	7/14/2004	44	200	39	na
SDALLV-11	9/13/2007	7/15/2004	381	148	50	148
SDHDRK-01	9/13/2007	7/12/2004	421	906	110	906
SDHDRK-09	9/11/2007	7/27/2004	2,402	400	75	400
SDTEM-04	9/18/2007	5/24/2004	1,186	252	95	245
SDTEMFP-01	9/19/2007	5/19/2004	1,057	2,500	234	2,147
SDWARN-01	9/11/2007	6/17/2004	2,780	473	113	473
North San Francisco Bay study unit						
NSFVOL-14	8/21/2007	10/7/2004	140	417	57	417
NSFVOL-18	8/28/2007	10/20/2004	203	670	135	660
NSFVP-29	8/27/2007	9/28/2004	210	120	62	120
NSFVP-34	8/22/2007	10/18/2004	323	258	41	258
NSFVP-36	8/20/2007	10/19/2004	8	306	145	300
NSFVP-38	8/22/2007	10/20/2004	33	770	210	770
NSFVP-39	11/16/2007	10/21/2004	248	460	56	460
NSFVP-41	8/20/2007	10/21/2004	49	235	60	235
NSFWG-03	8/29/2007	9/21/2004	275	552	270	552
NSFWGFP-01	8/29/2007	10/5/2004	83	528	138	528
Northern San Joaquin Basin study unit						
COS-08	4/3/2008	1/3/2005	42	575	178	570
ESJ-01	4/2/2008	1/24/2005	28	270	180	265
ESJ-06	4/2/2008	1/10/2005	40	403	200	395
NSJ-QPC-04	4/1/2008	1/24/2005	260	520	235	512
TRCY-03	3/31/2008	1/6/2005	207	900	420	890
Southern Sacramento Valley study unit						
NAM-03	4/10/2008	3/29/2005	87	660	185	655
SAM-10	4/8/2008	4/21/2005	29	278	156	162
SOL-08	4/8/2008	5/10/2005	108	1,780	1,100	1,760
SSV-QPC-07	4/10/2008	4/4/2005	158	303	175	303
SUI-03	4/9/2008	5/12/2005	88	225	60	220
YOL-01	4/7/2008	4/11/2005	59	470	210	460
YOL-14	4/9/2008	5/25/2005	13	1,350	530	797

Table 1. Identification, sampling, and construction information for trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[**GAMA well identification number acronyms:** ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: ft, foot; LSD, land-surface datum; na, not available; NAVD 88, North American Vertical Datum of 1988]

GAMA well identification number	Sample date	Previous sample date	Elevation of LSD (ft above NAVD 88)[1]	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
San Fernando–San Gabriel study unit						
ULASF-09	6/16/2008	6/7/2005	1,016	184	50	170
ULASF-10	6/16/2008	6/8/2005	662	930	268	894
ULASG-01	6/16/2008	6/7/2005	462	810	670	790
ULASG-08	6/17/2008	6/15/2005	718	399	110	299
ULASG-15	6/17/2008	6/23/2005	683	na	115	340
ULASG-17	6/17/2008	7/11/2005	720	186	na	na
Monterey Bay and Salinas Valley Basins study unit						
MSMB-03	8/20/2008	8/31/2005	23	1,364	1,301	1,361
MSMB-04	8/20/2008	8/17/2005	10	800	200	800
MSMB-16	8/19/2008	8/17/2005	158	552	315	535
MSMB-28	8/21/2008	8/3/2005	61	490	413	465
MSMB-31	8/21/2008	8/11/2005	148	619	198	607
MSPR-03	11/14/2008	7/28/2005	753	680	260	660
MSPR-09	11/14/2008	7/18/2005	581	502	72	495
MSSC-06	8/18/2008	8/24/2005	43	230	110	200
MSSC-11	8/19/2008	9/13/2005	353	320	255	320
MSSV-06	11/13/2008	8/2/2005	303	220	160	220
MSSV-15	11/13/2008	8/12/2005	190	200	60	180
Southeast San Joaquin Valley study unit						
KING-11	11/5/2008	10/20/2005	340	540	280	520
KING-13	11/5/2008	10/20/2005	315	420	260	400
KING-17	11/4/2008	10/26/2005	280	650	320	640
KING-24	11/3/2008	11/5/2005	325	236	140	236
KWH-10	11/5/2008	11/17/2005	410	323	na	na
KWH-12	11/6/2008	11/28/2005	291	404	205	381
TLR-03	11/4/2008	11/29/2005	246	1,420	1,067	1,395
TULE-05	11/3/2008	12/5/2005	577	1,368	930	1,348
TULE-10	11/3/2008	12/7/2005	403	965	201	965

[1] LSD is a datum plane that is approximately at land surface at each well. The altitude of the LSD is described in feet above the North American Vertical Datum of 1988.

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
San Diego Drainages study unit																	
SDALLV-07	7/14/2004	1	0	85	0	0	0	0	1	1	0	0	0	2	1	0	91
SDALLV-07	9/12/2007	4	3	85	0	63	0	0	0	2	0	0	0	2	1	0	160
SDALLV-11	7/15/2004	2	0	85	0	63	0	0	1	1	0	0	0	2	1	0	155
SDALLV-11	9/13/2007	4	3	85	0	63	0	0	0	2	0	0	0	2	1	0	160
SDHDRK-01	7/12/2004	1	0	85	0	63	0	0	1	1	0	0	0	2	1	0	154
SDHDRK-01	9/13/2007	4	3	85	0	63	0	0	0	2	0	0	0	2	1	0	160
SDHDRK-09	7/27/2004	1	0	85	0	63	0	0	1	1	0	0	0	2	1	0	154
SDHDRK-09	9/11/2007	4	5	85	0	63	0	0	0	2	5	34	0	2	1	0	201
SDTEM-04	5/24/2004	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153
SDTEM-04	9/18/2007	4	5	85	0	0	0	0	0	2	0	34	0	2	1	2	135
SDTEMFP-01	5/19/2004	7	2	85	0	63	58	0	1	1	5	34	4	2	1	2	258
SDTEMFP-01	9/19/2007	4	5	85	0	63	0	0	0	2	0	34	0	2	1	2	198
SDWARN-01	6/17/2004	2	0	85	0	63	0	0	1	1	0	0	0	2	1	0	155
SDWARN-01	9/11/2007	4	5	85	0	0	0	0	0	2	5	34	0	2	1	0	138
North San Francisco Bay study unit																	
NSFVOL-14	10/7/2004	7	2	85	0	63	58	1	1	1	5	35	4	2	1	2	259
NSFVOL-14	8/21/2007	4	3	85	0	63	58	0	0	2	5	0	4	2	1	2	224
NSFVOL-18	10/20/2004	2	0	85	0	63	0	1	1	1	0	0	0	2	1	0	155
NSFVOL-18	8/28/2007	4	5	85	0	63	58	0	0	1	5	35	4	2	1	2	258

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.—Continued

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
North San Francisco Bay study unit—Continued																	
NSFVP-29	9/28/2004	7	2	85	0	63	58	1	1	1	5	35	4	2	1	2	259
NSFVP-29	8/27/2007	4	3	85	0	63	58	0	0	1	5	0	4	2	1	2	223
NSFVP-34	10/18/2004	7	2	85	0	63	58	1	1	1	5	35	4	2	1	2	259
NSFVP-34	8/22/2007	4	3	85	0	63	58	0	0	1	5	0	4	2	1	2	223
NSFVP-36	10/19/2004	2	2	85	0	63	0	1	1	1	0	35	0	2	1	0	192
NSFVP-36	8/20/2007	4	0	85	0	63	58	0	0	2	5	0	0	2	1	2	217
NSFVP-38	10/20/2004	7	2	85	0	63	58	1	1	1	5	35	4	2	1	2	259
NSFVP-38	8/22/2007	4	3	85	0	63	58	0	0	1	5	0	4	2	1	2	223
NSFVP-39	10/21/2004	2	2	85	0	63	0	1	1	1	0	35	0	2	1	0	192
NSFVP-39	11/16/2007	4	5	85	0	63	58	0	0	1	5	35	4	2	1	2	258
NSFVP-41	10/21/2004	2	2	85	0	63	0	1	1	1	0	35	0	2	1	0	192
NSFVP-41	8/20/2007	4	3	85	0	63	58	0	0	2	5	0	0	2	1	2	220
NSFWG-03	9/21/2004	2	0	85	0	63	0	1	1	1	0	0	0	2	1	0	155
NSFWG-03	8/29/2007	4	5	85	0	63	58	0	0	1	5	35	4	2	1	2	258
NSFWGFP-01	10/5/2004	7	2	85	0	63	58	1	1	1	5	35	4	2	1	2	259
NSFWGFP-01	8/29/2007	4	3	85	0	63	58	0	0	1	5	0	4	2	1	2	223
Northern San Joaquin Basin study unit																	
COS-08	1/3/2005	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153
COS-08	4/3/2008	4	5	85	2	63	0	1	0	1	5	35	0	2	1	2	203

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.—Continued

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
Northern San Joaquin Basin study unit—Continued																	
ESJ-01	1/24/2005	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153
ESJ-01	4/2/2008	4	5	85	2	63	0	1	0	1	5	35	0	2	1	2	203
ESJ-06	1/10/2005	2	5	85	0	63	0	1	1	1	0	35	4	2	1	0	197
ESJ-06	4/2/2008	4	5	85	2	63	0	1	0	1	5	35	0	2	1	2	203
NSJ-QPC-04	1/24/2005	3	5	85	0	63	0	1	1	1	0	35	4	2	1	0	198
NSJ-QPC-04	4/1/2008	4	5	85	2	63	0	1	0	1	5	35	0	2	1	2	203
TRCY-03	1/6/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
TRCY-03	3/31/2008	4	5	85	2	63	0	1	0	1	5	35	0	2	1	2	203
Southern Sacramento Valley study unit																	
NAM-03	3/29/2005	2	0	85	0	70	0	0	0	0	0	0	0	2	1	0	160
NAM-03	4/10/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	2	262
SAM-10	4/21/2005	2	0	85	0	70	0	0	0	0	0	0	0	2	1	0	160
SAM-10	4/8/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	2	262
SOL-08	5/10/2005	2	0	85	0	70	0	0	0	0	0	0	0	2	1	0	160
SOL-08	4/8/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	2	262
SSV-QPC-07	4/4/2005	7	5	85	0	70	58	1	1	1	5	35	4	2	1	2	268
SSV-QPC-07	4/10/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	0	260
SUI-03	5/12/2005	2	0	85	0	0	0	0	0	0	0	0	0	2	1	0	90
SUI-03	4/9/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	2	262

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.—Continued

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
Southern Sacramento Valley study unit—Continued																	
YOL-01	4/11/2005	2	0	85	0	70	0	0	0	0	0	0	0	2	1	0	160
YOL-01	4/7/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	2	262
YOL-14	5/25/2005	7	5	85	0	70	58	1	1	1	5	35	4	2	1	2	268
YOL-14	4/9/2008	4	5	85	0	70	58	1	0	1	5	35	0	2	1	0	260
San Fernando–San Gabriel study unit																	
ULASF-09	6/27/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
ULASF-09	6/16/2008	4	5	85	0	63	58	1	1	1	5	35	4	2	1	0	257
ULASF-10	6/8/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
ULASF-10	6/16/2008	4	5	85	0	63	58	1	1	1	5	35	4	2	1	0	257
ULASG-01	6/7/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
ULASG-01	6/16/2008	4	5	85	0	63	58	1	1	1	5	35	4	2	1	0	257
ULASG-08	6/15/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
ULASG-08	6/17/2008	4	5	85	0	63	58	1	1	1	5	35	4	2	1	0	257
ULASG-15	6/23/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
ULASG-15	6/17/2008	4	5	85	0	63	58	1	1	1	5	35	4	2	1	0	257
ULASG-17	7/11/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
ULASG-17	6/17/2008	4	5	85	0	63	58	1	1	1	5	35	4	2	1	0	257

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.—Continued

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
Monterey Bay and Salinas Valley Basins study unit																	
MSMB-03	8/31/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
MSMB-03	8/20/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSMB-04	8/17/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
MSMB-04	8/20/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSMB-16	8/17/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
MSMB-16	8/19/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSMB-28	8/3/2005	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153
MSMB-28	8/21/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSMB-31	8/11/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
MSMB-31	8/21/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSPR-03	7/28/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
MSPR-03	11/14/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	0	202
MSPR-09	7/18/2005	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153
MSPR-09	11/14/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	0	202
MSSC-06	8/24/2005	7	5	85	0	63	58	1	1	1	5	35	4	2	1	2	262
MSSC-06	8/18/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSSC-11	9/13/2005	3	0	85	0	63	0	0	0	0	0	0	0	2	1	0	154
MSSC-11	8/19/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	2	204
MSSV-06	8/2/2005	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.—Continued

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
Monterey Bay and Salinas Valley Basins study unit—Continued																	
MSSV-06	11/13/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	0	202
MSSV-15	8/12/2005	2	0	85	0	63	0	0	0	0	0	0	0	2	1	0	153
MSSV-15	11/13/2008	4	5	85	0	63	0	1	1	1	5	35	0	2	1	0	202
Southeast San Joaquin Valley study unit																	
KING-11	10/20/2005	3	5	85	0	81	58	1	1	1	5	35	4	2	1	0	273
KING-11	11/5/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
KING-13	10/20/2005	3	5	85	0	81	58	1	1	1	5	35	4	2	1	0	273
KING-13	11/5/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
KING-17	10/26/2005	7	5	85	0	81	58	1	1	1	5	35	4	2	1	2	279
KING-17	11/4/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
KING-24	11/5/2005	3	0	85	0	81	0	0	0	1	0	0	0	2	0	0	172
KING-24	11/3/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
KWH-10	11/17/2005	3	0	85	0	81	0	0	0	1	0	0	0	2	0	0	172
KWH-10	11/5/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
KWH-12	11/28/2005	7	5	85	0	81	58	1	1	1	5	35	4	2	1	2	279
KWH-12	11/6/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
TLR-03	11/29/2005	3	0	85	0	81	0	0	0	1	0	0	0	2	0	0	172
TLR-03	11/4/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
TULE-05	12/5/2005	3	0	85	0	81	0	0	0	1	0	0	0	2	0	0	172

Table 2. Number of water-quality indicators and chemical constituents measured in samples collected at trend wells for the Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.—Continued

[**GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Other abbreviations**: NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; 1,2,3-TCP, 1,2,3-trichloropropane; NDMA, *N*-nitrosodimethylamine. Analytical methods are reported in table A1]

GAMA well identification number	Sample dates	Water-quality indicators		Organic constituents				Special-interest constituents			Inorganic constituents		Geochemical and age-dating tracers				Total number of distinct constituents measured per well[4]
		Measured onsite	Measured by NWQL	VOCs[1]	DBCP and EDB[1]	Pesticides and degradates[2]	Polar pesticides[2]	1,2,3-TCP[1]	NDMA	Perchlorate[3]	Nutrients	Major ions and trace elements	Arsenic and iron species	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes	
Laboratory Schedule				2020	1306	2003, 2032, or 2033	2060	non-USGS laboratory			2755	1948	non-USGS laboratory	1142	laboratory code 1565	2255	
Southeast San Joaquin Valley study unit—Continued																	
TULE-05	11/3/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219
TULE-10	12/7/2005	3	0	85	0	81	0	0	0	1	0	0	0	2	0	0	172
TULE-10	11/3/2008	4	5	85	2	81	0	1	0	1	5	35	0	2	1	0	219

[1] For a subset of samples, DBCP, EDB, and 1,2,3-TCP also were analyzed using methods having lower-level detection limits than the method used for analysis of VOCs as a class (table A1). The results from the method having the lower detection limit are reported (table A2).

[2] Pesticides and degradates were analyzed using the same analytical method in all samples (table A1). Three analytical schedules having 64, 71, or 83 compounds were used, and the base set of 64 compounds is included in all three schedules. Polar pesticides were analyzed using a different analytical method (table A1), and for compounds analyzed using both methods, the results from the pesticides and degradates method are reported (table A2).

[3] Perchlorate was analyzed in unfiltered samples with a reporting limit of 0.25, 0.5, or 1 µg/L prior to October 1, 2007, and was analyzed in filtered samples with a reporting limit of 0.1 µg/L after August 15, 2007. Some samples collected between those dates were analyzed using both methods.

[4] Constituents analyzed by more than one method (table A2) are only counted once in the total number of constituents analyzed.

Table 3A. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2020.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; NL-CA, CDPH notification level; RSD5-US,USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; D, detected in groundwater samples (table 5); na, not available; nv, no value in category; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	SRL[1] (µg/L)	Benchmark type[2]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Acetone	Solvent	81552	67-64-1	4	6	nv[3]	na	na	—	—
Acrylonitrile	Organic synthesis	34215	107-13-1	0.4	1.2	nv	RSD5-US	0.6	—	—
tert-Amyl methyl ether (TAME)	Gasoline oxygenate	50005	994-05-8	0.04	0.08	nv	na	na	—	—
Benzene	Gasoline hydrocarbon	34030	71-43-2	0.016	0.021	nv	MCL-CA	1	—	—
Bromobenzene	Solvent	81555	108-86-1	0.02	0.028	nv	na	na	—	—
Bromochloromethane	Fire retardant	77297	74-97-5	0.06	0.12	nv	HAL-US	90	D [g]	—
Bromodichloromethane	Disinfection byproduct (THM)	32101	75-27-4	0.028	0.04	nv	MCL-US	[4] 80	D [e,g]	D [a,e,g]
Bromoform (Tribromomethane)	Disinfection byproduct (THM)	32104	75-25-2	0.08	0.1	nv	MCL-US	[4] 80	D [g]	—
Bromomethane (Methyl bromide)	Fumigant	34413	74-83-9	0.26	0.4	nv	HAL-US	10	—	—
n-Butylbenzene	Gasoline hydrocarbon	77342	104-51-8	0.08	0.14	nv	NL-CA	260	—	—
sec-Butylbenzene	Gasoline hydrocarbon	77350	135-98-8	0.02	0.06	nv	NL-CA	260	—	—
tert-Butylbenzene	Gasoline hydrocarbon	77353	98-06-6	0.06	0.08	nv	NL-CA	260	—	—
Carbon disulfide	Organic synthesis	77041	75-15-0	0.04	0.06	0.03	NL-CA	160	D [b,e,g]	D [f]
Carbon tetrachloride (Tetrachloromethane)	Solvent	32102	56-23-5	0.06	0.08	nv	MCL-CA	0.5	D [d,e,f]	D [a,d,e,f]
Chlorobenzene	Solvent	34301	108-90-7	0.02	0.028	nv	MCL-CA	70	—	—
Chloroethane	Solvent	34311	75-00-3	0.1	0.12	nv	na	na	—	—
Chloroform (Trichloromethane)	Disinfection byproduct (THM)	32106	67-66-3	0.02	0.04	nv	MCL-US	[4] 80	D [a,b,c,d,e,g]	D [a,b,c,d,e,f,g]
Chloromethane	Solvent	34418	74-87-3	0.1	0.17	nv	HAL-US	30	—	—
3-Chloropropene	Organic synthesis	78109	107-05-1	0.08	0.5	nv	na	na	—	—
2-Chlorotoluene	Solvent	77275	95-49-8	0.02	0.04	nv	NL-CA	140	—	—
4-Chlorotoluene	Solvent	77277	106-43-4	0.02	0.05	nv	NL-CA	140	—	—
Dibromochloromethane	Disinfection byproduct (THM)	32105	124-48-1	0.1	0.12	nv	MCL-US	[4] 80	D [e,g]	D [e]
1,2-Dibromo-3-chloropropane (DBCP)	Fumigant	82625	96-12-8	0.03	1	nv	MCL-US	0.2	—[5]	—[5]
1,2-Dibromoethane (EDB)	Fumigant	77651	106-93-4	0.02	0.04	nv	MCL-US	0.05	—	—
Dibromomethane	Solvent	30217	74-95-3	0.04	0.05	nv	na	na	D [g]	—
1,2-Dichlorobenzene	Solvent	34536	95-50-1	0.02	0.048	nv	MCL-US	600	—	D [e]
1,3-Dichlorobenzene	Solvent	34566	541-73-1	0.02	0.04	nv	HAL-US	600	—	—

Table 3A. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; NL-CA, CDPH notification level; RSD5-US,USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; D, detected in groundwater samples (table 5); na, not available; nv, no value in category; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	SRL[1] (µg/L)	Benchmark type[2]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
1,4-Dichlorobenzene	Fumigant	34571	106-46-7	0.02	0.04	nv	MCL-CA	5	—	—
trans-1,4-Dichloro-2-butene	Organic synthesis	73547	110-57-6	0.4	0.7	nv	na	na	—	—
Dichlorodifluoromethane (CFC-12)	Refrigerant	34668	75-71-8	0.1	0.18	nv	NL-CA	1,000	D [e]	D [e,g]
1,1-Dichloroethane (1,1-DCA)	Solvent	34496	75-34-3	0.035	0.06	nv	MCL-CA	5	D [e]	D [e]
1,2-Dichloroethane (1,2-DCA)	Solvent	32103	107-06-2	0.06	0.13	nv	MCL-CA	0.5	D [a]	D [a,e]
1,1-Dichloroethene (1,1-DCE)	Organic synthesis	34501	75-35-4	0.02	0.024	nv	MCL-CA	6	D [a,e]	D [a,e]
cis-1,2-Dichloroethene (*cis*-1,2-DCE)	Solvent	77093	156-59-2	0.02	0.024	nv	MCL-CA	6	D [a,b,e,f]	D [a,b,d,e,f]
trans-1,2-Dichloroethene (*trans*-1,2-DCE)	Solvent	34546	156-60-5	0.018	0.032	nv	MCL-CA	10	—	D [a]
1,2-Dichloropropane	Fumigant	34541	78-87-5	0.02	0.029	nv	MCL-US	5	—	—
1,3-Dichloropropane	Fumigant	77173	142-28-9	0.06	0.06	nv	na	na	—	—
2,2-Dichloropropane	Fumigant	77170	594-20-7	0.05	0.06	nv	na	na	—	—
1,1-Dichloropropene	Organic synthesis	77168	563-58-6	0.026	0.04	nv	na	na	—	—
cis-1,3-Dichloropropene	Fumigant	34704	10061-01-5	0.05	0.1	nv	RSD5-US	[6] 4	—	—
trans-1,3-Dichloropropene	Fumigant	34699	10061-02-6	0.09	0.1	nv	RSD5-US	[6] 4	—	—
Diethyl ether	Solvent	81576	60-29-7	0.08	0.12	nv	na	na	—	—
Diisopropyl ether (DIPE)	Gasoline oxygenate	81577	108-20-3	0.06	0.1	nv	na	na	D [a]	D [a]
Ethylbenzene	Gasoline hydrocarbon	34371	100-41-4	0.02	0.04	0.06	MCL-CA	300	—	—
Ethyl *tert*-butyl ether (ETBE)	Gasoline oxygenate	50004	637-92-3	0.03	0.05	nv	na	na	—	—
Ethyl methacrylate	Organic synthesis	73570	97-63-2	0.14	0.18	nv	na	na	—	—
Ethyl methyl ketone (2-butanone)	Solvent	81595	78-93-3	1.6	4	nv[3]	HAL-US	4,000	—	—
o-Ethyl toluene (1-Ethyl-2-methyl benzene)	Gasoline hydrocarbon	77220	611-14-3	0.02	0.06	nv	na	na	—	—
Hexachlorobutadiene	Organic synthesis	39702	87-68-3	0.06	0.14	nv	RSD5-US	9	—	—
Hexachloroethane	Solvent	34396	67-72-1	0.14	0.14	nv	HAL-US	1	—	—
2-Hexanone (*n*-Butyl methyl ketone)	Solvent	77103	591-78-6	0.4	0.7	nv	na	na	—	—
Iodomethane (Methyl iodide)	Fumigant, natural	77424	74-88-4	0.4	0.8	nv	na	na	—	—

Table 3A. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; NL-CA, CDPH notification level; RSD5-US,USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; D, detected in groundwater samples (table 5); na, not available; nv, no value in category; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	SRL[1] (µg/L)	Benchmark type[2]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Isopropylbenzene	Gasoline hydrocarbon	77223	98-82-8	0.038	0.04	nv	NL-CA	770	—	—
4-Isopropyl-1-methyl benzene	Gasoline hydrocarbon	77356	99-87-6	0.06	0.08	nv	na	na	—	—
Methyl acrylate	Organic synthesis	49991	96-33-3	0.4	2	nv	na	na	—	—
Methyl acrylonitrile	Organic synthesis	81593	126-98-7	0.2	0.76	nv	na	na	—	—
Methyl *tert*-butyl ether (MTBE)	Gasoline oxygenate	78032	1634-04-4	0.1	0.17	nv	MCL-CA	13	D [a,e]	D [a,e]
Methyl *iso*-butyl ketone (MIBK)	Solvent	78133	108-10-1	0.2	0.4	nv	NL-CA	120	—	—
Methylene chloride (Dichloromethane)	Solvent	34423	75-09-2	0.04	0.06	nv	MCL-US	5	D [e,g]	D [a,e,g]
Methyl methacrylate	Organic synthesis	81597	80-62-6	0.2	0.35	nv	na	na	—	—
Naphthalene	Gasoline hydrocarbon	34696	91-20-3	0.2	0.52	nv	NL-CA	17	—	—
n-Propylbenzene	Solvent	77224	103-65-1	0.04	0.042	nv	NL-CA	260	—	—
Styrene	Gasoline hydrocarbon	77128	100-42-5	0.04	0.042	nv	MCL-US	100	—	—
1,1,1,2-Tetrachloroethane	Solvent	77562	630-20-6	0.03	0.04	nv	HAL-US	70	—	—
1,1,2,2-Tetrachloroethane	Solvent	34516	79-34-5	0.08	0.16	nv	MCL-CA	1	—	—
Tetrachloroethene (PCE)	Solvent	34475	127-18-4	0.03	0.06	nv	MCL-US	5	D [a,b,d,e]	D [a,b,d,e]
Tetrahydrofuran	Solvent	81607	109-99-9	1	2.2	nv [3]	na	na	—	—
1,2,3,4-Tetramethylbenzene	Gasoline hydrocarbon	49999	488-23-3	0.08	0.14	nv	na	na	—	—
1,2,3,5-Tetramethylbenzene	Gasoline hydrocarbon	50000	527-53-7	0.08	0.14	nv	na	na	—	—
Toluene	Gasoline hydrocarbon	34010	108-88-3	0.018	0.05	0.69	MCL-CA	150	—	—
1,2,3-Trichlorobenzene	Organic synthesis	77613	87-61-6	0.06	0.27	nv	na	na	—	—
1,2,4-Trichlorobenzene	Solvent	34551	120-82-1	0.04	0.12	nv	MCL-CA	5	—	—
1,1,1-Trichloroethane (TCA)	Solvent	34506	71-55-6	0.02	0.04	nv	MCL-US	200	D [e]	—
1,1,2-Trichloroethane	Solvent	34511	79-00-5	0.04	0.064	nv	MCL-CA	5	—	—
Trichloroethene (TCE)	Solvent	39180	79-01-6	0.02	0.038	nv	MCL-US	5	D [a,b,d,e,f]	D [a,b,d,e,f]
Trichlorofluoromethane (CFC-11)	Refrigerant	34488	75-69-4	0.08	0.16	nv	MCL-CA	150	D [e]	D [b,e]
1,2,3-Trichloropropane (1,2,3-TCP)	Fumigant/solvent	77443	96-18-4	0.12	0.18	nv	HAL-US [7]	40	—[(5)]	—[(5)]
Trichlorotrifluoroethane (CFC-113)	Refrigerant	77652	76-13-1	0.038	0.04	nv	MCL-CA	1,200	D [e,g]	D [e,g]
1,2,3-Trimethylbenzene	Gasoline hydrocarbon	77221	526-73-8	0.06	0.08	nv	na	na	—	—
1,2,4-Trimethylbenzene	Gasoline hydrocarbon	77222	95-63-6	0.04	0.12	0.56	NL-CA	330	—	—

Table 3A. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; NL-CA, CDPH notification level; RSD5-US,USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; D, detected in groundwater samples (table 5); na, not available; nv, no value in category; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	SRL[1] (µg/L)	Benchmark type[2]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
1,3,5-Trimethylbenzene	Organic synthesis	77226	108-67-8	0.04	0.044	nv	NL-CA	330	—	—
Vinyl bromide (Bromoethene)	Fire retardant	50002	593-60-2	0.1	0.12	nv	na	na	—	—
Vinyl chloride (Chloroethene)	Organic synthesis	39175	75-01-4	0.06	0.08	nv	MCL-CA	0.5	—	—
m- and *p*-Xylene	Gasoline hydrocarbon	85795	108-38-3, 106-42-3	0.06	0.08	0.33	MCL-CA	[8] 1,750	—	—
o-Xylene	Gasoline hydrocarbon	77135	95-47-6	0.038	0.04	0.12	MCL-CA	[8] 1,750	—	—

[1] Study reporting levels for VOCs are based on Fram and others (2012).

[2] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[3] GAMA project policy for acetone, ethyl methyl ketone, and tetrahydrofuran is to report all detections as "not analyzed" (Fram and others, 2012).

[4] The MCL-US benchmark for trihalomethanes is the sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

[5] DBCP and 1,2,3-TCP were detected in a few samples that were analyzed using their respective preferred method with lower detection limits. See tables 3B and 3H respectively for DBCP and 1,2,3-TCP.

[6] The RSD5 benchmark for 1,3-dichloropropene is the sum of its isomers (*cis* and *trans*).

[7] In earlier reports in this series, the NL-CA (0.005 µg/L) was used as the comparison benchmark for 1,2,3-TCP.

[8] The MCL-CA benchmarks for *m*- plus *p*-Xylene and *o*-Xylene is the sum of all three xylene compounds.

[a] Detected in the San Diego Drainages study unit.

[b] Detected in the North San Francisco Bay study unit.

[c] Detected in the Northern San Joaquin Basin study unit.

[d] Detected in the Southern Sacramento Valley study unit.

[e] Detected in the San Fernando–San Gabriel study unit.

[f] Detected in the Monterey Bay and Salinas Valley Basins study unit.

[g] Detected in the Southeast San Joaquin Valley study unit.

Table 3B. 1,2-Dibromo-3-chloropropane (DBCP) and 1,2-Dibromoethane (EDB), primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 1306.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. This analytical schedule is the preferred method for these two constituents, but was used only for analyses of samples from the Northern San Joaquin Basin and the Southeast San Joaquin Valley study units. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: MCL-US, U.S. Environmental Protection Agency maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; LRL, laboratory reporting level; D, detected in groundwater samples (table 5); µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
1,2-Dibromo-3-chloropropane (DBCP)	Fumigant	82625	96-12-8	0.030	0.030	MCL-US	0.2	D [c,g]	D [c,g]
1,2-Dibromoethane (EDB)	Fumigant	77651	106-93-4	0.02	0.040	MCL-US	0.05	—	—

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical, and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[c] Detected in the Northern San Joaquin Basin study unit.

[g] Detected in the Southeast San Joaquin Valley study unit.

Table 3C. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2003, and the expanded versions Schedule 2032 and Schedule 2033.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk-specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6A); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Acetochlor	Herbicide	49260	34256-82-1	0.006	0.010	na	na	—[3]	—[3]
Alachlor	Herbicide	46342	15972-60-8	0.005	0.008	MCL-US	2	—	—
Atrazine [2]	Herbicide	39632	1912-24-9	0.007	0.007	MCL-CA	1	D [a,b,c,e,f,g]	D [a,c,d,e,f,g]
Azinphos-methyl	Insecticide	82686	86-50-0	0.050	0.120	na	na	—[3]	—[3]
Azinphos-methyl oxon	Insecticide degradate	61635	961-22-8	0.016	0.070	na	na	—[3]	—[3]
Benfluralin	Herbicide	82673	1861-40-1	0.010	0.014	na	na	—[3]	—[3]
Carbaryl [2]	Insecticide	82680	63-25-2	0.041	0.200	RSD5-US	400	—	—
Carbofuran [2,4]	Insecticide	82674	1563-66-2	0.020	0.060	MCL-CA	18	—	—
2-Chloro-2,6-diethylacetanilide	Herbicide degradate	61618	6967-29-9	0.005	0.010	na	na	—	—
4-Chloro-2-methylphenol	Herbicide degradate	61633	1570-64-5	0.005	0.006	na	na	—[3]	—[3]
Chlorpyrifos	Insecticide	38933	2921-88-2	0.005	0.010	HAL-US	2	—[3]	—[3]
ChlorpyrIfos oxon	Insecticide degradate	61636	5598-15-2	0.050	0.056	na	na	—[3]	—[3]
Cyanazine [5]	Herbicide	04041	21725-46-2	0.018	0.040	HAL-US	1	—	—
Cyfluthrin	Insecticide	61585	68359-37-5	0.008	0.053	na	na	—[3]	—[3]
λ-Cyhalothrin [4]	Insecticide	61595	91465-08-6	0.004	0.010	na	na	—[3]	—[3]
Cypermethrin	Insecticide	61586	52315-07-8	0.009	0.046	na	na	—[3]	—[3]
DCPA (Dacthal)	Herbicide	82682	1861-32-1	0.003	0.006	HAL-US	70	D [f]	—
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) [2]	Herbicide degradate	04040	6190-65-4	0.006	0.014	na	na	D [a,c,e,f,g,3]	D [a,c,e,f,g,3]
Desulfinylfipronil	Insecticide degradate	62170	na	0.012	0.012	na	na	—	D [g]
Desulfinylfipronil amide	Insecticide degradate	62169	na	0.029	0.029	na	na	—	—
Diazinon	Insecticide	39572	333-41-5	0.005	0.005	HAL-US	1	—	—
3,4-Dichloroaniline	Herbicide degradate	61625	95-76-1	0.004	0.006	na	na	D [e,g]	D [e,g]
3,5-Dichloroaniline [5]	Herbicide degradate	61627	626-43-7	0.004	0.004	na	na	—	D [g]
Dichlorvos	Insecticide	38775	62-73-7	0.012	0.020	na	na	—[3]	—[3]
Dicrotophos	Insecticide	38454	141-66-2	0.080	0.084	na	na	—[3]	—[3]
Dieldrin	Insecticide	39381	60-57-1	0.009	0.009	RSD5-US	0.02	—	—
2,6-Diethylaniline	Herbicide degradate	82660	579-66-8	0.006	0.006	na	na	—	—

Table 3C. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2003, and the expanded versions Schedule 2032 and Schedule 2033.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk-specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6A); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Dimethoate	Insecticide	82662	60-51-5	0.006	0.006	na	na	—(3)	—(3)
Disulfoton [5]	Insecticide	82677	298-04-4	0.021	0.040	HAL-US	0.7	—	—
Disulfoton sulfone [5]	Insecticide degradate	61640	2497-06-5	0.006	0.014	na	na	—	—
α-Endosulfan [5]	Insecticide	34362	959-98-8	0.005	0.006	na	na	—	—
Endosulfan sulfate [5]	Insecticide degradate	61590	1031-07-8	0.014	0.022	na	na	—	—
Ethion	Insecticide	82346	563-12-2	0.004	0.016	na	na	—(3)	—(3)
Ethion monoxon	Insecticide degradate	61644	17356-42-2	0.002	0.034	na	na	—(3)	—(3)
Ethoprophos [5]	Herbicide	82672	13194-48-4	0.005	0.016	na	na	—	—
S-Ethyl-dipropylthiocarbamate (EPTC) [5]	Herbicide	82668	759-94-4	0.002	0.004	na	na	D [g]	D [g]
2-Ethyl-6-methylaniline	Herbicide degradate	61620	24549-06-2	0.004	0.010	na	na	—	—
Fenamiphos	Insecticide	61591	22224-92-6	0.029	0.029	HAL-US	0.7	—(3)	—(3)
Fenamiphos sulfone	Insecticide degradate	61645	31972-44-8	0.008	0.053	na	na	—(3)	—(3)
Fenamiphos sulfoxide	Insecticide degradate	61646	31972-43-7	0.031	0.200	na	na	—(3)	—(3)
Fipronil	Insecticide	62166	120068-37-3	0.016	0.040	na	na	—(3)	D [g,3]
Fipronil sulfide	Insecticide degradate	62167	120067-83-6	0.013	0.013	na	na	—(3)	D [g,3]
Fipronil sulfone	Insecticide degradate	62168	120068-36-2	0.024	0.024	na	na	—(3)	—(3)
Fonofos	Insecticide	04095	944-22-9	0.003	0.010	HAL-US	10	—	—
Hexazinone	Herbicide	04025	51235-04-2	0.008	0.026	HAL-US	400	D [e,g,3]	D [e,g,3]
Iprodione	Fungicide	61593	36734-19-7	0.010	1.422	na	na	—(3)	—(3)
Isofenphos	Insecticide	61594	25311-71-1	0.003	0.011	na	na	—(3)	—(3)
Malaoxon	Insecticide degradate	61652	1634-78-2	0.008	0.080	na	na	—(3)	—(3)
Malathion	Insecticide	39532	121-75-5	0.016	0.027	HAL-US	100	—(3)	—(3)
Metalaxyl [2]	Fungicide	61596	57837-19-1	0.005	0.007	na	na	—	—
Methidathion	Insecticide	61598	950-37-8	0.004	0.009	na	na	—	—
Metolachlor	Herbicide	39415	51218-45-2	0.006	0.014	HAL-US	700	—	—
Metribuzin	Herbicide	82630	21087-64-9	0.006	0.016	HAL-US	70	—(3)	—(3)

Table 3C. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2003, and the expanded versions Schedule 2032 and Schedule 2033.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk-specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6A); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Molinate [4]	Herbicide	82671	2212-67-1	0.002	0.003	MCL-CA	20	—	—
Myclobutanil	Fungicide	61599	88671-89-0	0.008	0.033	na	na	—[3]	—[3]
1-Naphthol	Insecticide degradate	49295	90-15-3	0.040	0.088	na	na	—[3]	—[3]
Oxyfluorfen [5]	Herbicide	61600	42874-03-3	0.006	0.007	na	na	—[3]	—[3]
Paraoxon-methyl	Insecticide degradate	61664	950-35-6	0.010	0.030	na	na	—[3]	—[3]
Parathion-methyl	Insecticide	82667	298-00-0	0.008	0.015	HAL-US	1	—[3]	—[3]
Pendimethalin	Herbicide	82683	40487-42-1	0.012	0.022	na	na	—[3]	—[3]
cis-Permethrin	Insecticide	82687	54774-45-7	0.006	0.014	na	na	—[3]	—[3]
Phorate	Insecticide	82664	298-02-2	0.011	0.040	na	na	—[3]	—[3]
Phorate oxon	Insecticide degradate	61666	2600-69-3	0.030	0.100	na	na	—[3]	—[3]
Phosmet	Insecticide	61601	732-11-6	0.008	0.200	na	na	—[3]	—[3]
Phosmet oxon	Insecticide degradate	61668	3735-33-9	0.051	0.060	na	na	—[3]	—[3]
Prometon	Herbicide	04037	1610-18-0	0.005	0.012	HAL-US	100	D [a,g,3]	D [a,e,g,3]
Prometryn	Herbicide	04036	7287-19-6	0.005	0.006	na	na	—	—
Pronamide (Propyzamide)	Herbicide	82676	23950-58-5	0.004	0.004	RSD5-US	20	—	—
Propanil [4]	Herbicide	82679	709-98-8	0.006	0.014	na	na	—	—
Propargite [5]	Insecticide	82685	2312-35-8	0.020	0.023	na	na	—	—
cis-Propiconazole [4]	Fungicide	79846	60207-90-1	0.006	0.008	na	na	—[3]	—[3]
trans-Propiconazole [4]	Fungicide	79847	60207-90-1	0.013	0.020	na	na	—	—
Simazine	Herbicide	04035	122-34-9	0.005	0.010	MCL-US	4	D [a,b,c,e,f,g]	D [a,b,c,e,g]
Tebuthiuron [2]	Herbicide	82670	34014-18-1	0.016	0.020	HAL-US	500	D [a,e]	D [a,e]
Tefluthrin [5]	Insecticide	61606	79538-32-2	0.008	0.010	na	na	—[3]	—[3]
Terbufos	Insecticide	82675	13071-79-9	0.012	0.018	HAL-US	0.4	—	—
Terbufos oxon sulfone	Insecticide degradate	61674	56070-15-6	0.045	0.068	na	na	—[3]	—[3]
Terbuthylazine	Herbicide	04022	5915-41-3	0.006	0.010	na	na	—	—
Thiobencarb	Herbicide	82681	28249-77-6	0.010	0.016	MCL-CA	70	—	—

Table 3C. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2003, and the expanded versions Schedule 2032 and Schedule 2033.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk-specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6A); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Tribufos	Defoliant	61610	78-48-8	0.004	0.035	na	na	—[3]	—[3]
Trifluralin	Herbicide	82661	1582-09-8	0.009	0.012	HAL-US	10	—[3]	—[3]

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical, and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] Compound also analyzed for selected samples by the additional Laboratory Schedule 2060 (table 3D).

