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Identifying the location and population served by domestic wells in California

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ABSTRACT

Study region: California, USA.
Study focus: Identification of groundwater use is an important step in the regional-scale assessment of groundwater quality. In California, 1990 US Census data indicate that domestic wells provide drinking-water to about 1.2 million people. However, the location of these domestic well users of groundwater is poorly identified because the census tracts can be quite large (up to 20,000 km^2). The purposes of this paper are to present methods used for (1) estimating the location of domestic wells, (2) estimating the location of households using domestic well water; and (3) identifying where in California groundwater is an important source of domestic drinking supply.
New hydrological insights for the region: Aggregating the results indicates that three hydrogeologic provinces contain nearly 80% of all domestic wells and also have the highest density of domestic well users: Central Valley (31.6%), Sierra Nevada (31.5%), and Northern Coast Ranges (16.6%). Results were also aggregated into groundwater basins and highland areas, collectively called Groundwater Units (GUs). Twenty-eight of the 938 GUs contain more than 50% of the total population served by domestic wells, 70 GUs contain more than 75%, and 150 GUs contain 90%. The 28 GUs are mostly located in the eastern and southern San Joaquin Valley (11), the Sacramento Valley (7), and the western foothills of the Sierra Nevada province (5). Using the information presented in this research along with other information about domestic-well use, the US Geological Survey has begun sampling high-use GUs for the Shallow Aquifer Assessment component of the Groundwater Ambient Assessment (GAMA) program.

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1. Introduction

The Shallow Aquifer Assessment Survey, a component of the California State Water Resources Control Board's Groundwater Ambient Monitoring Assessment program Priority Basin Project (GAMA), is focused on the study of groundwater used by individual households. Individual household wells (domestic wells) are usually shallower than public-supply wells, and are therefore more susceptible to contamination from the land surface, or from shallow underground contaminant sources such as leaking fuel or septic tanks. The U.S. Geological Survey (USGS) was tasked to identify where domestic wells are located in the state, and to identify and sample areas with high densities of domestic-well users. This paper describes the methodology and results of the domestic-well survey, and the identification of high-density domestic-well areas.

According to the 1990 decadal census, the last year the US Census surveyed drinking-water sources, 464,621 California households, equivalent to 1.2 million people were using domestic well water for their drinking water supply. The rest of the population (29.76 million at the time) relied upon a municipal source of water. The population of California reached 37.25 million in 2010. If the proportion of those using domestic wells is the same as in 1990, then over 1.5 million people obtained drinking water from domestic wells in 2010. The location of the 1.5 million people using domestic well water, prior to the research presented here, has only been aggregated into the geographic boundaries of a census tract, some of which can be quite large in California (up to 19,295 km^2). Simply distributing the population across the entire census tract would be a generalization that does not capture the natural clustering of populations that occurs due to the physical, cultural, and economic geography of the landscape. Therefore a more accurate method of determining the location of households using domestic well water was needed.

The California Department of Water Resources (DWR) keeps records of all types of wells drilled within the state in the form of Well Completion Reports (WCR) which are submitted to DWR by the well-drilling company. Some of these reports are in paper format only, however many have been digitally scanned. These files often contain a single scanned image of the driller's log, but sometimes they also contain a cover page or accompanying material. If a driller's log was included in the WCR, it often described specifics about the well such as the depth of the well, casing perforations, owner, well type (irrigation, domestic, monitoring, etc.), and location. Driller's log information is confidential by state law, making them unavailable to the general public. The USGS was granted access to these scanned images by DWR as part of the GAMA program. In this paper we describe the process by which the USGS georeferenced more than 600,000 WCRs and classified them by their well-type using a spatially-distributed randomized sampling routine.

The purposes of this paper are to present methods used for (1) estimating the location of domestic wells, (2) estimating the location of households using domestic well water; and (3) identifying where in California groundwater is an important source of domestic drinking supply. The locations of these "high use" areas were obtained by aggregating the results at the scale of groundwater basins and highland areas. Highlands areas, as defined by Johnson and Belitz (2014), are areas adjacent to and topographically up-gradient of a groundwater basin. Collectively, groundwater basins and highlands are called Groundwater Units (GUs). A complete list of California Groundwater Units is available for download (Johnson and Belitz, 2014).

2. Methodology

The methodology used in this research incorporated four primary processes: (1a) plotting, sampling, and coding of WCRs, (1b) estimating the location of domestic wells, (2) distributing household population data from the 1990 US Census, and (3) aggregating the results into Groundwater Units. In San Luis Obispo (SLO) County, the scanned WCRs were incomplete. Therefore, a geology dataset and a road-network dataset were used to estimate well locations.

2.1. Plotting, sampling, and coding of well completion reports

Plotting, sampling, and coding of digital WCRs included: geo-referencing the WCRs onto a digital map, attributing each location with the related WCR images, designing a web interface for presenting

spatially-distributed and randomized images to an analyst for recording characteristics of each well, and an approach for obtaining a set of domestic well log images that are representative of the state.

DWR provided 741,262 scanned WCRs to the USGS via external, digital storage devices. DWR estimates there could be one to two million WCRs in total (http://www.water.ca.gov/groundwater/wells.cfm). These reports were in various image formats, mostly JPEG or TIFF. DWR also provided accompanying Excel spreadsheets that listed the pathname to the folder where the image was stored, and the Public Land Surveying System (PLSS) designation. The PLSS designation lists the meridian, township, range, and section, and was used for locating each WCR. No other locational information was provided for each WCR.

The PLSS system in California consists of three meridians: Humboldt, Mt. Diablo, and San Bernardino from which the township and range lines emanate. Each township is approximately 36 miles^2 (6 mi $\times$ 6 mi, 9.65 km by 9.65 km), and is divided into 36 numbered sections. Each section is approximately 1 mile^2 (2.59 km^2). Therefore, if the PLSS section is listed for a WCR, and the center of the section is used as its location, its positional accuracy is $\pm$1137 meters (0.707 miles). Sections are further divided into sixteen portions (1/16 of a section) and designated by an alpha code in the PLSS. If the alpha code is listed for a WCR, it can be located to $\pm$142.25 meters (466.7 feet). The California Department of Pesticide Regulation (2000) provided a digital PLSS dataset for California that extends the PLSS through the old Spanish land grants (where the PLSS does not formally exist) so that the entire state is covered by PLSS sections. The state contains 158,678 PLSS sections in 4692 townships.

A tool was written in Visual Basic programing language that reads the PLSS information from each record in the Excel spreadsheets provided by DWR and plots the point onto a digital map. The point was located in the center of a given section (or 1/16 of a section when an alpha code was provided). In addition to plotting the well on a digital map, the program attributed the point location with the JPEG or TIFF hyperlink so that the WCR images could be viewed onscreen when the point was clicked. The images were stored on an internal server so that they could be accessed through a GIS application, an intranet website, or through a file browser.

A system was needed to determine whether each WCR was domestic or some other use in order to assign the domestic population to only domestic wells. However, it was not practical to open and view all 700,000+ WCRs, so a spatially unbiased, randomized sampling system was designed to facilitate viewing a limited number of WCRs. The system, designed to run on a GIS server, randomly selected one WCR within a given township and displayed the images onscreen through a web-browser interface, collectively known as the "well-log viewer". The analyst would then record what type of WCR they were viewing by examining the driller's log details (domestic, public supply, irrigation, etc.), what type of owner (individual, corporation, etc.) and the date the well was drilled or destroyed. These WCRs were coded "accepted". Depending on the number of wells within that township, the program would continue to display randomly selected WCRs to the analyst until either 10% of the WCRs, or a maximum of 10 were accepted within that township. If there were less than 50 WCRs in the township, the analyst continued to view randomly selected WCRs until 5 were accepted; if there were less than 5 WCRs total, all were viewed. A WCR did not count toward these goals and was considered "rejected" if the well was identified as being destroyed, it was a test or monitoring well, the WCR did not contain a driller's log, or the image hyperlink was broken. If the analyst had viewed 100 WCRs and was not able to successfully code and accept at least 10 valid wells, the township was still considered completed. The analysts continued this process until all townships within the state were accounted for.

A WCR was considered an individually-owned domestic well if the primary use of the well was identified as domestic, the owner was an individual, and the well was not destroyed, or, if it was a destroyed well, it was destroyed after 1990. This date was chosen so that wells that were in existence in 1990 would be included, to better match the 1990 census survey. The date the well was drilled was also recorded when available, but it was not used as a criterion. As a result, some wells that were drilled after 1990 could be included. The decision to include these wells was based upon the desire to capture as many domestic wells as possible that existed from 1990 to present.

2.2. Estimating the location of domestic wells

Estimating the location of domestic wells was accomplished by using the information gathered from the plotting, sampling, and coding of digital WCRs collectively called the "well-log survey". The results from the well-log survey were downscaled from the PLSS township scale to the section scale. The downscaling method assumes that the number of domestic wells in a township is proportional to the number of domestic wells in each section within that township.

For any given township, the number of domestic wells identified by the analysts was divided by the total number of WCRs viewed by the analysts (both accepted and rejected) regardless of well or image type, to create a ratio of domestic wells to WCRs, hereafter called the "township ratio" (TR_t) :

$$TR_t = \frac{DW_t}{WCR_t} \tag{1}$$

where DW_t is the number of identified domestic wells within a township and WCR_t is the number of WCRs viewed within a township. For example, if there were 48 WCRs in a township, seven were rejected, and five were accepted with three being domestic wells, TR_t would equal 0.25 because three of the twelve viewed WCRs were domestic wells.

The township ratio was used to estimate the number of domestic wells per section (DW_s) by multiplying TR_t by the total number of WCRs located in that section (WCR_s);

$$DW_s = TR_t \times WCR_s \tag{2}$$

For example, if a PLSS section contained 15 wells, and the TR_t for the township that the section belonged to was 0.2, then the section would be estimated to contain 3 domestic wells. This process was used to assign each section a number of domestic wells. Finally, the number of domestic wells within a section were divided by the area of the section (the size of each section varied slightly), forming a density (ρW_s);

$$\rho W_s = \frac{DW_s}{A_s} \tag{3}$$

where A_s = total area of the section. This density calculation was then used to aggregate to other geospatial boundaries, such as Groundwater Units, described is Section 2.3.

2.2.1. Using geology as a surrogate

The well-log data provided by DWR was incomplete in San Luis Obispo (SLO) County. Therefore, an alternative method to estimate the distribution of domestic wells in SLO County was developed. The alternative method is based on three observations: (1) the geology of SLO county is comparable to the geology of Monterey County to the north and Santa Barbara County to the south, (2) domestic well density in Monterey and Santa Barbara Counties is correlated with lithology, and (3) domestic wells tend to be located in sections with named roads. For each lithology, we calculated the density of domestic wells (number of wells per km) in Monterey and Santa Barbara Counties (Table A1). These densities were used to estimate the number of wells in each section within SLO County. Additional explanation is provided in the Appendix.

2.3. Distributing household population data from the US Census

The 1990 US Census surveyed households for their "Source of Water" (census question code H023). Possible responses to the survey question included "Public system or private company", "Individual well", or "Some other source". Individual well included wells that were drilled or dug. The Source of Water question was dropped after the 1990 decadal census for unknown reasons and has not been surveyed since.

The Summary Tape File 3 tabular data were downloaded from the US Census website, along with the geographic boundaries of the 1990 census tracts (see http://www2.census.gov/census_1990/1990STF3.html). The tabular data were converted to Excel and then joined to their related census tract polygons in a GIS software package. In total, there were 5568 unique census

tracts in the Excel table. When joined, the total number of households using a domestic well was 464,272.

Distributing the population using domestic supply evenly across a census tract would result in an over-generalized spatial homogeneity of domestic households, especially in the larger census tracts. Census tracts vary from <0.01 km^2 to 20,697 km^2. Instead, we used the estimated number of domestic wells in the PLSS sections within a census tract to distribute the number of households across the census tract. A census ratio (CR_c) was computed for each census tract:

$$CR_c = \frac{DH_c}{DW_c} \tag{4}$$

where DH_c is the reported number of households using domestic-well water within a census tract and DW_c is the sum of the number of domestic wells in the PLSS sections within a census tract. The census ratio was used to assign a number of households to each well within a census tract. In turn, the number of households within each section or other geographical boundaries can be computed (see Section 2.3).

For census tracts that contained households using domestic wells, but did not contain domestic wells according to the well-log survey, the density of households using domestic wells was assumed to be uniform across the census tract.

2.4. Aggregating data to Groundwater Units

Within the GAMA program, groundwater quality is evaluated on a basin scale, and not on a section scale (Belitz et al., 2003). Therefore, we aggregated section-scale estimates of the number of domestic wells and households dependent on groundwater into GUs in order to compare one unit to another. Groundwater Units do not follow exact PLSS section or census tract boundaries lines. Therefore, it was necessary to calculate domestic wells and census households in the sliver polygons formed when GUs intersect these irregular boundaries. This section describes the methodology for aggregating the data into Groundwater Units.

The PLSS sections, the census tract polygons, and the GUs of California (Johnson and Belitz, 2014) were merged to create a composite polygon dataset. The area of each new resulting sliver polygon was calculated. Using this calculated area and the density function for wells within a section (ρW_s) the number of domestic wells per sliver polygon was computed. Similarly, the number of households using domestic well water were also computed for any given boundary. This was accomplished by using the number of domestic wells in a polygon and multiplying it by the CR_c essentially assigning population to only domestic wells where applicable. In essence, the township ratio estimates the number of wells in a section. The census ratio estimates the number of households to assign to each well. In census tracts that did not contain any domestic wells, households were distributed uniformly.

Summing up the domestic wells or households for all the polygons within a given geographic boundary will result in the number of wells or households for that geographic boundary. The number of households were summed for each Groundwater Unit and ranked. Aggregating to Groundwater Units enabled the comparison between units and the ability to differentiate high-use areas and low-use areas.

3. Results and discussion

3.1. Plotting and coding well completion reports and domestic wells

Of the 741,262 WCRs provided by DWR, 635,736 WCRs were geocoded (Fig. 1). Most were located to the center of a 1 mi^2 PLSS section, and some were located to the center of the 1/16th of a section, mostly in the Central Valley. The remaining WCRs could not be geocoded because they were missing or had incomplete PLSS information. San Luis Obispo County can be seen with an absence of plotted WCRs, particularly noticeable at the county margins.

The number of WCRs in each of the 4692 townships ranged from zero to 8212, with an average of 134 WCRs. The spatially distributed, randomized system for selecting a WCR resulted in 41,671

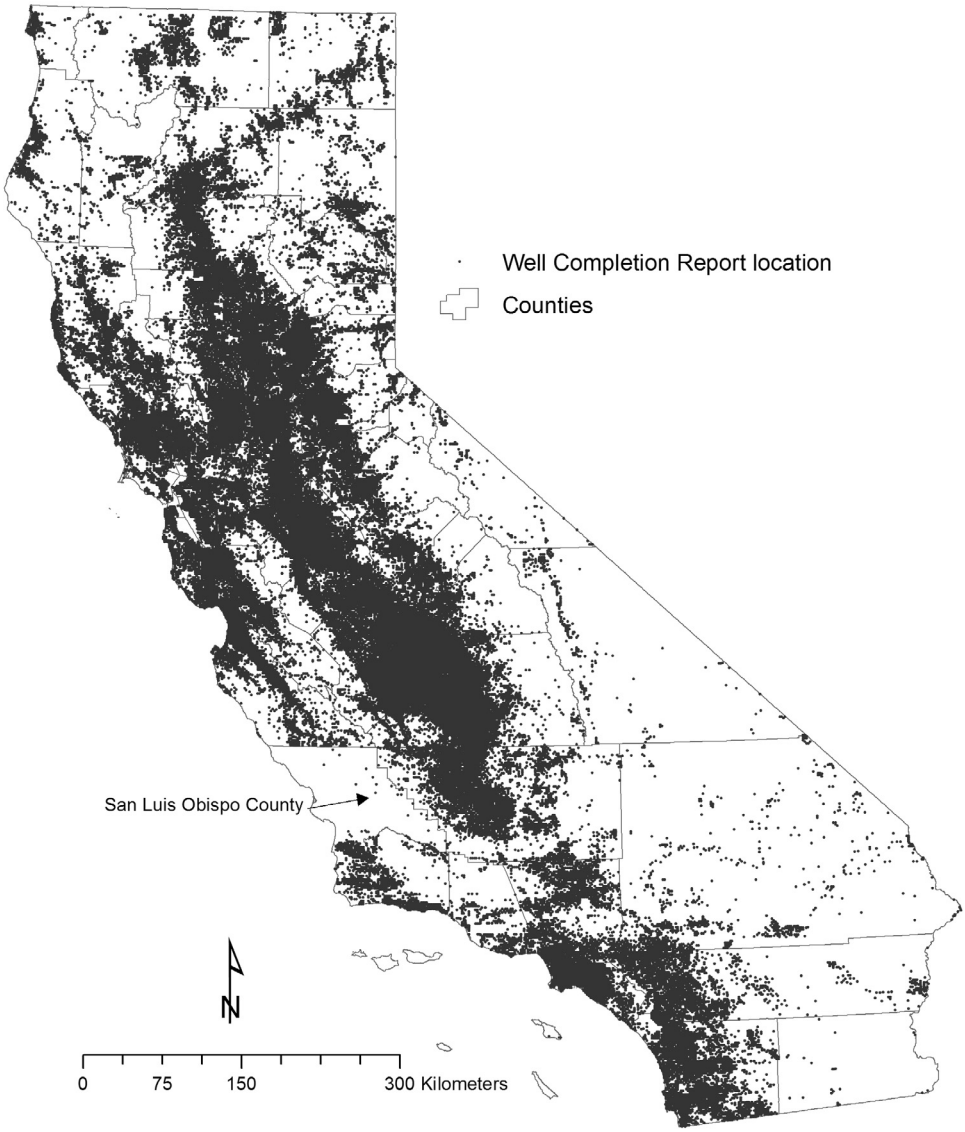

Fig. 1. Well completion reports (WCRs) located using the Public Land Survey System (PLSS). 635,736 WCRs were plotted.

WCRs being viewed, approximately 6% of the total number of WCRs (Fig. 2). The 41,671 WCRs viewed were classified into 9 categories: domestic (13,557), monitoring (8164), irrigation (4257), test (2162), municipal supply (814), industrial (397), stock (307), and other, including cathodic protection and oil and gas (7128). 4885 of the viewed WCRs did not contain a drillers' log. The domestic wells were further subdivided into individually owned wells (10,839) and wells owned by entities such as corporations (2718) on the basis of owner information reported on the WCR. The individually owned domestic wells (Fig. 2) were used in the subsequent analyses and are referred to simply as domestic wells in this paper.

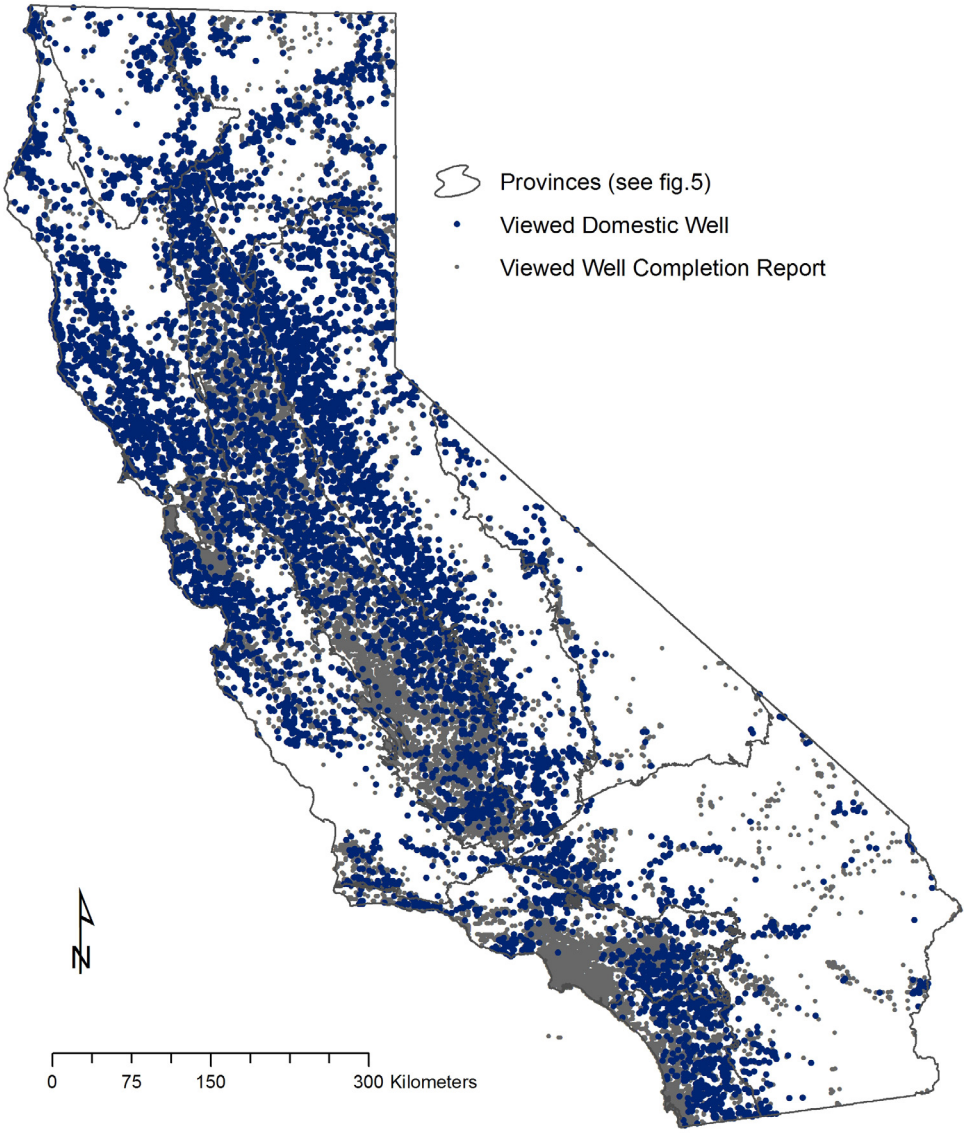

Fig. 2. Analysts viewed 41,671 well completion reports, of which 10,839 were identified as individually owned domestic wells.