[3] The median matrix-spike recovery was less than 70 percent. Low recoveries may indicate that the compound might not have been detected in some samples even if it was present.

[4] Compound analyzed by Schedule 2032, used only for the Southern Sacramento Valley study unit, and by Schedule 2033, used only for the Southeast San Joaquin Valley study unit.

[5] Compound analyzed by Schedule 2033, used only for the Southeast San Joaquin Valley study unit.

[a] Detected in the San Diego Drainages study unit.

[b] Detected in the North San Francisco Bay study unit.

[c] Detected in the Northern San Joaquin Basin study unit.

[d] Detected in the Southern Sacramento Valley study unit.

[e] Detected in the San Fernando–San Gabriel study unit.

[f] Detected in the Monterey Bay and Salinas Valley Basins study unit.

[g] Detected in the Southeast San Joaquin Valley study unit.

Table 3D. Polar pesticides, pesticide degradates, and caffeine, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2060.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6B); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection[2] (2004–2005)	Trend-well detection[2] (2007–2008)
Acifluorfen	Herbicide	49315	50594-66-6	[3] 0.007	0.060	na	na	—[4]	—[4]
Aldicarb	Insecticide	49312	116-06-3	[3] 0.040	0.120	MCL-US	3	—	—
Aldicarb sulfone	Degradate	49313	1646-88-4	0.018	0.080	MCL-US	3	—[4]	—[4]
Aldicarb sulfoxide	Degradate	49314	1646-87-3	[3] 0.008	0.060	MCL-US	4	—	—
Atrazine [5]	Herbicide	39632	1912-24-9	0.008	0.040	MCL-CA	1	D [e,g]	D [g]
Bendiocarb	Insecticide	50299	22781-23-3	0.020	0.040	na	na	—	—
Benomyl	Fungicide	50300	17804-35-2	[3] 0.004	0.040	na	na	—	—
Bensulfuron-methyl	Herbicide	61693	83055-99-6	[3] 0.016	0.060	na	na	—	—
Bentazon	Herbicide	38711	25057-89-0	[3] 0.011	0.040	MCL-CA	18	—	—
Bromacil	Herbicide	04029	314-40-9	0.018	0.040	HAL-US	70	—	—
Bromoxynil	Herbicide	49311	1689-84-5	[3] 0.017	0.120	na	na	—	—
Caffeine	Beverages	50305	58-08-2	[3] 0.010	0.060	na	na	D [d,e,g]	—
Carbaryl [5]	Herbicide	49310	63-25-2	0.018	0.040	RSD5-US	400	—	—
Carbofuran [5]	Herbicide	49309	1563-66-2	[3] 0.006	0.060	MCL-CA	18	—	—
Chloramben, methyl ester	Herbicide	61188	7286-84-2	[3] 0.018	0.100	na	na	—	—
Chlorimuron-ethyl	Herbicide	50306	90982-32-4	[3] 0.010	0.080	na	na	—	—
3-(4-Chlorophenyl)-1-methyl urea	Degradate	61692	5352-88-5	[3] 0.024	0.120	na	na	—[4]	—[4]
Clopyralid	Herbicide	49305	1702-17-6	[3] 0.014	0.060	na	na	—	—
Cycloate	Herbicide	04031	1134-23-2	[3] 0.013	0.060	na	na	—	—
2,4-D [6]	Herbicide	39732	94-75-7	[3] 0.022	0.060	HAL-US	70	—	—
2,4-D methyl ester [6]	Herbicide	50470	1928-38-7	[3] 0.009	0.200	na	na	—	—
2,4-D plus 2,4-D methyl ester [6]	Herbicides	66496	na	[3] 0.020	[3] 0.020	na	na	—	—
2,4-DB (4-(2,4-Dichlorophenoxy)butyric acid)	Herbicide	38746	94-82-6	[3] 0.016	0.020	na	na	—	—
DCPA (Dacthal) monoacid	Degradate	49304	887-54-7	[3] 0.012	0.028	na	na	—	—
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) [5]	Degradate	04040	6190-65-4	0.020	0.060	na	na	D [e]	D [e]
Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine)	Degradate	04038	1007-28-9	[3] 0.044	0.080	na	na	—	D [e]
Dicamba	Herbicide	38442	1918-00-9	[3] 0.013	0.080	HAL-US	4,000	—[4]	—[4]
Dichlorprop	Herbicide	49302	120-36-5	[3] 0.014	0.040	na	na	—	—

Table 3D. Polar pesticides, pesticide degradates, and caffeine, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2060.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6B); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection[2] (2004–2005)	Trend-well detection[2] (2007–2008)
Dinoseb (Dinitrobutyl phenol)	Herbicide	49301	88-85-7	0.038	0.040	MCL-CA	7	—	—
Diphenamid	Herbicide	04033	957-51-7	0.010	0.040	HAL-US	200	—	—
Diuron	Herbicide	49300	330-54-1	0.015	0.040	HAL-US	10	D [e]	—
Fenuron	Herbicide	49297	101-42-8	0.018	0.040	na	na	—	—
Flumetsulam	Herbicide	61694	98967-40-9	[3] 0.011	0.060	na	na	—	—
Fluometuron	Herbicide	38811	2164-17-2	0.016	0.040	HAL-US	90	—	—
Hydroxyatrazine (2-Hydroxy-4-isopropylamino-6-ethylamino-*s*-triazine)	Degradate	50355	2163-68-0	[3] 0.008	0.080	na	na	—	—
3-Hydroxycarbofuran	Degradate	49308	16655-82-6	[3] 0.006	0.020	na	na	—	—
Imazaquin	Herbicide	50356	81335-37-7	[3] 0.016	0.040	na	na	—	—
Imazethapyr	Herbicide	50407	81335-77-5	[3] 0.017	0.040	na	na	—	—
Imidacloprid	Insecticide	61695	138261-41-3	[3] 0.007	0.060	na	na	—	—
Linuron	Herbicide	38478	330-55-2	0.014	0.040	na	na	—	—
MCPA (2-Methyl-4-chlorophenoxyacetic acid)	Herbicide	38482	94-74-6	[3] 0.016	0.060	HAL-US	30	—	—
MCPB (4-(2-Methyl-4-chlorophenoxy)butyric acid)	Herbicide	38487	94-81-5	0.010	0.200	na	na	—	—
Metalaxyl [5]	Fungicide	50359	57837-19-1	0.012	0.040	na	na	—	—
Methiocarb	Insecticide	38501	2032-65-7	[3] 0.008	0.040	na	na	—	—
Methomyl	Insecticide	49296	16752-77-5	[3] 0.004	0.120	HAL-US	200	—	—
Metsulfuron methyl	Herbicide	61697	74223-64-6	[3] 0.025	[3] 0.14	na	na	—	—
Neburon	Herbicide	49294	555-37-3	0.012	0.020	na	na	—	—
Nicosulfuron	Herbicide	50364	111991-09-4	[3] 0.013	0.100	na	na	—	—
Norflurazon	Herbicide	49293	27314-13-2	[3] 0.016	0.040	na	na	—	—
Oryzalin	Herbicide	49292	19044-88-3	0.012	0.040	na	na	—	—
Oxamyl	Insecticide	38866	23135-22-0	0.012	0.120	MCL-CA	50	—	—
Picloram	Herbicide	49291	1918-02-01	[3] 0.020	0.120	MCL-US	500	—	—
Propham	Herbicide	49236	122-42-9	[3] 0.010	0.060	HAL-US	100	—	—
Propiconazole	Fungicide	50471	60207-90-1	0.010	0.060	na	na	—	—
Propoxur	Insecticide	38538	114-26-1	0.008	0.040	na	na	—	—
Siduron	Herbicide	38548	1982-49-6	[3] 0.017	0.040	na	na	—	—

Table 3D. Polar pesticides, pesticide degradates, and caffeine, primary uses or sources, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2060.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, USEPA Lifetime Health Advisory level; MCL-CA, CDPH maximum contaminant level; MCL-US, USEPA maximum contaminant level; RSD5-US, USEPA risk specific dose at a risk factor of 10^{-5}; This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; CDPH, California Department of Public Health; USEPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; D, detected in groundwater samples (table 6B); na, not available; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS registry number	Minimum LRL 2004–2008 (µg/L)	Maximum LRL 2004–2008 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection[2] (2004–2005)	Trend-well detection[2] (2007–2008)
Sulfometuron-methyl	Herbicide	50337	74222-97-2	[3] 0.009	0.091	na	na	D [b,7]	—[(7)]
Tebuthiuron [5]	Herbicide	82670	34014-18-1	0.026	0.060	HAL-US	500	—	D [e]
Terbacil	Herbicide	04032	5902-51-2	[3] 0.010	0.040	HAL-US	90	—	—
Triclopyr	Herbicide	49235	55335-06-3	[3] 0.022	0.080	na	na	—	—

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] Analysis by this laboratory schedule was performed for fewer than half of the samples during each time period.

[3] Value is an interim reporting level or a method reporting level rather than a laboratory reporting level.

[4] The median matrix-spike recovery was less than 70 percent. Low recoveries may indicate that the compound might not have been detected in some samples even if it was present.

[5] The preferred analytical method for this constituent is Laboratory Schedule 2003/2032/2033 (table 3C).

[6] Because 2,4-D and 2,4-D methyl ester can convert interchangeably during analysis, they are considered one constituent (parameter code 66496) in this report.

[7] The median laboratory matrix-spike recovery during 2007–2008 sampling was greater than 130 percent. High recoveries may indicate that reported values could be higher than what is in the samples.

[b] Detected in the North San Francisco Bay study unit.

[d] Detected in the Southern Sacramento Valley study unit.

[e] Detected in the San Fernando–San Gabriel study unit.

[g] Detected in the Southeast San Joaquin Valley study unit.

Table 3E. Nutrients, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 2755.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of February 10, 2007. **Benchmark type**: HAL-US, U.S. Environmental Protection Agency lifetime health advisory level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; LRL, laboratory reporting level; na, not available; mg/L, milligrams per liter]

Constituent	USGS parameter code	CAS registry number	Minimum LRL or MRL 2004–2008 (mg/L)	Maximum LRL or MRL, or SRL[1] 2004–2008 (mg/L)	Benchmark type[1]	Benchmark value (mg/L)
Ammonia (as nitrogen)	00608	7664-41-7	0.010	0.04	HAL-US	[2] 24.7
Nitrite (as nitrogen)	00613	14797-65-0	0.002	0.008	MCL-US	1
Nitrate plus nitrite (as nitrogen)	00631	na	0.04	0.06	MCL-US	10
Total nitrogen (ammonia, nitrite, nitrate, organic nitrogen)	62854	17778-88-0	0.03	0.1	na	na
Orthophosphate (as phosphorus)	00671	14265-44-2	0.006	0.006	na	na

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] The HAL-US is 30 mg/L "as ammonia." To facilitate comparson to the analytical results, we have converted and reported this HAL-US as 24.7 mg/L "as nitrogen."

Table 3F. Major and minor ions, total dissolved solids, trace elements, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 1948.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of June 1, 2008. **Benchmark type**: AL-US, U.S. Environmental Protection Agency action level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory; MCL-CA, California Department of Public Health maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL-CA, California Department of Public Health notification level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; LRL, laboratory reporting level; MRL, minimum reporting level; nv, no value in category; SRL, study reporting level; na, not available; mg/L, milligrams per liter; µg/L, micrograms per liter]

Constituent	USGS parameter code	CAS registry number	Minimum LRL or MRL 2004–2008	Maximum LRL or MRL 2004–2008	SRL[1]	Benchmark type[2]	Benchmark value
Major and minor ions (mg/L)							
Bromide	71870	24959-67-9	0.02	0.02	nv	na	na
Calcium	00915	7440-70-2	0.02	0.04	nv	na	na
Chloride	00940	16887-00-6	0.12	0.20	nv	SMCL-CA	[3] 250 (500)
Fluoride	00950	16984-48-8	0.08	0.12	nv	MCL-CA	2
Iodide [4]	71865	7553-56-2	0.002	0.002	nv	na	na
Magnesium	00925	7439-95-4	0.008	0.02	nv	na	na
Potassium	00935	7440-09-7	0.02	0.16	nv	na	na
Silica	00955	7631-86-9	0.02	0.04	nv	na	na
Sodium	00930	7440-23-5	0.10	0.20	nv	na	na
Sulfate	00945	14808-79-8	0.18	0.18	nv	SMCL-CA	[3] 250 (500)
Residue on evaporation (total dissolved solids, TDS)	70300	na	10	10	nv	SMCL-CA	[3] 500 (1,000)
Trace elements (µg/L)							
Aluminum	01106	7429-90-5	1.6	4	1.6	MCL-CA	1,000
Antimony	01095	7440-36-0	0.04	0.2	nv	MCL-US	6
Arsenic	01000	7440-38-2	0.06	0.12	nv	MCL-US	10
Barium	01005	7440-39-3	0.08	1	0.36	MCL-CA	1,000
Beryllium	01010	7440-41-7	0.008	0.06	nv	MCL-US	4
Boron	01020	7440-42-8	4	8	nv	NL-CA	1,000
Cadmium	01025	7440-43-9	0.02	0.04	nv	MCL-US	5
Chromium	01030	7440-47-3	0.04	0.8	0.42	MCL-CA	50
Cobalt	01035	7440-48-4	0.014	0.04	nv	na	na
Copper	01040	7440-50-8	0.4	1	1.7	AL-US	1,300
Iron	01046	7439-89-6	4	8	6	SMCL-CA	300
Lead	01049	7439-92-1	0.06	0.12	0.65	AL-US	15
Lithium	01130	7439-93-2	0.6	1	nv	na	na
Manganese	01056	7439-96-5	0.2	0.2	0.2	SMCL-CA	50

Table 3F. Major and minor ions, total dissolved solids, trace elements, comparative benchmarks, and reporting information for the USGS National Water Quality Laboratory Schedule 1948.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of June 1, 2008. **Benchmark type**: AL-US, U.S. Environmental Protection Agency action level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory; MCL-CA, California Department of Public Health maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL-CA, California Department of Public Health notification level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; LRL, laboratory reporting level; MRL, minimum reporting level; nv, no value in category; SRL, study reporting level; na, not available; mg/L, milligrams per liter; µg/L, micrograms per liter]

Constituent	USGS parameter code	CAS registry number	Minimum LRL or MRL 2004–2008	Maximum LRL or MRL 2004–2008	SRL[1]	Benchmark type[2]	Benchmark value
Trace elements (µg/L)—Continued							
Molybdenum	01060	7439-98-7	0.02	0.4	nv	HAL-US	40
Nickel	01065	7440-02-0	0.06	0.2	0.36	MCL-CA	100
Selenium	01145	7782-49-2	0.04	0.4	nv	MCL-US	50
Silver	01075	7440-22-4	0.008	0.2	nv	SMCL-CA	100
Strontium	01080	7440-24-6	0.4	0.8	nv	HAL-US	4,000
Thallium	01057	7440-28-0	0.04	0.04	nv	MCL-US	2
Tungsten [5]	01155	7440-33-7	0.02	0.06	0.11	na	na
Uranium	22703	7440-61-1	0.006	0.04	nv	MCL-US	30
Vanadium	01085	7440-62-2	0.04	0.16	0.11	NL-CA	50
Zinc	01090	7440-66-6	0.6	2	4.8	SMCL-CA [6]	5,000

[1] Study reporting levels (SRLs) for trace elements were defined on the basis of the examination of field blanks collected in GAMA study units from May 2004 through January 2008 (Olsen and others, 2010).

[2] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[3] The recommended SMCL-CA benchmarks for chloride, sulfate, and TDS are listed with the upper SMCL-CA benchmarks in parentheses.

[4] Samples collected for the San Diego Drainages study unit were not analyzed for iodide during either period.

[5] Samples collected for the San Diego Drainages, Northern San Joaquin Basin, and Southern Sacramento Valley study units were not analyzed for tungsten during either period.

[6] The secondary maximum contaminant level (SMCL-CA) for zinc is listed as SMCL-CA because SMCLs established by CDPH are used in this report for all constituents that have SMCL-CA values.

Table 3G. Arsenic and iron species, comparative benchmarks, and reporting information for the USGS Trace Metal Laboratory, Boulder, Colorado.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; MDL, method detection limit; NWQL, USGS National Water Quality Laboratory; na, not available; µg/L, micrograms per liter]

Constituent (valence state)	USGS parameter code	CAS registry number	MDL (µg/L)	Benchmark type[1]	Benchmark level (µg/L)
Arsenic (III)	99034	22569-72-8	1	na	na
Arsenic (total) [2]	99033	7440-38-2	0.5	MCL-US	10
Iron (II)	01047	7439-89-6	2	na	na
Iron (total) [2]	01046	7439-89-6	2	SMCL-CA	300

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] The preferred analytical method for this constituent is NWQL Schedule 1948 (table 3F).

Table 3H. Constituents of special interest, primary uses or sources, comparative benchmarks, and reporting information for the Montgomery Watson Harza Laboratory and Weck Laboratories, Inc.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of April 1, 2010. **Benchmark type**: HAL-US, U.S. Environmental Protection Agency lifetime health advisory; MCL-CA, California Department of Public Health maximum contaminant level; NL-CA, California Department of Public Health notification level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; MRL, minimum reporting level; LRL, laboratory reporting level; D, detected in groundwater samples (table 7); µg/L, micrograms per liter; nc, not collected; —, not detected]

Constituent	Primary use or source	USGS parameter code	CAS registry number	MRL or LRL (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Trend-well detection (2004–2005)	Trend-well detection (2007–2008)
Perchlorate (unfiltered) [2]	Rocket fuel, fireworks, flares, natural	61209	14797-73-0	0.5	MCL-CA	6	D [a,d,e,g]	D [a]
Perchlorate (filtered) [3]	Rocket fuel, fireworks, flares, natural	63790	14797-73-0	0.1	MCL-CA	6	nc	D [a,b,c,d,e,f,g]
N-Nitrosodimethylamine (NDMA) [4]	Disinfection byproduct	34438	62-75-9	0.002	NL-CA	0.010	—	—
1,2,3-Trichloropropane (1,2,3-TCP) [4]	Fumigant, solvent	77443	96-18-4	0.005	HAL-US [5]	40	D [g]	D [d,g]

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] Perchlorate analyses from unfiltered samples (all samples during 2004–05, and San Diego Drainages and North San Francisco Bay study units only during 2007–08) were performed by Montgomery Watson Harza Laboratory. The nominal MRLs were 0.25 or 0.5 µg/L; some higher salinity samples were diluted for analysis and had an MRL of 1 µg/L.

[3] Perchlorate analyses from filtered samples performed by Weck Laboratories, Inc., during 2007–08.

[4] NDMA and 1,2,3-TCP analyses were performed by Montgomery Watson Harza Laboratory for initial sampling and by Weck Laboratories, Inc., for resampling. All samples were additionally analyzed for 1,2,3-TCP by the USGS National Water Quality Laboratory Schedule 2020, which had an LRL ranging from 0.12 to 0.18.

[5] In some earlier reports in this series, the NL-CA (0.005 µg/L) was used as the comparison benchmark for 1,2,3-TCP.

[a] Detected in the San Diego Drainages study unit.

[b] Detected in the North San Francisco Bay study unit.

[c] Detected in the Northern San Joaquin Basin study unit.

[d] Detected in the Southern Sacramento Valley study unit.

[e] Detected in the San Fernando–San Gabriel study unit.

[f] Detected in the Monterey Bay and Salinas Valley Basins study unit.

[g] Detected in the Southeast San Joaquin Valley study unit.

Table 3I. Isotopic and radioactive constituents, comparative benchmarks, and reporting information for laboratories.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Stable isotope ratios are reported in the standard delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Benchmark type and value for tritium were in effect during both sampling periods and continue to be in effect (July 2012). **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client Services℠. **Other abbreviations**: CAS, Chemical Abstract Service; MRL, minimum reporting level; MU, method uncertainty; na, not available; pCi/L, picocuries per liter]

Constituent	USGS parameter code	CAS registry number	Reporting level type	Reporting level or uncertainty (range)	Benchmark type[1]	Benchmark value
Stable isotope ratios (per mil)						
$\delta^{2}H$ of water [2]	82082 [4]	na	MU	2	na	na
$\delta^{18}O$ of water [2]	82085 [4]	na	MU	0.20	na	na
$\delta^{13}C$ of dissolved carbonates [3]	82081 [4]	na	1 sigma	0.05	na	na
Radioactive constituents (percent modern)						
Carbon-14 [5]	49933	14762-75-5	1 sigma	(0.0015–0.002)	na	na
Radioactive constituents (pCi/L)						
Tritium [6]	07000	10028-17-8	MRL	(0.3–1)	MCL-CA	20,000

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] USGS Stable Isotope Laboratory, Reston, Virginia.

[3] University of Waterloo (contract laboratory).

[4] Parameters 82081, 82082, and 82085 are isotopes that are inherent constituents of the substance being measured. Parameter 82081 was not detected in Southeast San Joaquin Valley study unit wells during resampling in 2008 because those samples were not analyzed for it.

[5] University of Arizona, Accelerator Mass Spectrometry Laboratory (contract laboratory).

[6] USGS Stable Isotope and Tritium Laboratory, Menlo Park, California.

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; °C, degrees Celsius; mg/L, milligrams per liter; nc, not collected; na, not available; RL, reporting level or range; µS/cm, microsiemens per centimeter; <, less than; >, greater than; $CaCO_3$, calcium carbonate; *, concentration is greater than the benchmark level; **, concentration is greater than the upper benchmark level; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory [3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory [3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
San Diego Drainages study unit													
SDALLV-07	7/14/2004	nc	nc	nc	nc	nc	806	nc	nc	nc	nc	nc	nc
SDALLV-07	9/12/2007	3.0	19.5	nc	6.8	nc	772	153	nc	186	nc	0.1	nc
SDALLV-11	7/15/2004	nc	20.5	nc	nc	nc	**2,070	nc	nc	nc	nc	nc	nc
SDALLV-11	9/13/2007	1.9	21.0	nc	6.8	nc	**1,750	243	nc	296	nc	0.1	nc
SDHDRK-01	7/12/2004	nc	nc	nc	nc	nc	**2,280	nc	nc	nc	nc	nc	nc
SDHDRK-01	9/13/2007	0.3	25.0	nc	7.3	nc	**2,270	220	nc	268	nc	0.2	nc
SDHDRK-09	7/27/2004	nc	nc	nc	nc	nc	568	nc	nc	nc	nc	nc	nc
SDHDRK-09	9/11/2007	2.5	20.0	7.2	6.7	673	627	206	nc	251	nc	0.2	nc
SDTEM-04	5/24/2004	nc	19.5	nc	nc	nc	*1,020	nc	nc	nc	nc	nc	nc
SDTEM-04	9/18/2007	5.8	19.0	7.6	7.4	*956	*947	167	nc	203	nc	0.4	nc
SDTEMFP-01	5/19/2004	4.6	24.0	8.2	8.1	632	704	nc	116	nc	142	nc	2
SDTEMFP-01	9/19/2007	3.0	23.5	8.2	8.2	722	716	135	nc	162	nc	1.1	nc
SDWARN-01	6/17/2004	nc	20.0	nc	nc	nc	773	nc	nc	nc	nc	nc	nc
SDWARN-01	9/11/2007	3.1	20.0	7.2	7.3	806	751	221	nc	269	nc	0.2	nc
North San Francisco Bay study unit													
NSFVOL-14	10/7/2004	4.3	21.5	E7.2	6.5	186	191	nc	66	nc	80	nc	—
NSFVOL-14	8/21/2007	4.6	19.0	nc	*6.3	nc	201	80	nc	98	nc	—	nc
NSFVOL-18	10/20/2004	nc	26.5	nc	nc	nc	397	nc	nc	nc	nc	nc	nc
NSFVOL-18	8/28/2007	0.2	28.5	7.2	6.9	398	398	189	nc	230	nc	0.2	nc

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; °C, degrees Celsius; mg/L, milligrams per liter; nc, not collected; na, not available; RL, reporting level or range; µS/cm, microsiemens per centimeter; <, less than; >, greater than; $CaCO_3$, calcium carbonate; *, concentration is greater than the benchmark level; **, concentration is greater than the upper benchmark level; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory[3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
North San Francisco Bay study unit—Continued													
NSFVP-29	9/28/2004	5.7	16.5	7.5	6.8	409	362	nc	167	nc	203	nc	0.2
NSFVP-29	8/27/2007	6.2	16.5	nc	6.9	nc	379	164	nc	200	nc	0.1	nc
NSFVP-34	10/18/2004	0.2	19.5	7.7	7.3	199	211	nc	91	nc	110	nc	0.2
NSFVP-34	8/22/2007	<0.2	20.0	nc	7.0	nc	221	94	nc	115	nc	0.1	nc
NSFVP-36	10/19/2004	nc	18.5	7.6	nc	*1,360	*1,250	nc	nc	nc	nc	nc	nc
NSFVP-36	8/20/2007	0.7	19.0	nc	7.3	nc	*1,410	nc	nc	nc	nc	nc	nc
NSFVP-38	10/20/2004	<0.2	25.5	8.2	8.2	693	734	nc	381	nc	454	nc	4.8
NSFVP-38	8/22/2007	<0.2	28.5	nc	6.7	nc	765	389	nc	474	nc	0.1	nc
NSFVP-39	10/21/2004	nc	20.0	7.6	nc	310	332	nc	nc	nc	nc	nc	nc
NSFVP-39	11/16/2007	0.8	23.0	7.2	7.3	318	318	157	nc	191	nc	0.1	nc
NSFVP-41	10/21/2004	nc	20.5	7.3	nc	477	510	nc	nc	nc	nc	nc	nc
NSFVP-41	8/20/2007	1.2	18.5	nc	6.7	nc	428	161	nc	196	nc	—	nc
NSFWG-03	9/21/2004	nc	16.5	nc	nc	nc	260	nc	nc	nc	nc	nc	nc
NSFWG-03	8/29/2007	<0.2	17.0	6.5	*6.1	251	256	38	nc	46	nc	—	nc
NSFWGFP-01	10/5/2004	0.2	19.5	7.8	7.5	347	363	nc	143	nc	174	nc	0.4
NSFWGFP-01	8/29/2007	<0.2	20.0	nc	7.4	nc	356	149	nc	181	nc	0.2	nc
Northern San Joaquin Basin study unit													
COS-08	1/3/2005	nc	20.0	nc	nc	nc	216	nc	nc	nc	nc	nc	nc
COS-08	4/3/2008	1.3	20.0	7.8	7.6	217	214	99	nc	120	nc	0.3	nc

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; °C, degrees Celsius; mg/L, milligrams per liter; nc, not collected; na, not available; RL, reporting level or range; µS/cm, microsiemens per centimeter; <, less than; >, greater than; $CaCO_3$, calcium carbonate; *, concentration is greater than the benchmark level; **, concentration is greater than the upper benchmark level; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory [3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory [3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
Northern San Joaquin Basin study unit—Continued													
ESJ-01	1/24/2005	nc	19.0	nc	nc	nc	663	nc	nc	nc	nc	nc	nc
ESJ-01	4/2/2008	0.4	19.5	7.9	7.7	619	603	182	nc	221	nc	0.8	nc
ESJ-06	1/10/2005	nc	nc	7.4	7.4	319	340	130	nc	158	nc	—	nc
ESJ-06	4/2/2008	5.9	20.5	7.7	7.5	354	348	134	nc	163	nc	0.4	nc
NSJ-QPC-04	1/24/2005	nc	22.0	6.8	6.8	143	140	61	nc	74	nc	—	nc
NSJ-QPC-04	4/1/2008	4.8	22.5	7.4	7.1	150	151	63	nc	76	nc	—	nc
TRCY-03	1/6/2005	6.2	22.0	E6.6	7.5	*1,140	*1,110	202	194	246	235	—	1
TRCY-03	3/31/2008	4.8	22.5	7.5	7.6	*1,210	*1,170	201	nc	245	nc	0.4	nc
Southern Sacramento Valley study unit													
NAM-03	3/29/2005	nc	21.0	nc	nc	nc	382	nc	nc	nc	nc	nc	nc
NAM-03	4/10/2008	6.2	22.5	7.3	7.2	390	390	119	nc	145	nc	0.1	nc
SAM-10	4/21/2005	nc	18.5	nc	nc	nc	590	nc	nc	nc	nc	nc	nc
SAM-10	4/8/2008	5.1	19.5	7.6	7.4	660	648	242	nc	295	nc	0.5	nc
SOL-08	5/10/2005	nc	26.0	nc	nc	nc	443	nc	nc	nc	nc	nc	nc
SOL-08	4/8/2008	4.7	26.0	7.8	7.8	458	443	226	nc	274	nc	0.9	nc
SSV-QPC-07	4/4/2005	4.7	20.0	7.0	7.0	570	604	138	136	168	165	0.1	0.1
SSV-QPC-07	4/10/2008	5.8	20.5	7.4	7.0	603	602	140	nc	170	nc	0.2	nc
SUI-03	5/12/2005	nc	20.0	nc	nc	nc	712	nc	nc	nc	nc	nc	nc
SUI-03	4/9/2008	7.8	20.0	7.6	7.5	776	764	193	nc	234	nc	0.4	nc

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; °C, degrees Celsius; mg/L, milligrams per liter; nc, not collected; na, not available; RL, reporting level or range; µS/cm, microsiemens per centimeter; <, less than; >, greater than; $CaCO_3$, calcium carbonate; *, concentration is greater than the benchmark level; **, concentration is greater than the upper benchmark level; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory[3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
Southern Sacramento Valley study unit—Continued													
YOL-01	4/11/2005	nc	20.0	nc	nc	nc	883	nc	nc	nc	nc	nc	nc
YOL-01	4/7/2008	8.1	19.0	7.7	7.7	*927	895	328	nc	398	nc	1.0	nc
YOL-14	5/25/2005	<0.2	19.0	7.6	*6.3	*1,400	*1,240	171	169	207	E204	0.4	E0.7
YOL-14	4/9/2008	<0.2	17.5	7.6	7.6	**1,760	**1,650	275	nc	334	nc	0.7	nc
San Fernando–San Gabriel study unit													
ULASF-09	6/27/2005	5.8	20.0	6.8	6.6	*1,030	*1,080	178	167	217	204	0.1	0.1
ULASF-09	6/16/2008	4.5	20.5	6.8	6.8	*922	*927	152	nc	186	nc	0.1	nc
ULASF-10	6/8/2005	4.2	22.5	7.7	7.7	701	740	179	174	217	211	0.5	0.5
ULASF-10	6/16/2008	2.6	23.5	7.9	7.8	770	779	153	nc	186	nc	0.7	nc
ULASG-01	6/7/2005	3.4	21.0	nc	nc	nc	*1,140	nc	nc	nc	nc	nc	nc
ULASG-01	6/16/2008	4.0	21.5	7.2	*6.2	*1,190	*1,200	271	nc	331	nc	0.3	nc
ULASG-08	6/15/2005	7.6	22.0	6.9	7.5	556	636	161	155	196	188	0.1	0.6
ULASG-08	6/17/2008	4.9	22.5	7.9	7.7	671	675	161	nc	195	nc	0.7	nc
ULASG-15	6/23/2005	5.2	16.5	7.6	7.4	315	313	155	151	188	183	0.4	0.5
ULASG-15	6/17/2008	8.1	17.5	7.7	7.6	395	394	151	nc	183	nc	0.4	nc
ULASG-17	7/11/2005	2.6	21.5	nc	nc	nc	*1,100	nc	nc	nc	nc	nc	nc
ULASG-17	6/17/2008	4.2	21.5	7.3	7.0	*1,140	*1,150	327	nc	398	nc	0.3	nc

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory [3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory [3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
Monterey Bay and Salinas Valley Basins study unit													
MSMB-03	8/31/2005	1.9	33.0	nc	nc	nc	338	nc	nc	nc	nc	nc	nc
MSMB-03	8/20/2008	<0.2	32.0	*8.8	*8.7	507	537	169	nc	195	nc	5.2	nc
MSMB-04	8/17/2005	<0.2	23.0	8.0	8.1	*1,170	*1,210	164	163	198	199	0.8	1.6
MSMB-04	8/20/2008	<0.2	23.5	7.8	8.0	*1,540	*1,590	149	nc	181	nc	0.6	nc
MSMB-16	8/17/2005	4.1	19.5	nc	nc	nc	651	nc	nc	nc	nc	nc	nc
MSMB-16	8/19/2008	6.2	19.5	7.6	7.3	671	647	101	nc	122	nc	0.2	nc
MSMB-28	8/3/2005	nc	20.0	nc	nc	nc	719	nc	nc	nc	nc	nc	nc
MSMB-28	8/21/2008	6.7	20.0	7.2	7.0	761	736	192	nc	234	nc	0.2	nc
MSMB-31	8/11/2005	5.2	16.5	nc	nc	nc	594	nc	nc	nc	nc	nc	nc
MSMB-31	8/21/2008	6.9	16.5	7.3	7.1	613	585	210	nc	256	nc	0.2	nc
MSPR-03	7/28/2005	1.7	33.0	nc	nc	nc	815	nc	nc	nc	nc	nc	nc
MSPR-03	11/14/2008	0.7	26.5	7.9	7.8	875	884	290	nc	352	nc	1.2	nc
MSPR-09	7/18/2005	nc	23.5	nc	nc	nc	*1,590	nc	nc	nc	nc	nc	nc
MSPR-09	11/14/2008	0.4	24.0	7.9	7.8	*1,590	*1,600	328	nc	397	nc	1.6	nc
MSSC-06	8/24/2005	<0.2	18.5	7.6	7.5	665	694	136	128	165	156	0.3	0.2
MSSC-06	8/18/2008	<0.2	18.5	7.6	7.4	699	688	141	nc	171	nc	0.3	nc
MSSC-11	9/13/2005	<0.2	17.5	nc	nc	nc	414	nc	nc	nc	nc	nc	nc
MSSC-11	8/19/2008	<0.2	17.0	8.0	7.8	438	413	209	nc	253	nc	1.0	nc
MSSV-06	8/2/2005	nc	19.0	nc	nc	nc	538	nc	nc	nc	nc	nc	nc

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory [3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory [3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
Monterey Bay and Salinas Valley Basins study unit—Continued													
MSSV-06	11/13/2008	0.3	18.0	7.5	7.2	529	531	149	nc	181	nc	0.3	nc
MSSV-15	8/12/2005	nc	18.0	nc	nc	nc	606	nc	nc	nc	nc	nc	nc
MSSV-15	11/13/2008	0.4	17.0	7.5	7.5	605	593	161	nc	195	nc	0.3	nc
Southeast San Joaquin Valley study unit													
KING-11	10/20/2005	5.7	22.5	8.0	nc	423	409	149	nc	181	nc	0.8	nc
KING-11	11/5/2008	4.7	23.0	8.0	7.9	538	528	143	nc	173	nc	0.7	nc
KING-13	10/20/2005	6.9	23.0	7.7	nc	316	318	132	nc	160	nc	0.3	nc
KING-13	11/5/2008	5.7	22.5	7.8	7.6	315	312	129	nc	157	nc	0.4	nc
KING-17	10/26/2005	4.7	23.5	7.8	7.9	308	322	129	131	156	159	0.5	0.6
KING-17	11/4/2008	4.5	23.5	8.0	7.9	320	320	128	nc	155	nc	0.6	nc
KING-24	11/5/2005	5.9	21.0	nc	nc	nc	480	nc	nc	nc	nc	nc	nc
KING-24	11/3/2008	5.4	21.0	7.6	7.4	521	517	212	nc	258	nc	0.4	nc
KWH-10	11/17/2005	11.0	21.0	nc	nc	nc	650	nc	nc	nc	nc	nc	nc
KWH-10	11/5/2008	6.6	22.0	7.8	7.8	630	621	183	nc	221	nc	0.6	nc
KWH-12	11/28/2005	5.8	19.5	8.0	8.5	213	218	66	65	79	78	0.3	0.8
KWH-12	11/6/2008	7.1	20.0	7.7	8.2	240	235	72	nc	87	nc	0.2	nc
TLR-03	11/29/2005	<0.2	24.0	nc	nc	nc	425	nc	nc	nc	nc	nc	nc
TLR-03	11/4/2008	<0.2	26.5	*9.1	*9.2	488	491	124	nc	134	nc	7.9	nc
TULE-05	12/5/2005	0.4	27.5	nc	nc	nc	*1,120	nc	nc	nc	nc	nc	nc

Table 4. Water-quality indicators in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands Basin study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; °C, degrees Celsius; mg/L, milligrams per liter; nc, not collected; na, not available; RL, reporting level or range; µS/cm, microsiemens per centimeter; <, less than; >, greater than; $CaCO_3$, calcium carbonate; *, concentration is greater than the benchmark level; **, concentration is greater than the upper benchmark level; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, laboratory [3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, laboratory [3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		na	na	SMCL-US	SMCL-US	SMCL-CA	SMCL-CA	na	na	na	na	na	na
Benchmark level		na	na	<6.5 or >8.5	<6.5 or >8.5	[2] 900 (1,600)	[2] 900 (1,600)	na	na	na	na	na	na
[RL]		[0.2]	[0.0–38.5]	[0–14]	[0–14]	[5]	[5]	[1]	[1]	[1]	[1]	[1]	[1]
Southeast San Joaquin Valley study unit—Continued													
TULE-05	11/3/2008	0.5	28.0	8.4	8.3	721	624	122	nc	146	nc	1.5	nc
TULE-10	12/7/2005	7.6	21.0	nc	nc	nc	580	nc	nc	nc	nc	nc	nc
TULE-10	11/3/2008	5.7	21.0	7.4	7.4	657	650	201	nc	245	nc	0.3	nc

[1] Field measurement is the preferred method of determination.

[2] The SMCL-CA for specific conductance has recommended and upper benchmark values. The upper value is shown in parentheses.

[3] Bicarbonate and carbonate concentrations were calculated from the laboratory alkalinity and pH values using the advanced speciation method (http://or.water.usgs.gov/alk/methods.html) with $pK_1 = 6.35$, $pK_2 = 10.33$, and $pK_W = 14$.