The total number of townships with one or more domestic wells was 2369, slightly more than ½ the state's townships, and the township ratio in these townships ranged from 0.01 to 1, with an average value of 0.526 (Fig. 3).

For all counties except for San Luis Obispo County, the number of domestic wells per section was estimated using the township ratio (Eq. (2)) for a total 287,248 domestic wells. For San Luis Obispo County, the number of domestic wells per section was estimated from geology, road networks, and well data from the adjacent counties (see Appendix) bringing the total number of domestic wells in the state to 290,154. The number of domestic wells per section, in sections with domestic wells, varied from 0.01 to 700 (Fig. 4). The estimated number of domestic wells is likely low because not all WCRs in

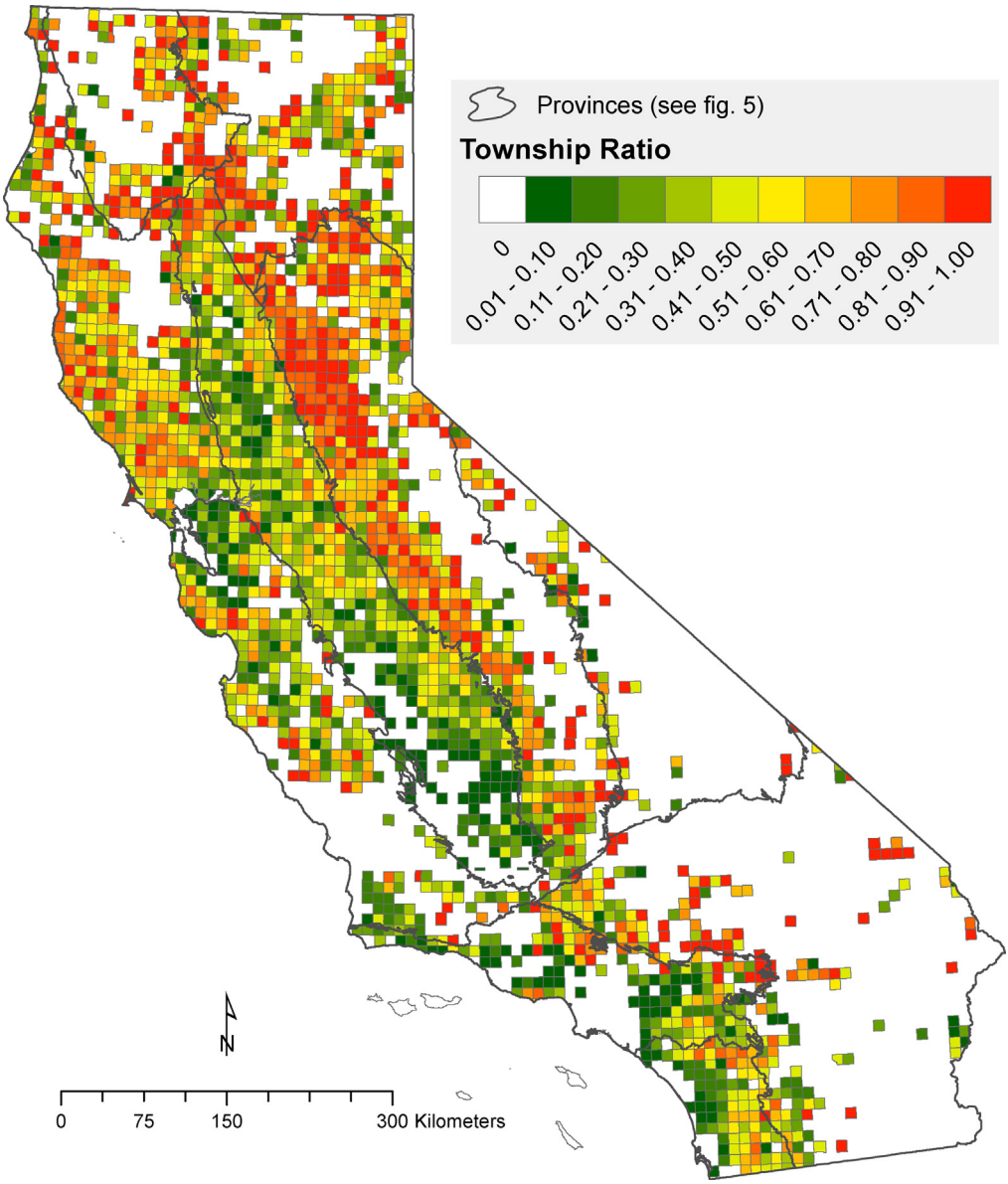

Fig. 3. Number of domestic wells vs. all other viewed wells within each township (Township Ratio).

the state at the time of this research had been scanned and provided to us. However, the distribution of those wells is likely accurate because we use a spatially distributed, randomized sampling approach.

Domestic wells were aggregated into hydrogeologic provinces (Belitz et al., 2003; Johnson and Belitz, 2003) (Table 1, Fig. 5) in order to identify which provinces contain the largest number of domestic wells. Nearly 2/3 of the domestic wells were located in the just two provinces, the Central Valley and Sierra Nevada provinces. The Central Valley, Sierra Nevada, and North Coast Ranges provinces together have nearly 80% of the domestic wells, 88% if one includes the Southern Coast Ranges (Table 1). These four provinces make up only about 40% of the total population of California (2000 US Census).

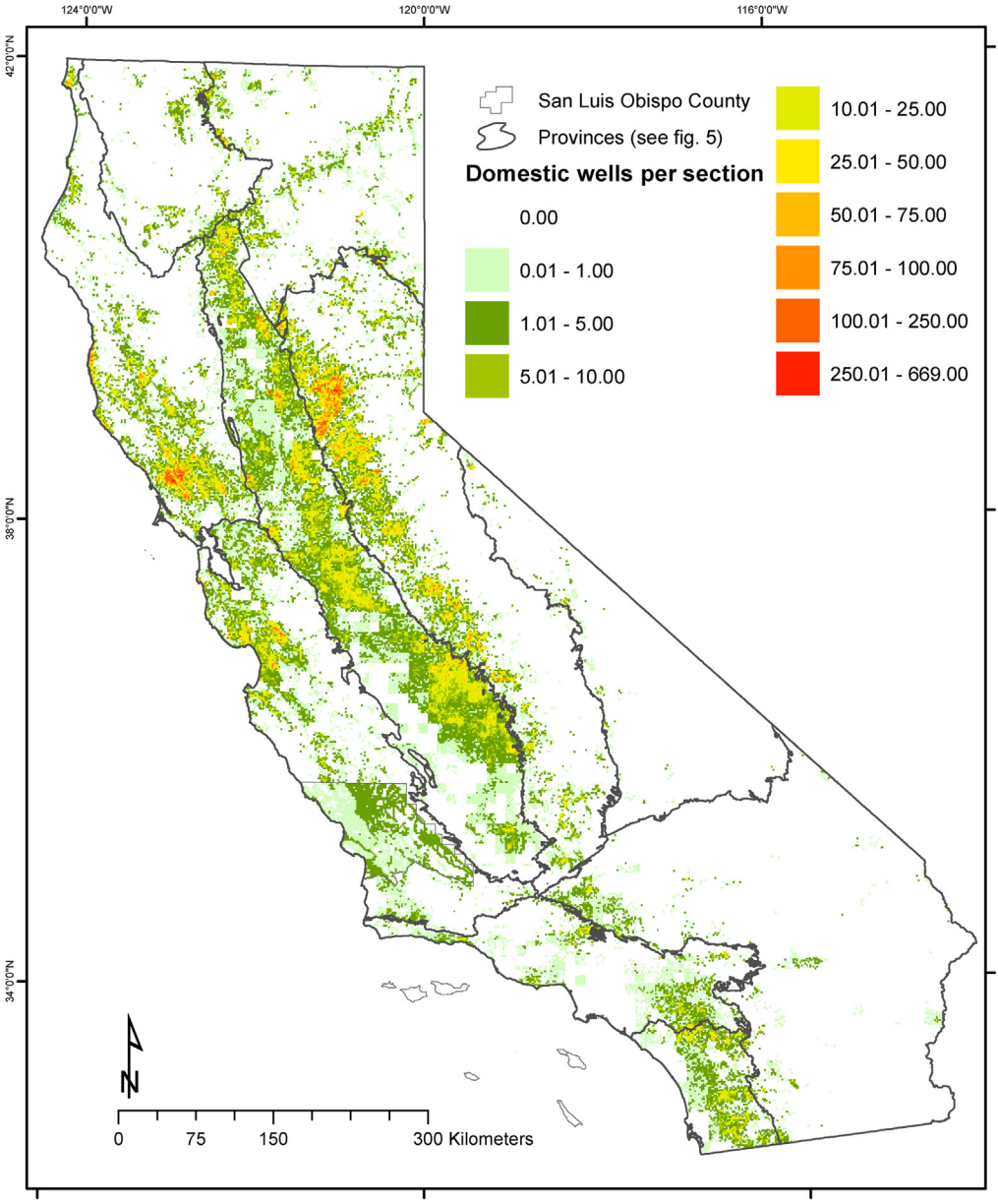

Fig. 4. Number of domestic wells per section estimated using the township ratio or for San Luis Obispo County, surrogate data.

Within the hydrogeologic provinces, one can recognize groundwater basins and highland areas (Fig. 5). A majority of the domestic wells in California (52%) are located in basins, even though 60% of the state consists of highlands (Table 1). Overall, the density of domestic wells in basins (0.94 per km^2) exceeds the density of domestic wells in highland areas (0.56 per km^2). This statewide pattern is also observed at the province-scale: the density of domestic wells in groundwater basins exceeds the density in highlands within each of the state's 10 hydrogeologic provinces (Table 1).

Table 1
Domestic wells in California per hydrogeologic province. Provinces are subdivided into groundwater basins and highland areas.

Hydrogeologic province	Area (km^2)[a]	Percent of area	Number of viewed domestic WCRs	Estimated number of domestic wells[b]	Percent of domestic wells	Density of domestic wells (wells/km^2)
Central Valley – total	52,758	12.9	2156	91,598	31.6	1.74
Groundwater basin	52,692	32.7		91,576	60.5	1.74
Highland	67	0.0		22	0.0	0.33
Sierra Nevada – total	65,891	16.1	2690	91,311	31.5	1.39
Groundwater basin	2095	1.3		3156	2.1	1.51
Highland	63,796	25.7		88,155	63.5	1.38
Northern Coast Ranges – total	37,525	9.2	1694	48,162	16.6	1.28
Groundwater basin	4495	2.8		29,048	19.2	6.46
Highland	32,964	13.3		19,114	13.8	0.58
Southern Coast Ranges – total	42,217	10.3	1067	24,696	8.5	0.58
Groundwater basin	12,747	7.9		15,357	10.1	1.20
Highland	29,456	11.9		9339	6.7	0.32
Modoc Plateau and Cascades – total	39,043	9.5	946	11,457	3.9	0.29
Groundwater basin	7280	4.5		4248	2.8	0.58
Highland	31,759	12.8		7210	5.2	0.23
San Diego – total	9980	2.4	483	9513	3.3	0.95
Groundwater basin	1106	0.7		1757	1.2	1.59
Highland	8872	3.6		7756	5.6	0.87
Transverse and Selected Peninsular Range – total	21,734	5.3	597	6022	2.1	0.28
Groundwater basin	7769	4.8		2610	1.7	0.34
Highland	13,963	5.6		3413	2.5	0.24
Klamath Mountains – total	22,809	5.6	457	3450	1.2	0.15
Groundwater basin	316	0.2		481	0.3	1.52
Highland	22,488	9.1		2970	2.1	0.13
Desert – total	80,979	19.8	574	3269	1.1	0.04
Groundwater basin	56,091	34.8		2640	1.7	0.05
Highland	24,884	10.0		629	0.5	0.03
Basin and Range – total	36,096	8.8	175	675	0.2	0.02
Groundwater basin	16,399	10.2		493	0.3	0.03
Highland	19,694	7.9		182	0.1	0.01
Grand Total	4,09,032	100	10,839	2,90,154	100	0.71
Groundwater basin	160,989	39%		1,51,365	52%	0.94
Highland	247,943	61%		1,38,789	48%	0.56

[a] Subareas may not exactly add up to totals due to scale and rounding errors. Overall, error is less than 0.025%.
[b] Calculated using the Township Ratio except in San Luis Obispo County (located in the Southern Coast Ranges) where the geology based method was used. Seventy additional domestic wells were estimated to be located in either the Catalina Islands or not in a province. The estimated number of domestic wells is likely low because not all WCRs had been scanned. However, the distribution of those wells is likely accurate because we use a spatially distributed, randomized sampling approach.

Of the 151,365 domestic wells located in groundwater basins, 60.5% are located in the basins of the Central Valley (Table 1). The Central Valley contains a large proportion of the area mapped as basins (32.7%) and has a relatively high density of domestic wells in basins (1.74 per km^2). Of the 138,789 domestic wells located in highland areas, 63.5% are located within the highlands of the Sierra Nevada. The Sierra Nevada contains a large proportion of the area mapped as highlands (25.7%). The Sierra Nevada province also has the highest density of domestic wells in highland areas (1.38 per km^2). The highest density of domestic wells for either highland areas or groundwater basins occurs in the groundwater basins of the Northern Coast Ranges (6.46 per km^2) with over 29,000 domestic

Fig. 5. Hydrogeologic provinces of California (Johnson and Belitz, 2003). Groundwater basins and Highlands shown (Johnson and Belitz, 2014).

wells (19.2% of the state total) yet only in 2.8% of the total state area mapped as groundwater basins (Table 1).

3.2. Distributing household population data from the US Census

The number of households using domestic well water in each census tract ranged from 0 to 2946 (Fig. 6). As expected, many of the urban areas have few households using a domestic well, because most

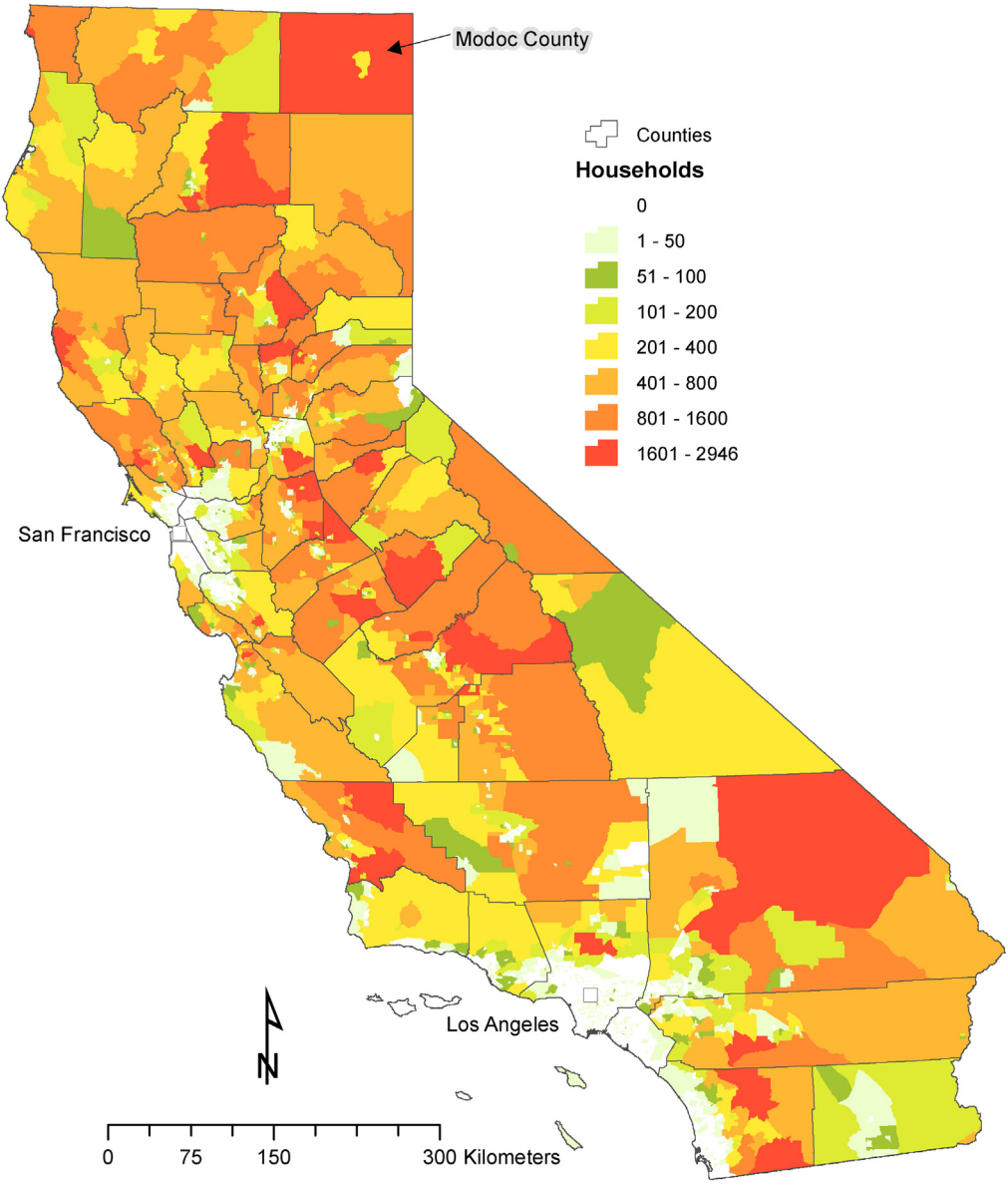

Fig. 6. Number of households per census tract using a domestic well for drinking water source (1990 US Census question code H023: Source of Water, reported as "Individual Well").

large cities have municipal supply systems in place. Conversely, some of the rural areas, especially the larger census tracts, have high numbers of households using domestic wells; a result of the size of the census tract and the fact that rural areas are often not served by municipal supply.

Fig. 7 shows the results of combining the location and numbers of domestic wells in California (Fig. 4) with the number of households using domestic well water (Fig. 6), aggregating the results to a PLSS section. Combining the data results in much greater precision in the locations of households served by domestic wells compared to the precision based on census data alone. For example, the Modoc County census tract in the NE corner of the state contains a high number of households served

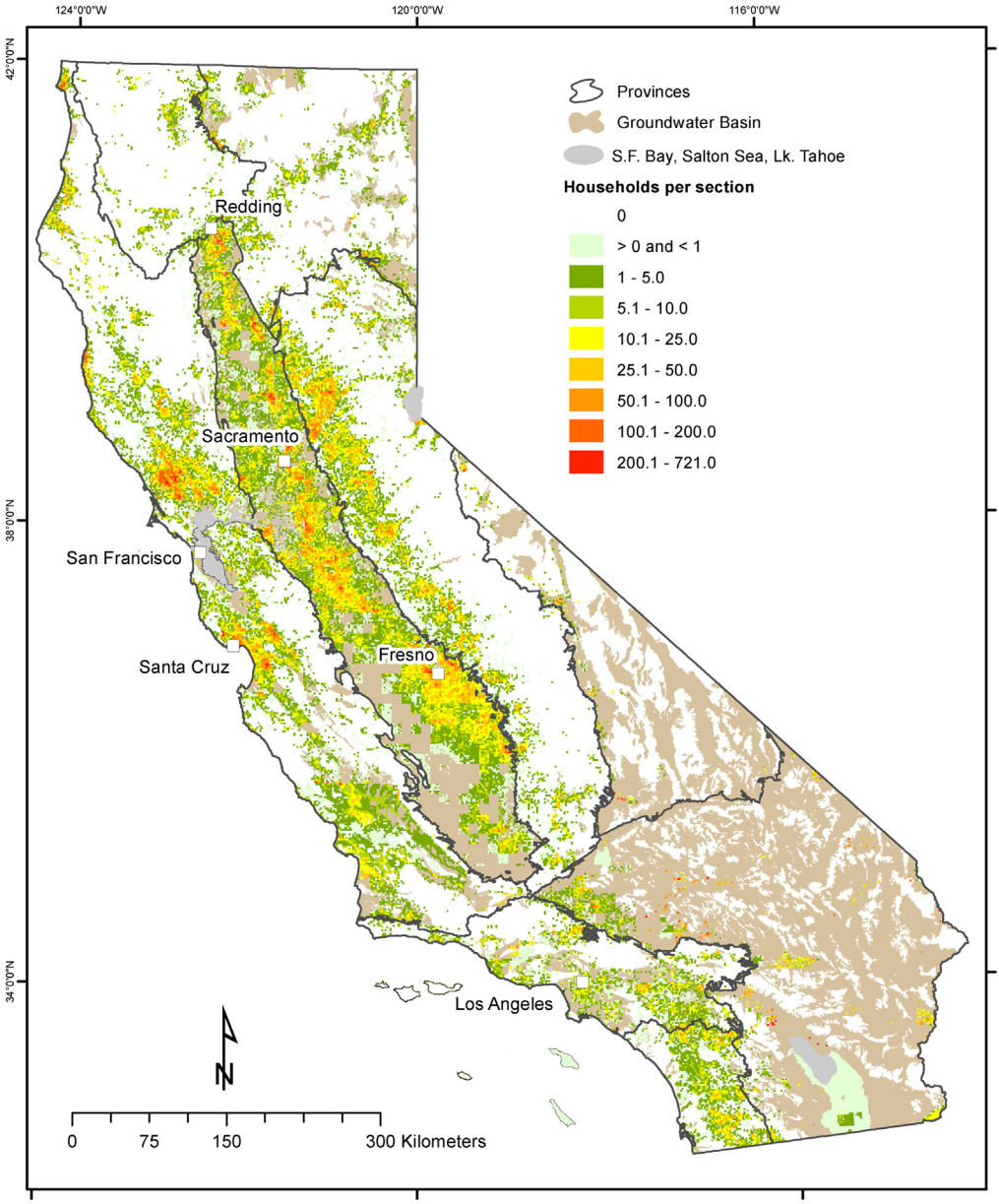

Fig. 7. Number of households per PLSS section using an individually owned domestic well as a source of drinking water.

by domestic wells (Fig. 6). The greater resolution afforded by combining the census and well location data reveals that these households are located in clusters, and that most of the County contains no households using domestic wells (Fig. 7). Areas with high numbers of households dependent on domestic well water can be seen north of San Francisco, near Santa Cruz, Redding, Fresno, portions of the Central Valley, and in the western foothills of the Sierra Nevada mountain range (Fig. 7).

There were 350 census tracts that had no domestic wells based upon the well-log survey, however households were reported as using domestic-well water according to the Census. In these census tracts, the population was assumed to be uniformly distributed across the entire census tract. Many

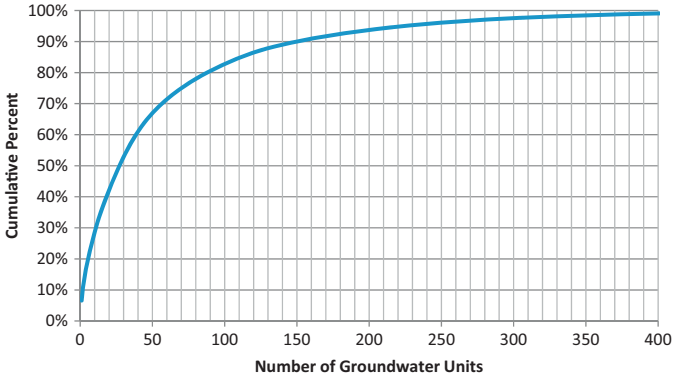

Fig. 8. Cumulative percentage graph of the number of Groundwater Units (GUs) ranked by households served (household data from 1990 US Census). Only the first 400 GUs shown.

of the sections in these census tracts have a value for the number of households using domestic wells of less than 1 (Fig. 7).

3.3. Ranking Groundwater Units by households served

Johnson and Belitz (2014) identified 938 Groundwater Units (GUs) in California. Twenty-eight GUs, less than 3% of the total, contain more than 50% of the total population served by domestic wells (Fig. 8, Table A2). Seventy GUs contain more than 75%, 150 GUs contain 90%, and 224 GUs contain more than 95% of the total population served by domestic wells. An additional 518 GUs make up the remaining 5%. One hundred and ninety-six GUs do not contain any households served by domestic wells.

For the purposes of mapping, five classes of GUs were identified: those GUs that collectively account for 50% of the households dependent on domestic wells (Class 1); those that account for an additional 25% of the households, bringing the cumulative total up to 75% (Class 2); those that account for an additional 15%, bringing the cumulative total up to 90% (Class 3); those that account for an additional 5%, bringing the cumulative total to 95% (Class 4); and the remaining GUs that account for the remaining 5% (Class 5). Fig. 9 shows the Groundwater Units by their class. A sixth class of GUs – those that do not contain households served by domestic wells – is shown by outline only. This information was used to identify areas of high domestic-well use; which are being targeted for sampling and assessment. A complete listing of all GUs and their ranking can be found in the Appendix (Table A2). The GU with the most domestic-well users is the Kings groundwater basin in the Central Valley, with more than 30,000 households using domestic wells. The second largest number occurs in the Eastern San Joaquin groundwater basin with nearly 20,000 households. The third largest is the North American Highlands with more than 16,000 users (Table A2).

3.4. Limitations in the data

The primary limitation of this work is the scale at which it was developed; therefore, there are limitations on the scale at which the results can be used. The statistical sampling of WCRs and computation of the "township ratio" were for townships (36 miles^2, 93.2 km^2). These ratios were then used to estimate the number of domestic wells at the scale of square-mile sections (2.59 km^2). In turn, the estimated section-scale distribution of wells was used to distribute the number of households dependent on domestic wells. The data for the number of households was from 1990 US Census tract data; the census tracts ranged in size from <004 mi^2 to 7450 mi^2 (<0.01 km^2 to 19,295 km^2), with an average of 26.5 mi^2 (68.6 km^2). The processing of these data resulted in some inconsistencies between our estimates of where the domestic wells are located and where the US Census indicates the households dependent on domestic wells are located. These inconsistencies can be classified into two types: (1) tracts where the 1990 US Census indicates at least one household dependent on domestic wells,

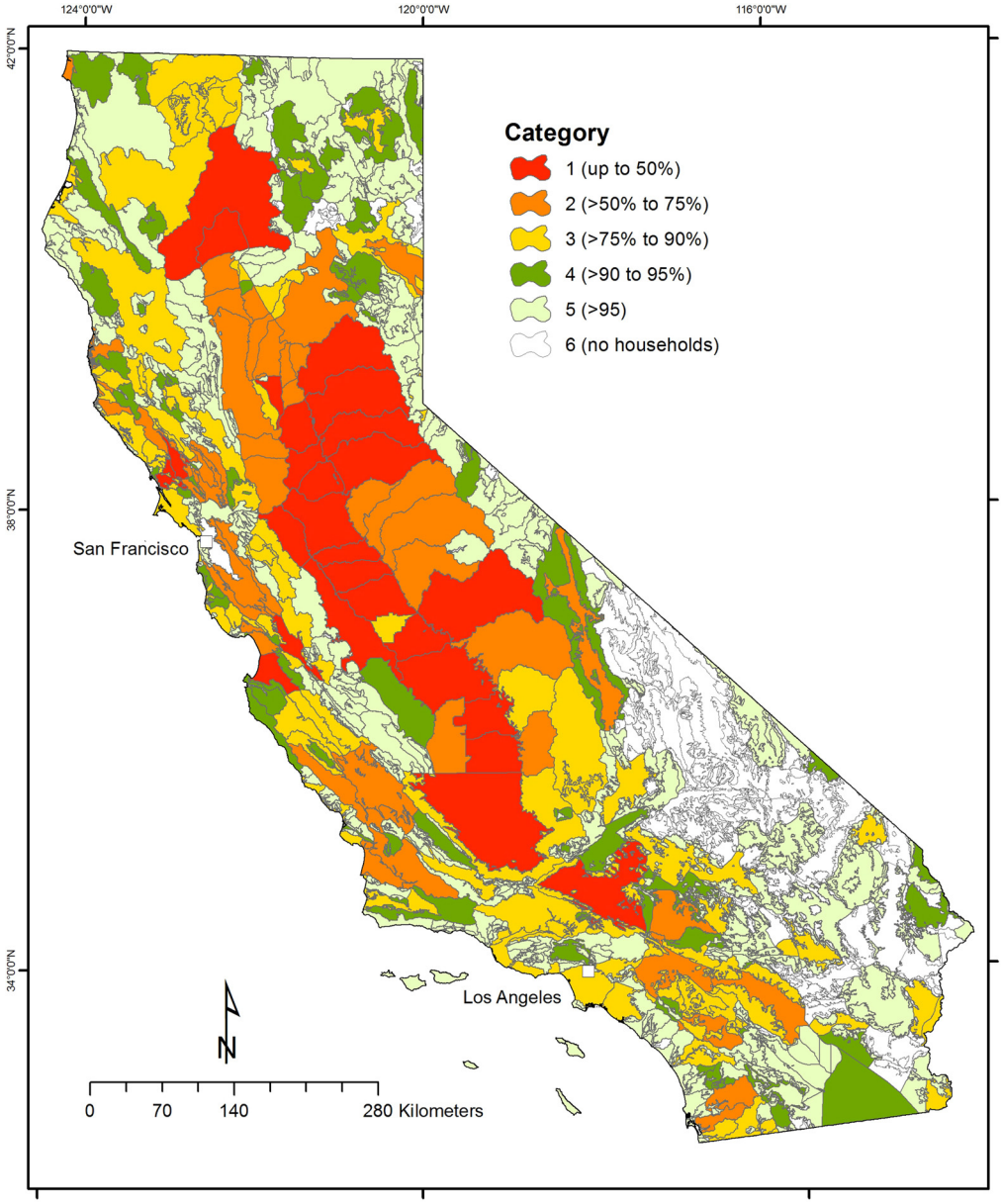

Fig. 9. Groundwater Units classified by category. Categories represent the cumulative percentage of the number of households served by domestic wells. Household data from 1990 US Census.

but where we estimate zero domestic wells; and (2) census tracts with no households dependent on domestic wells but where we estimate there to be at least one domestic well.

There are 350 census tracts (of 5568 total) classified as type 1 (tracts with households but no domestic wells). Many of these census tracts are located in urban areas where there are hundreds or thousands of WCRs, largely because of the large number of monitoring wells and cathodic protection wells. After viewing 100 WCRs in a township, the analyst was directed to stop. Due to the small number

of domestic wells compared to other wells located in the urban environment (287 of the 350 census tracts have less than 21 households dependent on domestic wells), the domestic well-log-survey may have missed them.

The 350 census tracts classified as type 1 contain a total of 5845 households dependent on domestic wells (1990 US Census), which is 1.3% of the total number for the state. The total area of these census tracts is 4795 km^2, which is 1.2% of the total area of the State. The average size of the 350 census tracts was 13.7 km^2, which is larger than a section (2.78 km^2), but smaller than a township (93 km^2) and smaller than the size of the average Groundwater Unit (439 km^2). In each of the 350 census tracts, we distributed the number of households uniformly across the census tract. The net result is a smoothing of the distribution of households at the scale of sections, but in a relatively small proportion of the State.

There are 849 census tracts (of 5568 total) classified at type 2 (tracts without households, but contain domestic wells). These 849 census tracts contain 7471 domestic wells, which is 2.6% of the total that we estimate for the State. The total area for these census tracts is 5519 km^2, which is 1.3% of the total area for the State. The average size of these census tracts was 6.5 km^2, which is larger than a section (2.78 km^2), but is smaller than a township (93 km^2) and smaller than the average Groundwater Unit (439 km^2). In these census tracts, no households were assigned to any wells. The identification of domestic wells in tracts where the US Census indicates no households suggests that our method for locating wells may disperse them over a wider area than which they actually occur. This smoothing would be a consequence of conducting the well-log survey at the scale of townships, and applying the township-ratio at the scale of sections. The net effect is that the mapped distributions of domestics wells (Fig. 4) and households dependent on domestic wells (Fig. 7) may be smoother than the actual distributions.

Given the scale of the inconsistencies between the estimated locations of domestic wells and the 1990 census of households dependent on domestic wells, we conclude that the map showing the distribution of households dependent on domestic wells (Fig. 7) may have inaccuracies at the scale of sections, but is likely to be robust at the scales of townships and Groundwater Units.

4. Conclusion

In total 635,736 WCRs were plotted, 41,671 were viewed and 10,839 were identified as individually-owned domestic wells. A township ratio was computed for 4692 townships and applied to each of the 158,678 sections in California. Geology was used as a surrogate in SLO County because of the lack of scanned WCRs. Adding the estimated number of domestic wells from the township ratio method and from the geology based method together, we calculate there to be 290,154 domestic wells in the state, 52% located in groundwater basins, 48% located in highland areas. The estimated number of domestic wells is likely low because not all WCRs in the state had been digitally scanned. However, the distribution of those wells is likely accurate because we use a spatially distributed, randomized approach. Three provinces contain nearly 80% of all domestic wells and also had the highest density: Central Valley (31.6%), Sierra Nevada (31.5%), and Northern Coast Ranges (16.6%).

The 1990 US Census reports more than 464,000 households using domestic well water in the state (the last decadal census where "Source of Water" was surveyed. If household domestic users increased at the same rate as did population (25%) from 1990 to 2010, then the estimated number of households using domestic water is 581,000 in 2010. The average household size in 2010 was 2.72 (2010 US Census), equating to more than 1.5 million people using domestic well water in the State of California.

The number of households within a census tract using domestic well water was proportionally assigned to domestic well locations. The total number of domestic users did not change for any census tract, only their spatial locations. This redistribution provides a more precise representation of the actual location of domestic well users. Aggregating the number of households into 938 Groundwater Units allowed the identification of GUs with a large number of domestic well users.

Twenty-eight GUs (3% of the total number of GUs) contain more than 50% of the total population served, 70 GUs contain more than 75%, 150 GUs contain 90%, and 224 GUs contain more than 95% of the total population served by domestic wells. The top three GUs with the most domestic well users are the Kings groundwater basin in the Central Valley (30,000 households), the Eastern San Joaquin groundwater basin (20,000 households), and the North American Highlands (16,000 households) (Table A2).

Using the information presented in this research along with other information about domestic well use, the USGS has begun sampling high-use GUs for the Shallow Aquifer Assessment component of the GAMA program (USGS, 2013). This sampling will help assess and monitor the quality of groundwater resources used for drinking-water supplies for the domestic-well users in these areas. The feasibility for other states to implement the methodology presented here depends on the availability of driller's logs in a readily accessible and indexed format. In addition, some method of geocoding the logs is necessary as the PLSS system may not be available in every state. We also used the PLSS system for computing the township ratio; however other regularized grids could presumably be used. Lastly, a method for viewing well logs systematically would be needed. We anticipated viewing tens of thousands of logs, so the additional cost and expertise of designing a web-based approach was justified. However, with a smaller number of logs, other traditional viewing approaches could be used.

Conflict of interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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Appendix A.

A.1. Geology as a surrogate for WCRs in SLO County

Geology was used as a surrogate for estimating the number and location of domestic wells within San Luis Obispo County, because of a lack of WCRs provided by DWR. In the neighboring counties to the north and south, the density of domestic wells was calculated for each lithology (Table A1). The lithology that occurred in SLO County was given the average density of domestic wells within the two neighboring counties for the same lithology.

Table A1
Estimated number of domestic wells per lithology for Monterey and Santa Barbara Counties. Totals are summarized for all PLSS sections and for those sections with a named street.

Lithology	All sections			Sections with a named street		
	Area (km)	Domestic wells	Density (wells/km)	Domestic wells	Area (km)	Density (wells/km)
Quaternary alluvium	2905.3	3661	1.26	3565	2577.3	1.38
Quaternary other sediment	222.0	161	0.73	155	189.2	0.82
Tertiary nonmarine sediment	271.1	137	0.51	131	170.7	0.77
Plio-Pleistocene sediment	1781.6	653	0.37	617	1107.4	0.56
Granitic rocks	1135.5	368	0.32	342	635.3	0.54
Water	51.7	16	0.31	13	26.1	0.51
Tertiary marine sediment	5698.3	1219	0.21	1099	3114.6	0.35
Metamorphic other	1041.3	101	0.10	84	399.7	0.21
Tertiary, mafic volcanics	35.1	3	0.09	2	17.6	0.13
Metasediment	1376.7	80	0.06	67	630.5	0.11
Franciscan complex	545.3	20	0.04	18	340.5	0.05
Ultramafic/mafic	128.9	3	0.02	1	68.4	0.02
Pyroclastic volcanics	2.3	0	0.00	0	1.0	0.00
Grand Total	15,195.2	6423	0.42	6094	9278	0.66

Table A2
Groundwater Units of California ranked by the number of households served by domestic well water. Household data from 1990 US Census.

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
5-22.08	Kings	Groundwater Basin	3949.0	5-22.08	30,640.4	1	6.6%	1
5-22.01	Eastern San Joaquin	Groundwater Basin	2861.8	5-22.01	19,768.4	2	10.8%	1
Hgb-5-21.64	North American Highlands	Highland area – Groundwater Basin	3816.6	5-21.64	16,159.6	3	14.3%	1
1-55	Santa Rosa Valley	Groundwater Basin	409.1	1-55	11,922.2	4	16.8%	1
5-22.03	Turlock	Groundwater Basin	1404.6	5-22.03	10,243.6	5	19.0%	1
5-22.11	Kaweah	Groundwater Basin	1802.6	5-22.11	9586.8	6	21.1%	1
5-6	Redding Area	Groundwater Basin	1579.3	5-6	9423.8	7	23.1%	1
1-59	Wilson Grove Formation Highlands	Groundwater Basin	349.9	1-59	8577.2	8	25.0%	1
Hgb-5-22.06	Madera highlands	Highland area – Groundwater Basin	6074.8	5-22.06	8536.8	9	26.8%	1
Hgb-5-22.16	Cosumnes Highlands	Highland area – Groundwater Basin	3535.0	5-22.16	8333.6	10	28.6%	1
5-22.04	Merced	Groundwater Basin	1987.2	5-22.04	7675.6	11	30.2%	1
Hgb-5-21.61	South Yuba Highlands	Highland area – Groundwater Basin	3733.2	5-21.61	7427.2	12	31.8%	1
5-22.02	Modesto	Groundwater Basin	997.5	5-22.02	6940.7	13	33.3%	1
5-22.15	Tracy	Groundwater Basin	1396.2	5-22.15	6829.6	14	34.8%	1
5-21.62	Sutter	Groundwater Basin	531.6	5-21.62	6024.5	15	36.1%	1
5-22.14	Kern County	Groundwater Basin	7871.9	5-22.14	5855.0	16	37.3%	1
5-22.16	COSUMNES	Groundwater Basin	1135.3	5-22.16	5806.7	17	38.6%	1
5-21.64	North American	Groundwater Basin	1377.1	5-21.64	5665.7	18	39.8%	1
3-3	Gilroy-Hollister Valley	Groundwater Basin	744.5	3-3	5655.7	19	41.0%	1
5-21.65	South American	Groundwater Basin	1002.9	5-21.65	5575.9	20	42.2%	1
5-22.06	Madera	Groundwater Basin	1590.8	5-22.06	5379.5	21	43.3%	1
3-4.1	180/400 foot Aquifer; East side Aquifer; Seaside Area; Langley Area; Corral de Tierra Area	Groundwater Basin	831.2	3-4.01; 3-4.02; 3-4.08; 3-4.09; 3-4.10	5211.8	22	44.5%	1
5-22.13	Tule	Groundwater Basin	1898.0	5-22.13	5153.7	23	45.6%	1
Hgb-5-21.65	South American Highlands	Highland area – Groundwater Basin	2469.1	5-21.65	5069.2	24	46.7%	1
6-44	Antelope Valley	Groundwater Basin	4088.4	6-44	4960.7	25	47.7%	1
5-22.07	Delta-Mendota	Groundwater Basin	3021.3	5-22.07	4959.2	26	48.8%	1
Hgb-5-6	Redding Area Highlands	Highland area – Groundwater Basin	8237.2	5-6	4852.1	27	49.8%	1

							Cumulative percent	
5-21.52	Colusa	Groundwater Basin	3716.6	5-21.52	4796.7	28	50.9%	2
Hgb-2-2	Napa-Sonoma Valley Highlands	Highland area – Groundwater Basin	888.6	2-2	4444.5	29	51.8%	2
2-2	Napa-Sonoma Valley	Groundwater Basin	530.4	2-2	4438.5	30	52.8%	2
5-21.66	Solano	Groundwater Basin	1720.1	5-21.66	4428.5	31	53.7%	2
3-2	Pajaro Valley	Groundwater Basin	356.6	3-2	4271.5	32	54.6%	2
3-4.06	Paso Robles Area	Groundwater Basin	2415.7	3-4.06	4250.2	33	55.5%	2
Hgb-5-22.03	Turlock Highlands	Highland area – Groundwater Basin	4077.3	5-22.03	4147.0	34	56.4%	2
8-2	Upper Santa Ana Valley	Groundwater Basin	1932.3	8-2	3798.2	35	57.2%	2
5-21.57	Vina	Groundwater Basin	504.5	5-21.57	3638.0	36	58.0%	2
5-22.12	Tulare Lake	Groundwater Basin	2119.9	5-22.12	3525.4	37	58.8%	2
5-21.59	East Butte	Groundwater Basin	1074.2	5-21.59	3501.9	38	59.5%	2
Hgb-5-22.08	Kings Highlands	Highland area – Groundwater Basin	4984.4	5-22.08	3412.8	39	60.3%	2
5-21.50	Red Bluff	Groundwater Basin	1079.3	5-21.50	3390.8	40	61.0%	2
5-21.51	Corning	Groundwater Basin	832.1	5-21.51	3250.8	41	61.7%	2
7-21	Coachella Valley	Groundwater Basin	1963.6	7-21	3061.3	42	62.3%	2
Hgb-5-22.04	Merced Highlands	Highland area – Groundwater Basin	2684.6	5-22.04	2990.6	43	63.0%	2
Hgb-5-21.59	East Butte Highlands	Highland area – Groundwater Basin	4416.5	5-21.59	2963.4	44	63.6%	2
6-42	Upper Mojave River Valley	Groundwater Basin	1670.7	6-42	2724.3	45	64.2%	2
5-21.67	Yolo	Groundwater Basin	913.9	5-21.67	2695.9	46	64.8%	2
Hgb-9-15	San Diego River Valley Highlands	Highland area – Groundwater Basin	977.8	9-15	2532.4	47	65.3%	2
6-4	Honey Lake Valley	Groundwater Basin	1260.9	6-4	2472.5	48	65.9%	2
Hgb-5-21.60	North Yuba Highlands	Highland area – Groundwater Basin	418.6	5-21.60	2457.3	49	66.4%	2
1-1	Smith River Plain	Groundwater Basin	163.8	1-1	2440.4	50	66.9%	2
Hgb-1-55	Santa Rosa Valley Highlands	Highland area – Groundwater Basin	730.5	1-55	2408.8	51	67.4%	2
3-12	Santa Maria	Groundwater Basin	745.3	3-12	2392.0	52	67.9%	2
Hgb-9-5	Temecula Valley Highlands	Highland area – Groundwater Basin	894.4	9-5	2305.8	53	68.4%	2
3-21	Santa Cruz Purisima Formation	Groundwater Basin	162.6	3-21	2230.4	54	68.9%	2
Hgb-5-22.01	Eastern San Joaquin Highlands	Highland area – Groundwater Basin	1312.3	5-22.01	2139.0	55	69.4%	2
1-21	Fort Bragg Terrace Area	Groundwater Basin	97.5	1-21	1899.8	56	69.8%	2
5-21.58	West Butte	Groundwater Basin	734.8	5-21.58	1894.8	57	70.2%	2