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloromethane (µg/L) (32101)	Dibromochloromethane (µg/L) (32105)	Bromoform (Tribromomethane) (µg/L) (32104)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloroethene (µg/L) (77093)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloromethane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
Number of wells with detections 2004–05		21	7	2	1	11	9	6	6	5	4	2
Detection frequency (percent) 2004–05		38.2	12.7	3.6	1.8	20.0	16.4	10.9	10.9	9.1	7.3	3.6
Number of wells with detections 2007–08		21	8	1	0	9	9	6	5	4	3	4
Detection frequency (percent) 2007–08		38.2	14.5	1.8	0.0	16.4	16.4	10.9	9.1	7.3	5.5	7.3
San Diego Drainages study unit												
SDALLV-07	7/14/2004	E0.02	—	—	—	—	—	—	—	—	—	—
SDALLV-07	9/12/2007	—	—	—	—	—	—	—	—	—	—	—
SDALLV-11	7/15/2004	0.20	—	—	—	0.37	E0.03	—	E0.02 [4]	E0.03	—	—
SDALLV-11	9/13/2007	0.80	—	—	—	0.90	—	—	0.10	E0.03	—	E0.03
SDHDRK-01	7/12/2004	0.27	—	—	—	*9.75	*7.27	1.08	—	E0.08	—	—
SDHDRK-01	9/13/2007	0.24	—	—	—	*7.85	*6.19	0.80	—	E0.10	—	—
SDHDRK-09	7/27/2004	—	—	—	—	—	—	—	—	—	—	—
SDHDRK-09	9/11/2007	—	—	—	—	—	—	—	—	—	—	—
SDTEM-04	5/24/2004	—	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloro-methane) (µg/L) (32106)	Bromo-dichloro-methane (µg/L) (32101)	Dibromo-chloro-methane (µg/L) (32105)	Bromoform (Tribromo-methane) (µg/L) (32104)	Perchloro-ethene (PCE, Tetra-chloroethene) (µg/L) (34475)	Trichloro-ethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)	Carbon tetra-chloride (Tetrachloro-methane) (µg/L) (32102)	1,1-Dichloro-ethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloro-ethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloro-methane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
San Diego Drainages study unit—Continued												
SDTEM-04	9/18/2007	E0.07	—	—	—	—	—	—	—	—	—	—
SDTEMFP-01	5/19/2004	—	—	—	—	E0.01 [4]	—	—	—	—	—	—
SDTEMFP-01	9/19/2007	E0.04	E0.03	—	—	—	—	—	—	—	—	—
SDWARN-01	6/17/2004	—	—	—	—	—	—	—	—	—	—	—
SDWARN-01	9/11/2007	—	—	—	—	—	—	—	—	—	—	—
North San Francisco Bay study unit												
NSFVOL-14	10/7/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVOL-14	8/21/2007	—	—	—	—	—	—	—	—	—	—	—
NSFVOL-18	10/20/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVOL-18	8/28/2007	—	—	—	—	—	—	—	—	—	—	—
NSFVP-29	9/28/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVP-29	8/27/2007	—	—	—	—	—	—	—	—	—	—	—
NSFVP-34	10/18/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVP-34	8/22/2007	—	—	—	—	—	—	—	—	—	—	—
NSFVP-36	10/19/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVP-36	8/20/2007	—	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloromethane (µg/L) (32101)	Dibromochloromethane (µg/L) (32105)	Bromoform (Tribromomethane) (µg/L) (32104)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloroethene (µg/L) (77093)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloromethane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
North San Francisco Bay study unit—Continued												
NSFVP-38	10/20/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVP-38	8/22/2007	E0.02	—	—	—	—	—	—	—	—	—	—
NSFVP-39	10/21/2004	—	—	—	—	—	—	—	—	—	—	—
NSFVP-39	11/16/2007	—	—	—	—	—	—	—	—	—	—	—
NSFVP-41	10/21/2004	E0.02	—	—	—	—	—	—	—	—	—	—
NSFVP-41	8/20/2007	E0.02	—	—	—	—	—	—	—	—	—	—
NSFWG-03	9/21/2004	—	—	—	—	—	—	—	—	—	—	—
NSFWG-03	8/29/2007	—	—	—	—	—	—	—	—	—	—	—
NSFWGFP-01	10/5/2004	—	—	—	—	2.67	0.40	0.15	—	—	—	—
NSFWGFP-01	8/29/2007	—	—	—	—	1.04	0.16	E0.04	—	—	—	—
Northern San Joaquin Basin study unit												
COS-08	1/3/2005	—	—	—	—	—	—	—	—	—	—	—
COS-08	4/3/2008	—	—	—	—	—	—	—	—	—	—	—
ESJ-01	1/24/2005	E0.01 [4]	—	—	—	—	—	—	—	—	—	—
ESJ-01	4/2/2008	—	—	—	—	—	—	—	—	—	—	—
ESJ-06	1/10/2005	E0.04	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloro-methane) (µg/L) (32106)	Bromo-dichloro-methane (µg/L) (32101)	Dibromo-chloro-methane (µg/L) (32105)	Bromoform (Tribromo-methane) (µg/L) (32104)	Perchloro-ethene (PCE, Tetra-chloroethene) (µg/L) (34475)	Trichloro-ethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)	Carbon tetra-chloride (Tetrachloro-methane) (µg/L) (32102)	1,1-Dichloro-ethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloro-ethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloro-methane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
Northern San Joaquin Basin study unit—Continued												
ESJ-06	4/2/2008	E0.06	—	—	—	—	—	—	—	—	—	—
NSJ-QPC-04	1/24/2005	—	—	—	—	—	—	—	—	—	—	—
NSJ-QPC-04	4/1/2008	—	—	—	—	—	—	—	—	—	—	—
TRCY-03	1/6/2005	E0.02	—	—	—	—	—	—	—	—	—	—
TRCY-03	3/31/2008	E0.02	—	—	—	—	—	—	—	—	—	—
Southern Sacramento Valley study unit												
NAM-03	3/29/2005	—	—	—	—	E0.02	—	—	—	—	—	—
NAM-03	4/10/2008	—	—	—	—	0.14	E0.05	E0.09	—	—	—	—
SAM-10	4/21/2005	0.27	—	—	—	—	E0.02	—	E0.04	—	—	—
SAM-10	4/8/2008	0.44	—	—	—	—	E0.04	—	E0.06	—	—	—
SOL-08	5/10/2005	—	—	—	—	—	—	—	—	—	—	—
SOL-08	4/8/2008	—	—	—	—	—	—	—	—	—	—	—
SSV-QPC-07	4/4/2005	E0.02	—	—	—	—	—	—	—	—	—	—
SSV-QPC-07	4/10/2008	E0.05	—	—	—	—	—	—	—	—	—	—
SUI-03	5/12/2005	—	—	—	—	—	—	—	—	—	—	—
SUI-03	4/9/2008	—	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloromethane (µg/L) (32101)	Dibromochloromethane (µg/L) (32105)	Bromoform (Tribromomethane) (µg/L) (32104)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloroethene (µg/L) (77093)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloromethane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
Southern Sacramento Valley study unit—Continued												
YOL-01	4/11/2005	E0.02	—	—	—	—	—	—	—	—	—	—
YOL-01	4/7/2008	E0.02	—	—	—	—	—	—	E0.03 [4]	—	—	—
YOL-14	5/25/2005	—	—	—	—	—	—	—	—	—	—	—
YOL-14	4/9/2008	—	—	—	—	—	—	—	—	—	—	—
San Fernando–San Gabriel study unit												
ULASF-09	6/27/2005	0.44	0.14	—	—	1.89	0.11	E0.02	E0.03	—	E0.06	—
ULASF-09	6/16/2008	0.80	0.28	—	—	1.30	E0.09	E0.03	—	—	E0.04	E0.03
ULASF-10	6/8/2005	0.17	—	—	—	1.18	3.65	0.15	E0.06	E0.02	E0.04	—
ULASF-10	6/16/2008	—	—	—	—	—	E0.05	—	—	—	—	—
ULASG-01	6/7/2005	0.29	E0.08	—	—	0.18	—	—	—	—	—	—
ULASG-01	6/16/2008	0.39	E0.10	—	—	0.30	—	—	—	—	—	—
ULASG-08	6/15/2005	0.82	0.27	E0.1	—	0.23	1.44	0.39	E0.04	E0.04	0.18	E0.04
ULASG-08	6/17/2008	2.93	2.19	0.6	—	0.52	1.8	0.44	E0.05	E0.10	0.44	0.14
ULASG-15	6/23/2005	—	—	—	—	—	—	—	—	—	—	—
ULASG-15	6/17/2008	—	—	—	—	—	—	—	—	—	—	—
ULASG-17	7/11/2005	3.23	0.12	—	—	1.80	E0.06	—	E0.04	E0.07	E0.03	—
ULASG-17	6/17/2008	5.28	E0.09	—	—	*10.89	*5.52	—	E0.08	0.49	E0.05	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloro-methane) (µg/L) (32106)	Bromo-dichloro-methane (µg/L) (32101)	Dibromo-chloro-methane (µg/L) (32105)	Bromoform (Tribromo-methane) (µg/L) (32104)	Perchloro-ethene (PCE, Tetra-chloroethene) (µg/L) (34475)	Trichloro-ethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)	Carbon tetra-chloride (Tetrachloro-methane) (µg/L) (32102)	1,1-Dichloro-ethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloro-ethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloro-methane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
Monterey Bay and Salinas Valley Basins study unit												
MSMB-03	8/31/2005	—	—	—	—	—	—	—	—	—	—	—
MSMB-03	8/20/2008	—	—	—	—	—	—	—	—	—	—	—
MSMB-04	8/17/2005	—	—	—	—	—	—	—	—	—	—	—
MSMB-04	8/20/2008	—	—	—	—	—	—	—	—	—	—	—
MSMB-16	8/17/2005	E0.04	—	—	—	E0.04	0.41	E0.04	E0.06	—	—	—
MSMB-16	8/19/2008	E0.05	—	—	—	—	0.72	E0.05	0.10	—	—	—
MSMB-28	8/3/2005	—	—	—	—	—	—	—	—	—	—	—
MSMB-28	8/21/2008	—	—	—	—	—	—	—	—	—	—	—
MSMB-31	8/11/2005	E0.02	—	—	—	—	—	—	—	—	—	—
MSMB-31	8/21/2008	—	—	—	—	—	—	—	—	—	—	—
MSPR-03	7/28/2005	—	—	—	—	—	—	—	—	—	—	—
MSPR-03	11/14/2008	—	—	—	—	—	—	—	—	—	—	—
MSPR-09	7/18/2005	—	—	—	—	—	—	—	—	—	—	—
MSPR-09	11/14/2008	—	—	—	—	—	—	—	—	—	—	—
MSSC-06	8/24/2005	—	—	—	—	—	—	—	—	—	—	—
MSSC-06	8/18/2008	—	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloromethane (µg/L) (32101)	Dibromochloromethane (µg/L) (32105)	Bromoform (Tribromomethane) (µg/L) (32104)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloroethene (µg/L) (77093)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloromethane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
Monterey Bay and Salinas Valley Basins study unit—Continued												
MSSC-11	9/13/2005	—	—	—	—	—	—	—	—	—	—	—
MSSC-11	8/19/2008	—	—	—	—	—	—	—	—	—	—	—
MSSV-06	8/2/2005	—	—	—	—	—	—	—	—	—	—	—
MSSV-06	11/13/2008	—	—	—	—	—	—	—	—	—	—	—
MSSV-15	8/12/2005	—	—	—	—	—	—	—	—	—	—	—
MSSV-15	11/13/2008	—	—	—	—	—	—	—	—	—	—	—
Southeast San Joaquin Valley study unit												
KING-11	10/20/2005	—	—	—	—	—	—	—	—	—	—	—
KING-11	11/5/2008	—	—	—	—	—	—	—	—	—	—	—
KING-13	10/20/2005	—	—	—	—	—	—	—	—	—	—	—
KING-13	11/5/2008	—	—	—	—	—	—	—	—	—	—	—
KING-17	10/26/2005	—	—	—	—	—	—	—	—	—	—	—
KING-17	11/4/2008	—	—	—	—	—	—	—	—	—	—	—
KING-24	11/5/2005	E0.07	—	—	—	—	—	—	—	—	—	—
KING-24	11/3/2008	E0.07	—	—	—	—	—	—	—	—	—	—
KWH-10	11/17/2005	1.35	E0.04	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Trihalomethane				Solvent						
		Chloroform (Trichloro-methane) (µg/L) (32106)	Bromo-dichloro-methane (µg/L) (32101)	Dibromo-chloro-methane (µg/L) (32105)	Bromoform (Tribromo-methane) (µg/L) (32104)	Perchloro-ethene (PCE, Tetra-chloroethene) (µg/L) (34475)	Trichloro-ethene (TCE) (µg/L) (39180)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)	Carbon tetra-chloride (Tetrachloro-methane) (µg/L) (32102)	1,1-Dichloro-ethene (1,1-DCE) (µg/L) (34501)	1,1-Dichloro-ethane (1,1-DCA) (µg/L) (34496)	Methylene chloride (Dichloro-methane) (µg/L) (34423)
Benchmark type[1]		MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	MCL-CA	MCL-US
Benchmark level		[3] 80	[3] 80	[3] 80	[3] 80	5	5	6	0.5	6	5	5
[LRL or SRL][2]		[0.02, 0.04]	[0.028, 0.04]	[0.1, 0.12]	[0.08, 0.1]	[0.03, 0.06]	[0.02, 0.038]	[0.02, 0.024]	[0.06, 0.08]	[0.02, 0.024]	[0.035, 0.06]	[0.04, 0.06]
Southeast San Joaquin Valley study unit—Continued												
KWH-10	11/5/2008	1.95	E0.09	—	—	E0.01 [4]	—	—	—	—	E0.01 [4]	—
KWH-12	11/28/2005	E0.04	—	—	—	0.24	—	—	—	—	—	—
KWH-12	11/6/2008	E0.06	—	—	—	0.32	—	—	E0.03 [4]	—	—	—
TLR-03	11/29/2005	—	—	—	—	—	—	—	—	—	—	—
TLR-03	11/4/2008	—	—	—	—	—	—	—	—	—	—	—
TULE-05	12/5/2005	1.83	2.16	4.1	3.08	—	—	—	—	—	—	1.38
TULE-05	11/3/2008	0.64	E0.08	—	—	E0.01 [4]	E0.01 [4]	—	—	—	—	0.16
TULE-10	12/7/2005	0.31	E0.05	—	—	—	—	—	—	—	—	—
TULE-10	11/3/2008	0.51	E0.08	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
		1,2-Dichloroethane (µg/L) (32103)	1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Dibromomethane (µg/L) (30217)	1,2-Dichlorobenzene (µg/L) (34536)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,2-Dibromo-3-chloropropane (DBCP) (82625)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	Diisopropyl ether (DIPE) (µg/L) (81577)	Carbon disulfide (µg/L) (77041)	Bromochloromethane (µg/L) (77297)
Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
Number of wells with detections 2004–05		1	1	1	0	0	4	4	1	6	1
Detection frequency (percent) 2004–05		1.8	1.8	1.8	0.0	0.0	7.3	7.3	1.8	10.9	1.8
Number of wells with detections 2007–08		2	0	0	1	1	4	4	1	1	0
Detection frequency (percent) 2007–08		3.6	0.0	0.0	1.8	1.8	7.3	7.3	1.8	1.8	0.0
San Diego Drainages study unit											
SDALLV-07	7/14/2004	—	—	—	—	—	—	—	—	—	—
SDALLV-07	9/12/2007	—	—	—	—	—	—	—	—	—	—
SDALLV-11	7/15/2004	—	—	—	—	—	—	*28.3	—	—	—
SDALLV-11	9/13/2007	—	—	—	—	—	—	2.2	—	—	—
SDHDRK-01	7/12/2004	0.31	—	—	—	—	—	0.8	0.11	—	—
SDHDRK-01	9/13/2007	0.27	—	—	—	E0.02	—	0.7	0.13	—	—
SDHDRK-09	7/27/2004	—	—	—	—	—	—	—	—	—	—
SDHDRK-09	9/11/2007	—	—	—	—	—	—	—	—	≤0.02 [5]	—
SDTEM-04	5/24/2004	—	—	—	—	—	—	—	—	—	—
SDTEM-04	9/18/2007	—	—	—	—	—	—	—	—	—	—
SDTEMFP-01	5/19/2004	—	—	—	—	—	—	—	—	—	—
SDTEMFP-01	9/19/2007	—	—	—	—	—	—	—	—	—	—
SDWARN-01	6/17/2004	—	—	—	—	—	—	—	—	—	—
SDWARN-01	9/11/2007	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

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GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
		1,2-Dichloroethane (µg/L) (32103)	1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Dibromomethane (µg/L) (30217)	1,2-Dichlorobenzene (µg/L) (34536)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,2-Dibromo-3-chloropropane (DBCP) (82625)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	Diisopropyl ether (DIPE) (µg/L) (81577)	Carbon disulfide (µg/L) (77041)	Bromochloromethane (µg/L) (77297)
Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
North San Francisco Bay study unit											
NSFVOL-14	10/7/2004	—	—	—	—	—	—	—	—	—	—
NSFVOL-14	8/21/2007	—	—	—	—	—	—	—	—	—	—
NSFVOL-18	10/20/2004	—	—	—	—	—	—	—	—	—	—
NSFVOL-18	8/28/2007	—	—	—	—	—	—	—	—	—	—
NSFVP-29	9/28/2004	—	—	—	—	—	—	—	—	—	—
NSFVP-29	8/27/2007	—	—	—	—	—	—	—	—	—	—
NSFVP-34	10/18/2004	—	—	—	—	—	—	—	—	—	—
NSFVP-34	8/22/2007	—	—	—	—	—	—	—	—	—	—
NSFVP-36	10/19/2004	—	—	—	—	—	—	—	—	0.33	—
NSFVP-36	8/20/2007	—	—	—	—	—	—	—	—	—	—
NSFVP-38	10/20/2004	—	—	—	—	—	—	—	—	—	—
NSFVP-38	8/22/2007	—	—	—	—	—	—	—	—	—	—
NSFVP-39	10/21/2004	—	—	—	—	—	—	—	—	0.13	—
NSFVP-39	11/16/2007	—	—	—	—	—	—	—	—	—	—
NSFVP-41	10/21/2004	—	—	—	—	—	—	—	—	—	—
NSFVP-41	8/20/2007	—	—	—	—	—	—	—	—	—	—
NSFWG-03	9/21/2004	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
		1,2-Dichloroethane (µg/L) (32103)	1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Dibromomethane (µg/L) (30217)	1,2-Dichlorobenzene (µg/L) (34536)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,2-Dibromo-3-chloropropane (DBCP) (82625)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	Diisopropyl ether (DIPE) (µg/L) (81577)	Carbon disulfide (µg/L) (77041)	Bromochloromethane (µg/L) (77297)
Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
North San Francisco Bay study unit—Continued											
NSFWG-03	8/29/2007	—	—	—	—	—	—	—	—	—	—
NSFWGFP-01	10/5/2004	—	—	—	—	—	—	—	—	—	—
NSFWGFP-01	8/29/2007	—	—	—	—	—	—	—	—	—	—
Northern San Joaquin Basin study unit											
COS-08	1/3/2005	—	—	—	—	—	—	—	—	—	—
COS-08	4/3/2008	—	—	—	—	—	—	—	—	—	—
ESJ-01	1/24/2005	—	—	—	—	—	—	—	—	—	—
ESJ-01	4/2/2008	—	—	—	—	—	—	—	—	—	—
ESJ-06	1/10/2005	—	—	—	—	—	0.10	—	—	—	—
ESJ-06	4/2/2008	—	—	—	—	—	0.06	—	—	—	—
NSJ-QPC-04	1/24/2005	—	—	—	—	—	—	—	—	—	—
NSJ-QPC-04	4/1/2008	—	—	—	—	—	—	—	—	—	—
TRCY-03	1/6/2005	—	—	—	—	—	—	—	—	—	—
TRCY-03	3/31/2008	—	—	—	—	—	—	—	—	—	—
Southern Sacramento Valley study unit											
NAM-03	3/29/2005	—	—	—	—	—	—	—	—	—	—
NAM-03	4/10/2008	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
		1,2-Dichloroethane (µg/L) (32103)	1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Dibromomethane (µg/L) (30217)	1,2-Dichlorobenzene (µg/L) (34536)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,2-Dibromo-3-chloropropane (DBCP) (82625)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	Diisopropyl ether (DIPE) (µg/L) (81577)	Carbon disulfide (µg/L) (77041)	Bromochloromethane (µg/L) (77297)
Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
Southern Sacramento Valley study unit—Continued											
SAM-10	4/21/2005	—	—	—	—	—	—	—	—	—	—
SAM-10	4/8/2008	—	—	—	—	—	—	—	—	—	—
SOL-08	5/10/2005	—	—	—	—	—	—	—	—	—	—
SOL-08	4/8/2008	—	—	—	—	—	—	—	—	—	—
SSV-QPC-07	4/4/2005	—	—	—	—	—	—	—	—	—	—
SSV-QPC-07	4/10/2008	—	—	—	—	—	—	—	—	—	—
SUI-03	5/12/2005	—	—	—	—	—	—	—	—	—	—
SUI-03	4/9/2008	—	—	—	—	—	—	—	—	—	—
YOL-01	4/11/2005	—	—	—	—	—	—	—	—	—	—
YOL-01	4/7/2008	—	—	—	—	—	—	—	—	—	—
YOL-14	5/25/2005	—	—	—	—	—	—	—	—	—	—
YOL-14	4/9/2008	—	—	—	—	—	—	—	—	—	—
San Fernando–San Gabriel study unit											
ULASF-09	6/27/2005	—	—	—	—	—	—	0.2	—	—	—
ULASF-09	6/16/2008	—	—	—	—	—	—	0.6	—	—	—
ULASF-10	6/8/2005	—	—	—	—	—	—	—	—	—	—
ULASF-10	6/16/2008	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
		1,2-Dichloroethane (µg/L) (32103)	1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Dibromomethane (µg/L) (30217)	1,2-Dichlorobenzene (µg/L) (34536)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,2-Dibromo-3-chloropropane (DBCP) (82625)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	Diisopropyl ether (DIPE) (µg/L) (81577)	Carbon disulfide (µg/L) (77041)	Bromochloromethane (µg/L) (77297)
Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
San Fernando–San Gabriel study unit—Continued											
ULASG-01	6/7/2005	—	—	—	—	—	—	—	—	—	—
ULASG-01	6/16/2008	—	—	—	—	—	—	E0.04 [4]	—	—	—
ULASG-08	6/15/2005	—	—	—	—	—	—	—	—	—	—
ULASG-08	6/17/2008	E0.06	—	—	E0.04	—	—	—	—	—	—
ULASG-15	6/23/2005	—	—	—	—	—	—	—	—	—	—
ULASG-15	6/17/2008	—	—	—	—	—	—	—	—	—	—
ULASG-17	7/11/2005	—	E0.02	—	—	—	—	E0.1	—	E0.03	—
ULASG-17	6/17/2008	—	—	—	—	—	—	0.1	—	—	—
Monterey Bay and Salinas Valley Basins study unit											
MSMB-03	8/31/2005	—	—	—	—	—	—	—	—	—	—
MSMB-03	8/20/2008	—	—	—	—	—	—	—	—	—	—
MSMB-04	8/17/2005	—	—	—	—	—	—	—	—	—	—
MSMB-04	8/20/2008	—	—	—	—	—	—	—	—	—	—
MSMB-16	8/17/2005	—	—	—	—	—	—	—	—	—	—
MSMB-16	8/19/2008	—	—	—	—	—	—	—	—	—	—
MSMB-28	8/3/2005	—	—	—	—	—	—	—	—	—	—
MSMB-28	8/21/2008	—	—	—	—	—	—	—	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

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GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
		1,2-Dichloroethane (µg/L) (32103)	1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Dibromomethane (µg/L) (30217)	1,2-Dichlorobenzene (µg/L) (34536)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,2-Dibromo-3-chloropropane (DBCP) (82625)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	Diisopropyl ether (DIPE) (µg/L) (81577)	Carbon disulfide (µg/L) (77041)	Bromochloromethane (µg/L) (77297)
Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
Monterey Bay and Salinas Valley Basins study unit—Continued											
MSMB-31	8/11/2005	—	—	—	—	—	—	—	—	—	—
MSMB-31	8/21/2008	—	—	—	—	—	—	—	—	—	—
MSPR-03	7/28/2005	—	—	—	—	—	—	—	—	—	—
MSPR-03	11/14/2008	—	—	—	—	—	—	—	—	—	—
MSPR-09	7/18/2005	—	—	—	—	—	—	—	—	—	—
MSPR-09	11/14/2008	—	—	—	—	—	—	—	—	—	—
MSSC-06	8/24/2005	—	—	—	—	—	—	—	—	0.17	—
MSSC-06	8/18/2008	—	—	—	—	—	—	—	—	0.35	—
MSSC-11	9/13/2005	—	—	—	—	—	—	—	—	—	—
MSSC-11	8/19/2008	—	—	—	—	—	—	—	—	—	—
MSSV-06	8/2/2005	—	—	—	—	—	—	—	—	—	—
MSSV-06	11/13/2008	—	—	—	—	—	—	—	—	—	—
MSSV-15	8/12/2005	—	—	—	—	—	—	—	—	—	—
MSSV-15	11/13/2008	—	—	—	—	—	—	—	—	—	—
Southeast San Joaquin Valley study unit											
KING-11	10/20/2005	—	—	—	—	—	E0.05	—	—	—	—
KING-11	11/5/2008	—	—	—	—	—	E0.03	—	—	—	—
KING-13	10/20/2005	—	—	—	—	—	—	—	—	—	—

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GAMA well identification number	Sample dates	Solvent					Fumigant	Gasoline oxygenate		Natural	Fire retardant
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Benchmark type[1]		MCL-CA	MCL-US	na	MCL-US	MCL-CA	MCL-US	MCL-CA	na	NL-CA	HAL-US
Benchmark level		0.5	200	na	600	10	0.2	13	na	160	90
[LRL or SRL][2]		[0.06, 0.13]	[0.02, 0.04]	[0.04, 0.05]	[0.02, 0.048]	[0.018, 0.032]	[0.03, 1][6]	[0.1, 0.17]	[0.06, 0.1]	[0.03]	[0.06, 0.12]
Southeast San Joaquin Valley study unit—Continued											
KING-13	11/5/2008	—	—	—	—	—	—	—	—	—	—
KING-17	10/26/2005	—	—	—	—	—	—	—	—	—	—
KING-17	11/4/2008	—	—	—	—	—	—	—	—	—	—
KING-24	11/5/2005	—	—	—	—	—	*0.35	—	—	0.10	—
KING-24	11/3/2008	—	—	—	—	—	*0.22	—	—	—	—
KWH-10	11/17/2005	—	—	—	—	—	—	—	—	—	—
KWH-10	11/5/2008	—	—	—	—	—	—	—	—	—	—
KWH-12	11/28/2005	—	—	—	—	—	—	—	—	—	—
KWH-12	11/6/2008	—	—	—	—	—	—	—	—	—	—
TLR-03	11/29/2005	—	—	—	—	—	—	—	—	—	—
TLR-03	11/4/2008	—	—	—	—	—	—	—	—	—	—
TULE-05	12/5/2005	—	—	1.54	—	—	—	—	—	E0.05	2.03
TULE-05	11/3/2008	—	—	—	—	—	—	—	—	—	—
TULE-10	12/7/2005	—	—	—	—	—	0.18	—	—	—	—
TULE-10	11/3/2008	—	—	—	—	—	0.08	E0.05 [4]	—	—	—

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Gasoline hydrocarbon						Refrigerant			Detections per sample	VOC detection summary
		m-Xylene plus *p*-Xylene (µg/L) (85795)	*o*-Xylene (µg/L) (77135)	Ethyl-benzene (µg/L) (34371)	Toluene (µg/L) (34010)	1,2,3-Trimethyl-benzene (µg/L) (77221)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Dichlorodi-fluoromethane (CFC-12) (µg/L) (34668)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoro-methane (CFC-11) (µg/L) (34488)		
Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
Number of wells with detections 2004–05		0	0	0	0	0	0	2	2	1		27
Detection frequency (percent) 2004–05		0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	1.8		49.1
Number of wells with detections 2007–08		0	0	0	0	0	0	3	2	2		26
Detection frequency (percent) 2007–08		0.0	0.0	0.0	0.0	0.0	0.0	5.5	3.6	3.6		47.3
San Diego Drainages study unit												
SDALLV-07	7/14/2004	—	—	—	—	—	—	—	—	—	1	
SDALLV-07	9/12/2007	—	—	—	—	—	—	—	—	—	0	
SDALLV-11	7/15/2004	—	—	—	—	—	—	—	—	—	5	
SDALLV-11	9/13/2007	—	—	—	—	—	—	—	—	—	6	
SDHDRK-01	7/12/2004	—	—	—	—	—	—	—	—	—	8	
SDHDRK-01	9/13/2007	—	—	—	—	—	—	—	—	—	9	
SDHDRK-09	7/27/2004	—	—	—	—	—	—	—	—	—	0	
SDHDRK-09	9/11/2007	—	—	—	—	—	—	—	—	—	0	
SDTEM-04	5/24/2004	—	—	—	—	—	—	—	—	—	0	
SDTEM-04	9/18/2007	—	—	—	—	—	—	—	—	—	1	

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Gasoline hydrocarbon						Refrigerant			Detections per sample	VOC detection summary
		m-Xylene plus *p*-Xylene (µg/L) (85795)	*o*-Xylene (µg/L) (77135)	Ethyl-benzene (µg/L) (34371)	Toluene (µg/L) (34010)	1,2,3-Trimethyl-benzene (µg/L) (77221)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Dichlorodi-fluoromethane (CFC-12) (µg/L) (34668)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoro-methane (CFC-11) (µg/L) (34488)		
Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
San Diego Drainages study unit—Continued												
SDTEMFP-01	5/19/2004	—	—	—	≤0.01 [5]	—	—	—	—	—	0	
SDTEMFP-01	9/19/2007	—	—	—	—	—	≤0.02 [5]	—	—	—	2	
SDWARN-01	6/17/2004	—	—	—	—	—	—	—	—	—	0	
SDWARN-01	9/11/2007	—	—	—	—	—	—	—	—	—	0	
North San Francisco Bay study unit												
NSFVOL-14	10/7/2004	—	—	—	—	—	—	—	—	—	0	
NSFVOL-14	8/21/2007	—	—	—	—	—	≤0.08 [5]	—	—	—	0	
NSFVOL-18	10/20/2004	—	—	—	—	—	—	—	—	—	0	
NSFVOL-18	8/28/2007	—	—	—	—	—	≤0.06 [5]	—	—	—	0	
NSFVP-29	9/28/2004	—	—	—	—	—	—	—	—	—	0	
NSFVP-29	8/27/2007	≤0.06 [5]	≤0.02 [5]	≤0.01 [5]	≤0.01 [5]	—	—	—	—	—	0	
NSFVP-34	10/18/2004	—	—	—	—	—	—	—	—	—	0	
NSFVP-34	8/22/2007	—	—	—	—	—	≤0.04 [5]	—	—	—	0	
NSFVP-36	10/19/2004	—	—	—	—	—	—	—	—	—	1	
NSFVP-36	8/20/2007	—	—	—	—	—	≤0.05 [5]	—	—	—	0	
NSFVP-38	10/20/2004	—	—	—	—	—	—	—	—	—	0	

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Gasoline hydrocarbon						Refrigerant			Detections per sample	VOC detection summary
		m-Xylene plus *p*-Xylene (µg/L) (85795)	*o*-Xylene (µg/L) (77135)	Ethyl-benzene (µg/L) (34371)	Toluene (µg/L) (34010)	1,2,3-Trimethyl-benzene (µg/L) (77221)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Dichlorodi-fluoromethane (CFC-12) (µg/L) (34668)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoro-methane (CFC-11) (µg/L) (34488)		
Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
North San Francisco Bay study unit—Continued												
NSFVP-38	8/22/2007	—	—	—	—	—	≤0.06 [5]	—	—	—	1	
NSFVP-39	10/21/2004	—	—	—	—	—	—	—	—	—	1	
NSFVP-39	11/16/2007	—	—	—	—	—	—	—	—	—	0	
NSFVP-41	10/21/2004	—	—	—	—	—	—	—	—	—	1	
NSFVP-41	8/20/2007	—	—	—	—	—	—	—	—	E0.06	2	
NSFWG-03	9/21/2004	—	—	—	—	—	—	—	—	—	0	
NSFWG-03	8/29/2007	—	—	—	—	—	≤0.03 [5]	—	—	—	0	
NSFWGFP-01	10/5/2004	—	—	—	—	—	—	—	—	—	3	
NSFWGFP-01	8/29/2007	—	—	—	—	—	≤0.04 [5]	—	—	—	3	
Northern San Joaquin Basin study unit												
COS-08	1/3/2005	—	—	—	—	—	—	—	—	—	0	
COS-08	4/3/2008	—	—	—	—	—	—	—	—	—	0	
ESJ-01	1/24/2005	—	—	—	—	—	—	—	—	—	0	
ESJ-01	4/2/2008	—	—	—	≤0.01 [5]	—	—	—	—	—	0	
ESJ-06	1/10/2005	—	—	—	—	—	—	—	—	—	2	
ESJ-06	4/2/2008	—	—	—	—	—	—	—	—	—	2	

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Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
Northern San Joaquin Basin study unit—Continued												
NSJ-QPC-04	1/24/2005	—	—	—	≤0.01 [5]	—	—	—	—	—	0	
NSJ-QPC-04	4/1/2008	—	—	—	—	—	—	—	—	—	0	
TRCY-03	1/6/2005	—	—	—	—	—	≤0.08 [5]	—	—	—	1	
TRCY-03	3/31/2008	—	—	—	—	—	—	—	—	—	1	
Southern Sacramento Valley study unit												
NAM-03	3/29/2005	—	—	—	—	—	—	—	—	—	1	
NAM-03	4/10/2008	—	—	—	—	—	—	—	—	—	3	
SAM-10	4/21/2005	—	—	—	—	—	—	—	—	—	3	
SAM-10	4/8/2008	—	—	—	—	—	—	—	—	—	3	
SOL-08	5/10/2005	—	—	—	—	—	—	—	—	—	0	
SOL-08	4/8/2008	—	—	—	—	—	—	—	—	—	0	
SSV-QPC-07	4/4/2005	—	—	—	—	—	—	—	—	—	1	
SSV-QPC-07	4/10/2008	—	—	—	—	—	—	—	—	—	1	
SUI-03	5/12/2005	—	—	—	—	—	—	—	—	—	0	
SUI-03	4/9/2008	—	—	—	≤0.43 [5]	—	—	—	—	—	0	
YOL-01	4/11/2005	—	—	—	—	—	—	—	—	—	1	

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Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
Southern Sacramento Valley study unit—Continued												
YOL-01	4/7/2008	—	—	—	—	—	—	—	—	—	1	
YOL-14	5/25/2005	—	—	—	—	—	—	—	—	—	0	
YOL-14	4/9/2008	—	—	—	≤0.02 [5]	—	—	—	—	—	0	
San Fernando–San Gabriel study unit												
ULASF-09	6/27/2005	—	—	—	—	—	—	E0.13	—	—	9	
ULASF-09	6/16/2008	—	—	—	—	—	—	E0.11	—	—	9	
ULASF-10	6/8/2005	—	—	—	—	—	—	E0.32	—	—	8	
ULASF-10	6/16/2008	—	—	—	—	—	—	—	—	—	1	
ULASG-01	6/7/2005	—	—	—	—	—	—	—	—	—	3	
ULASG-01	6/16/2008	—	—	—	—	—	—	—	—	—	3	
ULASG-08	6/15/2005	—	—	—	—	—	—	—	—	—	10	
ULASG-08	6/17/2008	—	—	—	—	—	—	—	—	—	12	
ULASG-15	6/23/2005	—	—	—	—	—	—	—	—	—	0	
ULASG-15	6/17/2008	—	—	—	—	—	≤0.06 [5]	—	—	—	0	
ULASG-17	7/11/2005	—	—	—	—	—	—	—	1.26	E0.09	12	
ULASG-17	6/17/2008	—	—	—	—	—	—	—	1.94	0.13	10	

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Gasoline hydrocarbon						Refrigerant			Detections per sample	VOC detection summary
		m-Xylene plus *p*-Xylene (µg/L) (85795)	*o*-Xylene (µg/L) (77135)	Ethyl-benzene (µg/L) (34371)	Toluene (µg/L) (34010)	1,2,3-Trimethyl-benzene (µg/L) (77221)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Dichlorodi-fluoromethane (CFC-12) (µg/L) (34668)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoro-methane (CFC-11) (µg/L) (34488)		
Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
Monterey Bay and Salinas Valley Basins study unit												
MSMB-03	8/31/2005	—	—	—	—	—	—	—	—	—	0	
MSMB-03	8/20/2008	—	—	—	—	—	—	—	—	—	0	
MSMB-04	8/17/2005	—	—	—	—	—	—	—	—	—	0	
MSMB-04	8/20/2008	—	—	—	—	—	—	—	—	—	0	
MSMB-16	8/17/2005	—	—	—	—	—	—	—	—	—	5	
MSMB-16	8/19/2008	—	—	—	—	—	—	—	—	—	4	
MSMB-28	8/3/2005	—	—	—	—	—	—	—	—	—	0	
MSMB-28	8/21/2008	—	—	—	—	—	—	—	—	—	0	
MSMB-31	8/11/2005	—	—	—	—	—	—	—	—	—	1	
MSMB-31	8/21/2008	—	—	—	—	—	—	—	—	—	0	
MSPR-03	7/28/2005	—	—	—	—	—	—	—	—	—	0	
MSPR-03	11/14/2008	—	—	—	—	—	—	—	—	—	0	
MSPR-09	7/18/2005	—	—	—	—	—	—	—	—	—	0	
MSPR-09	11/14/2008	—	—	—	—	—	—	—	—	—	0	
MSSC-06	8/24/2005	—	—	—	—	—	—	—	—	—	1	
MSSC-06	8/18/2008	—	—	—	—	—	—	—	—	—	1	
MSSC-11	9/13/2005	—	—	—	—	—	—	—	—	—	0	

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Gasoline hydrocarbon						Refrigerant			Detections per sample	VOC detection summary
		m-Xylene plus *p*-Xylene (µg/L) (85795)	*o*-Xylene (µg/L) (77135)	Ethyl-benzene (µg/L) (34371)	Toluene (µg/L) (34010)	1,2,3-Trimethyl-benzene (µg/L) (77221)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Dichlorodi-fluoromethane (CFC-12) (µg/L) (34668)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoro-methane (CFC-11) (µg/L) (34488)		
Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
Monterey Bay and Salinas Valley Basins study unit—Continued												
MSSC-11	8/19/2008	—	—	—	—	—	—	—	—	—	0	
MSSV-06	8/2/2005	—	—	—	—	—	—	—	—	—	0	
MSSV-06	11/13/2008	—	—	—	—	—	—	—	—	—	0	
MSSV-15	8/12/2005	—	—	—	—	—	—	—	—	—	0	
MSSV-15	11/13/2008	—	—	—	—	—	—	—	—	—	0	
Southeast San Joaquin Valley study unit												
KING-11	10/20/2005	≤0.04 [5]	—	—	—	—	—	—	—	—	1	
KING-11	11/5/2008	—	—	—	—	—	—	E0.15	—	—	2	
KING-13	10/20/2005	≤0.04 [5]	—	—	—	—	—	—	—	—	0	
KING-13	11/5/2008	—	—	—	—	—	—	—	—	—	0	
KING-17	10/26/2005	—	—	—	—	—	—	—	—	—	0	
KING-17	11/4/2008	—	—	—	—	—	—	—	—	—	0	
KING-24	11/5/2005	—	—	—	—	—	—	—	—	—	3	
KING-24	11/3/2008	—	—	—	—	—	—	—	—	—	2	
KWH-10	11/17/2005	—	—	—	—	—	—	—	—	—	2	
KWH-10	11/5/2008	—	—	—	—	—	—	—	—	—	2	

Table 5. Volatile organic compounds (VOCs) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. VOCs were analyzed in samples from 55 trend wells during 2004–05 and 2007–08. Information about analytes given in table 3A. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; HAL-US, USEPA lifetime health advisory level; NL-CA, CDPH notification level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; SRL, study reporting level; *, value greater than benchmark level; E, estimated or having a higher degree of uncertainty; ≤, less than or equal to; —, not detected]

GAMA well identification number	Sample dates	Gasoline hydrocarbon						Refrigerant			Detections per sample	VOC detection summary
		m-Xylene plus *p*-Xylene (µg/L) (85795)	*o*-Xylene (µg/L) (77135)	Ethyl-benzene (µg/L) (34371)	Toluene (µg/L) (34010)	1,2,3-Trimethyl-benzene (µg/L) (77221)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Dichlorodi-fluoromethane (CFC-12) (µg/L) (34668)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoro-methane (CFC-11) (µg/L) (34488)		
Benchmark type[1]		MCL-CA	MCL-CA	MCL-CA	MCL-CA	na	NL-CA	NL-CA	MCL-CA	MCL-CA		
Benchmark level		[7] 1,750	[7] 1,750	300	10	na	330	1,000	1,200	150		
[LRL or SRL][2]		[0.33]	[0.12]	[0.06]	[0.69]	[0.06, 0.08]	[0.56]	[0.1, 0.18]	[0.038, 0.04]	[0.08, 0.16]		
Southeast San Joaquin Valley study unit—Continued												
KWH-12	11/28/2005	—	—	—	—	—	—	—	—	—	2	
KWH-12	11/6/2008	—	—	—	—	—	—	—	—	—	2	
TLR-03	11/29/2005	—	—	—	—	—	—	—	—	—	0	
TLR-03	11/4/2008	—	—	—	—	—	—	—	—	—	0	
TULE-05	12/5/2005	≤0.12 [5]	≤0.06 [5]	≤0.04 [5]	≤0.09 [5]	E0.03 [4]	≤0.02 [5]	—	0.31	—	9	
TULE-05	11/3/2008	—	—	—	≤0.01 [5]	—	—	—	1.35	—	4	
TULE-10	12/7/2005	—	—	—	—	—	—	—	—	—	3	
TULE-10	11/3/2008	—	—	—	—	—	—	E0.01 [4]	—	—	3	

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and the MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] For constituents with SRLs defined by Fram and others (2012), the SRL is given. For all other constituents, the minimum and maximum LRLs used during the study period are given.