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-9-17	Sweetwater Valley Highlands	Highland area – Groundwater Basin	557.8	9-17	1884.9	58	70.6%	2
2-9	Santa Clara Valley	Groundwater Basin	1470.5	2-9	1880.8	59	71.0%	2
Hgb-3-4.06	Paso Robles Area Highlands	Highland area – Groundwater Basin	2366.8	3-4.06	1839.7	60	71.4%	2
Hgb-2-9	Santa Clara Valley Highlands	Highland area – Groundwater Basin	1395.3	2-9	1818.4	61	71.8%	2
Hgb-5-22.02	Modesto Highlands	Highland area – Groundwater Basin	2797.6	5-22.02	1788.5	62	72.2%	2
Hgb-1-21	Fort Bragg Terrace Area Highlands	Highland area – Groundwater Basin	798.3	1-21	1748.2	63	72.5%	2
5-21.60	North Yuba	Groundwater Basin	417.6	5-21.60	1722.1	64	72.9%	2
Hgb-5-22.13	Tule Highlands	Highland area – Groundwater Basin	1718.3	5-22.13	1716.1	65	73.3%	2
Hgb-3-12	Santa Maria Highlands	Highland area – Groundwater Basin	2122.4	3-12	1684.1	66	73.6%	2
6-12	Owens Valley	Groundwater Basin	2675.0	6-12	1627.3	67	74.0%	2
2-1	Petaluma Valley	Groundwater Basin	186.5	2-1	1610.1	68	74.3%	2
5-21.61	South Yuba	Groundwater Basin	423.0	5-21.61	1585.6	69	74.7%	2
Hgb-8-5	San Jacinto Highlands	Highland area – Groundwater Basin	833.8	8-5	1545.7	70	75.0%	3
1-4	Shasta Valley	Groundwater Basin	792.9	1-4	1516.9	71	75.3%	3
4-11	Coastal Plain of Los Angeles	Groundwater Basin	1274.2	4-11	1474.4	72	75.6%	3
4-4	Santa Clara River Valley	Groundwater Basin	775.4	4-4	1398.0	73	75.9%	3
Hgb-3-50	Felton Area Highlands	Highland area – Groundwater Basin	268.3	3-50	1397.1	74	76.2%	3
1-10	Eel River Valley	Groundwater Basin	298.4	1-10	1364.0	75	76.5%	3
5-22.05	Chowchilla	Groundwater Basin	644.4	5-22.05	1350.7	76	76.8%	3
Hgb-5-22.11	Kaweah Highlands	Highland area – Groundwater Basin	2304.5	5-22.11	1337.1	77	77.1%	3
Hgb-4-4	Santa Clara River Valley Highlands	Highland area – Groundwater Basin	3022.3	4-4	1328.2	78	77.4%	3
Hp-1.3	Northern Coast Ranges – Southern Coast	Highland area – Province	1122.5	None	1320.5	79	77.7%	3
Hgb-5-22.14	Kern County Highlands	Highland area – Groundwater Basin	4522.9	5-22.14	1318.5	80	78.0%	3
5-21.54	Antelope	Groundwater Basin	75.7	5-21.54	1297.6	81	78.2%	3
3-15	Santa Ynez River Valley	Groundwater Basin	827.5	3-15	1284.4	82	78.5%	3

							Cumulative percent	
Hgb-1-7	Hoopa Valley Highlands	Highland area – Groundwater Basin	5663.8	1-7	1255.4	83	78.8%	3
Hgb-1-54	Alexander Valley Highlands	Highland area – Groundwater Basin	772.2	1-54	1220.1	84	79.1%	3
Hgb-3-3	Gilroy-Hollister Valley Highlands	Highland area – Groundwater Basin	1640.4	3-3	1210.7	85	79.3%	3
9-5	Temecula Valley	Groundwater Basin	355.1	9-5	1180.8	86	79.6%	3
6-47	Harper Valley	Groundwater Basin	1657.2	6-47	1134.2	87	79.8%	3
8-5	San Jacinto	Groundwater Basin	758.3	8-5	1122.1	88	80.1%	3
Hgb-8-2	Upper Santa Ana valley Highlands	Highland area – Groundwater Basin	1333.6	8-2	1107.5	89	80.3%	3
7-32	Chocolate Valley	Groundwater Basin	522.5	7-32	1080.9	90	80.5%	3
1-8	Mad River Valley	Groundwater Basin	160.2	1-8	1076.5	91	80.8%	3
Hgb-1-59	Wilson Grove Formation Highlands	Highland area – Groundwater Basin	131.1	1-59	1072.7	92	81.0%	3
6-54	Indian Wells Valley	Groundwater Basin	1544.7	6-54	1067.4	93	81.2%	3
Hgb-5-30	Lower Lake Valley Highlands	Highland area – Groundwater Basin	415.5	5-30	1060.9	94	81.4%	3
Hp-7.1	Southern Coast Ranges – Santa Cruz/Half Moon Bay	Highland area – Province	379.2	None	1046.2	95	81.7%	3
6-40	Lower Mojave River Valley	Groundwater Basin	1155.3	6-40	1045.5	96	81.9%	3
Hgb-1-16	Seiad Valley Highlands	Highland area – Groundwater Basin	2600.5	1-16	1035.0	97	82.1%	3
Hgb-5-21.66	Solano Highlands	Highland area – Groundwater Basin	1096.1	5-21.66	1034.6	98	82.3%	3
Hgb-6-44	Antelope Valley Highlands	Highland area – Groundwater Basin	1700.5	6-44	997.6	99	82.5%	3
Hgb-1-60	Lower Russian River Valley Highlands	Highland area – Groundwater Basin	394.1	1-60	994.1	100	82.8%	3
Hgb-3-21	Santa Cruz Purisima Formation Highlands	Highland area – Groundwater Basin	108.9	3-21	984.2	101	83.0%	3
5-15	Big Valley	Groundwater Basin	98.1	5-15	968.5	102	83.2%	3
3-4.2	Forebay Aquifer; Upper Valley Aquifer	Groundwater Basin	778.0	3-4.04; 3-4.05	966.2	103	83.4%	3
7-39	Palo Verde Mesa	Groundwater Basin	910.2	7-39	956.0	104	83.6%	3
5-2	Alturas Area	Groundwater Basin	737.1	5-2	949.3	105	83.8%	3
1-54	Alexander Valley	Groundwater Basin	125.5	1-54	946.8	106	84.0%	3
Hgb-9-7	San Luis Rey Valley Highlands	Highland area – Groundwater Basin	837.2	9-7	917.2	107	84.2%	3

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
7-19	Lucerne Valley	Groundwater Basin	596.6	7-19	892.9	108	84.4%	3
Hp-9.3	San Diego Drainages – South San Diego	Highland area – Province	695.7	None	869.2	109	84.6%	3
8-1	Coastal Plain of Orange County	Groundwater Basin	899.1	8-1	863.8	110	84.8%	3
1-52	Ukiah Valley	Groundwater Basin	151.9	1-52	842.1	111	84.9%	3
7-10	Twentynine Palms Valley	Groundwater Basin	252.0	7-10	835.6	112	85.1%	3
Hgb-7-21	Coachella Valley Highlands	Highland area – Groundwater Basin	2159.9	7-21	817.7	113	85.3%	3
Hgb-5-21.58	West Butte Highlands	Highland area – Groundwater Basin	291.2	5-21.58	797.2	114	85.5%	3
1-5	Scott River Valley	Groundwater Basin	258.3	1-5	788.8	115	85.6%	3
5-14	Scotts Valley	Groundwater Basin	29.6	5-14	763.1	116	85.8%	3
7-9	Dale Valley	Groundwater Basin	860.1	7-9	761.3	117	86.0%	3
5-25	Kern River Valley	Groundwater Basin	321.3	5-25	754.6	118	86.1%	3
Hgb-5-21.57	Vina Highlands	Highland area – Groundwater Basin	666.3	5-21.57	753.2	119	86.3%	3
Hgb-6-4	Honey Lake Valley Highlands	Highland area – Groundwater Basin	1705.4	6-4	745.8	120	86.4%	3
Hgb-1-31	Weott Town Area Highlands	Highland area – Groundwater Basin	5599.0	1-31	711.9	121	86.6%	3
1-9	Eureka Plain	Groundwater Basin	151.5	1-9	706.9	122	86.7%	3
Hgb-1-4	Shasta Valley Highlands	Highland area – Groundwater Basin	1190.2	1-4	691.6	123	86.9%	3
Hgb-5-25	Kern River Valley Highlands	Highland area – Groundwater Basin	5143.2	5-25	681.5	124	87.0%	3
Hgb-5-22.15	Tracy Highlands	Highland area – Groundwater Basin	819.2	5-22.15	671.6	125	87.2%	3
Hp-1.4	Northern Coast Ranges – Point Reyes	Highland area – Province	839.8	None	646.6	126	87.3%	3
Hgb-9-6	Cahuilla Valley Highlands	Highland area – Groundwater Basin	140.5	9-6	646.6	127	87.5%	3
Hp-7.3	Southern Coast Ranges – San Luis Obispo	Highland area – Province	425.3	None	644.3	128	87.6%	3
Hgb-9-18	Otay Valley Highlands	Highland area – Groundwater Basin	363.3	9-18	633.8	129	87.7%	3
Hgb-3-6	Lockwood Valley Highlands	Highland area – Groundwater Basin	592.0	3-6	596.8	130	87.9%	3
Hgb-1-5	Scott River Valley Highlands	Highland area – Groundwater Basin	1426.3	1-5	563.8	131	88.0%	3

							Cumulative percent	
7-1	Lanfair Valley	Groundwater Basin	633.4	7-1	559.6	132	88.1%	3
Hgb-1-52	Ukiah Valley Highlands	Highland area – Groundwater Basin	611.0	1-52	548.2	133	88.2%	3
5-5	Fall River Valley	Groundwater Basin	219.0	5-5	539.9	134	88.3%	3
9-6	Cahuilla Valley	Groundwater Basin	73.7	9-6	534.8	135	88.5%	3
5-21.63	West Sutter	Groundwater Basin	416.9	5-21.63	527.5	136	88.6%	3
7-36	Yuma Valley	Groundwater Basin	501.6	7-36	524.2	137	88.7%	3
2-10	Livermore Valley	Groundwater Basin	281.5	2-10	522.8	138	88.8%	3
3-13	Cuyama Valley	Groundwater Basin	978.2	3-13	522.4	139	88.9%	3
7-38	Palo Verde Valley	Groundwater Basin	295.3	7-38	514.3	140	89.0%	3
6-5	Tahoe Valley	Groundwater Basin	92.7	6-5	512.4	141	89.1%	3
4-13	San Gabriel Valley	Groundwater Basin	512.7	4-13	506.0	142	89.2%	3
Hgb-2-10	Livermore Valley Highlands	Highland area – Groundwater Basin	785.8	2-10	497.8	143	89.3%	3
Hp-8.2	Transverse and Selected Peninsular Ranges – Malibu	Highland area – Province	345.2	None	468.2	144	89.4%	3
5-21.55	Dye Creek	Groundwater Basin	112.2	5-21.55	451.9	145	89.5%	3
Hgb-9-28	Campo Valley Highlands	Highland area – Groundwater Basin	178.1	9-28	448.8	146	89.6%	3
Hgb-1-46	Navarro River Valley Highlands	Highland area – Groundwater Basin	342.2	1-46	446.1	147	89.7%	3
2-3	Suisun-Fairfield Valley	Groundwater Basin	540.6	2-3	445.3	148	89.8%	3
Hgb-3-4.2	Forebay Aquifer; Upper Valley Aquifer Highlands	Highland area – Groundwater Basin	2040.8	3-4.2	444.5	149	89.9%	3
3-19	Carrizo Plain	Groundwater Basin	852.4	3-19	443.8	150	90.0%	4
4-5	Acton Valley	Groundwater Basin	33.5	4-5	440.4	151	90.1%	4
1-27	Big Lagoon Area	Groundwater Basin	54.0	1-27	434.9	152	90.2%	4
6-7	Antelope Valley	Groundwater Basin	81.3	6-7	423.2	153	90.3%	4
7-30	Imperial Valley	Groundwater Basin	3876.4	7-30	418.7	154	90.4%	4
Hgb-5-15	Big Valley Highlands	Highland area – Groundwater Basin	219.7	5-15	416.0	155	90.5%	4
Hgb-1-8	Mad River Valley Highlands	Highland area – Groundwater Basin	1380.6	1-8	408.2	156	90.6%	4
7-20	Morongo Valley	Groundwater Basin	29.3	7-20	406.7	157	90.6%	4
9-11	Santa Maria Valley	Groundwater Basin	49.7	9-11	406.5	158	90.7%	4
6-29	Mesquite Valley	Groundwater Basin	356.6	6-29	405.1	159	90.8%	4
Hgb-3-15	Santa Ynez River Valley Highlands	Highland area – Groundwater Basin	1644.5	3-15	403.7	160	90.9%	4
5-28	Tehachapi Valley West	Groundwater Basin	72.7	5-28	400.8	161	91.0%	4

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-3-4.1	180/400 Foot Aquifer; East Side Aquifer; seaside area; Langley Area; Corral de Tierra Area highlands	Highland area – Groundwater Basin	493.3	3-4.1	394.4	162	91.1%	4
Hgb-7-28	Vallecito-Carrizo Valley Highlands	Highland area – Groundwater Basin	568.0	7-28	389.2	163	91.2%	4
Hgb-3-45	Huasna Valley Highlands	Highland area – Groundwater Basin	254.2	3-45	380.7	164	91.2%	4
Hgb-9-11	Santa Maria Valley Highlands	Highland area – Groundwater Basin	103.5	9-11	379.9	165	91.3%	4
7-33	East Salton sea	Groundwater Basin	788.5	7-33	379.6	166	91.4%	4
Hgb-6-3	Willow Creek Valley Highlands	Highland area – Groundwater Basin	590.0	6-3	374.8	167	91.5%	4
6-46	Fremont Valley	Groundwater Basin	1356.6	6-46	371.5	168	91.6%	4
Hgb-2-3	Suisun-Fairfield Valley Highlands	Highland area – Groundwater Basin	335.1	2-3	367.8	169	91.6%	4
7-43	Chemehuevi Valley	Groundwater Basin	1100.5	7-43	361.1	170	91.7%	4
Hgb-6-12	Owens Valley Highlands	Highland area – Groundwater Basin	4321.1	6-12	361.0	171	91.8%	4
2-22	Half Moon Bay Terrace	Groundwater Basin	37.2	2-22	350.1	172	91.9%	4
5-10	American Valley	Groundwater Basin	27.5	5-10	347.7	173	92.0%	4
Hgb-9-10	San Pasqual Valley Highlands	Highland area – Groundwater Basin	236.0	9-10	345.7	174	92.0%	4
5-9	Indian Valley	Groundwater Basin	119.0	5-9	345.5	175	92.1%	4
Hgb-1-45	Big River Valley Highlands	Highland area – Groundwater Basin	514.6	1-45	331.2	176	92.2%	4
5-21.56	Los Molinos	Groundwater Basin	134.2	5-21.56	330.8	177	92.2%	4
4-12	San Fernando Valley	Groundwater Basin	586.1	4-12	330.7	178	92.3%	4
Hgb-3-7	Carmel Valley Highlands	Highland area – Groundwater Basin	646.6	3-7	325.6	179	92.4%	4
Hgb-5-13	Upper Lake Valley Highlands	Highland area – Groundwater Basin	199.6	5-13	323.8	180	92.5%	4
Hgb-5-46	Lake Britton Area Highlands	Highland area – Groundwater Basin	1282.4	5-46	323.0	181	92.5%	4
6-41	Middle Mojave River Valley	Groundwater Basin	855.2	6-41	322.0	182	92.6%	4
Hgb-6-42	Upper Mojave River Valley Highlands	Highland area – Groundwater Basin	870.1	6-42	319.6	183	92.7%	4
Hgb-1-19	Anderson Valley Highlands	Highland area – Groundwater Basin	457.8	1-19	317.8	184	92.7%	4
1-11	Covelo Round Valley	Groundwater Basin	66.4	1-11	314.6	185	92.8%	4

							Cumulative percent	
5-22.09	Westside	Groundwater Basin	2590.3	5-22.09	312.8	186	92.9%	4
Hgb-6-7	Antelope Valley Highlands	Highland area – Groundwater Basin	791.1	6-7	310.5	187	92.9%	4
2-19	Kenwood Valley	Groundwater Basin	20.8	2-19	309.9	188	93.0%	4
Hgb-5-5	Fall River Valley Highlands	Highland area – Groundwater Basin	2131.4	5-5	309.6	189	93.1%	4
Hgb-4-5	Acton Valley Highlands	Highland area – Groundwater Basin	65.3	4-5	302.2	190	93.1%	4
6-43	EL Mirage Valley	Groundwater Basin	307.1	6-43	298.8	191	93.2%	4
Hgb-1-1	Smith River Plain Highlands	Highland area – Groundwater Basin	1528.8	1-1	295.3	192	93.3%	4
Hgb-1-57	Bodega Bay Area Highlands	Highland area – Groundwater Basin	57.9	1-57	289.5	193	93.3%	4
Hgb-3-2	Pajaro Valley Highlands	Highland area – Groundwater Basin	110.3	3-2	284.9	194	93.4%	4
5-4	Big Valley	Groundwater Basin	372.6	5-4	282.0	195	93.4%	4
5-13	Upper Lake Valley	Groundwater Basin	29.4	5-13	280.7	196	93.5%	4
Hgb-2-1	Petaluma Valley Highlands	Highland area – Groundwater Basin	177.9	2-1	280.1	197	93.6%	4
Hgb-5-9	Indian Valley Highlands	Highland area – Groundwater Basin	1232.0	5-9	275.2	198	93.6%	4
6-1	Surprise Valley	Groundwater Basin	924.0	6-1	272.9	199	93.7%	4
Hgb-5-2	Alturas Area Highlands	Highland area – Groundwater Basin	2085.5	5-2	271.3	200	93.7%	4
7-44	Needles Valley	Groundwater Basin	355.7	7-44	270.6	201	93.8%	4
Hgb-1-32	Garberville Town Area Highlands	Highland area – Groundwater Basin	1093.6	1-32	270.5	202	93.9%	4
Hgb-1-15	Happy Camp Town Area Highlands	Highland area – Groundwater Basin	891.6	1-15	265.1	203	93.9%	4
Hgb-5-10	American Valley Highlands	Highland area – Groundwater Basin	238.0	5-10	264.0	204	94.0%	4
1-3	Butte Valley	Groundwater Basin	322.7	1-3	263.4	205	94.0%	4
Hgb-2-26	Pescadero Valley Highlands	Highland area – Groundwater Basin	198.4	2-26	258.8	206	94.1%	4
3-8	Los Osos Valley	Groundwater Basin	28.3	3-8	258.6	207	94.1%	4
5-11	Mohawk Valley	Groundwater Basin	76.8	5-11	258.5	208	94.2%	4
7-26	Terwilliger Valley	Groundwater Basin	32.4	7-26	256.5	209	94.2%	4
Hgb-1-6	Hayfork Valley Highlands	Highland area – Groundwater Basin	577.6	1-6	255.3	210	94.3%	4
3-1	Soquel Valley	Groundwater Basin	10.2	3-1	250.7	211	94.4%	4

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-8-4	Elsinore Highlands	Highland area – Groundwater Basin	278.9	8-4	242.7	212	94.4%	4
Hgb-7-27	San Felipe Valley Highlands	Highland area – Groundwater Basin	169.9	7-27	240.0	213	94.5%	4
3-6	Lockwood Valley	Groundwater Basin	242.6	3-6	239.4	214	94.5%	4
Hp-7.2	Southern Coast Ranges – Big Sur/Carmel	Highland area – Province	802.8	None	235.8	215	94.6%	4
8-9	Bear Valley	Groundwater Basin	79.0	8-9	234.8	216	94.6%	4
Hgb-2-22	Half Moon Bay Terrace Highlands	Highland area – Groundwater Basin	146.4	2-22	234.7	217	94.7%	4
3-9	San Luis Obispo Valley	Groundwater Basin	51.5	3-9	234.4	218	94.7%	4
5-95	Meadow Valley	Groundwater Basin	23.2	5-95	232.4	219	94.8%	4
Hgb-9-9	Escondido Valley Highlands	Highland area – Groundwater Basin	110.8	9-9	229.9	220	94.8%	4
Hgb-2-24	San Gregorio Valley Highlands	Highland area – Groundwater Basin	126.7	2-24	228.2	221	94.9%	4
Hgb-5-26	Walker Basin Creek Valley Highlands	Highland area – Groundwater Basin	152.8	5-26	225.4	222	94.9%	4
Hgb-1-9	Eureka Plain Highlands	Highland area – Groundwater Basin	299.5	1-9	224.1	223	95.0%	5
2-5	Clayton Valley	Groundwater Basin	72.2	2-5	222.4	224	95.0%	5
3-27	Scotts Valley	Groundwater Basin	3.1	3-27	220.3	225	95.0%	5
Hgb-1-13	Little Lake Valley Highlands	Highland area – Groundwater Basin	119.1	1-13	218.8	226	95.1%	5
Hgb-5-18	Coyote Valley Highlands	Highland area – Groundwater Basin	142.1	5-18	218.6	227	95.1%	5
Hgb-1-10	Eel River Valley Highlands	Highland area – Groundwater Basin	917.9	1-10	218.4	228	95.2%	5
8-4	Elsinore	Groundwater Basin	104.1	8-4	217.5	229	95.2%	5
5-21.68	Capay Valley	Groundwater Basin	101.1	5-21.68	215.5	230	95.3%	5
1-51	Potter Valley	Groundwater Basin	33.4	1-51	205.7	231	95.3%	5
7-5	Chuckwalla Valley	Groundwater Basin	2434.5	7-5	201.2	232	95.4%	5
5-12	Sierra Valley	Groundwater Basin	514.7	5-12	198.4	233	95.4%	5
Hgb-2-8	Castro Valley Highlands	Highland area – Groundwater Basin	122.2	2-8	195.4	234	95.5%	5
Hgb-3-9	San Luis Obispo Valley Highlands	Highland area – Groundwater Basin	166.3	3-9	194.0	235	95.5%	5
9-7	San Luis Rey Valley	Groundwater Basin	120.1	9-7	191.6	236	95.5%	5
Hgb-2-19	Kenwood Valley Highlands	Highland area – Groundwater Basin	51.8	2-19	191.3	237	95.6%	5

							Cumulative percent	
Hgb-6-5	Tahoe Valley Highlands	Highland area – Groundwater Basin	459.2	6-5	188.8	238	95.6%	5
Hgb-9-4	Santa Margarita Valley Highlands	Highland area – Groundwater Basin	378.4	9-4	187.0	239	95.7%	5
2-6	Ygnacio Valley	Groundwater Basin	62.6	2-6	186.2	240	95.7%	5
Hgb-9-24	Pamo Valley Highlands	Highland area – Groundwater Basin	282.7	9-24	184.4	241	95.7%	5
1-19	Anderson Valley	Groundwater Basin	20.1	1-19	180.7	242	95.8%	5
Hgb-7-20	Morongo Valley Highlands	Highland area – Groundwater Basin	142.8	7-20	179.9	243	95.8%	5
Hgb-5-60	Humbug Valley Highlands	Highland area – Groundwater Basin	136.0	5-60	176.2	244	95.9%	5
5-21.53	Bend	Groundwater Basin	84.0	5-21.53	175.9	245	95.9%	5
Hgb-4-12	San Fernando Valley Highlands	Highland area – Groundwater Basin	756.3	4-12	175.7	246	95.9%	5
7-24	Borrego Valley	Groundwater Basin	617.4	7-24	175.7	247	96.0%	5
1-13	Little Lake Valley	Groundwater Basin	40.6	1-13	175.4	248	96.0%	5
Hgb-3-26	West Santa Cruz Terrace Highlands	Highland area – Groundwater Basin	42.5	3-26	174.2	249	96.0%	5
6-67	Martis Valley	Groundwater Basin	147.1	6-67	173.6	250	96.1%	5
Hgb-5-14	Scotts Valley Highlands	Highland area – Groundwater Basin	156.7	5-14	173.5	251	96.1%	5
5-50	North Fork Battle Creek	Groundwater Basin	51.6	5-50	171.7	252	96.2%	5
7-62	Joshua Tree	Groundwater Basin	110.0	7-62	170.7	253	96.2%	5
Hgb-3-27	Scotts Valley Highlands	Highland area – Groundwater Basin	2.5	3-27	170.0	254	96.2%	5
4-17	Lockwood Valley	Groundwater Basin	88.2	4-17	165.5	255	96.3%	5
Hgb-7-1	Lanfair Valley Highlands	Highland area – Groundwater Basin	284.3	7-1	163.3	256	96.3%	5
Hgb-5-28	Tehachapi Valley West Highlands	Highland area – Groundwater Basin	65.5	5-28	162.0	257	96.3%	5
Hgb-6-67	Martis Valley Highlands	Highland area – Groundwater Basin	798.5	6-67	161.4	258	96.4%	5
Hgb-8-9	Bear Valley Highlands	Highland area – Groundwater Basin	119.8	8-9	157.0	259	96.4%	5
7-27	San Felipe Valley	Groundwater Basin	94.6	7-27	156.0	260	96.4%	5
Hgb-1-51	Potter Valley Highlands	Highland area – Groundwater Basin	145.1	1-51	155.6	261	96.5%	5
1-60	Lower Russian River Valley	Groundwater Basin	26.9	1-60	154.1	262	96.5%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
4-8	Las Posas Valley	Groundwater Basin	170.9	4-8	151.3	263	96.5%	5
5-18	Coyote Valley	Groundwater Basin	26.4	5-18	151.1	264	96.6%	5
3-16	Goleta	Groundwater Basin	37.3	3-16	148.9	265	96.6%	5
Hgb-9-2	San Mateo Valley Highlands	Highland area – Groundwater Basin	334.9	9-2	143.8	266	96.6%	5
5-60	Humbug Valley	Groundwater Basin	40.4	5-60	143.4	267	96.7%	5
5-17	Burns Valley	Groundwater Basin	11.6	5-17	142.7	268	96.7%	5
5-1	Goose Lake	Groundwater Basin	220.1	5-1	142.0	269	96.7%	5
Hgb-5-86	Joseph Creek Highlands	Highland area – Groundwater Basin	124.0	5-86	141.6	270	96.7%	5
6-2	Madeline Plains	Groundwater Basin	631.7	6-2	141.2	271	96.8%	5
Hgb-1-61	Fort Ross Terrace Deposits Highlands	Highland area – Groundwater Basin	86.0	1-61	138.1	272	96.8%	5
5-26	Walker Basin Creek Valley	Groundwater Basin	31.0	5-26	136.9	273	96.8%	5
Hgb-1-3	Butte Valley Highlands	Highland area – Groundwater Basin	641.7	1-3	135.1	274	96.9%	5
7-16	Ames Valley	Groundwater Basin	438.8	7-16	134.1	275	96.9%	5
5-66	Clear Lake Cache Formation	Groundwater Basin	120.4	5-66	134.0	276	96.9%	5
Hgb-6-8	Bridgeport Valley Highlands	Highland area – Groundwater Basin	801.9	6-8	133.8	277	97.0%	5
Hgb-3-13	Cuyama Valley Highlands	Highland area – Groundwater Basin	1145.2	3-13	133.4	278	97.0%	5
Hgb-5-4	Big Valley Highlands	Highland area – Groundwater Basin	1238.5	5-4	132.3	279	97.0%	5
Hgb-7-16	Ames Valley Highlands	Highland area – Groundwater Basin	313.6	7-16	131.7	280	97.0%	5
Hp-6	Northern and Southern Coast Ranges – San Francisco Bay and Delta	Highland area – Province	584.5	None	130.5	281	97.1%	5
5-87	Middle Fork Feather River	Groundwater Basin	17.6	5-87	130.0	282	97.1%	5
Hp-9.2	San Diego Drainages – South San Diego Coastal	Highland area – Province	582.5	None	125.1	283	97.1%	5
Hgb-5-68	Pope Valley Highlands	Highland area – Groundwater Basin	159.4	5-68	124.8	284	97.1%	5
Hgb-3-16	Goleta Highlands	Highland area – Groundwater Basin	96.1	3-16	124.0	285	97.2%	5
Hgb-2-30	Novato Valley Highlands	Highland area – Groundwater Basin	149.6	2-30	122.1	286	97.2%	5
2-30	Novato Valley	Groundwater Basin	83.1	2-30	121.7	287	97.2%	5

							Cumulative percent	
Hgb-1-53	Sanel Valley Highlands	Highland area – Groundwater Basin	139.1	1-53	121.0	288	97.3%	5
7-8	Bristol Valley	Groundwater Basin	2010.5	7-8	120.5	289	97.3%	5
9-15	San Diego River Valley	Groundwater Basin	40.0	9-15	115.8	290	97.3%	5
Hgb-9-8	Warner Valley Highlands	Highland area – Groundwater Basin	366.5	9-8	115.5	291	97.3%	5
7-2	Fenner Valley	Groundwater Basin	1831.1	7-2	111.9	292	97.4%	5
Hgb-9-12	San Dieguito Creek Highlands	Highland area – Groundwater Basin	184.4	9-12	111.2	293	97.4%	5
Hgb-2-11	Sunol Valley Highlands	Highland area – Groundwater Basin	434.7	2-11	110.7	294	97.4%	5
6-8	Bridgeport Valley	Groundwater Basin	131.5	6-8	110.2	295	97.4%	5
Hgb-5-19	Collayomi Valley Highlands	Highland area – Groundwater Basin	166.7	5-19	109.5	296	97.4%	5
Hgb-5-88	Stony Gorge Reservoir Highlands	Highland area – Groundwater Basin	280.7	5-88	109.4	297	97.5%	5
3-14	San Antonio Creek Valley	Groundwater Basin	331.4	3-14	109.3	298	97.5%	5
Hgb-5-7	Lake Almanor Valley Highlands	Highland area – Groundwater Basin	403.0	5-7	109.3	299	97.5%	5
Hgb-1-35	Hyampom Valley Highlands	Highland area – Groundwater Basin	1244.7	1-35	103.8	300	97.5%	5
7-29	Coyote Wells Valley	Groundwater Basin	589.4	7-29	103.6	301	97.6%	5
Hgb-7-44	Needles Valley Highlands	Highland area – Groundwater Basin	393.0	7-44	103.2	302	97.6%	5
6-104	Long Valley	Groundwater Basin	189.4	6-104	102.3	303	97.6%	5
Hgb-1-14	Lower Klamath River Valley Highlands	Highland area – Groundwater Basin	5022.4	1-14	102.1	304	97.6%	5
6-28	Pahrump Valley	Groundwater Basin	376.0	6-28	102.0	305	97.6%	5
1-2	Klamath River Valley	Groundwater Basin	652.9	1-2	99.9	306	97.7%	5
3-49	Montecito	Groundwater Basin	25.4	3-49	99.9	307	97.7%	5
Hgb-4-3	Ventura River Valley Highlands	Highland area – Groundwater Basin	420.3	4-3	99.6	308	97.7%	5
Hgb-3-8	Los Osos Valley Highlands	Highland area – Groundwater Basin	49.7	3-8	99.5	309	97.7%	5
Hgb-4-13	San Gabriel Valley Highlands	Highland area – Groundwater Basin	946.7	4-13	99.1	310	97.8%	5
Hp-1.2	Northern Coast Ranges – Central Coast	Highland area – Province	803.3	None	98.3	311	97.8%	5
2-4	Pittsburg Plain	Groundwater Basin	47.0	2-4	97.4	312	97.8%	5
4-3	Ventura River Valley	Groundwater Basin	51.5	4-3	97.3	313	97.8%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-2-7	San Ramon Valley Highlands	Highland area – Groundwater Basin	100.7	2-7	96.6	314	97.8%	5
5-19	Collayomi Valley	Groundwater Basin	26.3	5-19	95.5	315	97.9%	5
Hp-10.2	Desert – Southern	Highland area – Province	49.6	None	95.4	316	97.9%	5
Hgb-1-11	Covelo Round Valley Highlands	Highland area – Groundwater Basin	145.1	1-11	94.5	317	97.9%	5
Hgb-5-50	North Fork Battle Creek Highlands	Highland area – Groundwater Basin	254.9	5-50	93.9	318	97.9%	5
Hgb-1-2	Klamath River Valley Highlands	Highland area – Groundwater Basin	2399.3	1-2	92.0	319	97.9%	5
2-11	Sunol Valley	Groundwater Basin	67.3	2-11	89.7	320	98.0%	5
Hgb-1-12	Laytonville Valley Highlands	Highland area – Groundwater Basin	64.6	1-12	88.3	321	98.0%	5
3-5	Cholame Valley	Groundwater Basin	161.2	3-5	88.2	322	98.0%	5
Hgb-5-12	Sierra Valley Highlands	Highland area – Groundwater Basin	905.8	5-12	87.6	323	98.0%	5
Hgb-7-55	Collins Valley Highlands	Highland area – Groundwater Basin	256.8	7-55	87.0	324	98.0%	5
Hgb-5-22.07	Delta-Mendota Highlands	Highland area – Groundwater Basin	1914.2	5-22.07	83.9	325	98.1%	5
Hgb-9-29	Potrero Valley Highlands	Highland area – Groundwater Basin	36.4	9-29	83.5	326	98.1%	5
Hgb-8-6	Hemet Lake Valley Highlands	Highland area – Groundwater Basin	115.0	8-6	83.4	327	98.1%	5
Hgb-1-29	Honeydew Town Area Highlands	Highland area – Groundwater Basin	480.2	1-29	83.3	328	98.1%	5
6-96	Eagle Lake Area	Groundwater Basin	51.4	6-96	83.1	329	98.1%	5
Hp-4.1	Sierra Nevada – Tahoe	Highland area – Province	604.2	None	81.4	330	98.1%	5
Hgb-9-16	El Cajon Valley Highlands	Highland area – Groundwater Basin	29.3	9-16	80.8	331	98.2%	5
Hgb-5-22.09	Westside Highlands	Highland area – Groundwater Basin	643.8	5-22.09	80.8	332	98.2%	5
4-2	Ojai Valley	Groundwater Basin	27.7	4-2	78.1	333	98.2%	5
Hgb-6-6	Carson Valley Highlands	Highland area – Groundwater Basin	279.5	6-6	77.5	334	98.2%	5
9-28	Campo Valley	Groundwater Basin	14.3	9-28	76.7	335	98.2%	5
Hgb-4-16	Hidden Valley Highlands	Highland area – Groundwater Basin	30.5	4-16	76.4	336	98.2%	5
6-20	Middle Amargosa Valley	Groundwater Basin	1577.2	6-20	76.2	337	98.3%	5

							Cumulative percent	
Hgb-2-6	Ygnacio Valley Highlands	Highland area – Groundwater Basin	165.0	2-6	75.6	338	98.3%	5
Hgb-6-11	Long Valley Highlands	Highland area – Groundwater Basin	670.5	6-11	75.0	339	98.3%	5
5-27	Cummings Valley	Groundwater Basin	40.5	5-27	73.7	340	98.3%	5
Hgb-9-27	Cottonwood Valley Highlands	Highland area – Groundwater Basin	213.9	9-27	73.2	341	98.3%	5
Hgb-2-31	Arroyo Del Hambre Valley Highlands	Highland area – Groundwater Basin	39.4	2-31	72.9	342	98.3%	5
3-7	Carmel Valley	Groundwater Basin	20.9	3-7	72.4	343	98.4%	5
Hgb-5-22.10	Pleasant Valley Highlands	Highland area – Groundwater Basin	1510.6	5-22.10	72.2	344	98.4%	5
Hgb-4-11	Coastal Plain of Los Angeles Highlands	Highland area – Groundwater Basin	219.2	4-11	72.2	345	98.4%	5
6-45	Tehachapi Valley East	Groundwater Basin	97.0	6-45	71.9	346	98.4%	5
1-61	Fort Ross Terrace Deposits	Groundwater Basin	34.4	1-61	71.4	347	98.4%	5
Hgb-1-41	Little Valley Highlands	Highland area – Groundwater Basin	30.5	1-41	71.3	348	98.4%	5
Hgb-1-38	Lower Laytonville Valley Highlands	Highland area – Groundwater Basin	25.2	1-38	71.2	349	98.4%	5
3-45	Huasna Valley	Groundwater Basin	19.0	3-45	70.3	350	98.5%	5
Hgb-5-11	Mohawk Valley Highlands	Highland area – Groundwater Basin	226.3	5-11	70.1	351	98.5%	5
Hgb-4-22	Malibu Valley Highlands	Highland area – Groundwater Basin	157.8	4-22	69.9	352	98.5%	5
Hgb-2-28	Ross Valley Highlands	Highland area – Groundwater Basin	75.9	2-28	69.2	353	98.5%	5
Hgb-5-87	Middle Fork Feather River Highlands	Highland area – Groundwater Basin	141.4	5-87	69.2	354	98.5%	5
Hp-8.1	Transverse and Selected Peninsular Ranges – Santa Barbara	Highland area – Province	563.1	None	68.6	355	98.5%	5
Hgb-6-45	Tehachapi Valley East Highlands	Highland area – Groundwater Basin	154.6	6-45	68.1	356	98.6%	5
Hgb-5-66	Clear Lake Cache Formation Highlands	Highland area – Groundwater Basin	122.9	5-66	67.7	357	98.6%	5
3-53	Foothill	Groundwater Basin	12.6	3-53	67.6	358	98.6%	5
6-6	Carson Valley	Groundwater Basin	43.3	6-6	67.3	359	98.6%	5
2-40	Downtown	Groundwater Basin	30.9	2-40	66.6	360	98.6%	5
5-63	Stonyford Town Area	Groundwater Basin	26.1	5-63	66.3	361	98.6%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
1-12	Laytonville Valley	Groundwater Basin	20.3	1-12	65.6	362	98.6%	5
Hgb-5-36	Round Valley Highlands	Highland area – Groundwater Basin	397.4	5-36	64.8	363	98.7%	5
4-6	Pleasant Valley	Groundwater Basin	87.4	4-6	64.5	364	98.7%	5
2-26	Pescadero Valley	Groundwater Basin	11.8	2-26	64.4	365	98.7%	5
1-7	Hoopa Valley	Groundwater Basin	15.8	1-7	64.0	366	98.7%	5
Hgb-5-21.52	Colusa Highlands	Highland area – Groundwater Basin	1233.6	5-21.52	63.8	367	98.7%	5
Hgb-7-26	Terwilliger Valley Highlands	Highland area – Groundwater Basin	19.9	7-26	61.7	368	98.7%	5
Hgb-5-21.56	Los Molinos Highlands	Highland area – Groundwater Basin	1015.9	5-21.56	61.2	369	98.7%	5
Hgb-1-43	Williams Valley Highlands	Highland area – Groundwater Basin	120.1	1-43	60.8	370	98.7%	5
5-22.10	Pleasant Valley	Groundwater Basin	589.5	5-22.10	60.7	371	98.8%	5
9-25	Ranchita Town Area	Groundwater Basin	12.6	9-25	60.4	372	98.8%	5
6-11	Long Valley	Groundwater Basin	290.7	6-11	60.2	373	98.8%	5
Hgb-5-35	Mccloud Area Highlands	Highland area – Groundwater Basin	957.9	5-35	59.3	374	98.8%	5
Hgb-5-40	Hot Springs Valley Highlands	Highland area – Groundwater Basin	136.8	5-40	58.9	375	98.8%	5
9-9	Escondido Valley	Groundwater Basin	11.7	9-9	58.8	376	98.8%	5
3-26	West Santa Cruz Terrace	Groundwater Basin	31.8	3-26	57.7	377	98.8%	5
Hgb-5-31	Long Valley Highlands	Highland area – Groundwater Basin	120.2	5-31	57.6	378	98.8%	5
4-9	Simi Valley	Groundwater Basin	49.2	4-9	57.5	379	98.9%	5
Hgb-3-42	Chorro Valley Highlands	Highland area – Groundwater Basin	108.9	3-42	56.6	380	98.9%	5
Hgb-5-27	Cummings Valley Highlands	Highland area – Groundwater Basin	51.1	5-27	56.6	381	98.9%	5
2-35	Westside	Groundwater Basin	102.8	2-35	55.7	382	98.9%	5
2-7	San Ramon Valley	Groundwater Basin	28.6	2-7	55.0	383	98.9%	5
1-50	Knights Valley	Groundwater Basin	16.5	1-50	52.1	384	98.9%	5
Hgb-1-50	Knights Valley Highlands	Highland area – Groundwater Basin	40.2	1-50	52.1	385	98.9%	5
Hgb-9-13	Poway Valley Highlands	Highland area – Groundwater Basin	76.9	9-13	51.8	386	98.9%	5
Hgb-1-20	Garcia River Valley Highlands	Highland area – Groundwater Basin	17.9	1-20	51.8	387	99.0%	5
7-42	Vidal Valley	Groundwater Basin	557.1	7-42	51.6	388	99.0%	5