[3] The MCL-US benchmark for trihalomethanes is for the sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

[4] The detected concentration was less than the LT-MDL for this constituent. These results are counted as non-detections for the purpose of calculating detection frequencies.

[5] The detected concentrations were less than the SRLs defined by Fram and others (2012). These results are counted as non-detections for the purpose of calculating detection frequencies.

[6] Detections of DBCP occurred only in samples from the Northern San Joaquin Basin and the Southeast San Joaquin Valley study units, for which samples were analyzed by Laboratory Schedule 1306 (table 3B) in addition to Schedule 2020 (table 3A). Schedule 1306 is the preferred method and has a lower LRL at 0.030 µg/L than does Schedule 2020 at between 0.5 and 1 µg/L. Therefore, results for this compound are by Schedule 1306 for these two study units. The detections in 2008 for the wells KING-24 and TULE-10 were confirmed by Schedule 2020 analysis, with detections at concentrations similar to those determined by Schedule 1306 analysis. The other six occurrences of DBCP detected by Laboratory Schedule 1306 were not detected by Laboratory Schedule 2020.

[7] The MCL-CA benchmark for *m*- plus *p*-xylene and *o*-xylene is for the sum of all three xylene compounds.

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl dipropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
Number of trend wells with detections 2004–05		20	15	5	3	2	1	1	0	15
Detection frequency (percent) 2004–05		37	28	9	6	4	na[2]	2	0	28
Number of trend wells with detections 2007–08		17	14	5	5	2	1	0	0	12
Detection frequency (percent) 2007–08		31	26	9	9	4	na[2]	0	0	22
San Diego Drainages study unit										
SDALLV-07	7/14/2004	0.008	—	—	—	—	nc	—	—	E0.006
SDALLV-07	9/12/2007	E0.007	—	—	—	—	nc	—	—	—
SDALLV-11	7/15/2004	0.026	E0.007	E0.088	0.015	—	nc	—	—	E0.006
SDALLV-11	9/13/2007	0.010	—	E0.145	0.027	—	nc	—	—	E0.005 [3]
SDHDRK-01	7/12/2004	0.027	0.085	E0.025	0.007	—	nc	—	—	E0.013
SDHDRK-01	9/13/2007	0.020	0.050	E0.018	E0.007	—	nc	—	—	E0.014
SDHDRK-09	7/27/2004	0.006	—	—	—	—	nc	—	—	E0.006
SDHDRK-09	9/11/2007	E0.006	—	—	—	—	nc	—	—	E0.004 [3]
SDTEM-04	5/24/2004	—	—	—	—	—	nc	—	—	—
SDTEM-04	9/18/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDTEMFP-01	5/19/2004	0.006	—	—	—	—	nc	—	—	—

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl depropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
San Diego Drainages study unit—Continued										
SDTEMFP-01	9/19/2007	E0.005	—	—	—	—	nc	—	—	—
SDWARN-01	6/17/2004	—	—	—	—	—	nc	—	—	—
SDWARN-01	9/11/2007	—	—	—	—	—	nc	—	—	—
North San Francisco Bay study unit										
NSFVOL-14	10/7/2004	—	—	—	—	—	nc	—	—	—
NSFVOL-14	8/21/2007	—	—	—	—	—	nc	—	—	—
NSFVOL-18	10/20/2004	—	—	—	—	—	nc	—	—	—
NSFVOL-18	8/28/2007	—	—	—	—	—	nc	—	—	—
NSFVP-29	9/28/2004	0.009	—	—	—	—	nc	—	—	—
NSFVP-29	8/27/2007	0.010	—	—	—	—	nc	—	—	—
NSFVP-34	10/18/2004	—	—	—	—	—	nc	—	—	—
NSFVP-34	8/22/2007	—	—	—	—	—	nc	—	—	—
NSFVP-36	10/19/2004	—	—	—	—	—	nc	—	—	—
NSFVP-36	8/20/2007	—	—	—	—	—	nc	—	—	—
NSFVP-38	10/20/2004	—	—	—	—	—	nc	—	—	—
NSFVP-38	8/22/2007	—	—	—	—	—	nc	—	—	—

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl dipropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
North San Francisco Bay study unit—Continued										
NSFVP-39	10/21/2004	—	—	—	—	—	nc	—	—	—
NSFVP-39	11/16/2007	—	—	—	—	—	nc	—	—	—
NSFVP-41	10/21/2004	—	—	—	—	—	nc	—	—	—
NSFVP-41	8/20/2007	—	—	—	—	—	nc	—	—	—
NSFWG-03	9/21/2004	—	—	—	—	—	nc	—	—	—
NSFWG-03	8/29/2007	—	—	—	—	—	nc	—	—	—
NSFWGFP-01	10/5/2004	—	E0.006	—	—	—	nc	—	—	—
NSFWGFP-01	8/29/2007	—	—	—	—	—	nc	—	—	—
Northern San Joaquin Basin study unit										
COS-08	1/3/2005	—	—	—	—	—	nc	—	—	—
COS-08	4/3/2008	—	—	—	—	—	nc	—	—	—
ESJ-01	1/24/2005	0.008	0.011	—	—	—	nc	—	—	E0.007
ESJ-01	4/2/2008	E0.006	E0.007	—	—	—	nc	—	—	E0.008
ESJ-06	1/10/2005	—	—	—	—	—	nc	—	—	—
ESJ-06	4/2/2008	—	—	—	—	—	nc	—	—	—
NSJ-QPC-04	1/24/2005	—	—	—	—	—	nc	—	—	—

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl depropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
Northern San Joaquin Basin study unit—Continued										
NSJ-QPC-04	4/1/2008	—	—	—	—	—	nc	—	—	E0.008
TRCY-03	1/6/2005	—	—	—	—	—	nc	—	—	—
TRCY-03	3/31/2008	—	—	—	—	—	nc	—	—	—
Southern Sacramento Valley study unit										
NAM-03	3/29/2005	—	—	—	—	—	nc	—	—	—
NAM-03	4/10/2008	—	—	—	—	—	nc	—	—	—
SAM-10	4/21/2005	—	—	—	—	—	nc	—	—	—
SAM-10	4/8/2008	—	—	—	—	—	nc	—	—	—
SOL-08	5/10/2005	—	—	—	—	—	nc	—	—	—
SOL-08	4/8/2008	—	—	—	—	—	nc	—	—	—
SSV-QPC-07	4/4/2005	—	—	—	—	—	nc	—	—	—
SSV-QPC-07	4/10/2008	—	—	—	—	—	nc	—	—	E0.005 [3]
SUI-03	5/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc
SUI-03	4/9/2008	—	E0.006	—	—	—	nc	—	—	—
YOL-01	4/11/2005	—	—	—	—	—	nc	—	—	—
YOL-01	4/7/2008	—	—	—	—	—	nc	—	—	—

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl dipropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
Southern Sacramento Valley study unit—Continued										
YOL-14	5/25/2005	—	—	—	—	—	nc	—	—	—
YOL-14	4/9/2008	—	—	—	—	—	nc	—	—	—
San Fernando–San Gabriel study unit										
ULASF-09	6/27/2005	0.044	0.026	E0.016	—	—	nc	—	—	E0.014
ULASF-09	6/16/2008	0.022	0.014	E0.009	—	—	nc	—	—	E0.013
ULASF-10	6/8/2005	0.005	0.009	—	—	—	nc	—	—	E0.007
ULASF-10	6/16/2008	—	—	—	—	—	nc	—	—	—
ULASG-01	6/7/2005	0.072	0.020	0.025	—	—	nc	—	—	E0.018
ULASG-01	6/16/2008	0.065	0.020	0.022	—	—	nc	—	—	E0.029
ULASG-08	6/15/2005	0.010	0.029	—	—	—	nc	—	—	E0.021
ULASG-08	6/17/2008	0.010	0.008	—	E0.006	—	nc	—	—	E0.008
ULASG-15	6/23/2005	0.008	—	—	—	—	nc	—	—	—
ULASG-15	6/17/2008	0.008	—	—	—	—	nc	—	—	—
ULASG-17	7/11/2005	0.012	0.047	0.143	—	0.058	nc	—	—	E0.037
ULASG-17	6/17/2008	0.011	0.034	0.081	—	0.038	nc	—	—	E0.031

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
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Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
Monterey Bay and Salinas Valley Basins study unit										
MSMB-03	8/31/2005	—	—	—	—	—	nc	—	—	—
MSMB-03	8/20/2008	—	—	—	—	—	nc	—	—	—
MSMB-04	8/17/2005	—	—	—	—	—	nc	—	—	—
MSMB-04	8/20/2008	—	E0.007	—	—	—	nc	—	—	—
MSMB-16	8/17/2005	—	—	—	—	—	nc	—	—	—
MSMB-16	8/19/2008	—	—	—	—	—	nc	—	—	—
MSMB-28	8/3/2005	—	—	—	—	—	nc	—	—	—
MSMB-28	8/21/2008	—	—	—	—	—	nc	—	—	—
MSMB-31	8/11/2005	—	—	—	—	—	nc	—	—	—
MSMB-31	8/21/2008	—	—	—	—	—	nc	—	—	E0.005 [3]
MSPR-03	7/28/2005	—	—	—	—	—	nc	—	—	—
MSPR-03	11/14/2008	—	—	—	—	—	nc	—	—	—
MSPR-09	7/18/2005	—	E0.006	—	—	—	nc	—	—	E0.005
MSPR-09	11/14/2008	—	0.008	—	—	—	nc	—	—	E0.007
MSSC-06	8/24/2005	—	—	—	—	—	nc	—	—	—
MSSC-06	8/18/2008	—	—	—	—	—	nc	—	—	—
MSSC-11	9/13/2005	—	—	—	—	—	nc	—	—	—

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl dipropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
Monterey Bay and Salinas Valley Basins study unit—Continued										
MSSC-11	8/19/2008	—	—	—	—	—	nc	—	—	—
MSSV-06	8/2/2005	E0.005	—	—	—	—	nc	—	—	—
MSSV-06	11/13/2008	—	—	—	—	—	nc	—	—	—
MSSV-15	8/12/2005	E0.006	—	—	—	—	nc	E0.002	—	—
MSSV-15	11/13/2008	—	—	—	—	—	nc	—	—	—
Southeast San Joaquin Valley study unit										
KING-11	10/20/2005	—	—	—	—	—	—	—	—	—
KING-11	11/5/2008	—	—	—	—	—	—	—	—	—
KING-13	10/20/2005	—	—	—	—	—	—	—	—	—
KING-13	11/5/2008	—	—	—	—	—	—	—	—	—
KING-17	10/26/2005	—	—	—	—	—	—	—	—	—
KING-17	11/4/2008	—	—	—	—	—	—	—	—	—
KING-24	11/5/2005	0.012	0.015	—	—	—	—	—	—	—
KING-24	11/3/2008	0.088	0.019	—	E0.005	—	—	—	—	—
KWH-10	11/17/2005	0.024	0.009	—	—	—	—	—	—	E0.007
KWH-10	11/5/2008	0.031	E0.006	—	—	—	—	—	—	E0.012

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Herbicide								Herbicide degradate
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Tebuthiuron (µg/L) (82670)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	EPTC (*S*-Ethyl depropyl-thio-carbamate) (µg/L) (82668)	DCPA (Dacthal) (µg/L) (82682)	Trifluralin (µg/L) (82661)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)
Benchmark type		MCL-US	MCL-CA	HAL-US	HAL-US	HAL-US	na	HAL-US	HAL-US	na
Benchmark level		4	1	500	100	400	na	70	10	na
[LRL][1]		[0.005, 0.010]	[0.007]	[0.016, 0.020]	[0.005, 0.012]	[0.008, 0.026]	[0.002, 0.004]	[0.003, 0.006]	[0.009, 0.012]	[0.006, 0.014]
Southeast San Joaquin Valley study unit—Continued										
KWH-12	11/28/2005	0.026	0.021	—	E0.005	—	—	—	—	E0.006
KWH-12	11/6/2008	0.021	0.018	—	E0.005	—	—	—	—	E0.007
TLR-03	11/29/2005	—	—	—	—	—	—	—	—	—
TLR-03	11/4/2008	—	—	—	—	—	—	—	—	—
TULE-05	12/5/2005	0.008	0.009	—	—	—	—	—	—	E0.005
TULE-05	11/3/2008	E0.006	0.009	—	—	—	—	—	—	E0.010
TULE-10	12/7/2005	0.019	0.009	—	—	E0.010	0.039	—	—	E0.007
TULE-10	11/3/2008	0.022	0.009	—	—	0.028	0.026	—	E0.003 [3]	E0.008

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
Number of trend wells with detections 2004–05		2	0	0	0	0	0	0		22
Detection frequency (percent) 2004–05		4	na[2]	0	0	0	0	0		41
Number of trend wells with detections 2007–08		5	1	0	1	1	1	0		21
Detection frequency (percent) 2007–08		9	na[2]	0	2	2	2	0		39
San Diego Drainages study unit										
SDALLV-07	7/14/2004	—	nc	—	—	—	—	—	2	
SDALLV-07	9/12/2007	—	nc	—	—	—	—	—	1	
SDALLV-11	7/15/2004	—	nc	—	—	—	—	—	5	
SDALLV-11	9/13/2007	—	nc	—	—	—	—	—	3	
SDHDRK-01	7/12/2004	—	nc	—	—	—	—	—	5	
SDHDRK-01	9/13/2007	—	nc	—	—	—	—	—	5	
SDHDRK-09	7/27/2004	—	nc	—	—	—	—	—	2	
SDHDRK-09	9/11/2007	—	nc	—	—	—	—	—	1	
SDTEM-04	5/24/2004	—	nc	—	—	—	—	—	0	
SDTEM-04	9/18/2007	nc	nc	nc	nc	nc	nc	nc	nc	
SDTEMFP-01	5/19/2004	—	nc	—	—	—	—	—	1	
SDTEMFP-01	9/19/2007	—	nc	—	—	—	—	—	1	
SDWARN-01	6/17/2004	—	nc	—	—	—	—	—	0	
SDWARN-01	9/11/2007	—	nc	—	—	—	—	—	0	

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
North San Francisco Bay study unit										
NSFVOL-14	10/7/2004	—	nc	—	—	—	—	—	0	
NSFVOL-14	8/21/2007	—	nc	—	—	—	—	—	0	
NSFVOL-18	10/20/2004	—	nc	—	—	—	—	—	0	
NSFVOL-18	8/28/2007	—	nc	—	—	—	—	—	0	
NSFVP-29	9/28/2004	—	nc	—	—	—	—	—	1	
NSFVP-29	8/27/2007	—	nc	—	—	—	—	—	1	
NSFVP-34	10/18/2004	—	nc	—	—	—	—	—	0	
NSFVP-34	8/22/2007	—	nc	—	—	—	—	—	0	
NSFVP-36	10/19/2004	—	nc	—	—	—	—	—	0	
NSFVP-36	8/20/2007	—	nc	—	—	—	—	—	0	
NSFVP-38	10/20/2004	—	nc	—	—	—	—	—	0	
NSFVP-38	8/22/2007	—	nc	—	—	—	—	—	0	
NSFVP-39	10/21/2004	—	nc	—	—	—	—	—	0	
NSFVP-39	11/16/2007	—	nc	—	—	—	—	—	0	
NSFVP-41	10/21/2004	—	nc	—	—	—	—	—	0	
NSFVP-41	8/20/2007	—	nc	—	—	—	—	—	0	
NSFWG-03	9/21/2004	—	nc	—	—	—	—	—	0	

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GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
North San Francisco Bay study unit—Continued										
NSFWG-03	8/29/2007	—	nc	—	—	—	—	—	0	
NSFWGFP-01	10/5/2004	—	nc	—	—	—	—	—	1	
NSFWGFP-01	8/29/2007	—	nc	—	—	—	—	—	0	
Northern San Joaquin Basin study unit										
COS-08	1/3/2005	—	nc	—	—	—	—	—	0	
COS-08	4/3/2008	—	nc	—	—	—	—	—	0	
ESJ-01	1/24/2005	—	nc	—	—	—	—	—	3	
ESJ-01	4/2/2008	—	nc	—	—	—	—	—	3	
ESJ-06	1/10/2005	—	nc	—	—	—	—	—	0	
ESJ-06	4/2/2008	—	nc	—	—	—	—	—	0	
NSJ-QPC-04	1/24/2005	—	nc	—	—	—	—	—	0	
NSJ-QPC-04	4/1/2008	—	nc	—	—	—	—	—	1	
TRCY-03	1/6/2005	—	nc	—	—	—	—	—	0	
TRCY-03	3/31/2008	—	nc	—	—	—	—	—	0	
Southern Sacramento Valley study unit										
NAM-03	3/29/2005	—	nc	—	—	—	—	—	0	
NAM-03	4/10/2008	—	nc	—	—	—	—	—	0	
SAM-10	4/21/2005	—	nc	—	—	—	—	—	0	

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GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
Southern Sacramento Valley study unit—Continued										
SAM-10	4/8/2008	—	nc	—	—	—	—	—	0	
SOL-08	5/10/2005		nc	—	—	—	—	—	0	
SOL-08	4/8/2008	—	nc	—	—	—	—	—	0	
SSV-QPC-07	4/4/2005	—	nc	—	—	—	—	—	0	
SSV-QPC-07	4/10/2008	—	nc	—	—	—	—	—	0	
SUI-03	5/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	
SUI-03	4/9/2008	—	nc	—	—	—	—	—	1	
YOL-01	4/11/2005	—	nc	—	—	—	—	—	0	
YOL-01	4/7/2008	—	nc	—	—	—	—	—	0	
YOL-14	5/25/2005	—	nc	—	—	—	—	—	0	
YOL-14	4/9/2008	—	nc	—	—	—	—	—	0	
San Fernando–San Gabriel study unit										
ULASF-09	6/27/2005	—	nc	E0.0002 [3]	—	—	—	—	4	
ULASF-09	6/16/2008	—	nc	—	—	—	—	—	4	
ULASF-10	6/8/2005	—	nc	—	—	—	—	—	3	
ULASF-10	6/16/2008	—	nc	—	—	—	—	—	0	
ULASG-01	6/7/2005	—	nc	—	—	—	—	—	4	

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GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
San Fernando–San Gabriel study unit—Continued										
ULASG-01	6/16/2008	E0.004	nc	—	—	—	—	—	5	
ULASG-08	6/15/2005	—	nc	—	—	—	—	—	3	
ULASG-08	6/17/2008	E0.004	nc	—	—	—	—	—	4	
ULASG-15	6/23/2005	E0.003	nc	—	—	—	—	—	2	
ULASG-15	6/17/2008	E0.004	nc	—	—	—	—	—	2	
ULASG-17	7/11/2005	—	nc	—	—	—	—	—	5	
ULASG-17	6/17/2008	—	nc	—	—	—	—	—	5	
Monterey Bay and Salinas Valley Basins study unit										
MSMB-03	8/31/2005	—	nc	—	—	—	—	—	0	
MSMB-03	8/20/2008	—	nc	—	—	—	—	—	0	
MSMB-04	8/17/2005	—	nc	—	—	—	—	—	0	
MSMB-04	8/20/2008	—	nc	—	—	—	—	—	1	
MSMB-16	8/17/2005	—	nc	—	—	—	—	—	0	
MSMB-16	8/19/2008	—	nc	—	—	—	—	—	0	
MSMB-28	8/3/2005	—	nc	—	—	—	—	—	0	
MSMB-28	8/21/2008	—	nc	—	—	—	—	—	0	
MSMB-31	8/11/2005	—	nc	—	—	—	—	—	0	

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
Monterey Bay and Salinas Valley Basins study unit—Continued										
MSMB-31	8/21/2008	—	nc	—	—	—	—	—	0	
MSPR-03	7/28/2005	—	nc	—	—	—	—	—	0	
MSPR-03	11/14/2008	—	nc	—	—	—	—	—	0	
MSPR-09	7/18/2005	—	nc	—	—	—	—	—	2	
MSPR-09	11/14/2008	—	nc	—	—	—	—	—	2	
MSSC-06	8/24/2005	—	nc	—	—	—	—	—	0	
MSSC-06	8/18/2008	—	nc	—	—	—	—	—	0	
MSSC-11	9/13/2005	—	nc	—	—	—	—	—	0	
MSSC-11	8/19/2008	—	nc	—	—	—	—	—	0	
MSSV-06	8/2/2005	—	nc	—	—	—	—	—	1	
MSSV-06	11/13/2008	—	nc	—	—	—	—	—	0	
MSSV-15	8/12/2005	—	nc	—	—	—	—	—	2	
MSSV-15	11/13/2008	—	nc	—	—	—	—	—	0	
Southeast San Joaquin Valley study unit										
KING-11	10/20/2005	—	—	—	—	—	—	—	0	
KING-11	11/5/2008	—	—	—	—	—	—	—	0	
KING-13	10/20/2005	—	—	—	—	—	—	—	0	

Table 6A. Pesticides and pesticide degradates (Schedules 2003, 2032, and 2033) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Pesticides and degradates were analyzed in samples from 54 trend wells in 2004–05 and 54 trend wells in 2007–08; samples from 53 trend wells were analyzed during both time periods. Information about analytes given in table 3C. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, USEPA lifetime health advisory level; RSD5-US, USEPA risk-specific dose at a factor of 10^{-5}. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide degradate		Insecticide		Insecticide degradate			Detections per sample	Detection summary
		3,4-Dichloroaniline (µg/L) (61625)	3,5-Dichloroaniline (µg/L) (61627)	Dieldrin (µg/L) (39381)	Fipronil (µg/L) (62166)	Desulfinyl fipronil (µg/L) (62170)	Fipronil sulfide (µg/L) (62167)	Desulfinylfipronil amide (µg/L) (62169)		
Benchmark type		na	na	RSD5-US	na	na	na	na		
Benchmark level		na	na	0.02	na	na	na	na		
[LRL][1]		[0.004, 0.006]	[0.004]	[0.009]	[0.016, 0.040]	[0.012]	[0.013]	[0.029]		
Southeast San Joaquin Valley study unit—Continued										
KING-13	11/5/2008	—	—	—	—	—	—	—	0	
KING-17	10/26/2005	—	—	—	—	—	—	—	0	
KING-17	11/4/2008	—	—	—	—	—	—	—	0	
KING-24	11/5/2005	—	—	—	—	—	—	—	2	
KING-24	11/3/2008	E0.006	—	—	E0.021	E0.006	E0.009	E0.006 [3]	7	
KWH-10	11/17/2005	—	—	—	—	—	—	—	3	
KWH-10	11/5/2008	—	—	—	—	—	—	—	3	
KWH-12	11/28/2005	—	—	—	—	—	—	—	4	
KWH-12	11/6/2008	—	—	—	—	—	—	—	4	
TLR-03	11/29/2005	—	—	—	—	—	—	—	0	
TLR-03	11/4/2008	—	—	—	—	—	—	—	0	
TULE-05	12/5/2005	—	—	—	—	—	—	—	3	
TULE-05	11/3/2008	—	—	—	—	—	—	—	3	
TULE-10	12/7/2005	E0.006	—	—	—	—	—	—	6	
TULE-10	11/3/2008	E0.010	E0.004	—	—	—	—	—	7	

[1] Minimum and maximum LRL, or only LRL used during study period.

[2] Detection frequencies for EPTC and 3,5-dichloroaniline were not calculated because only 9 of 54 samples were analyzed for these compounds.

[3] The detected concentration was less than the LT-MDL for this compound. These results are counted as non-detections for the purpose of calculating detection frequencies.

Table 6B. Polar pesticides (Schedule 2060) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Polar pesticides were analyzed in samples from 19 trend wells in 2004–05 and 23 trend wells in 2007–08; samples from 10 trend wells were analyzed during both time periods. Only wells analyzed during at least one of the periods are listed. Information about analytes given in table 3D. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate		Beverage	Detections per sample	Detection summary
		Atrazine[2] (µg/L) (39632)	Tebuthiuron[2] (µg/L) (82670)	Diuron (µg/L) (49300)	Metsulfuron-methyl (µg/L) (61697)	Sulfometuron-methyl (µg/L) (50337)	Bromacil (µg/L) (04029)	Dinoseb (µg/L) (49301)	Diphenamid (µg/L) (04033)	Deethyl-atrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)[2] (µg/L) (04040)	Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine) (µg/L) (04038)	Caffeine (µg/L) (50305)		
Benchmark type		MCL-CA	HAL-US	HAL-US	na	na	na	MCL-CA	na	na	na	na		
Benchmark level		1	500	10	na	na	na	7	na	na	na	na		
[LRL][1]		[0.008, 0.040]	[0.026, 0.040]	[0.015, 0.040]	[0.025, 0.140]	[0.009, 0.091]	[0.018, 0.040]	[0.003, 0.040]	[0.010, 0.040]	[0.020, 0.060]	[0.044, 0.080]	[0.010, 0.060]		
Number of trend wells with detections 2004–05		4	0	1	1	1	0	0	0	2	0	3		7
Detection frequency (percent) 2004–05		21	0	5	5	5	0	0	0	11	0	16		37
Number of trend wells with detections 2007–08		2	2	0	0	0	0	0	0	2	1	0		2
Detection frequency (percent) 2007–08		9	9	0	0	0	0	0	0	9	4	0		9
San Diego Drainages study unit														
SDTEMFP-01	5/19/2004	—	—	—	—	—	—	—	—	—	—	—	0	
SDTEMFP-01	9/19/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
North San Francisco Bay study unit														
NSFVOL-14	10/7/2004	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVOL-14	8/21/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVOL-18	10/20/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
NSFVOL-18	8/28/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-29	9/28/2004	—	—	—	—	—	—	—	—	—	E0.004 [3]	—	0	

Table 6B. Polar pesticides (Schedule 2060) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Polar pesticides were analyzed in samples from 19 trend wells in 2004–05 and 23 trend wells in 2007–08; samples from 10 trend wells were analyzed during both time periods. Only wells analyzed during at least one of the periods are listed. Information about analytes given in table 3D. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate		Beverage	Detections per sample	Detection summary
		Atrazine[2] (µg/L) (39632)	Tebuthiuron[2] (µg/L) (82670)	Diuron (µg/L) (49300)	Metsulfuron-methyl (µg/L) (61697)	Sulfometuron-methyl (µg/L) (50337)	Bromacil (µg/L) (04029)	Dinoseb (µg/L) (49301)	Diphenamid (µg/L) (04033)	Deethyl-atrazine (2-Chloro-4-iso-propylamino-6-amino-*s*-triazine)[2] (µg/L) (04040)	Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine) (µg/L) (04038)	Caffeine (µg/L) (50305)		
Benchmark type		MCL-CA	HAL-US	HAL-US	na	na	na	MCL-CA	na	na	na	na		
Benchmark level		1	500	10	na	na	na	7	na	na	na	na		
[LRL][1]		[0.008, 0.040]	[0.026, 0.040]	[0.015, 0.040]	[0.025, 0.140]	[0.009, 0.091]	[0.018, 0.040]	[0.003, 0.040]	[0.010, 0.040]	[0.020, 0.060]	[0.044, 0.080]	[0.010, 0.060]		
North San Francisco Bay study unit—Continued														
NSFVP-29	8/27/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-34	10/18/2004	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-34	8/22/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-36	10/19/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
NSFVP-36	8/20/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-38	10/20/2004	—	—	—	—	0.052	—	—	—	—	—	—	1	
NSFVP-38	8/22/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-39	10/21/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
NSFVP-39	11/16/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFVP-41	10/21/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
NSFVP-41	8/20/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFWG-03	9/21/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
NSFWG-03	8/29/2007	—	—	—	—	—	—	—	—	—	—	—	0	
NSFWGFP-01	10/5/2004	—	—	—	—	—	—	—	—	—	—	—	0	
NSFWGFP-01	8/29/2007	E0.001 [3]	—	—	—	—	—	—	—	—	—	—	0	

Table 6B. Polar pesticides (Schedule 2060) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Polar pesticides were analyzed in samples from 19 trend wells in 2004–05 and 23 trend wells in 2007–08; samples from 10 trend wells were analyzed during both time periods. Only wells analyzed during at least one of the periods are listed. Information about analytes given in table 3D. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate		Beverage	Detections per sample	Detection summary
		Atrazine[2] (µg/L) (39632)	Tebuthiuron[2] (µg/L) (82670)	Diuron (µg/L) (49300)	Metsulfuron-methyl (µg/L) (61697)	Sulfometuron-methyl (µg/L) (50337)	Bromacil (µg/L) (04029)	Dinoseb (µg/L) (49301)	Diphenamid (µg/L) (04033)	Deethyl-atrazine (2-Chloro-4-iso-propylamino-6-amino-*s*-triazine)[2] (µg/L) (04040)	Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine) (µg/L) (04038)	Caffeine (µg/L) (50305)		
Benchmark type		MCL-CA	HAL-US	HAL-US	na	na	na	MCL-CA	na	na	na	na		
Benchmark level		1	500	10	na	na	na	7	na	na	na	na		
[LRL][1]		[0.008, 0.040]	[0.026, 0.040]	[0.015, 0.040]	[0.025, 0.140]	[0.009, 0.091]	[0.018, 0.040]	[0.003, 0.040]	[0.010, 0.040]	[0.020, 0.060]	[0.044, 0.080]	[0.010, 0.060]		
Northern San Joaquin Basin study unit														
TRCY-03	1/6/2005	—	—	—	—	—	—	—	—	—	—	—	0	
TRCY-03	3/31/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
Southern Sacramento Valley study unit														
NAM-03	3/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
NAM-03	4/10/2008	—	—	—	—	—	—	—	—	—	—	—	0	
SAM-10	4/21/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
SAM-10	4/8/2008	—	—	—	—	—	—	—	—	—	—	—	0	
SOL-08	5/10/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
SOL-08	4/8/2008	—	—	—	—	—	—	—	—	—	—	—	0	
SSV-QPC-07	4/4/2005	—	—	—	—	—	—	—	—	—	—	E0.011	1	
SSV-QPC-07	4/10/2008	—	—	—	—	—	—	—	—	—	—	—	0	
SUI-03	5/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
SUI-03	4/9/2008	—	—	—	—	—	—	—	—	—	—	—	0	
YOL-01	4/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
YOL-01	4/7/2008	—	—	—	—	—	—	—	—	—	—	—	0	

Table 6B. Polar pesticides (Schedule 2060) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Polar pesticides were analyzed in samples from 19 trend wells in 2004–05 and 23 trend wells in 2007–08; samples from 10 trend wells were analyzed during both time periods. Only wells analyzed during at least one of the periods are listed. Information about analytes given in table 3D. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate		Beverage	Detections per sample	Detection summary
		Atrazine[2] (µg/L) (39632)	Tebuthiuron[2] (µg/L) (82670)	Diuron (µg/L) (49300)	Metsulfuron-methyl (µg/L) (61697)	Sulfometuron-methyl (µg/L) (50337)	Bromacil (µg/L) (04029)	Dinoseb (µg/L) (49301)	Diphenamid (µg/L) (04033)	Deethyl-atrazine (2-Chloro-4-iso-propylamino-6-amino-*s*-triazine)[2] (µg/L) (04040)	Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine) (µg/L) (04038)	Caffeine (µg/L) (50305)		
Benchmark type		MCL-CA	HAL-US	HAL-US	na	na	na	MCL-CA	na	na	na	na		
Benchmark level		1	500	10	na	na	na	7	na	na	na	na		
[LRL][1]		[0.008, 0.040]	[0.026, 0.040]	[0.015, 0.040]	[0.025, 0.140]	[0.009, 0.091]	[0.018, 0.040]	[0.003, 0.040]	[0.010, 0.040]	[0.020, 0.060]	[0.044, 0.080]	[0.010, 0.060]		
Southern Sacramento Valley study unit—Continued														
YOL-14	5/25/2005	—	—	—	—	—	—	—	—	—	—	—	0	
YOL-14	4/9/2008	—	—	—	—	—	—	—	—	—	—	—	0	
San Fernando–San Gabriel study unit														
ULASF-09	6/27/2005	E0.029	—	—	—	—	E0.008 [3]	—	—	E0.017	E0.019 [3]	E0.012	3	
ULASF-09	6/16/2008	E0.018 [3]	—	—	—	—	—	—	—	E0.008 [3]	E0.015 [3]	—	0	
ULASF-10	6/8/2005	E0.007	—	—	—	—	—	—	—	E0.011 [3]	E0.005 [3]	—	1	
ULASF-10	6/16/2008	—	—	—	—	—	—	—	—	—	—	—	0	
ULASG-01	6/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
ULASG-01	6/16/2008	E0.024	E0.016	—	—	—	—	—	—	E0.029	E0.054	—	4	
ULASG-08	6/15/2005	E0.025	—	0.019	—	—	—	—	E0.006 [3]	E0.028	—	—	3	
ULASG-08	6/17/2008	E0.005 [3]	—	E0.005 [3]	—	—	—	—	E0.017 [3]	E0.003 [3]	—	—	0	
ULASG-15	6/23/2005	—	—	—	—	—	—	—	—	—	—	—	0	
ULASG-15	6/17/2008	—	—	—	—	—	—	—	—	—	—	—	0	
ULASG-17	7/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
ULASG-17	6/17/2008	0.046	0.079	—	—	—	—	—	—	E0.053	—	—	3	

Table 6B. Polar pesticides (Schedule 2060) in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Polar pesticides were analyzed in samples from 19 trend wells in 2004–05 and 23 trend wells in 2007–08; samples from 10 trend wells were analyzed during both time periods. Only wells analyzed during at least one of the periods are listed. Information about analytes given in table 3D. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level; HAL-US, U.S. Environmental Protection Agency lifetime health advisory level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; µg/L, micrograms per liter; na, not available; nc, not collected; —, not detected; E, estimated or having a higher degree of uncertainty]

GAMA well identification number	Sample dates	Herbicide								Herbicide degradate		Beverage	Detections per sample	Detection summary
		Atrazine[2] (µg/L) (39632)	Tebuthiuron[2] (µg/L) (82670)	Diuron (µg/L) (49300)	Metsulfuron-methyl (µg/L) (61697)	Sulfometuron-methyl (µg/L) (50337)	Bromacil (µg/L) (04029)	Dinoseb (µg/L) (49301)	Diphenamid (µg/L) (04033)	Deethyl-atrazine (2-Chloro-4-iso-propylamino-6-amino-*s*-triazine)[2] (µg/L) (04040)	Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine) (µg/L) (04038)	Caffeine (µg/L) (50305)		
Benchmark type		MCL-CA	HAL-US	HAL-US	na	na	na	MCL-CA	na	na	na	na		
Benchmark level		1	500	10	na	na	na	7	na	na	na	na		
[LRL][1]		[0.008, 0.040]	[0.026, 0.040]	[0.015, 0.040]	[0.025, 0.140]	[0.009, 0.091]	[0.018, 0.040]	[0.003, 0.040]	[0.010, 0.040]	[0.020, 0.060]	[0.044, 0.080]	[0.010, 0.060]		
Monterey Bay and Salinas Valley Basins study unit														
MSMB-04	8/17/2005	—	—	—	—	—	—	—	—	—	—	—	0	
MSMB-04	8/20/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
MSSC-06	8/24/2005	—	—	—	—	—	—	—	—	—	—	—	0	
MSSC-06	8/18/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
Southeast San Joaquin Valley study unit														
KING-11	10/20/2005	—	—	—	—	—	—	—	—	—	—	—	0	
KING-11	11/5/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
KING-13	10/20/2005	—	—	—	—	—	—	—	—	—	—	0.020	1	
KING-13	11/5/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
KING-17	10/26/2005	—	—	—	—	—	—	—	—	—	—	—	0	
KING-17	11/4/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	
KWH-12	11/28/2005	0.030	—	—	E0.067	—	E0.008 [3]	E0.003 [3]	—	E0.007 [3]	E0.034 [3]	—	2	
KWH-12	11/6/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	

[1] Minimum and maximum LRL used during study period, or only LRL used during study period.

[2] Schedule 2003/2032/2033 is the preferred method for atrazine, tebuthiuron, and deethylatrazine (table 6A). Results from Schedule 2060 are reported here for comparison purposes only.

[3] The detected concentration was less than the LT-MDL for this compound. These results are counted as non-detections for the purpose of calculating detection frequencies.

Table 7. Constituents of special interest in samples collected from trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Perchlorate was analyzed in samples from 36 trend wells during 2004–05 and 55 trend wells in 2007–08. NDMA was analyzed in 31 wells during 2004–05 and 17 wells in 2007–08; 6 wells were analyzed during both periods. 1,2,3-Trichloropropane was analyzed in 25 wells during 2004–05 and 38 wells during 2007–08; 15 wells were analyzed during both periods. Information about analytes given in table 3H. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, U.S. Environmental Protection Agency lifetime health advisory level; NL-CA, CDPH notification level; MCL-CA, CDPH maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; MRL, minimum reporting level; *, value greater than benchmark level; — not detected; <, less than; nc, not collected]

GAMA well identification number	Sample dates	Perchlorate [2] (µg/L) (61209)	Perchlorate [3] (µg/L) (63790)	*N*-Nitrosodimethylamine (NDMA) [4] (µg/L) (64176, 34438)	1,2,3-Trichloropropane [5] (µg/L) (77443)
Benchmark type[1]		MCL-CA	MCL-CA	NL-CA	HAL-US[6]
Benchmark level		6	6	0.002	40
[MRL(s)]		[0.25 0.5, 1]	[0.1]	[0.002]	[0.005]
San Diego Drainages study unit					
SDALLV-07	7/14/2004	<1	nc	—	nc
SDALLV-07	9/12/2007	<1	1.01	nc	nc
SDALLV-11	7/15/2004	2.5	nc	—	nc
SDALLV-11	9/13/2007	3.6	4.89	nc	nc
SDHDRK-01	7/12/2004	1.2	nc	—	nc
SDHDRK-01	9/13/2007	1.0	1.93	nc	nc
SDHDRK-09	7/27/2004	<0.5	nc	—	nc
SDHDRK-09	9/11/2007	nc	—	nc	nc
SDTEM-04	5/24/2004	nc	nc	nc	nc
SDTEM-04	9/18/2007	1.6	2.14	nc	nc
SDTEMFP-01	5/19/2004	1.4	nc	—	nc
SDTEMFP-01	9/19/2007	1.1	1.18	nc	nc
SDWARN-01	6/17/2004	<0.25	nc	—	nc
SDWARN-01	9/11/2007	<0.5	0.28	nc	nc
North San Francisco Bay study unit					
NSFVOL-14	10/7/2004	<0.5	nc	—	—
NSFVOL-14	8/21/2007	<0.5	0.33	nc	nc
NSFVOL-18	10/20/2004	<0.5	nc	—	—
NSFVOL-18	8/28/2007	<0.5	nc	nc	nc
NSFVP-29	9/28/2004	<0.5	nc	—	—
NSFVP-29	8/27/2007	<0.5	nc	nc	nc
NSFVP-34	10/18/2004	<0.5	nc	—	—
NSFVP-34	8/22/2007	<0.5	nc	nc	nc
NSFVP-36	10/19/2004	<0.5	nc	—	—
NSFVP-36	8/20/2007	<1	—	nc	nc
NSFVP-38	10/20/2004	<0.5	nc	—	—
NSFVP-38	8/22/2007	<1	nc	nc	nc

Table 7. Constituents of special interest in samples collected from trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Perchlorate [2] (µg/L) (61209)	Perchlorate [3] (µg/L) (63790)	*N*-Nitrosodimethylamine (NDMA) [4] (µg/L) (64176, 34438)	1,2,3-Trichloropropane [5] (µg/L) (77443)
Benchmark type[1]		MCL-CA	MCL-CA	NL-CA	HAL-US[6]
Benchmark level		6	6	0.002	40
[MRL(s)]		[0.25 0.5, 1]	[0.1]	[0.002]	[0.005]
North San Francisco Bay study unit—Continued					
NSFVP-39	10/21/2004	<0.5	nc	—	—
NSFVP-39	11/16/2007	<0.5	nc	nc	nc
NSFVP-41	10/21/2004	<0.5	nc	—	—
NSFVP-41	8/20/2007	<0.5	—	nc	nc
NSFWG-03	9/21/2004	<0.5	nc	—	—
NSFWG-03	8/29/2007	<0.5	nc	nc	nc
NSFWGFP-01	10/5/2004	<0.5	nc	—	—
NSFWGFP-01	8/29/2007	<0.5	nc	nc	nc
Northern San Joaquin Basin study unit					
COS-08	1/3/2005	nc	nc	nc	nc
COS-08	4/3/2008	nc	—	nc	—
ESJ-01	1/24/2005	nc	nc	nc	nc
ESJ-01	4/2/2008	nc	—	nc	—
ESJ-06	1/10/2005	<0.5	nc	—	—
ESJ-06	4/2/2008	nc	0.45	nc	—
NSJ-QPC-04	1/24/2005	<0.5	nc	—	—
NSJ-QPC-04	4/1/2008	nc	—	nc	—
TRCY-03	1/6/2005	<0.5	nc	—	—
TRCY-03	3/31/2008	nc	0.47	nc	—
Southern Sacramento Valley study unit					
NAM-03	3/29/2005	nc	nc	nc	nc
NAM-03	4/10/2008	nc	0.27	nc	—
SAM-10	4/21/2005	nc	nc	nc	nc
SAM-10	4/8/2008	nc	1.95	nc	0.006
SOL-08	5/10/2005	nc	nc	nc	nc
SOL-08	4/8/2008	nc	0.47	nc	0.006
SSV-QPC-07	4/4/2005	0.89	nc	—	—

Table 7. Constituents of special interest in samples collected from trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Perchlorate was analyzed in samples from 36 trend wells during 2004–05 and 55 trend wells in 2007–08. NDMA was analyzed in 31 wells during 2004–05 and 17 wells in 2007–08; 6 wells were analyzed during both periods. 1,2,3-Trichloropropane was analyzed in 25 wells during 2004–05 and 38 wells during 2007–08; 15 wells were analyzed during both periods. Information about analytes given in table 3H. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, U.S. Environmental Protection Agency lifetime health advisory level; NL-CA, CDPH notification level; MCL-CA, CDPH maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; MRL, minimum reporting level; *, value greater than benchmark level; — not detected; <, less than; nc, not collected]

GAMA well identification number	Sample dates	Perchlorate [2] (µg/L) (61209)	Perchlorate [3] (µg/L) (63790)	*N*-Nitrosodimethylamine (NDMA) [4] (µg/L) (64176, 34438)	1,2,3-Trichloropropane [5] (µg/L) (77443)
Benchmark type[1]		MCL-CA	MCL-CA	NL-CA	HAL-US[6]
Benchmark level		6	6	0.002	40
[MRL(s)]		[0.25 0.5, 1]	[0.1]	[0.002]	[0.005]
Southern Sacramento Valley study unit—Continued					
SSV-QPC-07	4/10/2008	nc	0.67	nc	0.005
SUI-03	5/12/2005	nc	nc	nc	nc
SUI-03	4/9/2008	nc	0.9	nc	—
YOL-01	4/11/2005	nc	nc	nc	nc
YOL-01	4/7/2008	nc	0.56	nc	0.006
YOL-14	5/25/2005	<1	nc	—	—
YOL-14	4/9/2008	nc	—	nc	0.005
San Fernando–San Gabriel study unit					
ULASF-09	6/27/2005	<0.5	nc	—	—
ULASF-09	6/16/2008	nc	2.24	—	—
ULASF-10	6/8/2005	<0.5	nc	—	—
ULASF-10	6/16/2008	nc	—	—	—
ULASG-01	6/7/2005	nc	nc	nc	nc
ULASG-01	6/16/2008	nc	*7.77	—	—
ULASG-08	6/15/2005	3.8	nc	—	—
ULASG-08	6/17/2008	nc	3.98	—	—
ULASG-15	6/23/2005	<0.5	nc	—	—
ULASG-15	6/17/2008	nc	0.19	—	—
ULASG-17	7/11/2005	nc	nc	nc	nc
ULASG-17	6/17/2008	nc	*7.60	—	—
Monterey Bay and Salinas Valley Basins study unit					
MSMB-03	8/31/2005	nc	nc	nc	nc
MSMB-03	8/20/2008	nc	0.10	—	—
MSMB-04	8/17/2005	<1	nc	—	—
MSMB-04	8/20/2008	nc	—	—	—
MSMB-16	8/17/2005	nc	nc	nc	nc
MSMB-16	8/19/2008	nc	0.50	—	—

Table 7. Constituents of special interest in samples collected from trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Perchlorate was analyzed in samples from 36 trend wells during 2004–05 and 55 trend wells in 2007–08. NDMA was analyzed in 31 wells during 2004–05 and 17 wells in 2007–08; 6 wells were analyzed during both periods. 1,2,3-Trichloropropane was analyzed in 25 wells during 2004–05 and 38 wells during 2007–08; 15 wells were analyzed during both periods. Information about analytes given in table 3H. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, U.S. Environmental Protection Agency lifetime health advisory level; NL-CA, CDPH notification level; MCL-CA, CDPH maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; MRL, minimum reporting level; *, value greater than benchmark level; — not detected; <, less than; nc, not collected]

GAMA well identification number	Sample dates	Perchlorate [2] (µg/L) (61209)	Perchlorate [3] (µg/L) (63790)	*N*-Nitrosodimethylamine (NDMA) [4] (µg/L) (64176, 34438)	1,2,3-Trichloropropane [5] (µg/L) (77443)
Benchmark type[1]		MCL-CA	MCL-CA	NL-CA	HAL-US[6]
Benchmark level		6	6	0.002	40
[MRL(s)]		[0.25 0.5, 1]	[0.1]	[0.002]	[0.005]
Monterey Bay and Salinas Valley Basins study unit—Continued					
MSMB-28	8/3/2005	nc	nc	nc	nc
MSMB-28	8/21/2008	nc	0.79	—	—
MSMB-31	8/11/2005	nc	nc	nc	nc
MSMB-31	8/21/2008	nc	0.65	—	—
MSPR-03	7/28/2005	nc	nc	nc	nc
MSPR-03	11/14/2008	nc	—	—	—
MSPR-09	7/18/2005	nc	nc	nc	nc
MSPR-09	11/14/2008	nc	0.12	—	—
MSSC-06	8/24/2005	<0.5	nc	—	—
MSSC-06	8/18/2008	nc	—	—	—
MSSC-11	9/13/2005	nc	nc	nc	nc
MSSC-11	8/19/2008	nc	—	—	—
MSSV-06	8/2/2005	nc	nc	nc	nc
MSSV-06	11/13/2008	nc	—	—	—
MSSV-15	8/12/2005	nc	nc	nc	nc
MSSV-15	11/13/2008	nc	—	—	—
Southeast San Joaquin Valley study unit					
KING-11	10/20/2005	0.94	nc	—	—
KING-11	11/5/2008	nc	0.73	nc	—
KING-13	10/20/2005	0.62	nc	—	—
KING-13	11/5/2008	nc	0.68	nc	—
KING-17	10/26/2005	<0.5	nc	—	—
KING-17	11/4/2008	nc	0.86	nc	—
KING-24	11/5/2005	<0.5	nc	nc	nc
KING-24	11/3/2008	nc	0.61	nc	—
KWH-10	11/17/2005	2.7	nc	nc	nc
KWH-10	11/5/2008	nc	3.92	nc	—

Table 7. Constituents of special interest in samples collected from trend wells sampled for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Perchlorate was analyzed in samples from 36 trend wells during 2004–05 and 55 trend wells in 2007–08. NDMA was analyzed in 31 wells during 2004–05 and 17 wells in 2007–08; 6 wells were analyzed during both periods. 1,2,3-Trichloropropane was analyzed in 25 wells during 2004–05 and 38 wells during 2007–08; 15 wells were analyzed during both periods. Information about analytes given in table 3H. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, U.S. Environmental Protection Agency lifetime health advisory level; NL-CA, CDPH notification level; MCL-CA, CDPH maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; MRL, minimum reporting level; *, value greater than benchmark level; — not detected; <, less than; nc, not collected]

GAMA well identification number	Sample dates	Perchlorate [2] (µg/L) (61209)	Perchlorate [3] (µg/L) (63790)	*N*-Nitrosodimethylamine (NDMA) [4] (µg/L) (64176, 34438)	1,2,3-Trichloropropane [5] (µg/L) (77443)
Benchmark type[1]		MCL-CA	MCL-CA	NL-CA	HAL-US[6]
Benchmark level		6	6	0.002	40
[MRL(s)]		[0.25 0.5, 1]	[0.1]	[0.002]	[0.005]
Southeast San Joaquin Valley study unit—Continued					
KWH-12	11/28/2005	<0.5	nc	—	0.008
KWH-12	11/6/2008	nc	0.93	nc	0.009
TLR-03	11/29/2005	<0.5	nc	nc	nc
TLR-03	11/4/2008	nc	—	nc	—
TULE-05	12/5/2005	<1	nc	nc	nc
TULE-05	11/3/2008	nc	0.82	nc	—
TULE-10	12/7/2005	0.64	nc	nc	nc
TULE-10	11/3/2008	nc	0.75	nc	0.006

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and the MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] Prior to October 1, 2007, perchlorate analyses were performed on unfiltered samples by Mongomery Watson Harza (MWH) Laboratories (table A1). The nominal MRLs were 0.25 or 0.5 µg/L; some higher salinity samples were diluted for analysis and had an MRL of 1 µg/L.

[3] After August 15, 2007, perchlorate analyses were performed on filtered samples by Weck Laboratories, Inc. (table A1).

[4] NDMA analyses performed prior to October 1, 2007, by MWH were reported using parameter code 64176 and expressed in nanograms per liter, converted to micrograms per liter here. NDMA analyses performed after October 1, 2007, by Weck were reported using paramenter code 34438.

[5] 1,2,3-Trichloropropane (1,2,3-TCP) analyses were performed by MWH prior to October 1, 2007, and by Weck after that date. All samples were additionally analyzed for 1,2,3-TCP by the USGS NWQL Schedule 2020 with no detections by that analytical method, which had an LRL ranging from 0.12 to 0.18 µg/L.

[6] In some earlier reports in this series, the NL-CA (0.005 µg/L) was used as the comparison benchmark for 1,2,3-TCP.

Table 8. Nutrients in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Nutrients were analyzed in samples from 19 trend wells during 2004–05 and 50 trend wells in 2007–08; 18 wells were analyzed during both periods. Information about analytes given in table 3E. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; CDPH, California Department of Public Health. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Ammonia (as nitrogen) (mg/L) (00608)	Nitrite (as nitrogen) (mg/L) (00613)	Nitrite plus nitrate (as nitrogen) (mg/L) (00631)	Total nitrogen (ammonia + nitrate + nitrite + organic nitrogen) (mg/L) (62854)	Orthophosphate (as phosphorus) (mg/L) (00671)
Benchmark type[1]		HAL-US	MCL-US	MCL-US	na	na
Benchmark level		[2] 24.7	1	10	na	na
[LRL][3]		[0.010, 0.04]	[0.002, 0.008]	[0.04, 0.06]	[0.03, 0.10]	[0.006]
San Diego Drainages study unit						
SDHDRK-09	7/27/2004	nc	nc	nc	nc	nc
SDHDRK-09	9/11/2007	—	—	0.56	0.6	0.056
SDTEMFP-01	5/19/2004	—	0.028	3.84	3.67	0.015
SDTEMFP-01	9/19/2007	nc	nc	nc	nc	nc
SDWARN-01	6/17/2004	nc	nc	nc	nc	nc
SDWARN-01	9/11/2007	—	0.006	2.14	2.23	0.341
North San Francisco Bay study unit						
NSFVOL-14	10/7/2004	—	—	0.79	0.76	0.181
NSFVOL-14	8/21/2007	0.026	E0.001	0.69	0.76	0.164
NSFVOL-18	10/20/2004	nc	nc	nc	nc	nc
NSFVOL-18	8/28/2007	0.151	—	—	0.2	0.207
NSFVP-29	9/28/2004	—	—	1.89	1.78	0.010
NSFVP-29	8/27/2007	—	—	1.4	1.47	0.019
NSFVP-34	10/18/2004	0.070	—	—	E0.06	0.318
NSFVP-34	8/22/2007	0.072	E0.001	—	0.09	0.338
NSFVP-36	10/19/2004	nc	nc	nc	nc	nc
NSFVP-36	8/20/2007	1.45	E0.001	—	1.66	0.586
NSFVP-38	10/20/2004	0.220	—	E0.06	0.28	0.146
NSFVP-38	8/22/2007	0.252	E0.002	—	0.31	0.158
NSFVP-39	10/21/2004	nc	nc	nc	nc	nc
NSFVP-39	11/16/2007	E0.019	—	—	—	0.135
NSFVP-41	10/21/2004	nc	nc	nc	nc	nc
NSFVP-41	8/20/2007	0.027	0.055	0.82	0.86	0.221
NSFWG-03	9/21/2004	nc	nc	nc	nc	nc
NSFWG-03	8/29/2007	—	—	—	—	0.147
NSFWGFP-01	10/5/2004	—	—	0.06	0.09	0.008
NSFWGFP-01	8/29/2007	—	—	0.09	0.06	0.019

Table 8. Nutrients in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Nutrients were analyzed in samples from 19 trend wells during 2004–05 and 50 trend wells in 2007–08; 18 wells were analyzed during both periods. Information about analytes given in table 3E. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; CDPH, California Department of Public Health. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Ammonia (as nitrogen) (mg/L) (00608)	Nitrite (as nitrogen) (mg/L) (00613)	Nitrite plus nitrate (as nitrogen) (mg/L) (00631)	Total nitrogen (ammonia + nitrate + nitrite + organic nitrogen) (mg/L) (62854)	Orthophosphate (as phosphorus) (mg/L) (00671)
Benchmark type[1]		HAL-US	MCL-US	MCL-US	na	na
Benchmark level		[2] 24.7	1	10	na	na
[LRL][3]		[0.010, 0.04]	[0.002, 0.008]	[0.04, 0.06]	[0.03, 0.10]	[0.006]
Northern San Joaquin Basin study unit						
COS-08	1/3/2005	nc	nc	nc	nc	nc
COS-08	4/3/2008	0.035	—	0.18	0.20	0.162
ESJ-01	1/24/2005	nc	nc	nc	nc	nc
ESJ-01	4/2/2008	—	—	3.52	3.71	0.034
ESJ-06	1/10/2005	nc	nc	nc	nc	nc
ESJ-06	4/2/2008	—	—	2.77	2.9	0.039
NSJ-QPC-04	1/24/2005	nc	nc	nc	nc	nc
NSJ-QPC-04	4/1/2008	—	—	1.09	1.15	0.286
TRCY-03	1/6/2005	—	—	2.30	2.44	0.016
TRCY-03	3/31/2008	—	—	2.48	2.61	0.021
Southern Sacramento Valley study unit						
NAM-03	3/29/2005	nc	nc	nc	nc	nc
NAM-03	4/10/2008	—	—	0.85	0.90	0.107
SAM-10	4/21/2005	nc	nc	nc	nc	nc
SAM-10	4/8/2008	—	—	7.27	7.65	0.040
SOL-08	5/10/2005	nc	nc	nc	nc	nc
SOL-08	4/8/2008	—	—	0.75	0.77	0.025
SSV-QPC-07	4/4/2005	—	—	1.80	1.79	0.084
SSV-QPC-07	4/10/2008	—	—	1.84	1.90	0.101
SUI-03	5/12/2005	nc	nc	nc	nc	nc
SUI-03	4/9/2008	—	—	5.79	6.08	0.041
YOL-01	4/11/2005	nc	nc	nc	nc	nc
YOL-01	4/7/2008	E0.010	—	5.17	5.52	0.040
YOL-14	5/25/2005	0.080	—	—	0.09	0.027
YOL-14	4/9/2008	0.082	—	E0.02	0.09	0.121

Table 8. Nutrients in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Nutrients were analyzed in samples from 19 trend wells during 2004–05 and 50 trend wells in 2007–08; 18 wells were analyzed during both periods. Information about analytes given in table 3E. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; CDPH, California Department of Public Health. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Ammonia (as nitrogen) (mg/L) (00608)	Nitrite (as nitrogen) (mg/L) (00613)	Nitrite plus nitrate (as nitrogen) (mg/L) (00631)	Total nitrogen (ammonia + nitrate + nitrite + organic nitrogen) (mg/L) (62854)	Orthophosphate (as phosphorus) (mg/L) (00671)
Benchmark type[1]		HAL-US	MCL-US	MCL-US	na	na
Benchmark level		[2] 24.7	1	10	na	na
[LRL][3]		[0.010, 0.04]	[0.002, 0.008]	[0.04, 0.06]	[0.03, 0.10]	[0.006]
San Fernando–San Gabriel study unit						
ULASF-09	6/27/2005	—	—	9.74	9.61	0.024
ULASF-09	6/16/2008	—	—	*10.9	11.2	0.036
ULASF-10	6/8/2005	—	—	1.90	1.83	0.022
ULASF-10	6/16/2008	—	—	0.56	0.54	0.021
ULASG-01	6/7/2005	nc	nc	nc	nc	nc
ULASG-01	6/16/2008	—	—	*10.4	10.8	0.066
ULASG-08	6/15/2005	—	—	*10.3	10.5	0.018
ULASG-08	6/17/2008	—	—	*11.6	12	0.028
ULASG-15	6/23/2005	—	—	0.79	0.85	E0.003
ULASG-15	6/17/2008	—	—	1.05	1.08	0.009
ULASG-17	7/11/2005	nc	nc	nc	nc	nc
ULASG-17	6/17/2008	—	—	*11.9	12.4	0.028
Monterey Bay and Salinas Valley Basins study unit						
MSMB-03	8/31/2005	nc	nc	nc	nc	nc
MSMB-03	8/20/2008	0.192	—	—	0.20	0.161
MSMB-04	8/17/2005	—	—	—	—	0.011
MSMB-04	8/20/2008	—	—	—	—	0.019
MSMB-16	8/17/2005	nc	nc	nc	nc	nc
MSMB-16	8/19/2008	—	—	4.64	4.79	0.036
MSMB-28	8/3/2005	nc	nc	nc	nc	nc
MSMB-28	8/21/2008	—	—	1.9	1.94	0.039
MSMB-31	8/11/2005	nc	nc	nc	nc	nc
MSMB-31	8/21/2008	—	—	7.06	7.75	0.048
MSPR-03	7/28/2005	nc	nc	nc	nc	nc
MSPR-03	11/14/2008	0.314	—	0.06	0.38	0.019

Table 8. Nutrients in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Nutrients were analyzed in samples from 19 trend wells during 2004–05 and 50 trend wells in 2007–08; 18 wells were analyzed during both periods. Information about analytes given in table 3E. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; CDPH, California Department of Public Health. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Ammonia (as nitrogen) (mg/L) (00608)	Nitrite (as nitrogen) (mg/L) (00613)	Nitrite plus nitrate (as nitrogen) (mg/L) (00631)	Total nitrogen (ammonia + nitrate + nitrite + organic nitrogen) (mg/L) (62854)	Orthophosphate (as phosphorus) (mg/L) (00671)
Benchmark type[1]		HAL-US	MCL-US	MCL-US	na	na
Benchmark level		[2] 24.7	1	10	na	na
[LRL][3]		[0.010, 0.04]	[0.002, 0.008]	[0.04, 0.06]	[0.03, 0.10]	[0.006]
Monterey Bay and Salinas Valley Basins study unit—Continued						
MSPR-09	7/18/2005	nc	nc	nc	nc	nc
MSPR-09	11/14/2008	0.258	0.008	0.43	0.68	0.021
MSSC-06	8/24/2005	0.070	—	—	0.09	0.103
MSSC-06	8/18/2008	0.070	—	—	0.08	0.131
MSSC-11	9/13/2005	nc	nc	nc	nc	nc
MSSC-11	8/19/2008	0.046	—	—	—	0.039
MSSV-06	8/2/2005	nc	nc	nc	nc	nc
MSSV-06	11/13/2008	—	—	0.95	0.9	0.066
MSSV-15	8/12/2005	nc	nc	nc	nc	nc
MSSV-15	11/13/2008	—	—	1.05	1.06	0.084
Southeast San Joaquin Valley study unit						
KING-11	10/20/2005	—	—	4.09	3.94	0.014
KING-11	11/5/2008	—	—	4.10	3.82	0.026
KING-13	10/20/2005	—	—	3.21	3.29	0.020
KING-13	11/5/2008	—	—	3.05	2.93	0.035
KING-17	10/26/2005	—	—	4.80	4.76	0.014
KING-17	11/4/2008	—	—	4.65	4.40	0.030
KING-24	11/5/2005	nc	nc	nc	nc	nc
KING-24	11/3/2008	—	—	6.74	6.43	0.041
KWH-10	11/17/2005	nc	nc	nc	nc	nc
KWH-10	11/5/2008	—	—	*14.7	14.2	0.021
KWH-12	11/28/2005	—	—	3.26	3.37	—
KWH-12	11/6/2008	—	—	3.70	3.85	E0.007
TLR-03	11/29/2005	nc	nc	nc	nc	nc
TLR-03	11/4/2008	0.022	—	—	—	0.048
TULE-05	12/5/2005	nc	nc	nc	nc	nc
TULE-05	11/3/2008	0.102	0.148	6.42	6.61	0.017

Table 8. Nutrients in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Nutrients were analyzed in samples from 19 trend wells during 2004–05 and 50 trend wells in 2007–08; 18 wells were analyzed during both periods. Information about analytes given in table 3E. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; MCL-CA, CDPH maximum contaminant level; CDPH, California Department of Public Health. Benchmark type, benchmark level, and RL as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Ammonia (as nitrogen) (mg/L) (00608)	Nitrite (as nitrogen) (mg/L) (00613)	Nitrite plus nitrate (as nitrogen) (mg/L) (00631)	Total nitrogen (ammonia + nitrate + nitrite + organic nitrogen) (mg/L) (62854)	Orthophosphate (as phosphorus) (mg/L) (00671)
Benchmark type[1]		HAL-US	MCL-US	MCL-US	na	na
Benchmark level		[2] 24.7	1	10	na	na
[LRL][3]		[0.010, 0.04]	[0.002, 0.008]	[0.04, 0.06]	[0.03, 0.10]	[0.006]
Southeast San Joaquin Valley study unit—Continued						
TULE-10	12/7/2005	nc	nc	nc	nc	nc
TULE-10	11/3/2008	—	—	9.25	9.17	0.020

[1] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] The HAL-US is 30 mg/L "as ammonia." To facilitate comparison to the analytical results, we have converted and reported this HAL-US as 24.7 mg/L "as nitrogen."

[3] Minimum and maximum LRL used during study period, or only LRL used during study period.

Table 9. Major and minor ions and dissolved solids in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Major ions were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, CDPH maximum contaminant level; SMCL-CA, CDPH secondary maximum contaminant level; MCL-US, USEPA maximum contaminant level; USEPA, U.S. Environmental Protection Agency. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; **, concentration greater than upper benchmark level; —, not detected]

GAMA well identification number	Sample dates	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		na	na	na	na	na	SMCL-CA[3]	MCL-CA	na	na	SMCL-CA[3]	SMCL-CA[3]
Benchmark level		na	na	na	na	na	250 (500)	2	na	na	250 (500)	500 (1,000)
[LRL][2]		[0.02, 0.04]	[0.008, 0.02]	[0.02, 0.16]	[0.10, 0.20]	[0.02]	[0.12, 0.20]	[0.08, 0.12]	[0.002]	[0.02, 0.04]	[0.18]	[10]
San Diego Drainages study unit												
SDHDRK-09	7/27/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDHDRK-09	9/11/2007	48.1	16.5	3.39	62.4	0.32	70.3	0.34	nc	56.8	27.1	414
SDTEM-04	5/24/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDTEM-04	9/18/2007	66.3	16.6	4.18	101	0.29	89.1	0.50	nc	26.2	162	*597
SDTEMFP-01	5/19/2004	25.6	3.00	1.77	116	0.32	86.8	0.82	nc	18.2	61.1	423
SDTEMFP-01	9/19/2007	26.7	3.70	1.77	117	0.31	84.4	0.68	nc	16.8	67.1	428
SDWARN-01	6/17/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDWARN-01	9/11/2007	52.5	8.19	1.28	105	0.35	79.6	0.31	nc	31.4	57.7	480
North San Francisco Bay study unit												
NSFVOL-14	10/7/2004	12.8	7.57	2.18	13.4	0.03	7.79	0.15	0.004	87.0	7.40	185
NSFVOL-14	8/21/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVOL-18	10/20/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVOL-18	8/28/2007	14.5	17.9	6.48	42.6	0.06	12.6	0.35	0.024	119.6	3.76	321
NSFVP-29	9/28/2004	35.7	24.8	0.90	9.06	0.17	5.94	—	E0.001	24.9	26.2	231
NSFVP-29	8/27/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-34	10/18/2004	9.14	6.26	4.70	23.5	0.07	10.6	0.34	0.020	85.3	2.6	185
NSFVP-34	8/22/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-36	10/19/2004	51.6	50.8	7.14	148	1.44	*250	0.16	0.261	46.8	12.4	*685
NSFVP-36	8/20/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-38	10/20/2004	6.26	1.51	2.29	177	0.10	25.5	0.42	0.138	52.9	1.72	*503

Table 9. Major and minor ions and dissolved solids in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Major ions were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, CDPH maximum contaminant level; SMCL-CA, CDPH secondary maximum contaminant level; MCL-US, USEPA maximum contaminant level; USEPA, U.S. Environmental Protection Agency. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; **, concentration greater than upper benchmark level; —, not detected]

GAMA well identification number	Sample dates	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		na	na	na	na	na	SMCL-CA[3]	MCL-CA	na	na	SMCL-CA[3]	SMCL-CA[3]
Benchmark level		na	na	na	na	na	250 (500)	2	na	na	250 (500)	500 (1,000)
[LRL][2]		[0.02, 0.04]	[0.008, 0.02]	[0.02, 0.16]	[0.10, 0.20]	[0.02]	[0.12, 0.20]	[0.08, 0.12]	[0.002]	[0.02, 0.04]	[0.18]	[10]
North San Francisco Bay study unit—Continued												
NSFVP-38	8/22/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-39	10/21/2004	13.9	7.88	6.79	42.3	0.09	7.00	0.37	0.077	104.6	5.46	267
NSFVP-39	11/16/2007	13.8	8.36	6.33	41.7	0.07	6.95	0.35	0.084	98.0	5.25	270
NSFVP-41	10/21/2004	33.0	20.9	2.09	39.2	0.19	42.4	0.24	0.015	50.2	23.6	313
NSFVP-41	8/20/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFWG-03	9/21/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFWG-03	8/29/2007	13.5	6.11	1.65	22.5	0.11	27.2	E0.08	0.009	62.3	32.9	202
NSFWGFP-01	10/5/2004	50.0	3.77	1.33	22.0	0.08	15.4	E0.10	0.007	37.9	15.9	243
NSFWGFP-01	8/29/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Northern San Joaquin Basin study unit												
COS-08	1/3/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
COS-08	4/3/2008	9.43	6.15	1.35	30.2	0.03	7.42	E0.09	0.017	63.6	3.08	174
ESJ-01	1/24/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ESJ-01	4/2/2008	60.3	14.0	4.08	45.7	0.20	63.5	0.14	0.032	48.2	20.6	391
ESJ-06	1/10/2005	28.1	13.2	7.42	19.2	0.08	13.5	0.13	0.004	67.2	13.6	243
ESJ-06	4/2/2008	30.1	13.0	7.43	19.3	0.06	14.3	0.14	E0.002	61.2	14.4	250
NSJ-QPC-04	1/24/2005	4.59	2.58	4.10	22.8	0.04	3.94	0.20	0.004	93.4	2.33	165
NSJ-QPC-04	4/1/2008	4.54	2.53	4.06	21.7	E0.02	4.98	0.21	0.005	85.8	2.36	167

Table 9. Major and minor ions and dissolved solids in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Major ions were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, CDPH maximum contaminant level; SMCL-CA, CDPH secondary maximum contaminant level; MCL-US, USEPA maximum contaminant level; USEPA, U.S. Environmental Protection Agency. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; **, concentration greater than upper benchmark level; —, not detected]

GAMA well identification number	Sample dates	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		na	na	na	na	na	SMCL-CA[3]	MCL-CA	na	na	SMCL-CA[3]	SMCL-CA[3]
Benchmark level		na	na	na	na	na	250 (500)	2	na	na	250 (500)	500 (1,000)
[LRL][2]		[0.02, 0.04]	[0.008, 0.02]	[0.02, 0.16]	[0.10, 0.20]	[0.02]	[0.12, 0.20]	[0.08, 0.12]	[0.002]	[0.02, 0.04]	[0.18]	[10]
Northern San Joaquin Basin study unit —Continued												
TRCY-03	1/6/2005	80.9	26.8	3.17	138	0.39	102	0.23	0.015	23.4	249	*751
TRCY-03	3/31/2008	82.4	26.3	3.12	135	0.37	108	0.25	0.003	20.5	*259	*782
Southern Sacramento Valley study unit												
NAM-03	3/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NAM-03	4/10/2008	18.2	10.7	1.97	43.5	0.14	41.5	0.29	0.006	84.2	9.67	281
SAM-10	4/21/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SAM-10	4/8/2008	65.1	29.7	3.84	21.4	0.12	32.7	E0.09	E0.002	59.2	27.0	413
SOL-08	5/10/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOL-08	4/8/2008	25.8	25.5	3.29	30.5	E0.02	6.37	0.22	—	54.2	13.4	282
SSV-QPC-07	4/4/2005	39.4	13.6	1.80	64.4	0.23	82.5	0.24	0.014	86.5	27.0	408
SSV-QPC-07	4/10/2008	35.9	12.3	1.65	60.2	0.26	80.3	0.23	0.018	80.3	29.0	411
SUI-03	5/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SUI-03	4/9/2008	46.7	36.5	5.00	41.6	0.32	110	0.71	0.008	70.9	8.90	450
YOL-01	4/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
YOL-01	4/7/2008	62.2	45.4	2.63	60.1	0.24	74.6	0.15	0.004	24.4	34.8	*535
YOL-14	5/25/2005	83.3	25.9	8.14	163	1.12	*342	E0.07	0.807	57.2	E0.12	*888
YOL-14	4/9/2008	86.1	59.6	6.70	157	0.98	*352	E0.12	0.690	47.1	71.9	*970

Table 9. Major and minor ions and dissolved solids in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Major ions were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, CDPH maximum contaminant level; SMCL-CA, CDPH secondary maximum contaminant level; MCL-US, USEPA maximum contaminant level; USEPA, U.S. Environmental Protection Agency. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; **, concentration greater than upper benchmark level; —, not detected]

GAMA well identification number	Sample dates	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		na	na	na	na	na	SMCL-CA[3]	MCL-CA	na	na	SMCL-CA[3]	SMCL-CA[3]
Benchmark level		na	na	na	na	na	250 (500)	2	na	na	250 (500)	500 (1,000)
[LRL][2]		[0.02, 0.04]	[0.008, 0.02]	[0.02, 0.16]	[0.10, 0.20]	[0.02]	[0.12, 0.20]	[0.08, 0.12]	[0.002]	[0.02, 0.04]	[0.18]	[10]
San Fernando–San Gabriel study unit												
ULASF-09	6/27/2005	113	41.9	3.44	44.2	0.23	111	0.23	0.005	45.6	166	*702
ULASF-09	6/16/2008	91.8	32.3	3.18	41.1	0.18	88.8	0.23	0.003	38.3	146	*608
ULASF-10	6/8/2005	63.3	14.3	3.88	68.8	0.31	58.5	0.36	0.055	24.3	101	454
ULASF-10	6/16/2008	53.8	10.9	3.61	91.4	0.40	70.7	0.38	0.038	19.2	121	482
ULASG-01	6/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ULASG-01	6/16/2008	127	41.7	2.28	62.4	0.24	86.9	0.48	0.005	37.7	207	*813
ULASG-08	6/15/2005	65.2	20.2	2.26	35.6	0.11	40.4	0.67	E0.001	26.1	65.0	400
ULASG-08	6/17/2008	60.0	17.2	2.44	47.4	0.12	42.0	0.78	E0.001	20.6	67.9	419
ULASG-15	6/23/2005	38.6	11.2	3.07	21.7	0.02	6.40	0.30	E0.001	14.3	17.0	199
ULASG-15	6/17/2008	40.3	11.0	3.42	21.4	0.07	17.3	0.29	—	13.1	25.5	225
ULASG-17	7/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ULASG-17	6/17/2008	163.0	34.3	2.77	35.5	0.60	49.8	0.33	E0.002	28.1	196	*607
Monterey Bay and Salinas Valley Basins study unit												
MSMB-03	8/31/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-03	8/20/2008	1.6	0.5	3.20	109	0.15	42.6	0.47	0.015	62.3	24.2	361
MSMB-04	8/17/2005	40.2	52.4	16.9	112	1.01	241	E0.07	E0.015	31.2	61.9	*658
MSMB-04	8/20/2008	49.3	62.2	19.5	134	1.34	*358	E0.10	0.028	26.9	69.7	*847
MSMB-16	8/17/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-16	8/19/2008	60.9	17.2	2.91	37.0	0.35	99.9	0.29	E0.002	39.2	54.9	430

Table 9. Major and minor ions and dissolved solids in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Major ions were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, CDPH maximum contaminant level; SMCL-CA, CDPH secondary maximum contaminant level; MCL-US, USEPA maximum contaminant level; USEPA, U.S. Environmental Protection Agency. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; **, concentration greater than upper benchmark level; —, not detected]

GAMA well identification number	Sample dates	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		na	na	na	na	na	SMCL-CA[3]	MCL-CA	na	na	SMCL-CA[3]	SMCL-CA[3]
Benchmark level		na	na	na	na	na	250 (500)	2	na	na	250 (500)	500 (1,000)
[LRL][2]		[0.02, 0.04]	[0.008, 0.02]	[0.02, 0.16]	[0.10, 0.20]	[0.02]	[0.12, 0.20]	[0.08, 0.12]	[0.002]	[0.02, 0.04]	[0.18]	[10]
Monterey Bay and Salinas Valley Basins study unit—Continued												
MSMB-28	8/3/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-28	8/21/2008	73.0	22.0	3.68	52.0	0.28	81.5	0.39	E0.002	39.1	65.0	468
MSMB-31	8/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-31	8/21/2008	70.0	15.8	1.80	32.5	0.61	37.1	0.34	E0.001	26.3	25.8	367
MSPR-03	7/28/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSPR-03	11/14/2008	19.5	9.2	3.11	165	0.18	36.3	0.35	0.092	46.2	110	*570
MSPR-09	7/18/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSPR-09	11/14/2008	21.9	10.7	2.20	317	0.57	157	0.49	0.093	41.2	242	**1,010
MSSC-06	8/24/2005	70.4	16.8	6.95	43.0	0.36	70.0	0.14	0.004	67.8	102	455
MSSC-06	8/18/2008	66.2	15.5	7.31	45.0	0.25	68.1	0.17	0.005	61.7	103	480
MSSC-11	9/13/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSC-11	8/19/2008	37.0	26.0	2.41	14.3	0.02	9.9	0.16	0.002	26.1	20.0	242
MSSV-06	8/2/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSV-06	11/13/2008	48.6	20.0	1.48	31.5	0.10	26.1	0.26	0.003	33.6	78.7	345
MSSV-15	8/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSV-15	11/13/2008	43.6	26.3	1.54	45.7	0.12	27.5	0.31	0.007	32.2	108	387
Southeast San Joaquin Valley study unit												
KING-11	10/20/2005	33.9	15.4	2.10	31.4	0.10	32.4	0.14	0.002	36.6	7.55	263
KING-11	11/5/2008	30.5	18.8	2.38	53.5	0.23	68.8	0.13	0.009	31.8	8.88	300

Table 9. Major and minor ions and dissolved solids in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Major ions were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, CDPH maximum contaminant level; SMCL-CA, CDPH secondary maximum contaminant level; MCL-US, USEPA maximum contaminant level; USEPA, U.S. Environmental Protection Agency. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; CDPH, California Department of Public Health; mg/L, milligrams per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; **, concentration greater than upper benchmark level; —, not detected]

GAMA well identification number	Sample dates	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		na	na	na	na	na	SMCL-CA[3]	MCL-CA	na	na	SMCL-CA[3]	SMCL-CA[3]
Benchmark level		na	na	na	na	na	250 (500)	2	na	na	250 (500)	500 (1,000)
[LRL][2]		[0.02, 0.04]	[0.008, 0.02]	[0.02, 0.16]	[0.10, 0.20]	[0.02]	[0.12, 0.20]	[0.08, 0.12]	[0.002]	[0.02, 0.04]	[0.18]	[10]
Southeast San Joaquin Valley study unit—Continued												
KING-13	10/20/2005	28.6	10.7	2.32	24.3	0.06	13.5	0.15	E0.002	47.0	5.30	224
KING-13	11/5/2008	26.8	9.6	2.35	26.6	0.06	13.6	0.16	—	49.5	5.59	214
KING-17	10/26/2005	23.3	12.3	3.51	26.0	0.05	10.9	0.16	E0.001	39.7	4.30	200
KING-17	11/4/2008	22.6	11.3	3.41	26.7	0.06	12.4	0.12	—	36.5	4.26	211
KING-24	11/5/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
KING-24	11/3/2008	43.4	28.5	3.10	23.8	0.13	8.6	0.14	E0.001	50.4	30.2	334
KWH-10	11/17/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
KWH-10	11/5/2008	40.5	19.2	3.80	62.3	0.12	35.1	0.19	0.004	23.9	34.6	393
KWH-12	11/28/2005	17.4	0.5	1.36	27.8	0.04	8.6	E0.10	—	15.0	12.9	144
KWH-12	11/6/2008	20.3	0.6	1.48	27.7	0.05	11.9	0.10	—	15.3	16.6	154
TLR-03	11/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TLR-03	11/4/2008	2.2	0.1	0.47	108	0.22	72.8	1.25	0.197	16.5	0.74	274
TULE-05	12/5/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TULE-05	11/3/2008	15.9	1.7	2.22	144	0.38	107	0.81	0.187	27.2	42.3	438
TULE-10	12/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TULE-10	11/3/2008	64.2	16.7	2.67	41.6	0.10	48.9	E0.09	0.003	25.8	24.4	378

[1] Maximum contaminant level thresholds are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2] Minimum and maximum LRL used during study period, or only LRL used during study period.

[3] The SMCL-CAs for chloride, sulfate, and total dissolved solids have recommended and upper threshold values. The upper value is shown in parentheses.