							Cumulative percent	
Hgb-3-51	Majors Creek Highlands	Highland area – Groundwater Basin	17.8	3-51	51.5	389	99.0%	5
Hgb-5-48	Burney Creek Valley Highlands	Highland area – Groundwater Basin	187.8	5-48	50.6	390	99.0%	5
Hgb-3-44	Pozo Valley Highlands	Highland area – Groundwater Basin	217.7	3-44	50.5	391	99.0%	5
Hp-1.1	Northern Coast Ranges – North Coast	Highland area – Province	164.3	None	50.4	392	99.0%	5
4-10	Conejo	Groundwater Basin	76.1	4-10	50.3	393	99.0%	5
5-84	Cuddy Valley	Groundwater Basin	14.0	5-84	50.2	394	99.0%	5
2-38	Lobos	Groundwater Basin	9.6	2-38	49.8	395	99.0%	5
1-15	Happy Camp Town Area	Groundwater Basin	11.2	1-15	49.4	396	99.0%	5
1-45	Big River Valley	Groundwater Basin	6.8	1-45	49.4	397	99.1%	5
Hgb-2-5	Clayton Valley Highlands	Highland area – Groundwater Basin	70.7	2-5	49.3	398	99.1%	5
5-30	Lower Lake Valley	Groundwater Basin	9.7	5-30	48.1	399	99.1%	5
7-25	Ocotillo-Clark Valley	Groundwater Basin	899.5	7-25	48.0	400	99.1%	5
7-11	Copper Mountain Valley	Groundwater Basin	122.5	7-11	47.9	401	99.1%	5
9-29	Potrero Valley	Groundwater Basin	8.2	9-29	46.7	402	99.1%	5
Hgb-6-46	Fremont Valley Highlands	Highland area – Groundwater Basin	914.4	6-46	45.0	403	99.1%	5
8-6	Hemet Lake Valley	Groundwater Basin	67.5	8-6	44.0	404	99.1%	5
Hgb-5-94	Middle Creek Highlands	Highland area – Groundwater Basin	110.4	5-94	43.8	405	99.1%	5
Hgb-3-36	Santa Rosa Valley Highlands	Highland area – Groundwater Basin	109.2	3-36	43.4	406	99.1%	5
Hgb-3-19	Carrizo Plain Highlands	Highland area – Groundwater Basin	305.4	3-19	41.9	407	99.2%	5
Hgb-1-30	Pepperwood Town Area Highlands	Highland area – Groundwater Basin	333.1	1-30	41.8	408	99.2%	5
1-6	Hayfork Valley	Groundwater Basin	13.3	1-6	41.6	409	99.2%	5
Hgb-5-1	Goose Lake Highlands	Highland area – Groundwater Basin	452.2	5-1	41.4	410	99.2%	5
Hgb-3-41	Morro Valley Highlands	Highland area – Groundwater Basin	60.0	3-41	40.3	411	99.2%	5
3-28	San Benito River Valley	Groundwater Basin	98.0	3-28	40.2	412	99.2%	5
Hgb-3-31	Hernandez Valley Highlands	Highland area – Groundwater Basin	202.7	3-31	39.9	413	99.2%	5
Hgb-5-29	Castac Lake Valley Highlands	Highland area – Groundwater Basin	63.7	5-29	39.3	414	99.2%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-5-21.68	Capay Valley Highlands	Highland area – Groundwater Basin	461.4	5-21.68	38.4	415	99.2%	5
Hgb-6-1	Surprise Valley Highlands	Highland area – Groundwater Basin	826.0	6-1	36.9	416	99.2%	5
5-68	Pope Valley	Groundwater Basin	29.1	5-68	36.0	417	99.2%	5
9-10	San Pasqual Valley	Groundwater Basin	18.3	9-10	35.4	418	99.3%	5
1-49	Annapolis Ohlson Ranch Fm Highlands	Groundwater Basin	35.0	1-49	35.1	419	99.3%	5
Hgb-3-29	Dry Lake Valley Highlands	Highland area – Groundwater Basin	276.2	3-29	34.3	420	99.3%	5
Hgb-3-46	Rafael Valley Highlands	Highland area – Groundwater Basin	154.6	3-46	34.0	421	99.3%	5
Hgb-1-40	Ten Mile River Valley Highlands	Highland area – Groundwater Basin	308.9	1-40	34.0	422	99.3%	5
Hgb-1-34	Dinsmores Town Area Highlands	Highland area – Groundwater Basin	183.6	1-34	33.7	423	99.3%	5
3-50	Felton Area	Groundwater Basin	4.7	3-50	33.4	424	99.3%	5
Hgb-6-40	Lower mojave river valley highlands	Highland area – Groundwater Basin	572.9	6-40	33.2	425	99.3%	5
Hgb-7-62	Joshua Tree Highlands	Highland area – Groundwater Basin	177.5	7-62	32.3	426	99.3%	5
Hgb-5-21.51	Corning Highlands	Highland area – Groundwater Basin	729.2	5-21.51	32.1	427	99.3%	5
Hgb-5-65	Little Indian Valley Highlands	Highland area – Groundwater Basin	94.9	5-65	31.7	428	99.3%	5
Hgb-7-3	Ward Valley Highlands	Highland area – Groundwater Basin	680.9	7-3	31.6	429	99.3%	5
Hgb-2-4	Pittsburg Plain Highlands	Highland area – Groundwater Basin	57.5	2-4	31.5	430	99.3%	5
Hgb-3-49	Montecito Highlands	Highland area – Groundwater Basin	44.3	3-49	31.5	431	99.3%	5
Hgb-3-5	Cholame Valley Highlands	Highland area – Groundwater Basin	306.3	3-5	30.7	432	99.3%	5
Hgb-5-17	Burns Valley Highlands	Highland area – Groundwater Basin	8.9	5-17	29.6	433	99.4%	5
Hgb-5-82	Cuddy Canyon Valley Highlands	Highland area – Groundwater Basin	37.3	5-82	29.2	434	99.4%	5
Hgb-5-21.50	Red Bluff Highlands	Highland area – Groundwater Basin	467.3	5-21.50	29.1	435	99.4%	5

							Cumulative percent	
Hgb-1-26	Redwood Creek Area Highlands	Highland area – Groundwater Basin	658.7	1-26	29.0	436	99.4%	5
Hgb-9-32	San Marcos Area Highlands	Highland area – Groundwater Basin	63.6	9-32	28.8	437	99.4%	5
Hgb-7-48	Helendale Fault Valley Highlands	Highland area – Groundwater Basin	39.6	7-48	28.4	438	99.4%	5
Hp-4.2	Sierra Nevada – Alpine County	Highland area – Province	863.6	None	28.2	439	99.4%	5
Hp-11	Southern Cal Islands (Group)	Highland area – Province	903.0	None	28.0	440	99.4%	5
5-65	Little Indian Valley	Groundwater Basin	5.1	5-65	27.9	441	99.4%	5
9-16	El Cajon Valley	Groundwater Basin	28.9	9-16	27.7	442	99.4%	5
Hgb-3-40	Toro Valley Highlands	Highland area – Groundwater Basin	37.9	3-40	27.5	443	99.4%	5
5-31	Long Valley	Groundwater Basin	11.3	5-31	27.4	444	99.4%	5
Hgb-5-95	Meadow Valley Highlands	Highland area – Groundwater Basin	139.4	5-95	27.3	445	99.4%	5
Hgb-1-18	Red Rock Valley Highlands	Highland area – Groundwater Basin	201.5	1-18	27.2	446	99.4%	5
Hgb-5-21.62	Sutter Highlands	Highland area – Groundwater Basin	33.7	5-21.62	27.1	447	99.4%	5
5-35	Mccloud Area	Groundwater Basin	86.3	5-35	27.1	448	99.4%	5
Hgb-3-34	Arroyo de la Cruz Valley Highlands	Highland area – Groundwater Basin	113.4	3-34	26.9	449	99.5%	5
Hgb-5-21.53	Bend Highlands	Highland area – Groundwater Basin	192.7	5-21.53	26.9	450	99.5%	5
6-33	Soda Lake Valley	Groundwater Basin	1538.0	6-33	26.5	451	99.5%	5
Hgb-3-53	Foothill Highlands	Highland area – Groundwater Basin	33.6	3-53	26.0	452	99.5%	5
Hgb-6-47	Harper Valley Highlands	Highland area – Groundwater Basin	565.6	6-47	25.5	453	99.5%	5
1-18	Red Rock Valley	Groundwater Basin	36.4	1-18	25.2	454	99.5%	5
3-17	Santa Barbara	Groundwater Basin	24.9	3-17	25.0	455	99.5%	5
1-46	Navarro River Valley	Groundwater Basin	3.1	1-46	24.9	456	99.5%	5
Hgb-5-58	Clover Valley Highlands	Highland area – Groundwater Basin	208.7	5-58	24.9	457	99.5%	5
5-48	Burney Creek Valley	Groundwater Basin	9.5	5-48	24.6	458	99.5%	5
4-23	Raymond	Groundwater Basin	106.0	4-23	24.4	459	99.5%	5
Hgb-5-16	High Valley Highlands	Highland area – Groundwater Basin	20.6	5-16	24.4	460	99.5%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-5-83	Cuddy Ranch Area Highlands	Highland area – Groundwater Basin	26.7	5-83	24.2	461	99.5%	5
5-86	Joseph Creek	Groundwater Basin	18.0	5-86	24.1	462	99.5%	5
1-30	Pepperwood Town Area	Groundwater Basin	25.5	1-30	23.8	463	99.5%	5
6-3	Willow Creek Valley	Groundwater Basin	47.3	6-3	23.5	464	99.5%	5
Hgb-9-1	San Juan Valley Highlands	Highland area – Groundwater Basin	404.0	9-1	23.2	465	99.5%	5
Hgb-1-62	Wilson Point Area Highlands	Highland area – Groundwater Basin	106.2	1-62	23.1	466	99.5%	5
Hp-9.1	San Diego Drainages – North San Diego Coastal	Highland area – Province	382.9	None	22.9	467	99.5%	5
1-40	Ten Mile River Valley	Groundwater Basin	6.0	1-40	22.8	468	99.6%	5
Hgb-1-39	Branscomb Town Area Highlands	Highland area – Groundwater Basin	93.4	1-39	22.5	469	99.6%	5
Hgb-9-23	San Elijo Valley Highlands	Highland area – Groundwater Basin	75.6	9-23	22.2	470	99.6%	5
Hgb-7-22	West Salton Sea Highlands	Highland area – Groundwater Basin	414.5	7-22	22.2	471	99.6%	5
Hgb-4-2	Ojai Valley Highlands	Highland area – Groundwater Basin	63.2	4-2	22.1	472	99.6%	5
2-33	Islais Valley	Groundwater Basin	24.0	2-33	22.1	473	99.6%	5
3-22	Santa Ana Valley	Groundwater Basin	11.0	3-22	22.0	474	99.6%	5
Hgb-1-42	Sherwood Valley Highlands	Highland area – Groundwater Basin	24.7	1-42	21.9	475	99.6%	5
Hgb-4-9	Simi Valley Highlands	Highland area – Groundwater Basin	172.4	4-9	21.8	476	99.6%	5
Hgb-1-28	Mattole River Valley Highlands	Highland area – Groundwater Basin	234.4	1-28	21.8	477	99.6%	5
Hgb-3-35	San Simeon Valley Highlands	Highland area – Groundwater Basin	84.0	3-35	21.7	478	99.6%	5
1-38	Lower Laytonville Valley	Groundwater Basin	8.7	1-38	21.6	479	99.6%	5
Hgb-4-6	Pleasant Valley Highlands	Highland area – Groundwater Basin	26.2	4-6	21.5	480	99.6%	5
1-14	Lower Klamath River Valley	Groundwater Basin	28.4	1-14	21.5	481	99.6%	5
5-16	High Valley	Groundwater Basin	9.5	5-16	21.4	482	99.6%	5
6-35	Cronise Valley	Groundwater Basin	511.1	6-35	21.2	483	99.6%	5
Hgb-9-22	Batiquitos Lagoon Valley Highlands	Highland area – Groundwater Basin	54.7	9-22	21.1	484	99.6%	5
Hgb-5-84	Cuddy Valley Highlands	Highland area – Groundwater Basin	30.2	5-84	20.8	485	99.6%	5

							Cumulative percent	
Hgb-3-22	Santa Ana Valley Highlands	Highland area – Groundwater Basin	37.8	3-22	20.7	486	99.6%	5
Hp-3	Modoc Plateau and Cascades	Highland area – Province	2418.0	None	20.5	487	99.6%	5
Hgb-6-2	Madeline Plains Highlands	Highland area – Groundwater Basin	1138.9	6-2	20.4	488	99.6%	5
1-34	Dinsmores Town Area	Groundwater Basin	9.2	1-34	20.3	489	99.6%	5
1-53	Sanel Valley	Groundwater Basin	22.6	1-53	20.3	490	99.7%	5
5-36	Round Valley	Groundwater Basin	29.4	5-36	20.2	491	99.7%	5
Hgb-1-33	Larabee Valley Highlands	Highland area – Groundwater Basin	29.4	1-33	20.1	492	99.7%	5
Hgb-5-21.54	Antelope Highlands	Highland area – Groundwater Basin	410.3	5-21.54	20.0	493	99.7%	5
Hgb-7-2	Fenner Valley Highlands	Highland area – Groundwater Basin	751.4	7-2	20.0	494	99.7%	5
1-26	Redwood Creek Area	Groundwater Basin	8.1	1-26	19.8	495	99.7%	5
Hgb-9-25	Ranchita Town Area Highlands	Highland area – Groundwater Basin	17.0	9-25	19.5	496	99.7%	5
5-82	Cuddy Canyon Valley	Groundwater Basin	13.4	5-82	19.3	497	99.7%	5
5-83	Cuddy Ranch Area	Groundwater Basin	17.0	5-83	19.3	498	99.7%	5
Hgb-5-63	Stonyford Town Area Highlands	Highland area – Groundwater Basin	331.5	5-63	19.2	499	99.7%	5
9-8	Warner Valley	Groundwater Basin	97.0	9-8	19.1	500	99.7%	5
Hgb-4-8	Las Posas Valley Highlands	Highland area – Groundwater Basin	82.6	4-8	18.7	501	99.7%	5
6-9	Mono Valley	Groundwater Basin	699.7	6-9	18.0	502	99.7%	5
Hgb-7-9	Dale Valley Highlands	Highland area – Groundwater Basin	451.6	7-9	17.7	503	99.7%	5
4-22	Malibu Valley	Groundwater Basin	2.5	4-22	17.6	504	99.7%	5
7-18	Johnson Valley	Groundwater Basin	453.5	7-18	17.4	505	99.7%	5
5-46	Lake Britton Area	Groundwater Basin	56.9	5-46	17.4	506	99.7%	5
Hgb-7-56	Yaqui Well Area Highlands	Highland area – Groundwater Basin	179.9	7-56	17.4	507	99.7%	5
Hgb-8-1	Coastal Plain Of Orange County Highlands	Highland area – Groundwater Basin	563.4	8-1	17.2	508	99.7%	5
4-1	Upper Ojai Valley	Groundwater Basin	15.4	4-1	17.1	509	99.7%	5
9-13	Poway Valley	Groundwater Basin	10.0	9-13	16.9	510	99.7%	5
Hgb-7-25	Ocotillo-Clark Valley Highlands	Highland area – Groundwater Basin	433.5	7-25	16.6	511	99.7%	5
Hgb-7-47	Jacumba Valley Highlands	Highland area – Groundwater Basin	38.8	7-47	16.1	512	99.7%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-4-1	Upper Ojai Valley Highlands	Highland area – Groundwater Basin	48.2	4-1	15.7	513	99.7%	5
Hgb-4-23	Raymond Highlands	Highland area – Groundwater Basin	141.4	4-23	15.6	514	99.7%	5
Hgb-3-37	Villa Valley Highlands	Highland area – Groundwater Basin	44.7	3-37	15.5	515	99.7%	5
Hgb-3-18	Carpinteria Highlands	Highland area – Groundwater Basin	86.7	3-18	15.3	516	99.8%	5
5-40	Hot Springs Valley	Groundwater Basin	9.7	5-40	15.3	517	99.8%	5
7-22	West Salton Sea	Groundwater Basin	426.5	7-22	15.2	518	99.8%	5
3-41	Morro Valley	Groundwater Basin	2.6	3-41	15.0	519	99.8%	5
Hgb-9-14	Mission Valley Highlands	Highland area – Groundwater Basin	145.0	9-14	15.0	520	99.8%	5
Hgb-3-28	San Benito River Valley Highlands	Highland area – Groundwater Basin	264.3	3-28	15.0	521	99.8%	5
Hgb-8-7	Big Meadows Valley Highlands	Highland area – Groundwater Basin	125.6	8-7	14.5	522	99.8%	5
3-42	Chorro Valley	Groundwater Basin	6.3	3-42	14.0	523	99.8%	5
3-30	Bitter Water Valley	Groundwater Basin	130.4	3-30	14.0	524	99.8%	5
4-16	Hidden Valley	Groundwater Basin	8.9	4-16	13.9	525	99.8%	5
Hgb-6-104	Long Valley Highlands	Highland area – Groundwater Basin	173.6	6-104	13.7	526	99.8%	5
5-7	Lake Almanor Valley	Groundwater Basin	29.0	5-7	13.6	527	99.8%	5
Hgb-5-59	Grizzly Valley Highlands	Highland area – Groundwater Basin	84.6	5-59	13.6	528	99.8%	5
5-59	Grizzly Valley	Groundwater Basin	54.4	5-59	13.5	529	99.8%	5
3-31	Hernandez Valley	Groundwater Basin	11.6	3-31	13.3	530	99.8%	5
Hgb-1-49	Annapolis Ohlson Ranch Fm Highlands	Highland area – Groundwater Basin	13.9	1-49	13.2	531	99.8%	5
Hgb-3-14	San Antonio Creek Valley Highlands	Highland area – Groundwater Basin	132.8	3-14	13.0	532	99.8%	5
2-37	South San Francisco	Groundwater Basin	8.8	2-37	12.9	533	99.8%	5
Hgb-1-27	Big Lagoon Area Highlands	Highland area – Groundwater Basin	128.9	1-27	12.8	534	99.8%	5
7-14	Lavic Valley	Groundwater Basin	413.9	7-14	12.5	535	99.8%	5
9-17	Sweetwater Valley	Groundwater Basin	23.9	9-17	12.4	536	99.8%	5
Hgb-7-14	Lavic Valley Highlands	Highland area – Groundwater Basin	247.8	7-14	12.3	537	99.8%	5
5-94	Middle Creek	Groundwater Basin	2.9	5-94	12.2	538	99.8%	5

							Cumulative percent	
Hgb-5-91	Antelope Creek Highlands	Highland area – Groundwater Basin	77.8	5-91	12.0	539	99.8%	5
6-106	Little Antelope Valley	Groundwater Basin	10.1	6-106	12.0	540	99.8%	5
Hgb-6-33	Soda Lake Valley Highlands	Highland area – Groundwater Basin	840.9	6-33	12.0	541	99.8%	5
Hgb-7-49	Pipes Canyon Fault Valley Highlands	Highland area – Groundwater Basin	56.3	7-49	12.0	542	99.8%	5
7-49	Pipes Canyon Fault Valley	Groundwater Basin	13.7	7-49	11.6	543	99.8%	5
2-24	San Gregorio Valley	Groundwater Basin	4.3	2-24	11.5	544	99.8%	5
Hgb-4-19	Thousand Oaks Area Highlands	Highland area – Groundwater Basin	31.1	4-19	11.5	545	99.8%	5
3-34	Arroyo De La Cruz Valley	Groundwater Basin	4.2	3-34	11.4	546	99.8%	5
Hgb-7-30	Imperial Valley Highlands	Highland area – Groundwater Basin	204.1	7-30	11.4	547	99.8%	5
6-52	Searles Valley	Groundwater Basin	797.3	6-52	11.3	548	99.8%	5
9-32	San Marcos Area	Groundwater Basin	8.6	9-32	11.3	549	99.8%	5
1-20	Garcia River Valley	Groundwater Basin	9.1	1-20	11.2	550	99.8%	5
Hgb-5-43	Rock Prairie Valley Highlands	Highland area – Groundwater Basin	90.8	5-43	10.7	551	99.8%	5
Hgb-5-90	Funks Creek Highlands	Highland area – Groundwater Basin	114.9	5-90	10.6	552	99.9%	5
Hgb-3-30	Bitter Water Valley Highlands	Highland area – Groundwater Basin	337.7	3-30	10.4	553	99.9%	5
Hgb-6-43	El Mirage Valley Highlands	Highland area – Groundwater Basin	94.6	6-43	10.3	554	99.9%	5
1-32	Garberville Town Area	Groundwater Basin	8.6	1-32	10.2	555	99.9%	5
Hgb-4-17	Lockwood Valley Highlands	Highland area – Groundwater Basin	91.4	4-17	10.1	556	99.9%	5
5-85	Mil Potrero Area	Groundwater Basin	9.3	5-85	10.0	557	99.9%	5
Hgb-7-24	Borrego Valley Highlands	Highland area – Groundwater Basin	384.9	7-24	9.7	558	99.9%	5
1-28	Mattole River Valley	Groundwater Basin	12.8	1-28	9.6	559	99.9%	5
Hgb-1-56	Mcdowell Valley Highlands	Highland area – Groundwater Basin	61.8	1-56	9.6	560	99.9%	5
2-39	Marina	Groundwater Basin	8.9	2-39	9.6	561	99.9%	5
3-25	Tres Pinos Valley	Groundwater Basin	13.7	3-25	9.5	562	99.9%	5
Hgb-6-96	Eagle Lake Area Highlands	Highland area – Groundwater Basin	280.7	6-96	9.5	563	99.9%	5
7-28	Vallecito-Carrizo Valley	Groundwater Basin	493.0	7-28	9.5	564	99.9%	5
1-35	Hyampom Valley	Groundwater Basin	5.5	1-35	9.5	565	99.9%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-7-12	Warren Valley Highlands	Highland area – Groundwater Basin	128.2	7-12	9.4	566	99.9%	5
9-27	Cottonwood Valley	Groundwater Basin	15.5	9-27	9.4	567	99.9%	5
Hgb-7-10	Twentynine Palms Valley Highlands	Highland area – Groundwater Basin	17.1	7-10	9.2	568	99.9%	5
1-29	Honeydew Town Area	Groundwater Basin	9.6	1-29	9.0	569	99.9%	5
Hgb-6-54	Indian Wells Valley Highlands	Highland area – Groundwater Basin	1101.4	6-54	8.8	570	99.9%	5
Hgb-3-17	Santa Barbara Highlands	Highland area – Groundwater Basin	9.9	3-17	8.7	571	99.9%	5
Hgb-7-11	Copper Mountain Valley Highlands	Highland area – Groundwater Basin	31.8	7-11	8.6	572	99.9%	5
Hgb-5-23	Panoche Valley Highlands	Highland area – Groundwater Basin	242.5	5-23	8.5	573	99.9%	5
Hgb-6-106	Little Antelope Valley Highlands	Highland area – Groundwater Basin	22.5	6-106	8.5	574	99.9%	5
1-33	Larabee Valley	Groundwater Basin	3.9	1-33	8.5	575	99.9%	5
Hgb-5-57	Last Chance Creek Valley Highlands	Highland area – Groundwater Basin	201.8	5-57	8.4	576	99.9%	5
Hgb-3-47	Big Spring Area Highlands	Highland area – Groundwater Basin	54.0	3-47	8.0	577	99.9%	5
1-43	Williams Valley	Groundwater Basin	6.7	1-43	8.0	578	99.9%	5
Hp-8.3	Transverse and Selected Peninsular Ranges – Palos Verdes	Highland area – Province	49.1	None	7.9	579	99.9%	5
5-29	Castac Lake Valley	Groundwater Basin	14.4	5-29	7.8	580	99.9%	5
2-27	Sand Point Area	Groundwater Basin	5.7	2-27	7.7	581	99.9%	5
Hgb-4-10	Conejo Highlands	Highland area – Groundwater Basin	26.9	4-10	7.6	582	99.9%	5
Hgb-3-43	Rinconada Valley Highlands	Highland area – Groundwater Basin	28.7	3-43	7.5	583	99.9%	5
3-18	Carpinteria	Groundwater Basin	32.9	3-18	7.4	584	99.9%	5
Hgb-5-47	Goose Valley Highlands	Highland area – Groundwater Basin	73.4	5-47	7.3	585	99.9%	5
Hgb-3-39	Old Valley Highlands	Highland area – Groundwater Basin	29.3	3-39	7.3	586	99.9%	5
3-36	Santa Rosa Valley	Groundwater Basin	14.3	3-36	7.0	587	99.9%	5
6-100	Secret Valley	Groundwater Basin	136.2	6-100	7.0	588	99.9%	5
7-12	Warren Valley	Groundwater Basin	96.1	7-12	6.9	589	99.9%	5