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Trace elements were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; AL-US, USEPA action level; MCL-CA, CDPH maximum contaminant level; NL-CA, CDPH notification level; SMCL, CDPH secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected; ≤, less than or equal to]

GAMA well identification number	Sample dates	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Benchmark type[3]		MCL-CA	MCL-US	MCL-US	MCL-CA	MCL-US	NL-CA	MCL-US	MCL-CA	na	AL-US	SMCL-CA	AL-US
Benchmark level		1,000	6	10	1,000	4	1,000	5	50	na	1,300	300	15
[LRL or SRL][1]		[1.6][2]	[0.06, 0.2]	[0.06, 0.12]	[0.36][2]	[0.008, 0.06]	[4, 8]	[0.02, 0.04]	[0.42][2]	[0.014, 0.04]	[1.7][2]	[6][2]	[0.65][2]
San Diego Drainages study unit													
SDHDRK-09	7/27/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDHDRK-09	9/11/2007	—	—	1.8	73	—	62	—	≤0.10	E0.04	2.0	12	0.98
SDTEM-04	5/24/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDTEM-04	9/18/2007	≤1.0	E0.03	1.6	56	—	166	E0.03	0.97	E0.03	≤1.6	≤4	≤0.15
SDTEMFP-01	5/19/2004	4.8	—	7.8	63	—	299	—	1.6	0.07	≤0.9	≤6	≤0.11
SDTEMFP-01	9/19/2007	4.3	—	6.1	63	—	289	—	1.9	E0.02	≤0.7	16	—
SDWARN-01	6/17/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDWARN-01	9/11/2007	≤1.0	—	1.2	126	—	90	—	0.63	E0.02	≤1.4	32	≤0.26
North San Francisco Bay study unit													
NSFVOL-14	10/7/2004	≤0.9	—	7.1	6	—	18	—	≤0.40	0.13	3.5	—	2.79
NSFVOL-14	8/21/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVOL-18	10/20/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVOL-18	8/28/2007	≤1.0	—	0.88	112	—	463	—	—	0.05	—	*332	—
NSFVP-29	9/28/2004	—	—	E0.10	172	—	258	—	0.90	0.13	2.3	—	1.02
NSFVP-29	8/27/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-34	10/18/2004	—	—	7.1	35	—	120	—	—	0.07	≤0.4	*999	—
NSFVP-34	8/22/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-36	10/19/2004	—	—	5.7	492	—	136	—	—	0.14	≤0.3	*671	1.07
NSFVP-36	8/20/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-38	10/20/2004	≤1.2	—	*17.2	69	—	*3,830	E0.04	—	0.03	3.3	12	0.73

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Trace elements were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; AL-US, USEPA action level; MCL-CA, CDPH maximum contaminant level; NL-CA, CDPH notification level; SMCL, CDPH secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected; ≤, less than or equal to]

GAMA well identification number	Sample dates	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Benchmark type[3]		MCL-CA	MCL-US	MCL-US	MCL-CA	MCL-US	NL-CA	MCL-US	MCL-CA	na	AL-US	SMCL-CA	AL-US
Benchmark level		1,000	6	10	1,000	4	1,000	5	50	na	1,300	300	15
[LRL or SRL][1]		[1.6][2]	[0.06, 0.2]	[0.06, 0.12]	[0.36][2]	[0.008, 0.06]	[4, 8]	[0.02, 0.04]	[0.42][2]	[0.014, 0.04]	[1.7][2]	[6][2]	[0.65][2]
North San Francisco Bay study unit—Continued													
NSFVP-38	8/22/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-39	10/21/2004	≤0.8	—	6.0	27	—	293	—	—	0.10	≤0.3	44	2.68
NSFVP-39	11/16/2007	24.6	—	5.5	21	0.011	247	—	—	0.06	—	30	≤0.45
NSFVP-41	10/21/2004	—	—	2.6	148	—	52	—	—	0.33	13.1	—	1.77
NSFVP-41	8/20/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFWG-03	9/21/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFWG-03	8/29/2007	2.2	—	1.6	3	—	E7	—	—	0.45	—	*2,420	≤0.23
NSFWGFP-01	10/5/2004	—	—	4.8	4	—	22	—	—	0.14	≤0.4	29	≤0.59
NSFWGFP-01	8/29/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Northern San Joaquin Basin study unit													
COS-08	1/3/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
COS-08	4/3/2008	≤1.3	—	*21.5	136	—	141 [4]	—	≤0.12	E0.01	—	81	—
ESJ-01	1/24/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ESJ-01	4/2/2008	—	—	*17.8	294	—	152 [4]	—	3.0	0.04	≤0.7	—	≤0.46
ESJ-06	1/10/2005	≤1.0	—	4.5	97	—	34	—	4.6	0.07	≤0.4	—	≤0.07
ESJ-06	4/2/2008	—	—	4.3	96	—	32 [4]	—	5.4	E0.02	≤0.7	—	≤0.20
NSJ-QPC-04	1/24/2005	≤0.9	—	2.3	31	—	32	—	1.2	0.03	—	150	≤0.12
NSJ-QPC-04	4/1/2008	—	E0.08	2.2	32	—	30 [4]	—	1.5	E0.02	—	93	≤0.06
TRCY-03	1/6/2005	8.0	—	0.80	25	—	*2,190	—	7.2	0.25	3.0	≤4	0.89
TRCY-03	3/31/2008	≤1.3	—	0.79	25	—	*2,120 [4]	—	6.9	0.03	2.1	≤6	1.19

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Benchmark type[3]		MCL-CA	MCL-US	MCL-US	MCL-CA	MCL-US	NL-CA	MCL-US	MCL-CA	na	AL-US	SMCL-CA	AL-US
Benchmark level		1,000	6	10	1,000	4	1,000	5	50	na	1,300	300	15
[LRL or SRL][1]		[1.6][2]	[0.06, 0.2]	[0.06, 0.12]	[0.36][2]	[0.008, 0.06]	[4, 8]	[0.02, 0.04]	[0.42][2]	[0.014, 0.04]	[1.7][2]	[6][2]	[0.65][2]
Southern Sacramento Valley study unit													
NAM-03	3/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NAM-03	4/10/2008	—	—	2.2	62	—	394 [4]	—	2.9	0.03	≤0.5	E7	≤0.23
SAM-10	4/21/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SAM-10	4/8/2008	—	—	3.1	157	—	14 [4]	—	7.3	0.03	≤1.4	—	≤0.64
SOL-08	5/10/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOL-08	4/8/2008	≤0.90	—	2.6	205	—	76	—	26	—	2.3	—	1.45
SSV-QPC-07	4/4/2005	≤1.3	—	1.6	47	—	*1,490	—	3.5	0.09	2.3	21	≤0.65
SSV-QPC-07	4/10/2008	—	—	1.9	44	—	*1,250 [4]	—	3.2	E0.02	1.8	15	≤0.46
SUI-03	5/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SUI-03	4/9/2008	—	—	*12.8	120	—	314 [4]	—	6.3	0.03	—	9	2.31
YOL-01	4/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
YOL-01	4/7/2008	—	—	1.2	247	—	*1,920 [4]	—	14.9	0.02	≤0.8	—	≤0.22
YOL-14	5/25/2005	≤1.0	—	5.7	731	—	941	—	—	0.16	≤1.4	*413	≤0.09
YOL-14	4/9/2008	≤1.1	—	6.7	492	E0.005	*1,310 [4]	—	—	0.09	—	*579	—
San Fernando–San Gabriel study unit													
ULASF-09	6/27/2005	—	—	0.50	121	—	123	E0.02	E0.50	0.37	4.0	≤4	≤0.43
ULASF-09	6/16/2008	—	E0.11	0.49	89	—	100	—	≤0.41	0.11	13.2	—	7.99
ULASF-10	6/8/2005	≤1.1	—	0.60	69	—	295	E0.03	2.4	0.10	≤1.2	—	≤0.09
ULASF-10	6/16/2008	≤1.0	—	0.76	53	E0.007	408	0.04	18	0.16	1.8	136	≤0.09
ULASG-01	6/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Benchmark type[3]		MCL-CA	MCL-US	MCL-US	MCL-CA	MCL-US	NL-CA	MCL-US	MCL-CA	na	AL-US	SMCL-CA	AL-US
Benchmark level		1,000	6	10	1,000	4	1,000	5	50	na	1,300	300	15
[LRL or SRL][1]		[1.6][2]	[0.06, 0.2]	[0.06, 0.12]	[0.36][2]	[0.008, 0.06]	[4, 8]	[0.02, 0.04]	[0.42][2]	[0.014, 0.04]	[1.7][2]	[6][2]	[0.65][2]
San Fernando–San Gabriel study unit—Continued													
ULASG-01	6/16/2008	—	—	0.72	84	—	80	0.13	2.6	0.10	≤1.0	—	3.38
ULASG-08	6/15/2005	≤1.4	E0.14	0.70	41	—	128	—	5.1	0.13	3.6	—	≤0.55
ULASG-08	6/17/2008	3.0	0.14	0.86	43	—	137	—	6.2	0.05	≤0.6	≤4	1.07
ULASG-15	6/23/2005	≤1.5	0.46	2.5	84	—	78	—	—	0.08	≤1.5	—	≤0.10
ULASG-15	6/17/2008	≤1.3	0.46	2.8	96	—	79	—	≤0.15	0.03	4.7	—	1.16
ULASG-17	7/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ULASG-17	6/17/2008	—	—	0.41	103	—	71	—	1.7	0.12	3.1	—	≤0.48
Monterey Bay and Salinas Valley Basins study unit													
MSMB-03	8/31/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-03	8/20/2008	17.5	—	3.5	2	—	227	—	—	E0.01	—	14 [4]	≤0.06
MSMB-04	8/17/2005	≤1.0	—	—	4	—	88	—	—	0.07	4.4	48	≤0.55
MSMB-04	8/20/2008	≤1.0	—	0.34	5	—	75	—	≤0.40	0.05	—	96	0.84
MSMB-16	8/17/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-16	8/19/2008	—	—	1.5	43	—	86	0.10	4.1	0.04	≤1.4	— [4]	≤0.37
MSMB-28	8/3/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-28	8/21/2008	—	—	0.77	57	—	46	0.04	1.4	0.04	2.5	— [4]	0.74
MSMB-31	8/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-31	8/21/2008	—	E0.07	0.69	74	—	19	E0.03	0.77	0.05	≤1.3	— [4]	≤0.24
MSPR-03	7/28/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSPR-03	11/14/2008	—	0.13	*17.7	38	—	764	0.22	—	0.03	—	49 [4]	≤0.32

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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Benchmark type[3]		MCL-CA	MCL-US	MCL-US	MCL-CA	MCL-US	NL-CA	MCL-US	MCL-CA	na	AL-US	SMCL-CA	AL-US
Benchmark level		1,000	6	10	1,000	4	1,000	5	50	na	1,300	300	15
[LRL or SRL][1]		[1.6][2]	[0.06, 0.2]	[0.06, 0.12]	[0.36][2]	[0.008, 0.06]	[4, 8]	[0.02, 0.04]	[0.42][2]	[0.014, 0.04]	[1.7][2]	[6][2]	[0.65][2]
Monterey Bay and Salinas Valley Basins study unit—Continued													
MSPR-09	7/18/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSPR-09	11/14/2008	—	0.11	5.8	25	E0.010	*2,210	0.16	1.3	E0.02	—	30	≤0.28
MSSC-06	8/24/2005	—	—	0.20	22	—	47	—	—	0.18	≤0.7	*657	≤0.09
MSSC-06	8/18/2008	≤1.3	—	0.11	23	—	41	—	—	0.05	—	*787 [4]	≤0.23
MSSC-11	9/13/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSC-11	8/19/2008	≤1.4	—	3.9	2	—	17	—	—	0.03	—	152 [4]	—
MSSV-06	8/2/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSV-06	11/13/2008	—	0.13	2.1	40	—	134	0.23	0.60	0.03	≤1.0	— [4]	≤0.16
MSSV-15	8/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSV-15	11/13/2008	E2.1	0.16	2.7	15	—	153	0.24	0.70	0.04	≤0.8	9 [4]	≤0.17
Southeast San Joaquin Valley study unit													
KING-11	10/20/2005	—	—	1.8	58	—	27	E0.03	1.3	—	≤0.7	7	≤0.07
KING-11	11/5/2008	—	0.04	2.0	76	—	45 [4]	E0.01	2.2	E0.02	—	— [4]	≤0.18
KING-13	10/20/2005	—	—	2.6	55	—	32	—	2.0	—	3.0	—	0.89
KING-13	11/5/2008	—	0.05	2.9	58	—	35 [4]	—	2.0	E0.02	≤0.6	— [4]	≤0.32
KING-17	10/26/2005	—	—	2.5	46	—	23	0.04	6.6	—	1.9	—	0.91
KING-17	11/4/2008	—	0.07	2.7	49	—	20 [4]	—	6.8	E0.01	—	— [4]	≤0.04
KING-24	11/5/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
KING-24	11/3/2008	—	0.06	1.1	100	—	19 [4]	—	1.7	0.05	1.8	—	≤0.50
KWH-10	11/17/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc

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GAMA well identification number	Sample dates	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Benchmark type[3]		MCL-CA	MCL-US	MCL-US	MCL-CA	MCL-US	NL-CA	MCL-US	MCL-CA	na	AL-US	SMCL-CA	AL-US
Benchmark level		1,000	6	10	1,000	4	1,000	5	50	na	1,300	300	15
[LRL or SRL][1]		[1.6][2]	[0.06, 0.2]	[0.06, 0.12]	[0.36][2]	[0.008, 0.06]	[4, 8]	[0.02, 0.04]	[0.42][2]	[0.014, 0.04]	[1.7][2]	[6][2]	[0.65][2]
Southeast San Joaquin Valley study unit—Continued													
KWH-10	11/5/2008	—	0.05	2.2	130	—	94 [4]	E0.02	2.2	0.04	—	— [4]	≤0.06
KWH-12	11/28/2005	2.3	—	0.66	25	—	19	—	1.8	E0.02	≤1.6	9	1.68
KWH-12	11/6/2008	9.9	0.09	0.62	34	—	17 [4]	—	1.9	E0.02	2.3	9 [4]	≤0.25
TLR-03	11/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TLR-03	11/4/2008	257	0.04	*27.7	14	—	460 [4]	0.03	≤0.06	—	—	8	≤0.04
TULE-05	12/5/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TULE-05	11/3/2008	E3.0	0.17	3.9	29	—	495 [4]	0.04	≤0.28	0.03	—	15 [4]	≤0.04
TULE-10	12/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TULE-10	11/3/2008	—	0.06	1.0	129	—	79 [4]	—	0.60	0.07	—	— [4]	≤0.18

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Trace elements were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; AL-US, USEPA action level; MCL-CA, CDPH maximum contaminant level; NL-CA, CDPH notification level; SMCL, CDPH secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected; ≤, less than or equal to]

GAMA well identification number	Sample dates	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Benchmark type[3]		na	SMCL-CA	HAL-US	MCL-CA	MCL-US	SMCL-CA	HAL-US	MCL-US	na	MCL-US	NL-CA	SMCL-CA
Benchmark level		na	50	40	100	50	100	4,000	2	na	30	50	5,000
[LRL or SRL][1]		[0.6, 1]	[0.2][2]	[0.02, 0.4]	[0.36][2]	[0.04, 0.4]	[0.008, 0.2]	[0.4, 0.8]	[0.04]	[0.11][2]	[0.006, 0.04]	[0.11][2]	[4.8][2]
San Diego Drainages study unit													
SDHDRK-09	7/27/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDHDRK-09	9/11/2007	8.6	0.5	6.4	≤0.36	0.90	—	182	—	nc	9.97	28.2	52.9 [5]
SDTEM-04	5/24/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDTEM-04	9/18/2007	3.0	—	11.0	0.48	1.9	—	361	—	nc	2.35	14.6	≤4.0 [5]
SDTEMFP-01	5/19/2004	4.2	—	2.0	0.55	1.8	—	277	—	13.7	2.55	*69.0	≤0.6
SDTEMFP-01	9/19/2007	5.3	0.3	1.8	≤0.18	1.9	—	279	—	nc	2.84	*69.4	≤0.9 [5]
SDWARN-01	6/17/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SDWARN-01	9/11/2007	6.2	1.6	3.3	≤0.16	1.8	—	484	—	nc	8.81	6.4	≤4.3 [5]
North San Francisco Bay study unit													
NSFVOL-14	10/7/2004	11.2	10.7	1.5	0.76	—	—	38	—	nc	0.128	15.4	8.2
NSFVOL-14	8/21/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVOL-18	10/20/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVOL-18	8/28/2007	48.5	*54.4	1.8	≤0.16	—	—	97.2	—	0.66	—	1.0	≤2.0 [5]
NSFVP-29	9/28/2004	6.5	≤0.1	E0.21	2.5	—	—	352	—	nc	0.088	1.4	49.7
NSFVP-29	8/27/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-34	10/18/2004	4.7	*434	1.9	≤0.26	—	—	30.9	—	nc	—	1.3	20.1
NSFVP-34	8/22/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-36	10/19/2004	33.8	*1,220	1.0	0.65	2	0.26	440	—	nc	0.065	0.40	49.8
NSFVP-36	8/20/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-38	10/20/2004	61.3	14.5	13.7	≤0.25	0.50	—	83.9	—	nc	0.109	1.0	5.9

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Benchmark type[3]		na	SMCL-CA	HAL-US	MCL-CA	MCL-US	SMCL-CA	HAL-US	MCL-US	na	MCL-US	NL-CA	SMCL-CA
Benchmark level		na	50	40	100	50	100	4,000	2	na	30	50	5,000
[LRL or SRL][1]		[0.6, 1]	[0.2][2]	[0.02, 0.4]	[0.36][2]	[0.04, 0.4]	[0.008, 0.2]	[0.4, 0.8]	[0.04]	[0.11][2]	[0.006, 0.04]	[0.11][2]	[4.8][2]
North San Francisco Bay study unit—Continued													
NSFVP-38	8/22/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFVP-39	10/21/2004	68.9	*78.1	1.8	≤0.34	—	—	39.8	0.22	nc	1.00	3.7	9.4
NSFVP-39	11/16/2007	60.8	*70.7	1.6	≤0.34	—	—	45.4	0.23	1.1	0.974	2.5	≤3.1 [5]
NSFVP-41	10/21/2004	33.5	*928	1.6	0.62	—	—	262	—	nc	0.250	3.1	5.8
NSFVP-41	8/20/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFWG-03	9/21/2004	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NSFWG-03	8/29/2007	8.5	*76.0	0.60	8.8	—	—	176	—	—	—	≤0.06	≤3.9 [5]
NSFWGFP-01	10/5/2004	10.6	16.0	0.70	0.43	—	—	188	—	nc	0.143	1.7	≤4.2
NSFWGFP-01	8/29/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Northern San Joaquin Basin study unit													
COS-08	1/3/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
COS-08	4/3/2008	E0.7	*132	2.2	—	0.07	—	104	—	nc	0.157	1.5	≤1.5 [5]
ESJ-01	1/24/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ESJ-01	4/2/2008	3.6	0.3	1.1	0.41	0.66	—	553	—	nc	6.10	17.3	≤2.7 [5]
ESJ-06	1/10/2005	0.8	—	0.87	0.80	0.50	—	340	—	nc	3.81	33.4	≤0.9
ESJ-06	4/2/2008	E0.8	—	0.78	≤0.23	0.34	—	329	—	nc	3.30	32.4	≤1.6 [5]
NSJ-QPC-04	1/24/2005	3.7	*54.8	0.76	≤0.18	—	—	48.4	—	nc	0.075	9.1	≤0.9
NSJ-QPC-04	4/1/2008	3.3	*64.9	0.71	—	0.07	—	54.6	—	nc	0.071	8.1	≤2.4 [5]
TRCY-03	1/6/2005	32.3	≤0.2	1.9	0.77	1.2	—	1,060	—	nc	3.37	2.7	≤2.0
TRCY-03	3/31/2008	33.6	0.3	1.7	≤0.32	1.1	—	1,060	—	nc	2.87	2.6	≤4.6 [5]

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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Benchmark type[3]		na	SMCL-CA	HAL-US	MCL-CA	MCL-US	SMCL-CA	HAL-US	MCL-US	na	MCL-US	NL-CA	SMCL-CA
Benchmark level		na	50	40	100	50	100	4,000	2	na	30	50	5,000
[LRL or SRL][1]		[0.6, 1]	[0.2][2]	[0.02, 0.4]	[0.36][2]	[0.04, 0.4]	[0.008, 0.2]	[0.4, 0.8]	[0.04]	[0.11][2]	[0.006, 0.04]	[0.11][2]	[4.8][2]
Southern Sacramento Valley study unit													
NAM-03	3/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
NAM-03	4/10/2008	24.9	0.5	0.59	0.46	0.21	—	200	—	nc	0.230	16.8	≤2.5 [5]
SAM-10	4/21/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SAM-10	4/8/2008	E0.5	—	0.42	≤0.27	0.20	—	556	—	nc	8.58	16.1	≤3.7 [5]
SOL-08	5/10/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOL-08	4/8/2008	21.9	≤0.1	0.70	≤0.21	0.43	—	575	—	nc	1.53	14.6	≤3.7 [5]
SSV-QPC-07	4/4/2005	45.7	1.6	0.51	8.4	—	—	415	—	nc	0.814	13.6	7.5
SSV-QPC-07	4/10/2008	54.7	1.2	0.48	≤0.27	0.20	—	351	—	nc	0.781	13.6	8.1 [5]
SUI-03	5/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SUI-03	4/9/2008	29.4	—	2.3	≤0.31	0.45	—	665	—	nc	2.68	25.0	12.1 [5]
YOL-01	4/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
YOL-01	4/7/2008	48.0	—	0.52	0.38	2.8	—	766	—	nc	1.15	4.8	≤1.3 [5]
YOL-14	5/25/2005	1.4	*501	3.8	1.1	—	—	1,070	—	nc	—	—	≤4.0
YOL-14	4/9/2008	2.6	*811	2.7	0.50	0.06	—	910	—	nc	0.120	0.54	≤3.5 [5]
San Fernando–San Gabriel study unit													
ULASF-09	6/27/2005	3.4	≤0.1	4.2	5.7	0.80	—	925	—	nc	9.25	4.2	≤3.7
ULASF-09	6/16/2008	2.2	≤0.2	4.2	1.0	0.34	—	767	—	—	6.68	3.9	25 [5]
ULASF-10	6/8/2005	3.5	1.1	13.9	1.7	0.70	—	559	—	nc	3.12	7.5	≤0.4
ULASF-10	6/16/2008	4.4	8.6	17.2	12.4	0.71	—	556	—	≤0.09	1.62	8.9	≤3.1 [5]
ULASG-01	6/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA well identification number	Sample dates	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Benchmark type[3]		na	SMCL-CA	HAL-US	MCL-CA	MCL-US	SMCL-CA	HAL-US	MCL-US	na	MCL-US	NL-CA	SMCL-CA
Benchmark level		na	50	40	100	50	100	4,000	2	na	30	50	5,000
[LRL or SRL][1]		[0.6, 1]	[0.2][2]	[0.02, 0.4]	[0.36][2]	[0.04, 0.4]	[0.008, 0.2]	[0.4, 0.8]	[0.04]	[0.11][2]	[0.006, 0.04]	[0.11][2]	[4.8][2]
San Fernando–San Gabriel study unit—Continued													
ULASG-01	6/16/2008	10.0	0.4	30.3	0.93	3.1	—	643	—	—	15.7	8.5	≤4.7 [5]
ULASG-08	6/15/2005	3.7	0.8	7.2	2.6	0.50	—	474	—	nc	13.0	6.7	≤3.3
ULASG-08	6/17/2008	5.3	0.7	8.0	0.39	0.40	—	479	—	0.12	13.6	7.1	≤2.2 [5]
ULASG-15	6/23/2005	2.4	—	2.2	1.8	E0.3	—	336	—	nc	1.48	1.6	≤2.6
ULASG-15	6/17/2008	2.2	—	2.1	≤0.34	0.20	—	392	—	0.30	1.71	1.3	9.1 [5]
ULASG-17	7/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
ULASG-17	6/17/2008	1.3	0.3	2.4	1.0	2.2	—	819	—	≤0.04	12.5	3.1	≤2.1 [5]
Monterey Bay and Salinas Valley Basins study unit													
MSMB-03	8/31/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-03	8/20/2008	13.7	3.4	11.0	≤0.12	—	—	9.49	—	1.9	—	0.28	—
MSMB-04	8/17/2005	10.9	13.3	2.1	1.2	—	—	276	—	nc	0.738	0.30	≤3.0
MSMB-04	8/20/2008	13.1	26.1	2.0	0.59	0.04	—	348	—	—	0.740	0.98	≤1.0 [5]
MSMB-16	8/17/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-16	8/19/2008	17.5	—	6.5	0.57	0.51	—	353	—	—	1.39	7.4	7.0 [5]
MSMB-28	8/3/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-28	8/21/2008	13.8	—	6.2	1.2	1.2	—	431	—	—	3.55	5.7	13.8 [5]
MSMB-31	8/11/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSMB-31	8/21/2008	7.1	0.4	2.0	0.70	0.40	—	321	—	—	7.54	3.3	7.2 [5]
MSPR-03	7/28/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSPR-03	11/14/2008	58.1	46.3	*71.8	0.42	0.14	—	297	E0.03	0.23	6.22	15.8	≤2.0 [5]

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Trace elements were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; AL-US, USEPA action level; MCL-CA, CDPH maximum contaminant level; NL-CA, CDPH notification level; SMCL, CDPH secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected; ≤, less than or equal to]

GAMA well identification number	Sample dates	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Benchmark type[3]		na	SMCL-CA	HAL-US	MCL-CA	MCL-US	SMCL-CA	HAL-US	MCL-US	na	MCL-US	NL-CA	SMCL-CA
Benchmark level		na	50	40	100	50	100	4,000	2	na	30	50	5,000
[LRL or SRL][1]		[0.6, 1]	[0.2][2]	[0.02, 0.4]	[0.36][2]	[0.04, 0.4]	[0.008, 0.2]	[0.4, 0.8]	[0.04]	[0.11][2]	[0.006, 0.04]	[0.11][2]	[4.8][2]
Monterey Bay and Salinas Valley Basins study unit—Continued													
MSPR-09	7/18/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSPR-09	11/14/2008	60.1	3.5	*48.2	≤0.29	2.1	—	304	—	0.25	5.50	30.3	≤2.2 [5]
MSSC-06	8/24/2005	19.1	*197	2.8	3.4	0.70	—	226	—	nc	E0.026	—	10.0
MSSC-06	8/18/2008	20.1	*192	2.8	0.54	E0.03	—	223	—	≤0.04	—	0.18	≤4.0 [5]
MSSC-11	9/13/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSC-11	8/19/2008	11.2	21.3	0.80	≤0.28	—	—	161	—	≤0.03	—	≤0.02	≤1.2 [5]
MSSV-06	8/2/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSV-06	11/13/2008	11.9	—	5.2	0.83	1.3	—	319	—	—	1.10	4.2	≤2.9 [5]
MSSV-15	8/12/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MSSV-15	11/13/2008	19.3	3.1	10.2	1.1	3.2	—	322	—	—	1.62	5.5	≤4.0 [5]
Southeast San Joaquin Valley study unit													
KING-11	10/20/2005	E0.4	1.5	3.5	—	0.22	—	262	—	≤0.04	0.690	46.6	≤1.4
KING-11	11/5/2008	E0.7	≤0.1	3.7	≤0.32	0.30	—	268	—	nc	0.726	*53.1	≤1.4
KING-13	10/20/2005	1.2	≤0.1	2.0	≤0.03	0.27	—	172	—	≤0.11	0.530	44.4	≤1.7
KING-13	11/5/2008	1.6	≤0.2	2.0	≤0.17	0.35	—	156	—	nc	0.590	48.9	≤2.0
KING-17	10/26/2005	1.4	≤0.1	1.6	—	0.26	—	173	—	0.39	1.56	37.1	≤3.1
KING-17	11/4/2008	1.3	—	1.6	≤0.16	0.31	—	178	—	nc	1.78	38.7	≤1.4
KING-24	11/5/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
KING-24	11/3/2008	E0.6	0.5	0.89	1.1	E0.04	—	267	—	nc	3.65	23.8	6.1
KWH-10	11/17/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc

Table 10. Trace elements in groundwater samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Trace elements were analyzed in samples from 24 trend wells during 2004–05 and 45 trend wells in 2007–08; 17 wells were analyzed during both periods. Information about analytes given in table 3F. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: HAL-US, USEPA lifetime health advisory level; MCL-US, USEPA maximum contaminant level; AL-US, USEPA action level; MCL-CA, CDPH maximum contaminant level; NL-CA, CDPH notification level; SMCL, CDPH secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; CDPH, California Department of Public Health; µg/L, micrograms per liter; LRL, laboratory reporting level; E, estimated or having a higher degree of uncertainty; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected; ≤, less than or equal to]

GAMA well identification number	Sample dates	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Benchmark type[3]		na	SMCL-CA	HAL-US	MCL-CA	MCL-US	SMCL-CA	HAL-US	MCL-US	na	MCL-US	NL-CA	SMCL-CA
Benchmark level		na	50	40	100	50	100	4,000	2	na	30	50	5,000
[LRL or SRL][1]		[0.6, 1]	[0.2][2]	[0.02, 0.4]	[0.36][2]	[0.04, 0.4]	[0.008, 0.2]	[0.4, 0.8]	[0.04]	[0.11][2]	[0.006, 0.04]	[0.11][2]	[4.8][2]
Southeast San Joaquin Valley study unit—Continued													
KWH-10	11/5/2008	6.5	≤0.1	6.5	≤0.19	0.46	—	317	—	nc	3.33	34.8	≤1.1
KWH-12	11/28/2005	0.9	0.4	1.4	≤0.27	0.30	—	275	—	≤0.10	3.53	7.5	≤3.2
KWH-12	11/6/2008	E0.9	0.3	1.2	≤0.26	0.34	—	315	—	nc	4.37	6.8	≤2.0
TLR-03	11/29/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TLR-03	11/4/2008	1.1	6.1	8.9	≤0.26	—	—	35.9	—	nc	0.014	0.46	—
TULE-05	12/5/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TULE-05	11/3/2008	20.8	3.0	12.5	≤0.28	6.1	—	121	—	nc	3.94	15.8	≤2.1
TULE-10	12/7/2005	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
TULE-10	11/3/2008	4.5	0.4	1.1	0.62	0.24	—	483	—	nc	16.8	12.4	≤1.1

[1] Minimum and maximum LRL used during study period, or only LRL used during study period, or SRL. Study reporting levels (SRLs) were defined on the basis of the examination of field blanks collected for GAMA-PBP study units between May 2004 and January 2008 (Olsen and others, 2010).

[2] Values equal to or less than the SRL are reported as less than or equal to the value reported by the laboratory. Values reported with a ≤ symbol in this table have the following field comment included in the USGS NWIS database: Result is < or = reported value, based on QC data (including but not limited to field blanks, source-solution blanks, trip blanks, NWQL set blanks, NWQL blank water certificates, and BQS Blind Blank Program data).

[3] Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[4] The USGS Branch of Quality Systems determined that results for this constituent from the USGS National Water Quality Laboratory had a negative analytical bias greater than 10 percent at the time of this measurement.

[5] The USGS Branch of Quality Systems determined that results for this constituent from the USGS National Water Quality Laboratory had a positive analytical bias greater than 10 percent at the time of this measurement.

Table 11. Arsenic and iron oxidation-reduction species in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Arsenic and iron oxidation-reduction species were analyzed in samples from 21 trend wells during 2004–05 and 14 trend wells in 2007–08; 9 wells were analyzed during both periods. Only wells sampled in at least one period are listed. Information about analytes given in table 3G. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; MDL, method detection level; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Arsenic (total, filtered) (99033)[1] (µg/L)	Arsenic-III (filtered) (99034) (µg/L)	Iron (total, filtered) (01046)[1] (µg/L)	Iron-II (filtered) (01047) (µg/L)
Benchmark type		MCL-US	na	SMCL-CA	na
Benchmark level		10	na	300	na
[MDL]		[0.5]	[1]	[2]	[2]
San Diego Drainages study unit					
SDTEMFP-01	5/19/2004	7.4	—	—	—
SDTEMFP-01	9/19/2007	nc	nc	nc	nc
North San Francisco Bay study unit					
NSFVOL-14	10/7/2004	7.0	—	2	2
NSFVOL-14	8/21/2007	3.7	2.0	38	28
NSFVOL-18	10/20/2004	nc	nc	nc	nc
NSFVOL-18	8/28/2007	0.7	—	280	243
NSFVP-29	9/28/2004	—	—	—	—
NSFVP-29	8/27/2007	—	—	—	—
NSFVP-34	10/18/2004	7.7	6.7	*900	860
NSFVP-34	8/22/2007	6.4	4.9	*1,030	863
NSFVP-38	10/20/2004	*16.2	2.8	9	7
NSFVP-38	8/22/2007	*14.0	10.0	9	9
NSFVP-39	10/21/2004	nc	nc	nc	nc
NSFVP-39	11/16/2007	2.0	1.3	22	17
NSFWG-03	9/21/2004	nc	nc	nc	nc
NSFWG-03	8/29/2007	1.9	—	*2,030	2,000
NSFW-GFP-01	10/5/2004	4.5	—	28	26
NSFW-GFP-01	8/29/2007	3.6	2.0	30	26
Northern San Joaquin Basin study unit					
ESJ-06	1/10/2005	5.7	—	—	—
ESJ-06	4/2/2008	nc	nc	nc	nc
NSJ-QPC-04	1/24/2005	1.9	—	57	34
NSJ-QPC-04	4/1/2008	nc	nc	nc	nc
Benchmark type		MCL-US	na	SMCL-CA	na
Benchmark level		10	na	300	na
[MDL]		[0.5]	[1]	[2]	[2]
Northern San Joaquin Basin study unit—Continued					
TRCY-03	1/6/2005	1.1	—	4	—
TRCY-03	3/31/2008	nc	nc	nc	nc
Southern Sacramento Valley study unit					
SSV-QPC-07	4/4/2005	1.4	—	18	9
SSV-QPC-07	4/10/2008	nc	nc	nc	nc
YOL-14	5/25/2005	5.2	4.9	*384	374
YOL-14	4/9/2008	nc	nc	nc	nc
San Fernando–San Gabriel study unit					
ULASF-09	6/27/2005	—	—	—	—
ULASF-09	6/16/2008	—	—	—	—
ULASF-10	6/8/2005	—	—	—	—
ULASF-10	6/16/2008	—	—	30	—
ULASG-01	6/7/2005	nc	nc	nc	nc
ULASG-01	6/16/2008	—	—	—	—
ULASG-08	6/15/2005	0.9	—	3	—
ULASG-08	6/17/2008	—	—	3	—
ULASG-15	6/23/2005	2.1	—	—	—
ULASG-15	6/17/2008	—	—	—	—
ULASG-17	7/11/2005	nc	nc	nc	nc
ULASG-17	6/17/2008	—	—	—	—
Monterey Bay and Salinas Valley Basins study unit					
MSMB-04	8/17/2005	—	—	45	9
MSMB-04	8/20/2008	nc	nc	nc	nc
MSSC-06	8/24/2005	—	—	*607	588
MSSC-06	8/18/2008	nc	nc	nc	nc

Table 11. Arsenic and iron oxidation-reduction species in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units. —Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Arsenic and iron oxidation-reduction species were analyzed in samples from 21 trend wells during 2004–05 and 14 trend wells in 2007–08; 9 wells were analyzed during both periods. Only wells sampled in at least one period are listed. Information about analytes given in table 3G. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-US, USEPA maximum contaminant level; SMCL-CA, California Department of Public Health secondary maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; USEPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; MDL, method detection level; nc, not collected; na, not available; *, value greater than benchmark level; —, not detected]

GAMA well identification number	Sample dates	Arsenic (total, filtered) (99033)[1] (µg/L)	Arsenic-III (filtered) (99034) (µg/L)	Iron (total, filtered) (01046)[1] (µg/L)	Iron-II (filtered) (01047) (µg/L)
Benchmark type		MCL-US	na	SMCL-CA	na
Benchmark level		10	na	300	na
[MDL]		[0.5]	[1]	[2]	[2]
Southeast San Joaquin Valley study unit					
KING-11	10/20/2005	1.1	—	6	—
KING-11	11/5/2008	nc	nc	nc	nc
KING-13	10/20/2005	1.5	—	—	—
KING-13	11/5/2008	nc	nc	nc	nc
KING-17	10/26/2005	1.5	—	—	—
KING-17	11/4/2008	nc	nc	nc	nc
KWH-12	11/28/2005	—	—	—	—
KWH-12	11/6/2008	nc	nc	nc	nc

[1]The preferred analytical method for this constituent is Laboratory Schedule 1948 (table 10).

Table 12. Isotopic tracers in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level[1] (MRL or ssL_c) are reported as non-detections (—). Stable isotopes of water were measured in 55 trend-well samples during both time periods. Tritium was analyzed in samples from 50 trend wells during 2004–05 and 55 trend wells in 2007–08. Carbon isotopes were analyzed in samples from 17 trend wells during 2004–05 and 29 trend wells in 2007–08; 9 wells were analyzed during both periods. Information about analytes given in table 3I. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; H, hydrogen; O, oxygen; C, carbon; CSU, 1-sigma combined standard uncertainty; pCi/L, picocuries per liter; MRL, minimum reporting level; ssL_c, sample-specific critical level; ±, plus or minus; nc, not collected; na, not available]

GAMA identification number	Sample dates	δ^2H of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)			$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
Benchmark type		na	na	MCL-CA			na	na
Benchmark level		na	na	20,000			na	na
				Result ± CSU	Reporting level	Reporting level type[1]		
San Diego Drainages study unit								
SDALLV-07	7/14/2004	–37.1	–5.77	13.8 ± 1	1	MRL	nc	nc
SDALLV-07	9/12/2007	–36.1	–5.90	10.2 ± 1	1	MRL	nc	nc
SDALLV-11	7/15/2004	–46.9	-6.54	22.1 ± 1.3	1	MRL	nc	nc
SDALLV-11	9/13/2007	–47.6	–6.94	14.1 ± 1.3	1	MRL	nc	nc
SDHDRK-01	7/12/2004	–39.5	–5.70	8.3 ± 1	1	MRL	nc	nc
SDHDRK-01	9/13/2007	–39.1	–5.78	6.7 ± 1	1	MRL	nc	nc
SDHDRK-09	7/27/2004	–43.3	–6.93	7.1 ± 1	1	MRL	nc	nc
SDHDRK-09	9/11/2007	–42.2	–6.68	7.7 ± 1	1	MRL	nc	nc
SDTEM-04	5/24/2004	–46.0	–5.90	10.6 ± 1	1	MRL	nc	nc
SDTEM-04	9/18/2007	–66.6	–8.43	12.4 ± 1.3	1	MRL	–10.92	100
SDTEMFP-01	5/19/2004	–48.1	–7.02	—	1	MRL	–16.50	74
SDTEMFP-01	9/19/2007	–47.4	–7.05	—	1	MRL	–14.69	77
SDWARN-01	6/17/2004	–51.4	–7.57	—	1	MRL	nc	nc
SDWARN-01	9/11/2007	–50.4	–7.44	—	1	MRL	nc	nc
North San Francisco Bay study unit								
NSFVOL-14	10/7/2004	–39.9	–6.12	4.2 ± 0.6	1	MRL	–17.60	93
NSFVOL-14	8/21/2007	–38.4	–5.66	6.1 ± 1	1	MRL	–16.32	104
NSFVOL-18	10/20/2004	–48.2	–7.24	—	1	MRL	nc	nc
NSFVOL-18	8/28/2007	–48.6	–7.22	—	0.6	MRL	–13.03	26
NSFVP-29	9/28/2004	–43.7	–6.98	7.4 ± 1	1	MRL	–17.85	105
NSFVP-29	8/27/2007	–44.7	–6.91	5.8 ± 1	1	MRL	–17.34	104
NSFVP-34	10/18/2004	–46.5	–7.12	—	1	MRL	–17.58	20
NSFVP-34	8/22/2007	–46.1	–7.07	—	1	ssL_C	–16.79	19
NSFVP-36	10/19/2004	–52.9	–7.72	—	1	MRL	nc	nc
NSFVP-36	8/20/2007	–52.7	–7.72	—	1	MRL	–20.23	10
NSFVP-38	10/20/2004	–50.4	–7.75	—	1	MRL	–14.62	0.56

Table 12. Isotopic tracers in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level[1] (MRL or ssL_c) are reported as non-detections (—). Stable isotopes of water were measured in 55 trend-well samples during both time periods. Tritium was analyzed in samples from 50 trend wells during 2004–05 and 55 trend wells in 2007–08. Carbon isotopes were analyzed in samples from 17 trend wells during 2004–05 and 29 trend wells in 2007–08; 9 wells were analyzed during both periods. Information about analytes given in table 3I. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; H, hydrogen; O, oxygen; C, carbon; CSU, 1-sigma combined standard uncertainty; pCi/L, picocuries per liter; MRL, minimum reporting level; ssL_c, sample-specific critical level; ±, plus or minus; nc, not collected; na, not available]

GAMA identification number	Sample dates	δ^2H of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)			$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
Benchmark type		na	na		MCL-CA		na	na
Benchmark level		na	na		20,000		na	na
				Result ± CSU	Reporting level	Reporting level type[1]		
North San Francisco Bay study unit—Continued								
NSFVP-38	8/22/2007	–49.7	–7.69	—	0.6	MRL	–13.75	0.26
NSFVP-39	10/21/2004	–46.8	–7.11	1.9 ± 1	1	MRL	nc	nc
NSFVP-39	11/16/2007	–48.2	–7.01	1.9 ± 0.8	0.8	MRL	–17.96	56
NSFVP-41	10/21/2004	–40.3	–5.99	7.0 ± 1	1	MRL	nc	nc
NSFVP-41	8/20/2007	–39.7	–6.03	3.5 ± 0.6	1	MRL	–20.95	89
NSFWG-03	9/21/2004	–36.8	–6.17	—	1	MRL	nc	nc
NSFWG-03	8/29/2007	–37.2	–6.06	—	0.6	MRL	–20.08	87
NSFWGFP-01	10/5/2004	–37.7	–6.14	2.2 ± 0.6	1	MRL	–15.48	45
NSFWGFP-01	8/29/2007	–37.6	–6.10	1.6 ± 0.6	0.6	MRL	–15.36	41
Northern San Joaquin Basin study unit								
COS-08	1/3/2005	–53.7	–7.33	—	1	MRL	nc	nc
COS-08	4/3/2008	–53.7	–7.27	na[2]	na[2]	na[2]	–15.72	31
ESJ-01	1/24/2005	–67.6	–9.31	20.5 ± 1.3	1	MRL	nc	nc
ESJ-01	4/2/2008	–63.2	–8.42	na[2]	na[2]	na[2]	–15.67	75
ESJ-06	1/10/2005	–63.5	–8.86	7.4 ± 1	1	MRL	nc	nc
ESJ-06	4/2/2008	–65.8	–8.94	4.5 ± 0.35	0.32	ssL_C	–15.20	80
NSJ-QPC-04	1/24/2005	–55.4	–7.12	5.4 ± 0.6	1	MRL	nc	nc
NSJ-QPC-04	4/1/2008	–50.9	–7.13	2.1 ± 0.32	0.32	ssL_C	–17.00	81
TRCY-03	1/6/2005	–55.9	–7.50	—	1	MRL	–12.76	69
TRCY-03	3/31/2008	–57.3	–7.54	1.6 + 0.35	0.35	ssL_C	–12.30	69
Southern Sacramento Valley study unit								
NAM-03	3/29/2005	–53.0	–7.32	—	1	MRL	nc	nc
NAM-03	4/10/2008	–50.8	–7.40	0.6 + 0.35	0.35	ssL_C	–17.14	68
SAM-10	4/21/2005	–50.1	–6.94	4.5 ± 1	1	MRL	nc	nc
SAM-10	4/8/2008	–50.4	–7.08	4.4 + 0.32	0.32	ssL_C	–18.07	99
SOL-08	5/10/2005	–48.4	–7.19	—	1	MRL	nc	nc

Table 12. Isotopic tracers in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level[1] (MRL or ssL_c) are reported as non-detections (—). Stable isotopes of water were measured in 55 trend-well samples during both time periods. Tritium was analyzed in samples from 50 trend wells during 2004–05 and 55 trend wells in 2007–08. Carbon isotopes were analyzed in samples from 17 trend wells during 2004–05 and 29 trend wells in 2007–08; 9 wells were analyzed during both periods. Information about analytes given in table 3I. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Benchmark type**: MCL-CA, California Department of Public Health maximum contaminant level. Benchmark type and benchmark level as of April 1, 2010. **Other abbreviations**: USGS, U.S. Geological Survey; H, hydrogen; O, oxygen; C, carbon; CSU, 1-sigma combined standard uncertainty; pCi/L, picocuries per liter; MRL, minimum reporting level; ssL_c, sample-specific critical level; ±, plus or minus; nc, not collected; na, not available]

GAMA identification number	Sample dates	δ^2H of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)			$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
Benchmark type		na	na		MCL-CA		na	na
Benchmark level		na	na		20,000		na	na
				Result ± CSU	Reporting level	Reporting level type[1]		
Southern Sacramento Valley study unit—Continued								
SOL-08	4/8/2008	–50.6	–7.08	—	0.32	ssL_C	–14.65	48
SSV-QPC-07	4/4/2005	–52.7	–7.40	1.3 ± 1	1	MRL	–17.00	77
SSV-QPC-07	4/10/2008	–55.5	–7.46	1.7 ± 0.38	0.35	ssL_C	nc	nc
SUI-03	5/12/2005	–45.2	–6.46	—	1	MRL	nc	nc
SUI-03	4/9/2008		–6.40	0.6 ± 0.35	0.35	ssL_C	–13.15	62
YOL-01	4/11/2005	–41.4	–5.29	7.7 ± 1	1	MRL	nc	nc
YOL-01	4/7/2008	–41.9	–5.34	6.0 ± 0.35	0.32	ssL_C	–13.32	86
YOL-14	5/25/2005	–66.4	–9.08	—	1	MRL	–2.13	7.4
YOL-14	4/9/2008	–63.9	–8.40	2.2 ± 0.32	0.32	ssL_C	nc	nc
San Fernando–San Gabriel study unit								
ULASF-09	6/27/2005	–54.5	–7.61	20.5 ± 1.6	1	MRL	–16.00	100
ULASF-09	6/16/2008	–53.8	–7.79	16.9 ± 0.67	0.38	ssL_C	nc	nc
ULASF-10	6/8/2005	–51.6	–7.66	3.8 ± 0.6	1	MRL	–14.90	79
ULASF-10	6/16/2008	–47.2	–7.25	0.6 ± 0.45	0.45	ssL_C	nc	nc
ULASG-01	6/7/2005	–45.4	–6.45	8.0 ± 0.6	1	MRL	nc	nc
ULASG-01	6/16/2008	–44.7	–6.57	8.9 ± 0.48	0.35	ssL_C	nc	nc
ULASG-08	6/15/2005	–47.6	–7.20	6.1 ± 0.6	1	MRL	–14.90	93
ULASG-08	6/17/2008	–48.5	–7.31	4.5 ± 0.32	0.32	ssL_C	nc	nc
ULASG-15	6/23/2005	–60.5	–9.22	14.7 ± 1.3	1	MRL	–11.40	96
ULASG-15	6/17/2008	–55.3	–7.93	17.6 ± 0.64	0.32	ssL_C	nc	nc
ULASG-17	7/11/2005	–50.8	–7.68	9.0 ± 1	1	MRL	nc	nc
ULASG-17	6/17/2008	–51.1	–7.67	7.6 ± 0.38	0.32	ssL_C	nc	nc
Monterey Bay and Salinas Valley Basins study unit								
MSMB-03	8/31/2005	–50.7	–7.38	—	1	MRL	nc	nc
MSMB-03	8/20/2008	–50.7	–7.42	—	0.32	ssL_C	–15.68	5.4
MSMB-04	8/17/2005	–45.9	–7.32	2.2 ± 1	1	MRL	–15.50	5.7

Table 12. Isotopic tracers in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA identification number	Sample dates	δ^2H of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)			$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
Benchmark type		na	na		MCL-CA		na	na
Benchmark level		na	na		20,000		na	na
				Result ± CSU	Reporting level	Reporting level type[1]		
Monterey Bay and Salinas Valley Basins study unit—Continued								
MSMB-04	8/20/2008	–47.8	–7.28	—	0.32	ssL_C	–13.97	83
MSMB-16	8/17/2005	–45.6	–6.72	1.0 ± 0.6	1	MRL	nc	nc
MSMB-16	8/19/2008	–45.3	–6.71	5.1 ± 0.35	0.32	ssL_C	–16.85	60
MSMB-28	8/3/2005	–46.5	–6.66	1.6 ± 0.6	1	MRL	nc	nc
MSMB-28	8/21/2008	–44.8	–6.58	2.0 ± 0.32	0.32	ssL_C	–14.44	99
MSMB-31	8/11/2005	–41.7	–6.30	6.7 ± 1	1	MRL	nc	nc
MSMB-31	8/21/2008	–42.1	–6.26	1.6 ± 0.38	0.38	ssL_C	–12.20	65
MSPR-03	7/28/2005	–58.4	–8.30	—	1	MRL	nc	nc
MSPR-03	11/14/2008	–58.2	–8.18	—	0.32	ssL_C	nc	nc
MSPR-09	7/18/2005	–55.2	–7.93	—	1	MRL	nc	nc
MSPR-09	11/14/2008	–56.0	–7.81	—	0.32	ssL_C	nc	nc
MSSC-06	8/24/2005	–32.9	–5.45	4.5 ± 1	1	MRL	–20.40	72
MSSC-06	8/18/2008	–32.4	–5.37	3.6 ± 0.32	0.32	ssL_C	–20.62	74
MSSC-11	9/13/2005	–38.1	–6.28	—	1	MRL	nc	nc
MSSC-11	8/19/2008	–38.3	–6.32	—	0.32	ssL_C	–9.08	1.6
MSSV-06	8/2/2005	–34.9	–4.87	6.7 ± 1	1	MRL	nc	nc
MSSV-06	11/13/2008	–32.7	–4.46	5.6 ± 0.35	0.32	ssL_C	nc	nc
MSSV-15	8/12/2005	–27.0	–3.58	7 ± 1	1	MRL	nc	nc
MSSV-15	11/13/2008	–30.2	–4.24	5.1 ± 0.41	0.35	ssL_C	nc	nc
Southeast San Joaquin Valley study unit								
KING-11	10/20/2005	–61.3	–8.14	—	1	MRL	nc	nc
KING-11	11/5/2008	–62.7	–8.28	—	0.48	ssL_C	nc	nc
KING-13	10/20/2005	–61.7	–8.10	—	1	MRL	nc	nc
KING-13	11/5/2008	–62.5	–8.42	1.1 ± 0.35	0.35	ssL_C	nc	nc
KING-17	10/26/2005	–61.2	–7.71	—	1	MRL	–14.10	67
KING-17	11/4/2008	–61.4	–7.80	—	0.45	ssL_C	nc	nc

Table 12. Isotopic tracers in samples collected from trend wells for seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

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GAMA identification number	Sample dates	$\delta^{2}H$ of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)			$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
Benchmark type		na	na	MCL-CA			na	na
Benchmark level		na	na	20,000			na	na
				Result ± CSU	Reporting level	Reporting level type[1]		
Southeast San Joaquin Valley study unit—Continued								
KING-24	11/5/2005	–85.2	–11.50	nc	nc	nc	nc	nc
KING-24	11/3/2008	–86.5	–11.68	17.3 ± 0.70	0.35	ssL_C	nc	nc
KWH-10	11/17/2005	–64.0	–7.84	nc	nc	nc	nc	nc
KWH-10	11/5/2008	–64.8	–8.01	10.0 ± 0.51	0.35	ssL_C	nc	nc
KWH-12	11/28/2005	–87.2	–12.21	16 ± 1.6	1	MRL	–15.30	86
KWH-12	11/6/2008	–86.1	–12.12	12.5 ± 0.61	0.38	ssL_C	nc	nc
TLR-03	11/29/2005	–80.5	–11.06	nc	nc	nc	nc	nc
TLR-03	11/4/2008	–81.2	–11.01	0.4 ± 0.38	0.38	ssL_C	nc	nc
TULE-05	12/5/2005	–68.4	–8.66	nc	nc	nc	nc	nc
TULE-05	11/3/2008	–64.3	–7.90	0.9 ± 0.32	0.32	ssL_C	nc	nc
TULE-10	12/7/2005	–72.9	–10.30	nc	nc	nc	nc	nc
TULE-10	11/3/2008	–71.4	–10.10	4.5 ± 0.32	0.32	ssL_C	nc	nc

[1] Tritium reporting levels were expressed as MRL before August 2008 and as ssL_c after August 2008 (both reporting level types were used during August 2008).

[2] Result was rejected after quality-assurance review.

Appendix

This appendix includes discussions of the methods used to collect and analyze groundwater samples and report the resulting water-quality data. Methods used during initial sampling are described in published GAMA Data Series Reports for each study unit (Wright and others, 2005; Kulongoski and others, 2006; Bennett and others, 2006; Dawson and others, 2008; Land and Belitz, 2008; Kulongoski and Belitz, 2007; and Burton and Belitz, 2008). In each case, the methods were selected to obtain representative samples of the groundwater from each well and to minimize the potential for contamination of the samples or bias in the data. Procedures used to collect and assess QC data and the results of the QC assessments for the resampled trend wells also are discussed.

Groundwater samples were collected and QA procedures were implemented using standard and modified USGS protocols from the NFM (U.S. Geological Survey, variously dated; Wilde and others, 1999, 2004) and the NAWQA Program (Koterba and others, 1995). The QA plan followed by the NWQL, the primary laboratory used to analyze samples for this study, is described in Maloney (2005) and Pirkey and Glodt (1998).

Sample Collection and Analysis

Prior to sampling, wells were pumped continuously until field measurements of water temperature, dissolved oxygen, pH, and specific conductance were stable (Wilde and others, 1999). Wells were sampled using Teflon® tubing with brass and stainless-steel fittings attached to a sampling point (usually a hose-bib fitting) on the well-discharge pipe as close to the well head as possible. The sampling point was located upstream from water-storage tanks and from the well-head treatment system (if a system existed). If a chlorinating system was attached to the well, the chlorinator was shut off, when possible, before the well was purged and sampled in order to clear all chlorine out of the system. The absence of free chlorine was verified using a Hach® field test kit. All samples were collected outdoors by connecting a 1- to 3-foot length of Teflon® tubing to the sampling point (Lane and others, 2003). All fittings and lengths of tubing were cleaned between samples (Wilde, 2004).

For the field measurements, groundwater was pumped through a flow-through chamber (that was attached to the sampling point) fitted with a multi-probe meter that simultaneously measured the field water-quality indicators—dissolved oxygen, temperature, pH, and specific conductance. Field measurements were made in accordance with protocols in the NFM (Radtke and others, 2005; Wilde and Radtke, 2005; Lewis, 2006; Wilde, 2006; Wilde and others, 2006). All sensors on the multi-probe meter were calibrated daily. Measured dissolved oxygen, temperature, pH, and specific conductance values were recorded at approximately 5-minute (min) intervals, and when these values remained stable for a minimum of 30 min, samples for laboratory analyses then were collected.

Field measurements and instrument calibrations were recorded by hand on field record sheets and electronically in the Personal Computer Field Form (PCFF) program. Analytical service requests for the NWQL also were managed by PCFF, whereas analytical service requests for other laboratories were entered into laboratory-specific spreadsheets. Information from PCFF was uploaded directly into NWIS at the end of every week of sample collection.

Detailed sampling protocols for individual analyses and groups of analytes are described in Koterba and others (1995), in the NFM (Wilde and others, 1999, 2004), and in the references for analytical methods listed in table A1; only brief descriptions are given here. VOC samples were collected in three 40-millilter (mL) sample vials that were purged with three vial volumes of unfiltered groundwater before bottom-filling to eliminate atmospheric contamination. One to one (1:1) hydrochloric acid to water (HCl/H_2O) solution was added as a preservative to the VOC samples. Perchlorate samples were collected in 125-mL polystyrene bottles and then filtered in two or three 20-mL aliquots of groundwater through a 0.20-micrometer (µm) pore-size Corning® syringe-tip disk filter into sterilized 125-mL bottles. Tritium samples were collected by bottom-filling one 1-L polyethylene bottle with unfiltered groundwater, after first overfilling the bottles with three volumes of unfiltered groundwater. Samples for analysis of stable isotopes of hydrogen and oxygen in water were each collected in a 60-mL clear glass bottle filled with unfiltered groundwater, sealed with a conical cap, and secured with electrical tape to prevent leakage and evaporation.

Samples for analysis of pesticides (including polar pesticides) and pesticide degradates were collected in 1-L baked amber glass bottles. These samples were each filtered through a 0.7-µm nominal pore-size glass fiber filter during collection. NDMA samples were collected in 500-mL baked amber bottles treated with 0.05 gram (g) of sodium thiosulfate ($Na_2S_2O_3$) as a preservative and were filtered at Weck prior to analysis.

Groundwater samples for trace elements, major and minor ions, silica, laboratory alkalinity, and TDS analyses required filling one 250-mL polyethylene bottle with unfiltered groundwater and one 500-mL and one 250-mL polyethylene bottle with filtered groundwater (Wilde and others, 2004). Filtration was done using a 0.45-µm pore-size PALL® unvented capsule filter that was pre-rinsed with 2 L of deionized water, then rinsed with 1 L of groundwater prior to sampling. The 250-mL filtered sample to be analyzed for trace elements was preserved with 7.5-Normal (N) nitric acid. Nutrient samples were collected by filtering groundwater into 125-mL brown polyethylene bottles. Arsenic and iron

species samples were filtered into 250-mL polyethylene bottles that were covered with tape to prevent light exposure and preserved with 6-N hydrochloric acid. Stable isotopes of carbon in dissolved inorganic carbon and carbon-14 abundance samples were filtered and bottom-filled into 500-mL glass bottles that first were overfilled with three bottle volumes of filtered groundwater. These samples had no headspace and were sealed with conical caps to avoid atmospheric contamination. Bicarbonate and carbonate concentrations were calculated from the laboratory alkalinity and pH values using the advanced speciation method (http://or.water.usgs.gov/alk/methods.html) with $pK_1 = 6.35$, $pK_2 = 10.33$, and $pK_W = 14$.

Temperature-sensitive samples were stored on ice prior to and during shipping to the various laboratories. The non-temperature-sensitive samples for tritium and stable isotopes of hydrogen and oxygen in water were shipped monthly. Temperature-sensitive or time-sensitive samples for VOCs, pesticides (including polar pesticides) and pesticide degradates, perchlorate, NDMA, trace elements, nutrients, major and minor ions, silica, TDS, and laboratory alkalinity were shipped daily whenever possible. Samples to be analyzed for arsenic and iron species were shipped weekly. The temperature-sensitive samples for stable isotopes of carbon in dissolved inorganic carbon and carbon-14 abundance were stored on ice, archived in a laboratory refrigerator, and shipped after all of the laboratory alkalinity measurements were received.

Seven laboratories performed chemical analyses on samples collected during resampling for trends (table A1), although most of the analyses were performed at the NWQL. The NWQL maintains a rigorous QA program (Pirkey and Glodt, 1998; Maloney, 2005). Laboratory QC samples, including method blanks, continuing calibration verification standards, standard reference samples, reagent spikes of target analytes and surrogates, external certified reference materials, and external blind proficiency samples are analyzed regularly. Method detection limits are tested continuously and laboratory reporting levels updated accordingly. NWQL maintains National Environmental Laboratory Accreditation Program (NELAP) and other certifications (http://www.nelac-institute.org/accred-labs.php). The USGS Branch of Quality Systems (BQS) maintains independent oversight of QA at the NWQL. The BQS also runs the National Field Quality Assurance Program (NFQA) that includes annual testing of all USGS field personnel for proficiency in making field water-quality measurements (http://qadata.cr.usgs.gov/nfqa/). Results for analyses made at the NWQL or by laboratories contracted by the NWQL are uploaded directly into the USGS NWIS database. Results of analyses made at other laboratories are compiled in a project database and uploaded from there into the USGS NWIS database.

Data Reporting

The following section gives details for the laboratory reporting conventions and the constituents sampled for trends that are determined by multiple methods or by multiple laboratories.

Reporting Limits

The USGS NWQL uses different conventions for reporting results for organic and inorganic constituents. For organic constituents, LRLs and LT-MDLs are used as thresholds for reporting analytical results. The LRL is set to minimize the reporting of false negatives (not detecting a compound when it actually is present in a sample) to less than 1 percent (Childress and others, 1999). The LRL usually is set at two times the LT-MDL. The LT-MDL is derived from the standard deviation of at least 24 method detection limit (MDL) determinations made over an extended period of time. The MDL is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the concentration is greater than zero (at the MDL, there is less than a 1 percent chance of a false positive) (Childress and others, 1999; U.S. Environmental Protection Agency, 2002). Inorganic detections at concentrations less than the LT-MDL are reported as non-detections with a dash (–) in the data tables. The USGS NWQL updates LRL and LT-MDL values regularly, and the values or ranges of values listed in this report were in effect during the initial sampling period (May 2004 to February 2006) and the resampling period (September 2007 to November 2008) for trend wells from the first seven GAMA-PBP study units.

For organic constituents, concentrations between the LRL and the LT-MDL are reported as having a higher degree of uncertainty (coded by the letter "E" preceding the values in the tables and text). For information-rich methods, detections less than the LT-MDL have a high certainty of presence, but the precise concentration is uncertain. Detections of organic compounds at concentrations less than the LT-MDL are reported in the data tables, but are qualified with E-code remarks and footnotes, and are not considered detections in the calculations of detection statistics. Information-rich methods are those that use gas chromatography or high-performance liquid chromatography (HPLC) with mass spectrometry detection, such as those methods used to analyze VOCs and pesticides. Compounds are identified by presence of characteristic fragmentation patterns in their mass spectra in addition to being quantified by measurement of peak areas at their associated chromatographic retention times. E-coded values also may result from detections outside the range of calibration standards, from detections that did not meet all laboratory QC criteria, and from samples that were diluted prior to analysis (Childress and others, 1999).

Total dissolved solids, perchlorate, and NDMA are reported by using minimum reporting levels (MRLs). The MRL is the smallest measurable concentration of a constituent that may be reliably reported using a given analytical method (Timme, 1995).

The reporting limits for radiochemical constituents (carbon-14 and tritium) are based on sample-specific critical levels (ssL_C) (McCurdy and others, 2008). The critical level is analogous to the LT-MDL used for reporting analytical results for organic and non-radioactive inorganic constituents. Here, the critical level is defined as the minimum measured activity that indicates a positive detection of the radionuclide in the sample with less than a 5 percent probability of a false positive detection. Sample-specific critical levels are used for radiochemical measurements because the critical level is sensitive to sample size and sample yield during analytical processing and is dependent on instrument background, on counting times for the sample and background, and on the characteristics of the instrument being used and the nuclide being measured. An ssL_C is calculated for each sample, and the measured activity in the sample is compared to the ssL_C associated with that sample. Measured activities less than the ssL_C are reported as non-detections with a dash (–) in the data tables.

The analytical uncertainties associated with measurement of activities also are sensitive to sample-specific parameters, including sample size, sample yield during analytical processing, and time elapsed between sample collection and various steps in the analytical procedure, as well as parameters associated with the instrumentation. Therefore, tritium activities are reported as plus or minus (±) sample-specific combined standard uncertainties (CSU) (table 12). The CSU is reported at the 68 percent confidence level (1-sigma). Tritium reporting levels were expressed as MRLs before August 2007, and as ssL_Cs after August 2007. Both reporting level types were used during August 2007.

Results for some organic and inorganic constituents are presented using SRLs derived from assessment of data from QC samples associated with groundwater samples collected as part of the GAMA-PBP (Olsen and others, 2010; Fram and others, 2012). SRLs are equal to or greater than the reporting levels used by the laboratory. Detections reported by the laboratory with concentrations less than SRLs may have significant contamination bias. Such detections are expressed in the results tables as equal to or less than (≤) the reported concentration.

Notation

Stable isotopic compositions of hydrogen, oxygen, and carbon are reported as relative isotope ratios in units of per mil using the standard delta notation (Coplen and others, 2002):

$$\delta^{i}E = \left[\frac{R_{sample}}{R_{reference}} - 1\right] \times 1{,}000 \text{ per mil} \qquad \text{(A1)}$$

where i is the atomic mass of the heavier isotope of the element,

E is the element (H for hydrogen, O for oxygen, C for carbon),

R_{sample} is the ratio of the abundance of the heavier isotope of the element (^2H, ^{18}O, ^{13}C) to the lighter isotope of the element (^1H, ^{16}O, ^{12}C) in the sample, and

$R_{reference}$ is the ratio of the abundance of the heavier isotope of the element to the lighter isotope of the element in the reference material.

The reference material for oxygen and hydrogen is Vienna Standard Mean Ocean Water (VSMOW), which is assigned $\delta^{18}O$ and $\delta^{2}H$ values of 0 per mil (note that $\delta^{2}H$ is sometimes written as δD because the common name of the heavier isotope of hydrogen, hydrogen-2, is deuterium) (Coplen and others, 2002). The reference material for carbon is Vienna Pee Dee Belemnite (VPDB), which is assigned a $\delta^{13}C$ value of 0 per mil (Coplen and others, 2002). Positive values indicate enrichment of the heavier isotope, and negative values indicate depletion of the heavier isotope, compared to the ratios observed in the standard reference material.

Constituents on Multiple Analytical Schedules

Fourteen constituents targeted in this study were measured by more than one analytical method or by more than one laboratory (table A2). Preferred analytical methods are indicated in the constituent tables (tables 3A, 3B, 3D, 3E, 3G, 3H) and the results tables (tables 4, 5, 6, 7, 10, 11). The preferred methods were generally selected on the basis of better performance or sensitivity for the constituent but, in all cases, results are given for both methods in the results tables. Six pesticide compounds—atrazine, deethylatrazine, carbaryl, carbofuran, metalaxyl, and tebuthiuron—as well as two VOCs—DBCP and EDB—were analyzed by two different NWQL analytical methods (table A2). An additional VOC—1,2,3-TCP—was analyzed by the NWQL, as well as by an outside laboratory (MWH during initial sampling, and Weck during resampling).

Similarly, total dissolved arsenic and iron concentrations were measured by the NWQL, as well as by the USGS NRP-TML as part of the determination of the oxidation-reduction species of these metals. The process, using iron as an example, is as follows:

$$\frac{Fe(III)}{Fe(II)} = \frac{Fe(T) - Fe(II)}{Fe(II)} \quad \text{(A2)}$$

where *Fe(T)* is the total iron concentration (measured);
Fe(II) is the concentration of ferrous iron (measured); and
Fe(III) is the concentration of ferric iron (calculated). For arsenic, the measured oxidation-reduction species is arsenite [As(III)], and the calculated species is arsenate [As(V)].

The field water-quality indicators—pH and specific conductance—were measured in the field and at the NWQL during the resampling period and for some samples collected from trend wells during initial sampling. During initial sampling, field measurements of alkalinity were often performed on samples for which alkalinity was also measured by the NWQL. The field measurements are the preferred method for these three water-quality indicators. However, field and laboratory measurements are reported in table 4. Field values are preferred because field conditions are considered more representative of groundwater conditions (Hem, 1985).

Additionally, perchlorate was measured by two laboratories (MWH and Weck) for nine samples collected from trend wells in the San Diego Drainages and North San Francisco Bay study units (table 7). Prior to August 2007, perchlorate analysis for GAMA-PBP was performed on unfiltered samples by MWH. After December 2007, perchlorate analysis was performed on filtered samples by Weck. From August to December 2007, perchlorate analyses were performed by both laboratories on selected samples in an effort to determine the comparability of results from the two laboratories.

Quality-Control Methods and Results

The purpose of QC samples is to identify which data best represent environmental conditions and which may have been affected by contamination or bias during sample collection, processing, storage, transportation, and (or) laboratory analysis. Four types of QC measurements were evaluated in this study: (1) blank samples were collected to assess positive bias as a result of contamination during sample handling or analysis, (2) replicate samples were collected to assess variability, (3) matrix-spike tests were done for organic constituents to assess positive or negative bias, and (4) surrogate compounds were added to samples analyzed for organic constituents to assess potential matrix effects from the chemical composition of each groundwater sample, as well as to assess potential bias of laboratory analytical methods.

Blank Samples

The primary purposes of collecting blanks are to evaluate the magnitude of potential contamination of samples with compounds of interest during sample handling or analysis and to identify and mitigate the sources of sample contamination.

Blank Collection and Analysis

Blanks were collected using blank water certified by the NWQL to contain less than the reporting levels for selected constituents investigated in the study (National Water Quality Laboratory, written commun., 2012). Nitrogen-purged, organic-free blank water was used for blanks of organic constituents, and inorganic-free blank water was used for blanks of inorganic constituents. Two types of blanks (field and source-solution) were collected during resampling in 2007–2008 (table A3).

Field blanks were collected to assess potential contamination of samples during collection, processing, transport, and analysis. To collect field blanks at the sampling sites, blank water was either pumped or poured through the sampling equipment (fittings and tubing) used to collect groundwater samples, then processed and transported using the same protocols used for the groundwater samples. Field blanks were analyzed for VOCs (11 field blanks), pesticides and pesticide degradates (10), perchlorate (9), 1,2,3-TCP (7), NDMA (2), trace elements (11), nutrients (11), major and minor ions (11), silica (11), TDS (11), total arsenic and iron (1), and arsenic and iron species (1).

Source-solution blanks are collected at the beginning of a study, or when using a new lot of blank water, to assess potential contamination of samples during transport and analysis and potential contamination of the certified blank water obtained from the NWQL. Source-solution blanks were collected in the field inside the mobile laboratory by pouring blank water directly into sample containers. These samples were then preserved, stored, shipped, and analyzed in the same manner as the groundwater samples. Source-solution blanks were analyzed for VOCs (4 source solution blanks), perchlorate (5), 1,2,3-TCP (2), trace elements (2), nutrients (1), major and minor ions (2), silica (2), and TDS (2).

Blanks were not collected for isotopic ratios. Isotopic ratios of hydrogen, oxygen, and carbon are an intrinsic property of any of these elements; therefore, the concept of a blank does not apply to these ratios. In addition, blanks were not collected for tritium. Tritium is in the atmosphere and would dissolve into any solution used in collecting a blank, making it impractical to collect a blank for tritium.

Blank Sample Results

Blanks were analyzed for 272 constituents. Field blanks were not analyzed for the four field water-quality indicators (dissolved oxygen, water temperature, pH, and specific conductance), the five laboratory water-quality indicators (specific conductance, pH, alkalinity, bicarbonate, and carbonate), the four species of arsenic and iron, or the five isotopic tracers (two stable isotopes of water, tritium, and two isotopes of carbon). Of the 272 constituents for which blanks were performed, 12 constituents were detected in at least 1 field blank (table A3). For three trace elements (copper, lead, and nickel), a nutrient (nitrite), a major ion (calcium), and silica, the detected concentrations in blanks were less than the applicable reporting limits (LRL, LT-MDL, MDL, MRL, or SRL); thus, no change in reporting limits was applied to results for these constituents due to detections in blanks. An additional trace element, chromium, had a measured concentration in a blank of 0.89 µg/L, which is greater than the SRL of 0.42 µg/L established by Olsen and others (2010). The detection was considered isolated, however, because the chromium concentration in the associated groundwater sample was less than 0.42 µg/L. Therefore, the SRL of 0.42 µg/L for chromium was used for this study.

Similar to chromium, isolated low-level detections of acetone and chloroform in blanks were not accompanied by detections in their associated groundwater samples; therefore, acetone and chloroform results are reported here in accordance with the LRLs in effect for acetone and chloroform at the time of analysis (table A3). For the single field blank detection of 1,2,3-TCP, the source-solution blank and the groundwater sample associated with the field blank also had detections at concentrations similar to the detection in the field blank. Therefore, the detection of 1,2,3-TCP in the Southern Sacramento Valley study unit well YOL-01 during resampling may be attributed to inadvertent sample contamination affecting all three samples. Similar to copper, lead, and nickel, the detected concentrations in blanks for two VOCs—1,2,4-trimethylbenzene and toluene—were all less than the SRLs established by Fram and others (2012); thus, these SRLs were applied to results for these constituents. Detections of constituents at concentrations less than SRLs were coded as less than or equal to (≤) their measured concentrations in the samples and are counted as non-detections for the purpose of calculating detection frequencies for this report.

All but 2 of the 12 constituents detected in field blanks collected during resampling of trend wells in 2007–2008 (nitrite and 1,2,3-TCP) were also detected in at least one field blank collected during initial sampling of the 7 resampled study units. An additional 45 constituents were detected in at least one field blank collected during the initial sampling of these study units, which occurred during 2004–2005, and decisions to qualify results from these sampling efforts were made during preparation of the pertinent data series reports (Wright and others, 2005; Bennett and others, 2006; Kulongoski and others, 2006; Kulongoski and Belitz, 2007; Burton and Belitz, 2008; Dawson and others, 2008; Land and Belitz, 2008). In some cases, blank sample data qualification done after initial sampling has been superceded by GAMA policy in effect since the application of study reporting levels (Olsen and others, 2010; Fram and others, 2012).

Replicate Samples

Sequential replicate samples were collected to assess the precision of the water-quality data. Estimates of data precision are needed to assess whether differences between concentrations in samples are due to differences in groundwater quality (for example, spatial or temporal trends) or to variability that may result from collecting, processing, and analyzing the samples.

Replicate Collection and Analysis

The acceptable limits for differences in measured concentrations between replicate paired samples were determined using one of two criteria. The criterion selection depended on the magnitude of the measured concentration of a constituent relative to its reporting level. If the concentration of a constituent was less than 5 times its reporting level, a standard deviation (SD) for the sample pair of less than half the reporting level was considered acceptable. If the concentration of a constituent was greater than or equal to 5 times its reporting level, a *relative* standard deviation (RSD) of less than 10 percent was considered acceptable. The RSD is defined as the SD divided by the mean concentration for each replicate pair of samples expressed as a percentage. An RSD of less than 10 percent was also used for isotopes, with the exception of tritium. For tritium, the activity in the paired samples could differ by no more than the combined standard uncertainty reported for the samples in order to be acceptable.

When one or both values of a replicate pair were reported as non-detections, variability was evaluated in the following manner. If both values were reported as non-detections, the variability was considered acceptable because the results are perfectly consistent. If one value was reported as a non-detection (<RL) and the other value was reported as a detection less than the RL, the variability was considered acceptable because these two values, while not perfectly consistent, are in agreement as being less than the RL. If one value was reported as a non-detection and the other value was reported as a detection greater than or equal to the RL, the variability for the pair was considered unacceptable.

Replicate Results

Tables A4A–A4B summarize the results of replicate analyses for constituents in groundwater samples collected during resampling for trends and that were detected in at least one of the samples of a replicate pair. One or 2 replicates for 10 constituents indicated unacceptable variability, including 2 of 5 replicates for perchlorate (method performed on filtered

samples); 2 of 6 replicates for aluminum, nickel, and zinc; 1 of 6 replicates for chromium, copper, and iron; 1 of 5 replicates for 1,2,3-TCP and pmc; and 1 of 3 replicates for arsenite [As(III)]. Environmental detections were not modified on the basis of the replicate analyses.

Matrix-Spike Samples

Addition of a known concentration of a constituent (spike) to a replicate environmental sample enables the analyzing laboratory to determine the effect of the matrix, in this case groundwater, on the analytical technique used to measure the constituent. The known compounds added in matrix spikes are the same as those being analyzed in the environmental samples. This enables an analysis of matrix interferences on a compound-by-compound basis. For this study, matrix spikes were added by the laboratories performing the analysis rather than in the field. Low matrix-spike recovery may indicate that the compound might not have been detected in some samples if it were present at very low concentrations. Low and high matrix-spike recoveries may be a potential concern if the concentration of a compound in a groundwater sample is close to the health-based benchmark; a low recovery could result in a falsely measured concentration less than the health-based benchmark, whereas a high recovery could result in a falsely measured concentration greater than the health-based benchmark.

The GAMA-PBP defined the data-quality objective range for acceptable median matrix-spike recoveries as 70–130 percent. Only constituents with median matrix-spike recoveries outside of this range were flagged as having unacceptable recoveries. For some constituents, an acceptable range of 70–130 percent for median matrix-spike recovery was more restrictive than the acceptable control limits for laboratory set-spike recoveries. Laboratory set spikes are aliquots of laboratory blank water to which the same spike solution used for the matrix spikes has been added. One set spike is analyzed with each set of samples. Acceptable control limits for set spikes are defined relative to the long-term variability in recovery. For example, for many NWQL analyses, acceptable set-spike recovery is within ± 3 F-pseudosigma of the median recovery for at least 30 set spikes (Conner and others, 1998). The F-psuedosigma is calculated by dividing the fourth-spread (analogous to interquartile range) by 1.349; therefore, the smaller the F-pseudosigma, the more precise the determinations (Hoaglin, 1983). Laboratory matrix spikes were performed for 231 out of the 232 organic constituents sampled in this study, including VOCs, pesticides (including polar pesticides), and pesticide degradates because the analytical methods for these constituents may be susceptible to matrix interference. NDMA was sampled for in only two of the study units, and no matrix spikes were performed for NDMA.

Matrix-Spike Recoveries

Tables A5A–A5E present a summary of matrix-spike recoveries of organic constituents analyzed in trend samples. Median matrix-spike recoveries were within acceptable limits for all VOCs (tables A5A, A5B, A5E). However, median matrix-spike recoveries for 50 of the 143 pesticide compounds were lower than the acceptable limits (tables A5C, A5D), which may indicate that these constituents might not have been detected in some samples even if they were present in the samples. In addition, median recoveries for seven pesticide compounds were higher than acceptable limits, but despite this indication of positive analytical bias, only one of these seven compounds (tebuthiuron) was detected in unspiked groundwater samples during this study.

Surrogate Compounds

Surrogate compounds are added to groundwater samples in the laboratory prior to analysis to evaluate the recovery of similar constituents. Surrogate compounds were added in the laboratory to all groundwater and QC samples that were analyzed by the NWQL for VOCs and pesticides and pesticide degradates. Surrogates are used to identify general problems that may arise during laboratory sample analysis that could affect the analysis results for all compounds in that sample. Potential problems include matrix interferences (such as high levels of dissolved organic carbon) that can produce a positive or negative bias or incomplete laboratory recovery (possibly because of improper maintenance and calibration of analytical equipment) that produces a negative bias. A 70 to 130 percent recovery of surrogates, in general, is considered acceptable; values outside this range indicate possible problems with the processing and analysis of samples (Connor and others, 1998; Sandstrom and others, 2001) or groundwater matrix interference.

Surrogate recoveries

Median recoveries were within the acceptable range for all surrogates added to samples for the analyses of VOCs and pesticide compounds (table A6). However, all of the surrogates had recoveries that fell outside the acceptable ranges for samples from individual wells on a few occasions. Only rarely did this occur in samples from the same well for both sampling periods. Therefore, it is unlikely that groundwater matrix interferences caused the recoveries to be outside of the acceptable ranges in most cases.

Table A1. Analytical methods used for the determination of organic and inorganic constituents by the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) and contract laboratories.

[Laboratory entity codes in the USGS National Water Information System (NWIS) for laboratories other than the USGS NWQL are given in parentheses after the laboratory names. UV, ultraviolet; VOC, volatile organic compound; δ, delta notation, the ratio of a heavier isotope of an element (^{i}E) to the more common lighter isotope of that element, relative to a standard reference material, expressed as per mil]

Constituent	Analytical method	Laboratory and analytical schedule	Citation(s)
		Water-quality indicators	
Field parameters	Calibrated field meters and test kits	USGS field measurement	U.S. Geological Survey, variously dated
		Organic constituents	
VOCs	Purge and trap capillary gas chromatography/mass spectrometry	NWQL, Schedule 2020	U.S. Environmental Protection Agency, 1995; Connor and others, 1998
Pesticides and degradates	Solid-phase extraction and gas chromatography/mass spectrometry	NWQL, Schedule 2003	Zaugg and others, 1995; Lindley and others, 1996; Madsen and others, 2003; Sandstrom and others, 2001
Polar pesticides and degradates	Solid-phase extraction and high-performance liquid chromatography (HPLC)/mass spectrometry with selective-ion monitoring	NWQL, Schedule 2060	Furlong and others, 2001
		Constituents of special interest	
Perchlorate (on unfiltered samples)	Chromatography and mass spectrometry	Montgomery Watson Harza Laboratory	Hautman and others, 1999
Perchlorate (on filtered samples)	Liquid chromatography with mass spectrometry/mass spectrometry (USEPA Method 331.0)	Weck Laboratories, Inc., Industry, California, standard operating procedure ORG099.R01	U.S. Environmental Protection Agency, 2005
N-Nitrosodimethylamine (NDMA)	Isotopic dilution with gas chromatography and chemical-ionization mass spectrometry (USEPA Method 1625 *modified*)	Weck Laboratories, Inc., Industry, California, standard operating procedure ORG065.R10	U.S. Environmental Protection Agency, 1989; Plomley and others, 1994
1,2,3-Trichloropropane	Purge and trap gas chromatography/mass spectrometry	Weck Laboratories, Inc., Industry, California, SRL 524M-TCP	Okamato and others, 2002
		Inorganic constituents	
Nutrients	Alkaline persulfate digestion, Kjedahl digestion	NWQL, Schedule 2755	Fishman, 1993; Patton and Kryskalla, 2003
Major and minor ions, trace elements	Atomic absorption spectrometry, colorimetry, ion-exchange chromatography, inductively-coupled plasma atomic-emission spectrometry and mass spectrometry	NWQL, Schedule 1948	Fishman and Friedman, 1989; Fishman, 1993; Faires, 1993; McLain, 1993; Garbarino, 1999; American Public Health Association, 1998; Garbarino and others, 2006
Arsenic and iron species	Various techniques of ultraviolet visible (UV-VIS) spectrophotometry and atomic-absorbance spectroscopy	USGS Trace Metal Laboratory, Boulder, Colorado (USGSTMCO)	Stookey, 1970; To and others, 1998; McCleskey and others, 2003

Table A1. Analytical methods used for the determination of organic and inorganic constituents by the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) and contract laboratories.—Continued

[Laboratory entity codes in the USGS National Water Information System (NWIS) for laboratories other than the USGS NWQL are given in parentheses after the laboratory names. UV, ultraviolet; VOC, volatile organic compound; δ, delta notation, the ratio of a heavier isotope of an element (*iE*) to the more common lighter isotope of that element, relative to a standard reference material, expressed as per mil]

Constituent	Analytical method	Laboratory and analytical schedule	Citation(s)
		Isotopes	
Stable isotopes of hydrogen ($\delta^{2}H$) and oxygen ($\delta^{18}O$) of water	Gaseous hydrogen and carbon dioxide–water equilibration and stable-isotope mass spectrometry	USGS Stable Isotope Laboratory, Reston, Virginia (USGSSIVA), NWQL Schedule 1142	Epstein and Mayeda, 1953; Coplen and others, 1991; Coplen, 1994
$\delta^{13}C$ of dissolved inorganic carbon and carbon-14 abundance	Accelerator mass spectrometry	Woods Hole Oceanographic Institution, National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS), Woods Hole, Massachusetts (MA-WHAMS), NWQL Schedule 2255	Vogel and others, 1987; Donahue and others, 1990; McNichol and others, 1992; Gagnon and Jones, 1993; McNichol and others, 1994; Schneider and others, 1994
Tritium	Electrolytic enrichment-liquid scintillation	USGS Stable Isotope and Tritium Laboratory, Menlo Park, California (USGSH3CA)	Thatcher and others, 1977

Table A2. Preferred analytical methods or laboratories for selected constituents collected during resampling for trends in the Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project, California, September 2007 to November 2008.