							Cumulative percent	
Hgb-5-8	Mountain Meadows Valley Highlands	Highland area – Groundwater Basin	211.7	5-8	6.5	590	99.9%	5
Hgb-6-52	Searles Valley Highlands	Highland area – Groundwater Basin	524.6	6-52	6.4	591	99.9%	5
3-44	Pozo Valley	Groundwater Basin	27.7	3-44	6.3	592	99.9%	5
Hgb-7-59	Mason Valley Highlands	Highland area – Groundwater Basin	75.2	7-59	6.2	593	99.9%	5
3-46	Rafael Valley	Groundwater Basin	12.1	3-46	6.1	594	99.9%	5
1-25	Prairie Creek Area	Groundwater Basin	81.0	1-25	6.1	595	99.9%	5
7-47	Jacumba Valley	Groundwater Basin	9.9	7-47	6.0	596	99.9%	5
1-39	Branscomb Town Area	Groundwater Basin	5.6	1-39	5.9	597	99.9%	5
7-59	Mason Valley	Groundwater Basin	22.3	7-59	5.9	598	99.9%	5
Hgb-7-5	Chuckwalla Valley Highlands	Highland area – Groundwater Basin	909.9	7-5	5.5	599	99.9%	5
9-1	San Juan Valley	Groundwater Basin	67.6	9-1	5.4	600	99.9%	5
3-47	Big Spring Area	Groundwater Basin	29.6	3-47	5.4	601	99.9%	5
1-48	Gravelly Valley	Groundwater Basin	12.0	1-48	5.2	602	99.9%	5
1-57	Bodega Bay Area	Groundwater Basin	10.8	1-57	5.2	603	99.9%	5
Hgb-6-100	Secret Valley Highlands	Highland area – Groundwater Basin	506.8	6-100	5.2	604	99.9%	5
1-31	Weott Town Area	Groundwater Basin	14.8	1-31	5.2	605	99.9%	5
Hgb-5-20	Berryessa Valley Highlands	Highland area – Groundwater Basin	50.5	5-20	5.1	606	99.9%	5
Hgb-5-93	North Fork Cache Creek Highlands	Highland area – Groundwater Basin	306.0	5-93	5.1	607	99.9%	5
Hgb-6-20	Middle Amargosa Valley Highlands	Highland area – Groundwater Basin	767.4	6-20	5.1	608	99.9%	5
Hgb-5-71	Vallecitos Creek Valley Highlands	Highland area – Groundwater Basin	205.4	5-71	5.0	609	99.9%	5
7-63	Vandeventer Flat	Groundwater Basin	27.2	7-63	5.0	610	99.9%	5
Hgb-3-52	Needle Rock Point Highlands	Highland area – Groundwater Basin	4.1	3-52	4.9	611	99.9%	5
2-28	Ross Valley	Groundwater Basin	7.1	2-28	4.8	612	99.9%	5
6-66	Lee Flat	Groundwater Basin	82.1	6-66	4.7	613	99.9%	5
Hgb-5-21.67	Yolo Highlands	Highland area – Groundwater Basin	88.8	5-21.67	4.7	614	99.9%	5
3-43	Rinconada Valley	Groundwater Basin	10.4	3-43	4.7	615	100.0%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-2-29	San Rafael Valley Highlands	Highland area – Groundwater Basin	17.1	2-29	4.6	616	100.0%	5
Hgb-6-15	Deep Springs Valley Highlands	Highland area – Groundwater Basin	392.7	6-15	4.6	617	100.0%	5
2-8	Castro Valley	Groundwater Basin	7.4	2-8	4.5	618	100.0%	5
Hgb-7-19	Lucerne Valley Highlands	Highland area – Groundwater Basin	282.0	7-19	4.3	619	100.0%	5
5-91	Antelope Creek	Groundwater Basin	8.3	5-91	4.2	620	100.0%	5
9-18	Otay Valley	Groundwater Basin	27.6	9-18	4.1	621	100.0%	5
Hgb-5-92	Blanchard Valley Highlands	Highland area – Groundwater Basin	108.5	5-92	4.1	622	100.0%	5
3-35	San Simeon Valley	Groundwater Basin	2.3	3-35	4.1	623	100.0%	5
Hgb-6-41	Middle Mojave River Valley Highlands	Highland area – Groundwater Basin	351.6	6-41	4.0	624	100.0%	5
Hgb-6-9	Mono Valley Highlands	Highland area – Groundwater Basin	1092.2	6-9	4.0	625	100.0%	5
1-62	Wilson Point Area	Groundwater Basin	2.9	1-62	4.0	626	100.0%	5
Hgb-7-36	Yuma Valley Highlands	Highland area – Groundwater Basin	194.3	7-36	3.9	627	100.0%	5
1-42	Sherwood Valley	Groundwater Basin	4.7	1-42	3.9	628	100.0%	5
Hp-5	Basin and Range	Highland area – Province	649.4	None	3.8	629	100.0%	5
1-56	Mcdowell Valley	Groundwater Basin	6.0	1-56	3.7	630	100.0%	5
6-10	Adobe Lake Valley	Groundwater Basin	161.3	6-10	3.7	631	100.0%	5
Hgb-6-95	Dry Valley Highlands	Highland area – Groundwater Basin	34.5	6-95	3.7	632	100.0%	5
Hgb-6-56	Rose Valley Highlands	Highland area – Groundwater Basin	319.9	6-56	3.6	633	100.0%	5
Hgb-7-63	Vandeventer Flat Highlands	Highland area – Groundwater Basin	33.5	7-63	3.5	634	100.0%	5
6-14	Fish Lake Valley	Groundwater Basin	194.8	6-14	3.5	635	100.0%	5
6-56	Rose Valley	Groundwater Basin	172.1	6-56	3.5	636	100.0%	5
Hgb-5-21.55	Dye Creek Highlands	Highland area – Groundwater Basin	179.0	5-21.55	3.5	637	100.0%	5
5-58	Clover Valley	Groundwater Basin	67.9	5-58	3.4	638	100.0%	5
Hgb-5-41	Egg Lake Valley Highlands	Highland area – Groundwater Basin	328.5	5-41	3.4	639	100.0%	5
4-20	Russell Valley	Groundwater Basin	12.5	4-20	3.4	640	100.0%	5
9-24	Pamo Valley	Groundwater Basin	6.1	9-24	3.4	641	100.0%	5

							Cumulative percent	
Hgb-3-25	Tres Pinos Valley Highlands	Highland area – Groundwater Basin	11.3	3-25	3.3	642	100.0%	5
4-19	Thousand Oaks Area	Groundwater Basin	12.6	4-19	3.3	643	100.0%	5
Hgb-3-33	San Carpoforo Valley Highlands	Highland area – Groundwater Basin	93.6	3-33	3.2	644	100.0%	5
1-41	Little Valley	Groundwater Basin	3.3	1-41	3.1	645	100.0%	5
Hgb-5-3	Jess Valley Highlands	Highland area – Groundwater Basin	245.0	5-3	3.0	646	100.0%	5
3-33	San Carpoforo Valley	Groundwater Basin	4.3	3-33	2.9	647	100.0%	5
4-7	Arroyo Santa Rosa Valley	Groundwater Basin	15.1	4-7	2.9	648	100.0%	5
9-19	Tia Juana	Groundwater Basin	29.9	9-19	2.9	649	100.0%	5
Hgb-5-64	Bear Valley Highlands	Highland area – Groundwater Basin	92.9	5-64	2.8	650	100.0%	5
3-40	Toro Valley	Groundwater Basin	2.9	3-40	2.8	651	100.0%	5
Hgb-5-53	Dixie Valley Highlands	Highland area – Groundwater Basin	573.7	5-53	2.7	652	100.0%	5
3-29	Dry Lake Valley	Groundwater Basin	5.7	3-29	2.6	653	100.0%	5
6-95	Dry Valley	Groundwater Basin	26.3	6-95	2.6	654	100.0%	5
Hgb-4-20	Russell Valley Highlands	Highland area – Groundwater Basin	44.3	4-20	2.6	655	100.0%	5
Hgb-1-17	Bray Town Area Highlands	Highland area – Groundwater Basin	304.9	1-17	2.6	656	100.0%	5
Hgb-5-54	Ash Valley Highlands	Highland area – Groundwater Basin	220.9	5-54	2.5	657	100.0%	5
3-52	Needle Rock Point	Groundwater Basin	1.9	3-52	2.4	658	100.0%	5
2-32	Visitacion Valley	Groundwater Basin	23.6	2-32	2.4	659	100.0%	5
3-24	Quien Sabe Valley	Groundwater Basin	19.0	3-24	2.3	660	100.0%	5
5-54	Ash Valley	Groundwater Basin	24.3	5-54	2.3	661	100.0%	5
5-45	Cayton Valley	Groundwater Basin	5.3	5-45	2.2	662	100.0%	5
3-32	Peach Tree Valley	Groundwater Basin	39.6	3-32	2.2	663	100.0%	5
Hgb-5-61	Chrome Town Area Highlands	Highland area – Groundwater Basin	33.5	5-61	2.1	664	100.0%	5
6-105	Slinkard Valley	Groundwater Basin	18.3	6-105	2.1	665	100.0%	5
Hgb-6-105	Slinkard Valley Highlands	Highland area – Groundwater Basin	53.8	6-105	2.0	666	100.0%	5
6-69	Kelso Lander Valley	Groundwater Basin	45.2	6-69	2.0	667	100.0%	5
2-31	Arroyo Del Hambre Valley	Groundwater Basin	3.2	2-31	2.0	668	100.0%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
5-71	Vallecitos Creek Valley	Groundwater Basin	61.1	5-71	1.9	669	100.0%	5
4-15	Tierra Rejada	Groundwater Basin	18.6	4-15	1.8	670	100.0%	5
Hp-2	Klamath Mountains	Highland area – Province	479.1	None	1.8	671	100.0%	5
3-39	Old Valley	Groundwater Basin	4.8	3-39	1.8	672	100.0%	5
5-3	Jess Valley	Groundwater Basin	27.1	5-3	1.8	673	100.0%	5
5-61	Chrome Town Area	Groundwater Basin	5.7	5-61	1.7	674	100.0%	5
5-64	Bear Valley	Groundwater Basin	36.9	5-64	1.7	675	100.0%	5
7-48	Helendale Fault Valley	Groundwater Basin	10.6	7-48	1.6	676	100.0%	5
7-56	Yaqui Well Area	Groundwater Basin	60.6	7-56	1.6	677	100.0%	5
Hgb-3-32	Peach Tree Valley Highlands	Highland area – Groundwater Basin	168.8	3-32	1.6	678	100.0%	5
6-94	Grasshopper Valley	Groundwater Basin	71.5	6-94	1.6	679	100.0%	5
3-37	Villa Valley	Groundwater Basin	5.5	3-37	1.6	680	100.0%	5
Hgb-3-23	Upper Santa Ana Valley Highlands	Highland area – Groundwater Basin	37.3	3-23	1.6	681	100.0%	5
Hgb-4-7	Arroyo Santa Rosa Valley Highlands	Highland area – Groundwater Basin	12.4	4-7	1.5	682	100.0%	5
5-47	Goose Valley	Groundwater Basin	17.0	5-47	1.5	683	100.0%	5
Hgb-3-24	Quien Sabe Valley Highlands	Highland area – Groundwater Basin	79.1	3-24	1.5	684	100.0%	5
Hgb-3-38	Cayucos Valley Highlands	Highland area – Groundwater Basin	5.4	3-38	1.4	685	100.0%	5
9-12	San Dieguito Creek	Groundwater Basin	14.4	9-12	1.4	686	100.0%	5
3-20	Ano Nuevo Area	Groundwater Basin	8.2	3-20	1.4	687	100.0%	5
Hgb-5-69	Yosemite Valley Highlands	Highland area – Groundwater Basin	889.0	5-69	1.4	688	100.0%	5
Hgb-2-35	Westside Highlands	Highland area – Groundwater Basin	33.0	2-35	1.4	689	100.0%	5
Hgb-5-85	Mil Potrero Area Highlands	Highland area – Groundwater Basin	25.6	5-85	1.2	690	100.0%	5
Hgb-7-18	Johnson Valley Highlands	Highland area – Groundwater Basin	259.1	7-18	1.2	691	100.0%	5
Hgb-6-69	Kelso Lander Valley Highlands	Highland area – Groundwater Basin	52.9	6-69	1.2	692	100.0%	5
Hgb-1-25	Prairie Creek Area Highlands	Highland area – Groundwater Basin	12.7	1-25	1.1	693	100.0%	5
5-41	Egg Lake Valley	Groundwater Basin	16.6	5-41	1.1	694	100.0%	5
Hgb-3-20	Ano Nuevo Area Highlands	Highland area – Groundwater Basin	13.3	3-20	1.1	695	100.0%	5
5-90	Funks Creek	Groundwater Basin	12.2	5-90	1.1	696	100.0%	5

							Cumulative percent	
3-23	Upper Santa Ana Valley	Groundwater Basin	5.8	3-23	0.9	697	100.0%	5
9-14	Mission Valley	Groundwater Basin	29.7	9-14	0.9	698	100.0%	5
Hgb-1-48	Gravelly Valley Highlands	Highland area – Groundwater Basin	97.7	1-48	0.8	699	100.0%	5
8-7	Big Meadows Valley	Groundwater Basin	57.3	8-7	0.8	700	100.0%	5
1-17	Bray Town Area	Groundwater Basin	32.5	1-17	0.8	701	100.0%	5
9-23	San Elijo Valley	Groundwater Basin	3.6	9-23	0.8	702	100.0%	5
6-15	Deep Springs Valley	Groundwater Basin	121.1	6-15	0.8	703	100.0%	5
5-92	Blanchard Valley	Groundwater Basin	9.0	5-92	0.8	704	100.0%	5
Hgb-1-36	Hettenshaw Valley Highlands	Highland area – Groundwater Basin	12.2	1-36	0.7	705	100.0%	5
1-36	Hettenshaw Valley	Groundwater Basin	3.4	1-36	0.7	706	100.0%	5
5-8	Mountain Meadows Valley	Groundwater Basin	33.0	5-8	0.7	707	100.0%	5
Hgb-5-56	Yellow Creek Valley Highlands	Highland area – Groundwater Basin	78.8	5-56	0.6	708	100.0%	5
Hgb-5-70	Los Banos Creek Valley Highlands	Highland area – Groundwater Basin	307.4	5-70	0.6	709	100.0%	5
Hgb-6-66	Lee Flat Highlands	Highland area – Groundwater Basin	104.3	6-66	0.6	710	100.0%	5
Hgb-6-35	Cronise Valley Highlands	Highland area – Groundwater Basin	150.5	6-35	0.6	711	100.0%	5
Hgb-6-10	Adobe Lake Valley Highlands	Highland area – Groundwater Basin	538.3	6-10	0.5	712	100.0%	5
Hgb-5-45	Cayton Valley Highlands	Highland area – Groundwater Basin	60.4	5-45	0.5	713	100.0%	5
Hgb-4-18	Hungry Valley Highlands	Highland area – Groundwater Basin	69.6	4-18	0.5	714	100.0%	5
Hgb-2-27	Sand Point Area Highlands	Highland area – Groundwater Basin	0.5	2-27	0.5	715	100.0%	5
9-4	Santa Margarita Valley	Groundwater Basin	32.2	9-4	0.4	716	100.0%	5
Hgb-4-15	Tierra Rejada Highlands	Highland area – Groundwater Basin	2.0	4-15	0.4	717	100.0%	5
5-56	Yellow Creek Valley	Groundwater Basin	9.4	5-56	0.4	718	100.0%	5
5-20	Berryessa Valley	Groundwater Basin	5.6	5-20	0.4	719	100.0%	5
3-38	Cayucos Valley	Groundwater Basin	1.4	3-38	0.4	720	100.0%	5
Hgb-7-46	Canebrake Valley Highlands	Highland area – Groundwater Basin	58.9	7-46	0.3	721	100.0%	5
3-51	Majors Creek	Groundwater Basin	1.5	3-51	0.3	722	100.0%	5
9-22	Batiquitos Lagoon Valley	Groundwater Basin	3.0	9-22	0.3	723	100.0%	5

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-1-44	Eden Valley Highlands	Highland area – Groundwater Basin	39.2	1-44	0.2	724	100.0%	5
Hgb-6-94	Grasshopper Valley Highlands	Highland area – Groundwater Basin	189.2	6-94	0.2	725	100.0%	5
Hgb-8-8	Seven Oaks Valley Highlands	Highland area – Groundwater Basin	32.5	8-8	0.2	726	100.0%	5
7-35	Ogilby Valley	Groundwater Basin	539.0	7-35	0.2	727	100.0%	5
Hgb-7-33	East Salton Sea Highlands	Highland area – Groundwater Basin	262.7	7-33	0.2	728	100.0%	5
7-55	Collins Valley	Groundwater Basin	28.6	7-55	0.2	729	100.0%	5
Hgb-5-89	Squaw Flat Highlands	Highland area – Groundwater Basin	29.8	5-89	0.2	730	100.0%	5
7-46	Canebrake Valley	Groundwater Basin	21.9	7-46	0.1	731	100.0%	5
Hp-10.1	Desert – Eastern	Highland area – Province	701.2	None	0.1	732	100.0%	5
5-57	Last Chance Creek Valley	Groundwater Basin	18.8	5-57	0.1	733	100.0%	5
5-43	Rock Prairie Valley	Groundwater Basin	23.2	5-43	0.1	734	100.0%	5
Hgb-2-36	San Pedro Valley Highlands	Highland area – Groundwater Basin	19.5	2-36	0.1	735	100.0%	5
5-89	Squaw Flat	Groundwater Basin	5.2	5-89	0.0	736	100.0%	5
Hgb-7-35	Ogilby Valley Highlands	Highland area – Groundwater Basin	110.0	7-35	0.0	737	100.0%	5
Hgb-5-62	Elk Creek Area Highlands	Highland area – Groundwater Basin	281.4	5-62	0.0	738	100.0%	5
5-23	Panoche Valley	Groundwater Basin	133.9	5-23	0.0	739	100.0%	5
Hgb-7-32	Chocolate Valley Highlands	Highland area – Groundwater Basin	286.3	7-32	0.0	740	100.0%	5
2-36	San Pedro Valley	Groundwater Basin	2.8	2-36	0.0	741	100.0%	5
Hgb-6-107	Sweetwater Flat Highlands	Highland area – Groundwater Basin	124.7	6-107	0.0	742	100.0%	6
Hgb-7-29	Coyote Wells Valley Highlands	Highland area – Groundwater Basin	189.0	7-29	0.0	743	100.0%	6
Hgb-6-29	Mesquite Valley Highlands	Highland area – Groundwater Basin	177.8	6-29	0.0	744	100.0%	6
Hgb-7-43	Chemehuevi Valley Highlands	Highland area – Groundwater Basin	665.6	7-43	0.0	745	100.0%	6
Hgb-9-3	San Onofre Valley Highlands	Highland area – Groundwater Basin	100.1	9-3	0.0	746	100.0%	6
Hgb-1-37	Cottoneva Creek Valley Highlands	Highland area – Groundwater Basin	29.7	1-37	0.0	747	100.0%	6