[Preferred analytical schedules are generally the methods of analysis with the greatest accuracy and precision out of the ones used for the constituent in question. USGS National Water Quality Laboratory (NWQL) schedules are referred to by number; Weck, Weck Laboratories, Inc.; MWH, Montgomery Watson Harza Laboratories; TML, USGS Trace Metal Laboratory, Boulder, Colorado; VOC, volatile organic compound; field, analysis performed by field crew upon sample collection]

Constituent	Primary constituent classification	Preferred analytical method [1]	Secondary analytical method
Duplicate analyses performed by two different analytical schedules at the NWQL			
Atrazine	Pesticide	2003 [a,b,d,e,f] or 2032 [c] or 2033 [g]	2060 [b,d,e]
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)	Pesticide degradate	2003 [a,b,d,e,f] or 2032 [c] or 2033 [g]	2060 [b,d,e]
Carbaryl	Pesticide	2003 [a,b,d,e,f] or 2032 [c] or 2033 [g]	2060 [b,d,e]
Carbofuran	Pesticide	2032 [c] or 2033 [g]	2060 [b,d,e]
Tebuthiuron	Pesticide	2003 [a,b,d,e,f] or 2032 [c] or 2033 [g]	2060 [b,d,e]
Metalaxyl	Pesticide	2003 [a,b,d,e,f] or 2032 [c] or 2033 [g]	2060 [b,d,e]
1,2-Dibromo-3-chloropropane (DBCP)	VOC, fumigant	1306 [c,g]	2020 [a,b,c,d,e,f,g]
1,2-Dibromoethane (EDB)	VOC, fumigant	1306 [c,g]	2020 [a,b,c,d,e,f,g]
Duplicate analyses performed by two different laboratories (or by USGS field personnel and NWQL)			
pH	Water-quality indicator [2]	field [a,b,c,d,e,f,g]	1948 [a,b,c,d,e,f,g]
Specific conductance	Water-quality indicator [2]	field [a,b,c,d,e,f,g]	1948 [a,b,c,d,e,f,g]
1,2,3-Trichloropropane (1,2,3-TCP)	Constituent of special interest	Weck [c,d,e,f,g]	2020 [a,b,c,d,e,f,g]
Perchlorate	Constituent of special interest	Weck [a,b,c,d,e,f,g]	MWH [a,b]
Arsenic (total)	Trace element	1948 [a,b,c,d,e,f,g]	TML [b,e]
Iron (total)	Trace element	1948 [a,b,c,d,e,f,g]	TML [b,e]

[1] NWQL SC 2032 and 2033 use the same analytical method as NWQL SC 2003, but analyze for additional compounds.

[2] An additional water-quality indicator, alkalinity, was measured both in the field and by NWQL during initial sampling, but was only measured by NWQL during resampling.

[a] Analysis used in the San Diego Drainages study unit during resampling for trends.

[b] Analysis used in the North San Francisco Bay study unit during resampling for trends.

[c] Analysis used in the Northern San Joaquin Basin study unit during resampling for trends.

[d] Analysis used in the Southern Sacramento Valley study unit during resampling for trends.

[e] Analysis used in the San Fernando–San Gabriel study unit during resampling for trends.

[f] Analysis used in the Monterey Bay and Salinas Valley Basins study unit during resampling for trends.

[g] Analysis used in the Southeast San Joaquin Valley study unit during resampling for trends.

Table A3. Constituents detected in blanks collected during resampling of the first seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units and constituents for which study reporting levels were established by the GAMA Program.

[E, estimated or having a high degree of uncertainty; LRL, laboratory reporting level; mg/L, milligrams per liter; µg/L, micrograms per liter; nv, no value in category; SRL, study reporting level; <, less than or equal to; —, not detected]

Constituent	Field blanks	Source-solution blanks	LRL [1]	Concentrations or range of concentrations detected in blanks druing 2007–08	SRL [2]	Number of trend-well samples <-coded/total number of detections during 2007–08
Volatile organic compounds (µg/L)						
Acetone	1/11	1/4	4, 6	E1.4 [3]	all [4]	0/0
Carbon disulfide	0/11	0/4	0.04, 0.06	—	0.03	1/2
Chloroform	1/11	0/4	0.02, 0.04	E0.02	nv	0/21
Ethylbenzene	0/11	0/4	0.02, 0.04	—	0.06	1/1
Ethyl methyl ketone	0/11	0/4	1.6, 4	—	all [4]	1/1
1,2,4-Trimethylbenzene	4/11	0/4	0.04, 0.12	E0.03–0.11	0.56	9/9
Toluene	2/11	1/4	0.018, 0.05	E0.02, E0.02	0.69	5/5
m-Xylene plus *p*-xylene	0/11	0/4	0.06, 0.08	—	0.33	1/1
o-Xylene	0/11	0/4	0.038, 0.04	—	0.12	1/1
Constituent of special interest (µg/L)						
1,2,3-Trichloropropane [5]	1/7	1/2	0.005	0.0054, 0.0056	nv	0/7
Nutrients and major and minor ions (mg/L)						
Nitrite, as nitrogen	1/11	0/1	0.002, 0.008	E0.001	nv	0/50
Calcium	2/11	0/2	0.02, 0.04	E0.011, 0.021	nv	0/45
Silica	3/11	0/2	0.02, 0.04	E0.01–0.17	nv	0/45
Trace elements (µg/L)						
Aluminum	0/11	0/2	1.6, 4	—	1.6	12/21
Barium	0/11	0/2	0.08, 1	—	0.36	0/45
Chromium	1/11	0/2	0.12, 0.8	0.89	0.42	7/37
Copper	1/11	0/2	0.4, 1	E0.23	1.7	15/26
Iron	0/11	0/2	4, 8	—	6	3/26
Lead	1/11	1/2	0.06, 0.12	0.11	0.65	30/40
Manganese	0/11	0/2	0.2, 0.2	—	0.2	5/35
Nickel	2/11	1/2	0.06, 0.2	0.12, 0.24	0.36	22/43
Tungsten	0/5	0/2	0.02, 0.06	—	0.11	4/11
Vanadium	0/11	0/2	0.04, 0.16	—	0.11	2/45
Zinc	0/11	0/2	0.6, 2	—	4.8	34/43

[1] Minimum and maximum LRLs used during study period, or only LRL used during study period.

[2] SRLs for trace elements from Olsen and others (2010) and SRLs for volatile organic compounds from Fram and others (2012).

[3] The detected concentration was less than the LT-MDL for this constituent. This result in a groundwater sample would have counted as a non-detection.

[4] Based on findings by Fram and others (2012), all detections of this compound are reported as "not analyzed."

[5] Field blanks performed for low-level analyses of 1,2,3-trichloropropane were analyzed by Weck Laboratories, Inc.

Table A4A. Quality-control summary for replicate analyses of organic constituents and constituents of special interest in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Constituents for which all replicate pairs were non-detections are not listed. **Abbreviations**: RL, reporting level; ≥, greater than or equal to; <, less than; nv, no value in category]

Constituent	Number of replicates performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration <RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration ≥RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[5]	Paired concentrations of replicates not within acceptable agreement[3,4]
Volatile organic compounds (VOCs)							
1,1-Dichloroethene	8	7	0	1	0	0	nv
1,2-Dichloroethane	8	7	0	1	0	0	nv
Bromodichloromethane	8	7	0	1	0	0	nv
cis-1,2-Dichloroethene	8	6	0	2	0	0	nv
Diisopropyl ether (DIPE)	8	7	0	1	0	0	nv
Methyl *tert*-butyl ether (MTBE)	8	6	0	2	0	0	nv
Tetrachloroethene (PCE)	8	4	0	4	0	0	nv
Carbon tetrachloride (Tetrachloromethane)	8	6	0	2	0	0	nv
trans-1,2-Dichloroethene	8	7	0	1	0	0	nv
Trichloroethene	8	4	0	4	0	0	nv
Chloroform (Trichloromethane)	8	1	0	6	0	0	nv
Pesticides, pesticide degradates, and caffeine							
Simazine	7	4	0	3	0	0	nv
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)	7	2	0	5	0	0	nv
Atrazine	7	3	0	4	0	0	nv
Prometon	7	6	0	1	0	0	nv
Tebuthiuron	7	5	0	2	0	0	nv
3,4-Dichloroaniline	7	6	0	1	0	0	nv
Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine)	4	3	0	1	0	0	nv

Table A4A. Quality-control summary for replicate analyses of organic constituents and constituents of special interest in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.—Continued

[Constituents for which all replicate pairs were non-detections are not listed. **Abbreviations**: RL, reporting level; ≥, greater than or equal to; <, less than; nv, no value in category]

Constituent	Number of replicates performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration <RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration ≥RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[5]	Paired concentrations of replicates not within acceptable agreement[3,4]
Constituents of special interest							
Perchlorate (unfiltered)	5	3	0	2	0	0	nv
Perchlorate (filtered)	5	1	2	0	1	1	(0.259, <0.1) (1.95, 1.56)
1,2,3-Trichloropropane	5	4	0	0	1	0	(0.0055, <0.005)

[1] When the constituent is not detected in either sample of the replicate, agreement is considered acceptable.

[2] When the constituent is not detected in one of the two samples making up the replicate and is detected at a concentration less than the RL in the other sample, agreement is considered acceptable.

[3] When the constituent is not detected in one of the two samples making up the replicate and is detected at a concentration greater than or equal to the RL in the other sample, agreement is considered unacceptable.

[4] In order for two detected concentrations of the samples making up a replicate to be considered within acceptable agreement, one of the following two criteria must be met: 1. For sample concentrations less than 5 times the RL for the constituent in question, the standard deviation for the two sample concentrations must be less than 1/2 the RL. 2. For sample concentrations greater than or equal to 5 times the RL, the relative standard deviation must be less than 10 percent.

Table A4B. Quality-control summary for replicate analyses of inorganic constituents in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Constituents for which all replicate pairs were non-detections are not listed. Abbreviations: RL, reporting level; ≥, greater than or equal to; <, less than; E, estimated or having a higher degree of uncertainty; nv, no value in category; %, percent]

Constituent	Number of replicate analyses performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration <RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration ≥RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Trace Elements							
Aluminum	6	3	1	0	1	1	(<1.6, 8.1) (5.3, 1.8)
Antimony	6	2	4	0	0	0	nv
Arsenic	6	0	6	0	0	0	nv
Barium	6	0	6	0	0	0	nv
Boron	6	0	6	0	0	0	nv
Cadmium	6	4	2	0	0	0	nv
Chromium	6	0	5	0	0	1	(0.20, 0.26)
Cobalt	6	0	5	1	0	0	nv
Copper	6	1	4	0	0	1	(E0.50, E0.72)
Iron	6	2	2	1	0	1	(4.6, 3.6)
Lead	6	0	6	0	0	0	nv
Lithium	6	0	6	0	0	0	nv
Manganese	6	0	5	1	0	0	nv
Molybdenum	6	0	6	0	0	0	nv
Nickel	6	1	3	0	0	2	(0.13, 0.15) (0.38, 0.64)
Selenium	6	0	6	0	0	0	nv
Strontium	6	0	6	0	0	0	nv
Uranium	6	0	6	0	0	0	nv
Vanadium	6	0	6	0	0	0	nv
Zinc	6	0	4	0	0	2	(0.7, E0.3) (3.7, 4,7)

Table A4B. Quality-control summary for replicate analyses of inorganic constituents in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.—Continued

[Constituents for which all replicate pairs were non-detections are not listed. Abbreviations: RL, reporting level; ≥, greater than or equal to; <, less than; E, estimated or having a higher degree of uncertainty; nv, no value in category; %, percent]

Constituent	Number of replicate analyses performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration <RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration ≥RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Nutrients							
Ammonia (as nitrogen)	7	6	1	0	0	0	nv
Nitrate plus nitrite (as nitrogen) [5]	7	1	6	0	0	0	nv
Nitrite (as nitrogen)	7	6	1	0	0	0	nv
Total nitrogen (ammonia + nitrite + nitrate + organic nitrogen)	7	0	7	0	0	0	nv
Phosphate, orthophosphate (as phosphorus)	7	0	7	0	0	0	nv
Major and minor ions, silica, and total dissolved solids (TDS)							
Bromide	6	0	6	0	0	0	nv
Calcium	6	0	6	0	0	0	nv
Chloride	6	0	6	0	0	0	nv
Fluoride	6	1	5	0	0	0	nv
Iodide	5	1	4	0	0	0	nv
Magnesium	6	0	6	0	0	0	nv
Potassium	6	0	6	0	0	0	nv
Sodium	6	0	6	0	0	0	nv
Sulfate	6	0	6	0	0	0	nv
Silica (as SiO_2)	6	0	6	0	0	0	nv
TDS	6	0	6	0	0	0	nv
Arsenic species							
Arsenic (total)	3	1	2	0	0	0	nv
Arsenic-III	3	2	0	0	1	0	(1, <1)

Table A4B. Quality-control summary for replicate analyses of inorganic constituents in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.—Continued

[Constituents for which all replicate pairs were non-detections are not listed. Abbreviations: RL, reporting level; ≥, greater than or equal to; <, less than; E, estimated or having a higher degree of uncertainty; nv, no value in category; %, percent]

Constituent	Number of replicate analyses performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration <RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration ≥RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Isotopic Tracers							
$\delta^{2}H$ of water	8	nv	8	nv	nv	nv	nv
$\delta^{18}O$ of water	8	nv	8	nv	nv	nv	nv
Tritium	7	nv	7	nv	nv	nv	nv
$\delta^{13}C$ of dissolved carbonates	5	nv	5	nv	nv	nv	nv
Carbon-14 (percent modern carbon)	5	nv	4	nv	nv	1	(17.52%, 31.70%)

[1] When the constituent is not detected in either sample of the replicate, agreement is considered acceptable.

[2] When the constituent is not detected in one of the two samples of the replicate pair and is detected at a concentration less than the RL in the other sample, agreement is considered acceptable.

[3] When the constituent is not detected in one of the two samples of the replicate pair and is detected at a concentration greater than or equal to the RL in the other sample, agreement is considered unacceptable.

[4] In order for two detected concentrations of the samples of a replicate pair to be considered within acceptable agreement, one of the following two criteria must be met: 1. For sample concentrations less than 5 times the RL for the constituent, the standard deviation for the two sample concentrations must be less than 1/2 the RL. 2. For sample concentrations greater than or equal to 5 times the RL, the relative standard deviation must be less than 10 percent.

[5] Nitrite plus nitrate (as nitrogen) is refered to as nitrate in the text for brevity.

Table A5A. Quality-control summary for matrix-spike recoveries of volatile organic compounds (VOCs) in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Acetone	7	97	133	107
Acrylonitrile	7	97	115	110
tert-Amyl methyl ether (TAME)	7	94	121	106
Benzene	7	96	112	103
Bromobenzene	7	94	128	101
Bromochloromethane [1]	7	90	118	105
Bromodichloromethane [1]	7	98	118	103
Bromoform (Tribromomethane) [1]	7	95	123	103
Bromomethane (Methyl bromide)	7	89	145	111
n-Butylbenzene	7	80	108	90
sec-Butylbenzene	7	92	122	99
tert-Butylbenzene	7	95	123	108
Carbon disulfide [1]	7	65	123	82
Carbon tetrachloride (Tetrachloromethane) [1]	7	96	117	107
Chlorobenzene	7	95	117	101
Chloroethane	7	70	127	109
Chloroform (Trichloromethane) [1]	7	84	124	113
Chloromethane	7	82	114	95
3-Chloropropene	7	90	119	110
2-Chlorotoluene	7	95	128	110
4-Chlorotoluene	7	96	119	104
Dibromochloromethane [1]	7	98	109	100
1,2-Dibromo-3-chloropropane (DBCP) [1]	7	87	113	101
1,2-Dibromoethane (EDB)	7	96	114	100
Dibromomethane [1]	7	90	115	104
1,2-Dichlorobenzene [1]	7	93	125	103
1,3-Dichlorobenzene	7	94	120	104
1,4-Dichlorobenzene	7	94	119	101
trans-1,4-Dichloro-2-butene	7	94	118	103
Dichlorodifluoromethane (CFC-12) [1]	7	61	112	81
1,1-Dichloroethane (1,1-DCA) [1]	7	93	119	108
1,2-Dichloroethane (1,2-DCA) [1]	7	96	122	106
1,1-Dichloroethene (1,1-DCE) [1]	7	92	114	99
cis-1,2-Dichloroethene (*cis*-1,2-DCE) [1]	7	90	118	107
trans-1,2-Dichloroethene (*trans*-1,2-DCE) [1]	7	92	114	109
1,2-Dichloropropane	7	91	114	103
1,3-Dichloropropane	7	92	118	107
2,2-Dichloropropane	7	74	104	100
1,1-Dichloropropene	7	92	105	101
cis-1,3-Dichloropropene	7	87	103	98
trans-1,3-Dichloropropene	7	89	102	97
Diethyl ether	7	88	121	116
Diisopropyl ether (DIPE) [1]	7	90	120	112

Table A5A. Quality-control summary for matrix-spike recoveries of volatile organic compounds (VOCs) in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.—Continued

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Ethylbenzene [1]	7	98	117	103
Ethyl *tert*-butyl ether (ETBE)	7	94	120	105
Ethyl methacrylate	7	94	113	100
Ethyl methyl ketone (2-butanone) [1]	7	93	123	111
o-Ethyl toluene (2-ethyl toluene)	7	95	115	101
Hexachlorobutadiene	7	69	112	84
Hexachloroethane	7	90	110	97
2-Hexanone (*n*-Butyl methyl ketone)	7	93	124	113
Iodomethane (Methyl iodide)	7	67	121	112
Isopropylbenzene	7	93	120	103
4-Isopropyl-1-methyl benzene (p-isopropyltoluene)	7	88	113	100
Methyl acrylate	7	93	116	106
Methyl acrylonitrile	7	90	121	110
Methyl *tert*-butyl ether (MTBE) [1]	7	90	122	108
Methyl *iso*-butyl ketone (MIBK)	7	100	121	104
Methylene chloride (Dichloromethane) [1]	7	93	114	100
Methyl methacrylate	7	89	112	102
Naphthalene	7	91	113	101
n-Propylbenzene	7	90	114	101
Styrene	7	75	114	102
1,1,1,2-Tetrachloroethane	7	89	116	108
1,1,2,2-Tetrachloroethane	7	94	128	106
Tetrachloroethene (PCE, Perchloroethene) [1]	7	91	110	101
Tetrahydrofuran	7	94	123	113
1,2,3,4-Tetramethylbenzene	7	89	107	100
1,2,3,5-Tetramethylbenzene	7	94	116	104
Toluene	7	97	110	102
1,2,3-Trichlorobenzene	7	94	114	104
1,2,4-Trichlorobenzene	7	81	103	99
1,1,1-Trichloroethane (1,1,1-TCA) [1]	7	93	121	108
1,1,2-Trichloroethane (1,1,2-TCA)	7	92	116	106
Trichloroethene (TCE) [1]	7	90	110	97
Trichlorofluoromethane (CFC-11) [1]	7	94	116	108
1,2,3-Trichloropropane (1,2,3-TCP)	7	95	128	100
Trichlorotrifluoroethane (CFC-113) [1]	7	81	104	95
1,2,3-Trimethylbenzene	7	93	127	109
1,2,4-Trimethylbenzene	7	93	173	104
1,3,5-Trimethylbenzene	7	97	118	103
Vinyl bromide (Bromoethene)	7	85	116	101
Vinyl chloride (Chloroethene)	7	88	117	103
m- plus *p*-Xylene [1]	7	100	118	107
o-Xylene [1]	7	94	120	104

[1] Constituent detected in groundwater samples.

Table A5B. Quality-control summary for matrix-spike recoveries of low-level fumigants in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
1,2-Dibromo-3-chloropropane (DBCP) [1]	2	96	129	112
1,2-Dibromoethane (EDB)	2	90	123	106

[1] Constituent detected in groundwater samples.

Table A5C. Quality-control summary for matrix-spike recoveries of pesticides and pesticide degradates (Laboratory Schedules 2003/2032/2033) in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Acetochlor	5	59	96	67
Alachlor	5	64	100	74
Atrazine [1]	5	66	100	83
Azinphos-methyl	5	38	72	64
Azinphos-methyl oxon	5	16	58	41
Benfluralin	5	43	63	46
Carbaryl	5	48	92	80
Carbofuran	1	70	70	70
2-Chloro-2,6-diethylacetanilide	5	58	88	73
4-Chloro-2-methylphenol	5	43	83	59
Chlorpyrifos	5	50	84	63
Chlorpyrifos oxon	5	0	55	15
Cyanazine	1	85	85	85
Cyfluthrin	5	35	51	46
λ-Cyhalothrin	1	48	48	48
Cypermethrin	5	36	49	44
DCPA (Dacthal) [1]	5	71	99	88
Deethylatrazine (2-Chloro-4-isopropyl-amino-6-amino-*s*-triazine) [1]	5	32	55	43
Desulfinylfipronil [1]	5	46	91	81
Desulfinylfipronil amide	5	46	90	78
Diazinon	5	66	85	76
3,4-Dichloroaniline [1]	5	52	87	73
3,5-Dichloroaniline [1]	1	91	91	91
Dichlorvos	5	5	26	8
Dicrotophos	5	13	47	28
Dieldrin	5	75	104	87
2,6-Diethylaniline	5	71	92	82
Dimethoate	5	25	36	36
Disulfoton	1	78	78	78
Disulfoton sulfone	1	83	83	83
α-Endosulfan	1	79	79	79
Endosulfan sulfate	1	82	82	82
Ethion	5	47	97	64
Ethion monoxon	5	49	75	68
Ethoprophos	1	79	79	79
S-Ethyl-dipropylthiocarbamate (EPTC) [1]	1	88	88	88
2-Ethyl-6-methylaniline [1]	5	72	94	85
Fenamiphos	5	45	90	66
Fenamiphos sulfone	5	41	76	64
Fenamiphos sulfoxide	5	10	79	35
Fipronil [1]	5	45	75	59
Fipronil sulfide [1]	5	36	94	66

Table A5C. Quality-control summary for matrix-spike recoveries of pesticides and pesticide degradates (Laboratory Schedules 2003/2032/2033) in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.—Continued

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Fipronil sulfone	5	33	77	54
Fonofos	5	66	85	71
Hexazinone [1]	5	36	61	55
Iprodione	5	36	61	53
Isofenphos	5	53	83	69
Malaoxon	5	41	97	54
Malathion	5	52	85	66
Metalaxyl	5	59	85	80
Methidathion	5	56	99	73
Metolachlor	5	60	91	76
Metribuzin	5	53	72	60
Molinate	1	90	90	90
Myclobutanil	5	62	93	69
1-Naphthol	5	15	41	28
Oxyfluorfen	1	69	69	69
Paraoxon-methyl	5	25	50	35
Parathion-methyl	5	52	64	62
Pendimethalin	5	57	80	64
cis-Permethrin	5	34	81	39
Phorate	5	38	69	51
Phorate oxon	5	49	71	67
Phosmet	5	10	30	26
Phosmet oxon	5	0	31	9
Prometon [1]	5	58	87	68
Prometryn	5	58	103	75
Pronamide	5	57	96	71
Propanil	1	82	82	82
Propargite	1	61	61	61
cis-Propiconazole	1	89	89	89
trans-Propiconazole	1	85	85	85
Simazine [1]	5	57	101	74
Tebuconazole	1	52	52	52
Tebuthiuron [1]	5	89	210	138
Tefluthrin	1	46	46	46
Terbufos	5	49	210	75
Terbufos oxon sulfone	5	44	75	51
Terbuthylazine	5	68	94	82
Thiobencarb	1	98	98	98
Tribufos	5	29	65	51
Trifluralin	5	49	68	52

[1] Constituent detected in groundwater samples.

Table A5D. Quality-control summary for matrix-spike recoveries of polar pesticides, pesticide degradates, and caffeine (Laboratory Schedule 2060) in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Acifluorfen	2	64	73	69
Aldicarb	2	70	76	73
Aldicarb sulfone	2	59	77	68
Aldicarb sulfoxide	2	96	100	98
Atrazine [1]	2	99	109	104
Bendiocarb	2	77	88	83
Benomyl	2	73	77	75
Bensulfuron-methyl	2	118	139	129
Bentazon	2	79	82	81
Bromacil	2	72	89	81
Bromoxynil	2	77	85	81
Caffeine [1]	2	78	83	81
Carbaryl	2	88	91	90
Carbofuran	2	100	102	101
Chloramben, methyl ester	2	84	85	85
Chlorimuron-ethyl	2	133	157	145
3-(4-Chlorophenyl)-1-methyl urea	2	45	82	64
Clopyralid	2	68	77	73
Cycloate	2	61	84	73
2,4-D plus 2,4-D methyl ester	2	82	89	86
2,4-DB (4-(2,4-Dichlorophenoxy)butyric acid)	2	78	81	80
DCPA (Dacthal) monoacid	2	85	87	86
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) [1]	2	78	89	84
Deisopropyl atrazine (2-Chloro-6-ethylamino-4-amino-*s*-triazine) [1]	2	82	104	93
Dicamba	2	66	71	69
Dichlorprop	2	96	98	97
Dinoseb (Dinitrobutyl phenol)	2	85	88	87
Diphenamid	2	104	111	108
Diuron [1]	2	93	103	98
Fenuron	2	99	104	102
Flumetsulam	2	133	161	147
Fluometuron	2	95	95	95
Hydroxyatrazine (2-Hydroxy-4-isopropylamino-6-ethylamino-*s*-triazine)	2	86	121	104
3-Hydroxycarbofuran	2	86	86	86
Imazaquin	2	128	141	135
Imazethapyr	2	111	121	116
Imidacloprid	2	108	109	109
Linuron	2	86	98	92
MCPA (2-Methyl-4-chlorophenoxyacetic acid)	2	92	94	93

Table A5D. Quality-control summary for matrix-spike recoveries of polar pesticides, pesticide degradates, and caffeine (Laboratory Schedule 2060) in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.—Continued

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
MCPB (4-(2-Methyl-4-chlorophenoxy)butyric acid)	2	69	74	72
Metalaxyl	2	101	103	102
Methiocarb	2	83	105	94
Methomyl	2	98	105	102
Metsulfuron methyl	2	108	181	145
Neburon	2	93	94	94
Nicosulfuron	2	287	346	317
Norflurazon	2	104	110	107
Oryzalin	2	83	84	84
Oxamyl	2	92	94	93
Picloram	2	72	76	74
Propham	2	61	91	76
Propiconazole	2	84	87	86
Propoxur	2	102	102	102
Siduron	2	105	123	114
Sulfometuron-methyl [1]	2	126	145	136
Tebuthiuron [1]	2	110	122	116
Terbacil	2	78	87	83
Triclopyr	2	84	92	88

[1] Constituent detected in groundwater samples.

Table A5E. Quality-control summary for matrix-spike recoveries of the constiuent of special interest[1], 1,2,3-trichloropropane, in spiked samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units.

[Acceptable recovery range is between 70 and 130 percent]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
1,2,3-Trichloropropane (1,2,3-TCP) [2]	3	88	147	118

[1] Matrix spikes were not collected for perchlorate or *N*-nitrosodimethylamine during re-sampling for trends.

[2] Constituent detected in groundwater samples.

Table A6. Quality-control summary for surrogate recoveries of volatile organic compounds (VOCs), pesticides and pesticide degradates, and polar pesticides and degradates in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.

[Values underlined and in bold font represent recoveries greater than 130 percent; values underlined and in italic font represent recoveries less than 70 percent. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSSC, Santa Cruz study area; MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Abbreviations**: NWQL SC, National Water Quality Laboratory schedule; E, estimated or having a high degree of uncertainty; >, greater than; <, less than]

GAMA well identification number	Surrogates															
	Volatile organic compounds NWQL SC 2020						Pesticides and degradates NWQL SC 2003/2032/2033				Polar pesticides NWQL SC 2060					
	1,2-Dichloroethane-*d*4		Toluene-*d*8		1-Bromo-4-fluorobenzene		alpha-HCH-*d*6		Diazinon-*d*10		2,4,5-T		Barban		Caffeine-^{13}C	
	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08
San Diego Drainages study unit																
SDALLV-07	120	116	101	76	103	95	71	88	71	93	nc	nc	nc	nc	nc	nc
SDALLV-11	**132**	111	102	88	106	99	82	90	76	101	nc	nc	nc	nc	nc	nc
SDHDRK-01	122	109	99	92	98	100	92	86	94	95	nc	nc	nc	nc	nc	nc
SDHDRK-09	110	112	99	79	97	95	78	90	72	98	nc	nc	nc	nc	nc	nc
SDTEM-04	109	125	99	75	92	95	84	nc	*63*	nc	nc	nc	nc	nc	nc	nc
SDTEMFP-01	121	126	99	74	84	96	93	88	110	96	95	nc	124	nc	**132**	nc
SDWARN-01	95	114	102	79	104	94	77	83	72	87	nc	nc	nc	nc	nc	nc
North San Francisco Bay study unit																
NSFVOL-14	117	**144**	100	71	96	94	95	93	86	96	87	70	84	79	96	*60*
NSFVOL-18	112	115	97	92	93	100	89	88	83	78	86	nc	82	nc	71	nc
NSFVP-29	115	107	101	105	97	100	90	*69*	72	91	97	83	89	*66*	124	E70
NSFVP-34	111	**138**	98	71	98	91	87	94	75	101	77	71	80	84	**E135**	98
NSFVP-36	117	**136**	97	*68*	94	91	95	89	79	94	72	nc	79	nc	*69*	nc
NSFVP-38	119	**147**	96	71	91	94	101	108	85	119	74	70	71	75	101	*59*
NSFVP-39	115	93	94	77	94	99	107	86	91	93	72	nc	*63*	nc	*61*	nc
NSFVP-41	116	**135**	96	*69*	92	94	104	90	90	94	76	nc	80	nc	71	nc
NSFWG-03	110	120	100	93	79	100	74	*68*	*54*	*67*	79	nc	82	nc	*67*	nc
NSFWGFP-01	119	100	107	87	106	98	84	85	*70*	91	92	89	112	76	129	*E50*

Table A6. Quality-control summary for surrogate recoveries of volatile organic compounds (VOCs), pesticides and pesticide degradates, and polar pesticides and degradates in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[Values underlined and in bold font represent recoveries greater than 130 percent; values underlined and in italic font represent recoveries less than 70 percent. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSSC, Santa Cruz study area; MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Abbreviations**: NWQL SC, National Water Quality Laboratory schedule; E, estimated or having a high degree of uncertainty; >, greater than; <, less than]

GAMA well identification number	Surrogates															
	Volatile organic compounds NWQL SC 2020						Pesticides and degradates NWQL SC 2003/2032/2033				Polar pesticides NWQL SC 2060					
	1,2-Dichloroethane-*d*4		Toluene-*d*8		1-Bromo-4-fluorobenzene		alpha-HCH-*d*6		Diazinon-*d*10		2,4,5-T		Barban		Caffeine-^{13}C	
	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08
Northern San Joaquin Basin study unit																
COS-08	108	120	97	89	102	97	77	79	*56*	80	nc	nc	nc	nc	nc	nc
ESJ-01	110	121	94	88	101	97	82	78	76	79	nc	nc	nc	nc	nc	nc
ESJ-06	111	120	95	91	105	98	88	84	*60*	86	nc	nc	nc	nc	nc	nc
NSJ-QPC-04	111	**132**	104	94	120	100	102	81	79	89	nc	nc	nc	nc	nc	nc
TRCY-03	112	**133**	93	91	103	101	124	76	105	*68*	E123	nc	117	nc	110	nc
Southern Sacramento Valley study unit																
NAM-03	96	103	92	86	79	97	97	90	*67*	70	89	nc	81	nc	83	nc
SAM-10	102	**139**	99	88	94	99	102	90	98	75	85	nc	88	nc	83	nc
SOL-08	100	**136**	99	82	96	97	119	83	97	73	87	nc	79	nc	70	nc
SSV-QPC-07	103	**134**	97	102	96	106	101	94	107	*69*	102	85	91	83	**E143**	72
SUI-03	**143**	128	103	100	80	104	nc	94	nc	95	86	nc	81	nc	71	nc
YOL-01	125	126	104	89	83	97	94	92	85	91	83	nc	82	nc	*62*	nc
YOL-14	105	**131**	100	100	93	104	89	89	93	101	84	76	106	75	115	74
San Fernando–San Gabriel study unit																
ULASF-09	114	108	98	90	94	94	99	78	99	*65*	*67*	70	86	*50*	118	*66*
ULASF-10	119	109	99	88	84	96	99	91	90	100	73	75	91	70	127	75
ULASG-01	124	**131**	96	95	*62*	101	92	85	85	78	*E55*	nc	86	nc	82	nc
ULASG-08	104	125	99	91	100	99	102	92	97	79	80	E100	78	84	106	90
ULASG-15	93	126	96	95	88	100	88	95	83	97	89	E97	92	83	E121	95
ULASG-17	99	129	104	98	92	102	100	99	102	94	E101	nc	86	nc	96	nc

Table A6. Quality-control summary for surrogate recoveries of volatile organic compounds (VOCs), pesticides and pesticide degradates, and polar pesticides and degradates in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[Values underlined and in bold font represent recoveries greater than 130 percent; values underlined and in italic font represent recoveries less than 70 percent. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSSC, Santa Cruz study area; MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Abbreviations**: NWQL SC, National Water Quality Laboratory schedule; E, estimated or having a high degree of uncertainty; >, greater than; <, less than]

GAMA well identification number	Surrogates															
	Volatile organic compounds NWQL SC 2020						Pesticides and degradates NWQL SC 2003/2032/2033				Polar pesticides NWQL SC 2060					
	1,2-Dichloroethane-*d*4		Toluene-*d*8		1-Bromo-4-fluorobenzene		alpha-HCH-*d*6		Diazinon-*d*10		2,4,5-T		Barban		Caffeine-^{13}C	
	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08	2004–05	2007–08
Monterey Bay and Salinas Valley Basins study unit																
MSMB-03	93	103	101	81	104	100	89	89	88	85	nc	nc	nc	nc	nc	nc
MSMB-04	103	100	94	78	84	100	91	92	100	91	E125	nc	101	nc	**148**	nc
MSMB-16	109	**134**	95	72	83	94	83	80	89	*66*	nc	nc	nc	nc	nc	nc
MSMB-28	**144**	**138**	105	79	70	95	*69*	83	*68*	71	nc	nc	nc	nc	nc	nc
MSMB-31	109	**137**	100	82	96	95	85	82	75	76	nc	nc	nc	nc	nc	nc
MSPR-03	105	104	102	92	113	98	93	90	98	91	nc	nc	nc	nc	nc	nc
MSPR-09	127	106	101	94	*61*	100	100	88	86	98	nc	nc	nc	nc	nc	nc
MSSC-06	104	**135**	99	73	95	93	100	78	107	*69*	E128	nc	110	nc	E126	nc
MSSC-11	87	**139**	93	75	95	94	82	89	86	90	nc	nc	nc	nc	nc	nc
MSSV-06	**140**	102	104	92	70	99	*69*	80	*55*	*63*	nc	nc	nc	nc	nc	nc
MSSV-15	125	103	100	92	*69*	100	82	75	78	*63*	nc	nc	nc	nc	nc	nc
Southeast San Joaquin Valley study unit																
KING-11	116	126	93	87	84	98	71	77	*57*	*65*	**E138**	nc	111	nc	**137**	nc
KING-13	112	124	93	86	81	99	85	84	*66*	72	**162**	nc	116	nc	**140**	nc
KING-17	**158**	126	92	87	*69*	99	76	86	*55*	72	**171**	nc	102	nc	**132**	nc
KING-24	95	118	100	88	98	98	83	78	82	106	nc	nc	nc	nc	nc	nc
KWH-10	95	127	100	86	95	98	82	89	77	92	nc	nc	nc	nc	nc	nc
KWH-12	97	108	105	97	118	99	77	78	78	*67*	130	nc	94	nc	127	nc
TLR-03	97	122	98	91	96	97	79	77	81	78	nc	nc	nc	nc	nc	nc
TULE-05	103	121	99	89	100	99	82	80	98	81	nc	nc	nc	nc	nc	nc
TULE-10	105	123	97	90	98	99	74	82	*67*	*67*	nc	nc	nc	nc	nc	nc

Table A6. Quality-control summary for surrogate recoveries of volatile organic compounds (VOCs), pesticides and pesticide degradates, and polar pesticides and degradates in samples collected for trends in seven Groundwater Ambient Monitoring and Assessment (GAMA) study units.—Continued

[Values underlined and in bold font represent recoveries greater than 130 percent; values underlined and in italic font represent recoveries less than 70 percent. **GAMA well identification number acronyms**: ***San Diego Drainages study unit***: SDALLV, Alluvial Basins study area; SDHDRK, Hard Rock study area; SDTEM, Temecula Valley study area; SDTEMFP, Temecula Valley study area flow-path well; SDWARN, Warner Valley study area. ***North San Francisco Bay study unit***: NSFVOL, Volcanic Highlands study area; NSFVP, Valley and Plains study area; NSFWG, Wilson Grove Formation Highlands study area; NSFWGFP, Wilson Grove Formation Highlands study area flow-path well. ***Northern San Joaquin Basin study unit***: COS, Cosumnes Basin study area; ESJ, Eastern San Joaquin Basin study area; NSJ-QPC, Uplands study area; TRCY, Tracy Basin study area. ***Southern Sacramento Valley study unit***: NAM, North American study area; SAM, South American study area; SOL, Solano study area; SSV-QPC, Uplands study area; SUI, Suisun-Fairfield study area; YOL, Yolo study area. ***San Fernando–San Gabriel study unit***: ULASF, San Fernando study area; ULASG, San Gabriel study area. ***Monterey Bay and Salinas Valley Basins study unit***: MSSC, Santa Cruz study area; MSMB, Monterey Bay study area; MSPR, Paso Robles study area; MSSC, Santa Cruz study area; MSSV, Salinas Valley study area. ***Southeast San Joaquin Valley study unit***: KING, Kings study area; KWH, Kaweah study area; TLR, Tulare Lake study area; TULE, Tule study area. **Abbreviations**: NWQL SC, National Water Quality Laboratory schedule; E, estimated or having a high degree of uncertainty; >, greater than; <, less than]

	Surrogates															
	Volatile organic compounds NWQL SC 2020						**Pesticides and degradates NWQL SC 2003/2032/2033**				**Polar pesticides NWQL SC 2060**					
	1,2-Dichloroethane-*d*4		**Toluene-*d*8**		**1-Bromo-4-fluorobenzene**		**alpha-HCH-*d*6**		**Diazinon-*d*10**		**2,4,5-T**		**Barban**		**Caffeine-^{13}C**	
	2004–05	**2007–08**	**2004–05**	**2007–08**	**2004–05**	**2007–08**	**2004–05**	**2007–08**	**2004–05**	**2007–08**	**2004–05**	**2007–08**	**2004–05**	**2007–08**	**2004–05**	**2007–08**
Summary:																
Median recovery (percent)	111	124	99	88	95	98	88	86	83	86	87	76	86	76	110	72
Number of recoveries <70 percent	0	0	0	2	4	0	2	2	12	11	2	0	1	2	4	4
Number of recoveries >130 percent	5	17	0	0	0	0	0	0	0	0	4	0	0	0	7	0

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Director, California Water Science Center
U.S. Geological Survey
6000 J Street, Placer Hall
Sacramento, California 95819
http://ca.water.usgs.gov

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