							Cumulative percent	
Hgb-9-19	Tia Juana Highlands	Highland area – Groundwater Basin	12.4	9-19	0.0	748	100.0%	6
2-29	San Rafael Valley	Groundwater Basin	3.5	2-29	0.0	749	100.0%	6
7-34	Amos Valley	Groundwater Basin	525.8	7-34	0.0	750	100.0%	6
Hgb-7-37	Arroyo Seco Valley Highlands	Highland area – Groundwater Basin	420.5	7-37	0.0	751	100.0%	6
Hgb-6-101	Bull Flat Highlands	Highland area – Groundwater Basin	445.2	6-101	0.0	752	100.0%	6
Hgb-6-30	Ivanpah Valley Highlands	Highland area – Groundwater Basin	327.3	6-30	0.0	753	100.0%	6
5-93	North Fork Cache Creek	Groundwater Basin	14.1	5-93	0.0	754	100.0%	6
7-37	Arroyo Seco Valley	Groundwater Basin	1038.1	7-37	0.0	755	100.0%	6
1-16	Seiad Valley	Groundwater Basin	9.1	1-16	0.0	757	100.0%	6
1-22	Fairchild Swamp Valley	Groundwater Basin	13.3	1-22	0.0	758	100.0%	6
1-37	Cottoneva Creek Valley	Groundwater Basin	3.1	1-37	0.0	759	100.0%	6
1-44	Eden Valley	Groundwater Basin	5.6	1-44	0.0	760	100.0%	6
4-18	Hungry Valley	Groundwater Basin	21.5	4-18	0.0	761	100.0%	6
5-37	Toad Well Area	Groundwater Basin	13.6	5-37	0.0	762	100.0%	6
5-38	Pondosa Town Area	Groundwater Basin	8.4	5-38	0.0	763	100.0%	6
5-44	Long Valley	Groundwater Basin	4.4	5-44	0.0	764	100.0%	6
5-49	Dry Burney Creek Valley	Groundwater Basin	12.4	5-49	0.0	765	100.0%	6
5-51	Butte Creek Valley	Groundwater Basin	13.1	5-51	0.0	766	100.0%	6
5-52	Grays Valley	Groundwater Basin	22.0	5-52	0.0	767	100.0%	6
5-53	Dixie Valley	Groundwater Basin	19.7	5-53	0.0	768	100.0%	6
5-62	Elk Creek Area	Groundwater Basin	5.8	5-62	0.0	769	100.0%	6
5-69	Yosemite Valley	Groundwater Basin	30.2	5-69	0.0	770	100.0%	6
5-70	Los Banos Creek Valley	Groundwater Basin	19.6	5-70	0.0	771	100.0%	6
5-88	Stony Gorge Reservoir	Groundwater Basin	4.3	5-88	0.0	772	100.0%	6
6-101	Bull Flat	Groundwater Basin	73.4	6-101	0.0	773	100.0%	6
6-107	Sweetwater Flat	Groundwater Basin	19.2	6-107	0.0	774	100.0%	6
6-13	Black Springs Valley	Groundwater Basin	124.5	6-13	0.0	775	100.0%	6
6-16	Eureka Valley	Groundwater Basin	521.1	6-16	0.0	776	100.0%	6
6-17	Saline Valley	Groundwater Basin	591.6	6-17	0.0	777	100.0%	6
6-18	Death Valley	Groundwater Basin	3725.2	6-18	0.0	778	100.0%	6
6-19	Wingate Valley	Groundwater Basin	288.5	6-19	0.0	779	100.0%	6
6-21	Lower Kingston Valley	Groundwater Basin	970.2	6-21	0.0	780	100.0%	6
6-22	Upper Kingston Valley	Groundwater Basin	715.3	6-22	0.0	781	100.0%	6
6-23	Riggs Valley	Groundwater Basin	354.2	6-23	0.0	782	100.0%	6

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
6-24	Red Pass Valley	Groundwater Basin	389.8	6-24	0.0	783	100.0%	6
6-25	Bicycle Valley	Groundwater Basin	362.0	6-25	0.0	784	100.0%	6
6-26	Avawatz Valley	Groundwater Basin	111.7	6-26	0.0	785	100.0%	6
6-27	Leach Valley	Groundwater Basin	247.6	6-27	0.0	786	100.0%	6
6-30	Ivanpah Valley	Groundwater Basin	801.2	6-30	0.0	787	100.0%	6
6-31	Kelso Valley	Groundwater Basin	1030.7	6-31	0.0	788	100.0%	6
6-32	Broadwell Valley	Groundwater Basin	371.8	6-32	0.0	789	100.0%	6
6-34	Silver Lake Valley	Groundwater Basin	142.5	6-34	0.0	790	100.0%	6
6-36	Langford Valley	Groundwater Basin	120.6	6-36	0.0	791	100.0%	6
6-37	Coyote Lake Valley	Groundwater Basin	356.5	6-37	0.0	792	100.0%	6
6-38	Caves Canyon Valley	Groundwater Basin	295.3	6-38	0.0	793	100.0%	6
6-48	Goldstone Valley	Groundwater Basin	113.7	6-48	0.0	794	100.0%	6
6-49	Superior Valley	Groundwater Basin	486.9	6-49	0.0	795	100.0%	6
6-50	Cuddeback Valley	Groundwater Basin	384.1	6-50	0.0	796	100.0%	6
6-51	Pilot Knob Valley	Groundwater Basin	560.9	6-51	0.0	797	100.0%	6
6-53	Salt Wells Valley	Groundwater Basin	119.3	6-53	0.0	798	100.0%	6
6-55	Coso Valley	Groundwater Basin	103.4	6-55	0.0	799	100.0%	6
6-57	Darwin Valley	Groundwater Basin	178.7	6-57	0.0	800	100.0%	6
6-58	Panamint Valley	Groundwater Basin	1049.3	6-58	0.0	801	100.0%	6
6-61	Cameo Area	Groundwater Basin	37.6	6-61	0.0	802	100.0%	6
6-62	Race Track Valley	Groundwater Basin	57.1	6-62	0.0	803	100.0%	6
6-63	Hidden Valley	Groundwater Basin	72.6	6-63	0.0	804	100.0%	6
6-64	Marble Canyon Area	Groundwater Basin	41.9	6-64	0.0	805	100.0%	6
6-65	Cottonwood Spring Area	Groundwater Basin	15.8	6-65	0.0	806	100.0%	6
6-68	Santa Rosa Flat	Groundwater Basin	67.9	6-68	0.0	807	100.0%	6
6-70	Cactus Flat	Groundwater Basin	28.4	6-70	0.0	808	100.0%	6
6-71	Lost Lake Valley	Groundwater Basin	94.1	6-71	0.0	809	100.0%	6
6-72	Coles Flat	Groundwater Basin	11.9	6-72	0.0	810	100.0%	6
6-73	Wild Horse Mesa Area	Groundwater Basin	13.4	6-73	0.0	811	100.0%	6
6-74	Harrisburg Flats	Groundwater Basin	100.9	6-74	0.0	812	100.0%	6
6-75	Wildrose Canyon	Groundwater Basin	20.8	6-75	0.0	813	100.0%	6
6-76	Brown Mountain Valley	Groundwater Basin	87.9	6-76	0.0	814	100.0%	6
6-77	Grass Valley	Groundwater Basin	40.4	6-77	0.0	815	100.0%	6
6-78	Denning Spring Valley	Groundwater Basin	29.3	6-78	0.0	816	100.0%	6
6-79	California Valley	Groundwater Basin	235.2	6-79	0.0	817	100.0%	6
6-80	Middle Park Canyon	Groundwater Basin	7.0	6-80	0.0	818	100.0%	6
6-81	Butte Valley	Groundwater Basin	35.6	6-81	0.0	819	100.0%	6
6-82	Spring Canyon Valley	Groundwater Basin	19.4	6-82	0.0	820	100.0%	6
6-84	Greenwater Valley	Groundwater Basin	242.1	6-84	0.0	821	100.0%	6

							Cumulative percent	
6-85	Gold Valley	Groundwater Basin	13.0	6-85	0.0	822	100.0%	6
6-86	Rhodes Hill Area	Groundwater Basin	63.0	6-86	0.0	823	100.0%	6
6-88	Owl Lake Valley	Groundwater Basin	90.0	6-88	0.0	824	100.0%	6
6-89	Kane Wash Area	Groundwater Basin	24.1	6-89	0.0	825	100.0%	6
6-90	Cady Fault Area	Groundwater Basin	32.2	6-90	0.0	826	100.0%	6
6-91	Cow Head Lake Valley	Groundwater Basin	22.7	6-91	0.0	827	100.0%	6
6-92	Pine Creek Valley	Groundwater Basin	38.6	6-92	0.0	828	100.0%	6
6-93	Harvey Valley	Groundwater Basin	18.2	6-93	0.0	829	100.0%	6
6-97	Horse Lake Valley	Groundwater Basin	15.5	6-97	0.0	830	100.0%	6
6-98	Tuledad Canyon Valley	Groundwater Basin	20.9	6-98	0.0	831	100.0%	6
6-99	Painters Flat	Groundwater Basin	25.9	6-99	0.0	832	100.0%	6
7-13	Deadman Valley	Groundwater Basin	478.6	7-13	0.0	833	100.0%	6
7-15	Bessemer Valley	Groundwater Basin	158.1	7-15	0.0	834	100.0%	6
7-17	Means Valley	Groundwater Basin	60.5	7-17	0.0	835	100.0%	6
7-3	Ward Valley	Groundwater Basin	2256.5	7-3	0.0	836	100.0%	6
7-31	Orocopia Valley	Groundwater Basin	389.4	7-31	0.0	837	100.0%	6
7-4	Rice Valley	Groundwater Basin	761.1	7-4	0.0	838	100.0%	6
7-40	Quien Sabe Point Valley	Groundwater Basin	101.7	7-40	0.0	839	100.0%	6
7-41	Calzona Valley	Groundwater Basin	325.9	7-41	0.0	840	100.0%	6
7-45	Piute Valley	Groundwater Basin	708.6	7-45	0.0	841	100.0%	6
7-50	Iron Ridge Area	Groundwater Basin	21.2	7-50	0.0	842	100.0%	6
7-51	Lost Horse Valley	Groundwater Basin	70.0	7-51	0.0	843	100.0%	6
7-52	Pleasant Valley	Groundwater Basin	39.0	7-52	0.0	844	100.0%	6
7-53	Hexie Mountain Area	Groundwater Basin	45.0	7-53	0.0	845	100.0%	6
7-54	Buck Ridge Fault Valley	Groundwater Basin	28.0	7-54	0.0	846	100.0%	6
7-6	Pinto Valley	Groundwater Basin	738.3	7-6	0.0	847	100.0%	6
7-61	Davies Valley	Groundwater Basin	14.4	7-61	0.0	848	100.0%	6
7-7	Cadiz Valley	Groundwater Basin	1092.0	7-7	0.0	849	100.0%	6
8-8	Seven Oaks Valley	Groundwater Basin	16.5	8-8	0.0	850	100.0%	6
9-2	San Mateo Valley	Groundwater Basin	12.1	9-2	0.0	851	100.0%	6
9-3	San Onofre Valley	Groundwater Basin	5.1	9-3	0.0	852	100.0%	6
Hgb-1-22	Fairchild Swamp Valley Highlands	Highland area – Groundwater Basin	63.7	1-22	0.0	853	100.0%	6
Hgb-5-37	Toad Well Area Highlands	Highland area – Groundwater Basin	127.5	5-37	0.0	854	100.0%	6
Hgb-5-38	Pondosa Town Area Highlands	Highland area – Groundwater Basin	83.6	5-38	0.0	855	100.0%	6
Hgb-5-44	Long Valley Highlands	Highland area – Groundwater Basin	11.2	5-44	0.0	856	100.0%	6

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-5-49	Dry Burney Creek Valley Highlands	Highland area – Groundwater Basin	66.1	5-49	0.0	857	100.0%	6
Hgb-5-51	Butte Creek Valley Highlands	Highland area – Groundwater Basin	397.1	5-51	0.0	858	100.0%	6
Hgb-5-52	Grays Valley Highlands	Highland area – Groundwater Basin	75.0	5-52	0.0	859	100.0%	6
Hgb-6-13	Black Springs Valley Highlands	Highland area – Groundwater Basin	165.1	6-13	0.0	860	100.0%	6
Hgb-6-14	Fish Lake Valley Highlands	Highland area – Groundwater Basin	351.3	6-14	0.0	756	100.0%	6
Hgb-6-16	Eureka Valley Highlands	Highland area – Groundwater Basin	833.0	6-16	0.0	861	100.0%	6
Hgb-6-17	Saline Valley Highlands	Highland area – Groundwater Basin	928.6	6-17	0.0	862	100.0%	6
Hgb-6-18	Death Valley Highlands	Highland area – Groundwater Basin	3493.6	6-18	0.0	863	100.0%	6
Hgb-6-19	Wingate Valley Highlands	Highland area – Groundwater Basin	249.7	6-19	0.0	864	100.0%	6
Hgb-6-21	Lower Kingston Valley Highlands	Highland area – Groundwater Basin	277.6	6-21	0.0	865	100.0%	6
Hgb-6-22	Upper Kingston Valley Highlands	Highland area – Groundwater Basin	402.9	6-22	0.0	866	100.0%	6
Hgb-6-23	Riggs Valley Highlands	Highland area – Groundwater Basin	246.7	6-23	0.0	867	100.0%	6
Hgb-6-24	Red Pass Valley Highlands	Highland area – Groundwater Basin	148.0	6-24	0.0	868	100.0%	6
Hgb-6-25	Bicycle Valley Highlands	Highland area – Groundwater Basin	189.2	6-25	0.0	869	100.0%	6
Hgb-6-26	Avawatz Valley Highlands	Highland area – Groundwater Basin	83.3	6-26	0.0	870	100.0%	6
Hgb-6-27	Leach Valley Highlands	Highland area – Groundwater Basin	187.8	6-27	0.0	871	100.0%	6
Hgb-6-28	Pahrump Valley Highlands	Highland area – Groundwater Basin	129.9	6-28	0.0	872	100.0%	6
Hgb-6-31	Kelso Valley Highlands	Highland area – Groundwater Basin	556.3	6-31	0.0	873	100.0%	6
Hgb-6-32	Broadwell Valley Highlands	Highland area – Groundwater Basin	241.6	6-32	0.0	874	100.0%	6
Hgb-6-34	Silver Lake Valley Highlands	Highland area – Groundwater Basin	88.1	6-34	0.0	875	100.0%	6

							Cumulative percent	
Hgb-6-36	Langford Valley Highlands	Highland area – Groundwater Basin	66.1	6-36	0.0	876	100.0%	6
Hgb-6-37	Coyote Lake Valley Highlands	Highland area – Groundwater Basin	290.2	6-37	0.0	877	100.0%	6
Hgb-6-38	Caves Canyon Valley Highlands	Highland area – Groundwater Basin	75.6	6-38	0.0	878	100.0%	6
Hgb-6-48	Goldstone Valley Highlands	Highland area – Groundwater Basin	161.8	6-48	0.0	879	100.0%	6
Hgb-6-49	Superior Valley Highlands	Highland area – Groundwater Basin	387.1	6-49	0.0	880	100.0%	6
Hgb-6-50	Cuddeback Valley Highlands	Highland area – Groundwater Basin	250.1	6-50	0.0	881	100.0%	6
Hgb-6-51	Pilot Knob Valley Highlands	Highland area – Groundwater Basin	390.7	6-51	0.0	882	100.0%	6
Hgb-6-53	Salt Wells Valley Highlands	Highland area – Groundwater Basin	44.5	6-53	0.0	883	100.0%	6
Hgb-6-55	Coso Valley Highlands	Highland area – Groundwater Basin	405.4	6-55	0.0	884	100.0%	6
Hgb-6-57	Darwin Valley Highlands	Highland area – Groundwater Basin	269.4	6-57	0.0	885	100.0%	6
Hgb-6-58	Panamint Valley Highlands	Highland area – Groundwater Basin	1261.7	6-58	0.0	886	100.0%	6
Hgb-6-61	Cameo Area Highlands	Highland area – Groundwater Basin	158.2	6-61	0.0	887	100.0%	6
Hgb-6-62	Race Track Valley Highlands	Highland area – Groundwater Basin	210.9	6-62	0.0	888	100.0%	6
Hgb-6-63	Hidden Valley Highlands	Highland area – Groundwater Basin	118.4	6-63	0.0	889	100.0%	6
Hgb-6-64	Marble Canyon Area Highlands	Highland area – Groundwater Basin	195.5	6-64	0.0	890	100.0%	6
Hgb-6-65	Cottonwood Spring Area Highlands	Highland area – Groundwater Basin	57.3	6-65	0.0	891	100.0%	6
Hgb-6-68	Santa Rosa Flat Highlands	Highland area – Groundwater Basin	101.6	6-68	0.0	892	100.0%	6
Hgb-6-70	Cactus Flat Highlands	Highland area – Groundwater Basin	84.8	6-70	0.0	893	100.0%	6
Hgb-6-71	Lost Lake Valley Highlands	Highland area – Groundwater Basin	99.8	6-71	0.0	894	100.0%	6
Hgb-6-72	Coles Flat Highlands	Highland area – Groundwater Basin	19.6	6-72	0.0	895	100.0%	6

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-6-73	Wild Horse Mesa Area Highlands	Highland area – Groundwater Basin	43.3	6-73	0.0	896	100.0%	6
Hgb-6-74	Harrisburg Flats Highlands	Highland area – Groundwater Basin	62.5	6-74	0.0	897	100.0%	6
Hgb-6-75	Wildrose Canyon Highlands	Highland area – Groundwater Basin	44.5	6-75	0.0	898	100.0%	6
Hgb-6-76	Brown Mountain Valley Highlands	Highland area – Groundwater Basin	100.8	6-76	0.0	899	100.0%	6
Hgb-6-77	Grass Valley Highlands	Highland area – Groundwater Basin	25.9	6-77	0.0	900	100.0%	6
Hgb-6-78	Denning Spring Valley Highlands	Highland area – Groundwater Basin	38.2	6-78	0.0	901	100.0%	6
Hgb-6-79	California Valley Highlands	Highland area – Groundwater Basin	115.5	6-79	0.0	902	100.0%	6
Hgb-6-80	Middle Park Canyon Highlands	Highland area – Groundwater Basin	5.4	6-80	0.0	903	100.0%	6
Hgb-6-81	Butte Valley Highlands	Highland area – Groundwater Basin	44.7	6-81	0.0	904	100.0%	6
Hgb-6-82	Spring Canyon Valley Highlands	Highland area – Groundwater Basin	69.6	6-82	0.0	905	100.0%	6
Hgb-6-84	Greenwater Valley Highlands	Highland area – Groundwater Basin	172.8	6-84	0.0	906	100.0%	6
Hgb-6-85	Gold Valley Highlands	Highland area – Groundwater Basin	36.1	6-85	0.0	907	100.0%	6
Hgb-6-86	Rhodes Hill Area Highlands	Highland area – Groundwater Basin	109.3	6-86	0.0	908	100.0%	6
Hgb-6-88	Owl Lake Valley Highlands	Highland area – Groundwater Basin	96.8	6-88	0.0	909	100.0%	6
Hgb-6-89	Kane Wash Area Highlands	Highland area – Groundwater Basin	37.2	6-89	0.0	910	100.0%	6
Hgb-6-90	Cady Fault Area Highlands	Highland area – Groundwater Basin	30.7	6-90	0.0	911	100.0%	6
Hgb-6-91	Cow Head Lake Valley Highlands	Highland area – Groundwater Basin	37.0	6-91	0.0	912	100.0%	6
Hgb-6-92	Pine Creek Valley Highlands	Highland area – Groundwater Basin	243.6	6-92	0.0	913	100.0%	6
Hgb-6-93	Harvey Valley Highlands	Highland area – Groundwater Basin	85.8	6-93	0.0	914	100.0%	6
Hgb-6-97	Horse Lake Valley Highlands	Highland area – Groundwater Basin	205.1	6-97	0.0	915	100.0%	6

							Cumulative percent	
Hgb-6-98	Tuledad Canyon Valley Highlands	Highland area – Groundwater Basin	131.4	6-98	0.0	916	100.0%	6
Hgb-6-99	Painters Flat Highlands	Highland area – Groundwater Basin	52.3	6-99	0.0	917	100.0%	6
Hgb-7-13	Deadman Valley Highlands	Highland area – Groundwater Basin	121.8	7-13	0.0	918	100.0%	6
Hgb-7-15	Bessemer Valley Highlands	Highland area – Groundwater Basin	129.5	7-15	0.0	919	100.0%	6
Hgb-7-17	Means Valley Highlands	Highland area – Groundwater Basin	29.9	7-17	0.0	920	100.0%	6
Hgb-7-31	Orocopia Valley Highlands	Highland area – Groundwater Basin	306.6	7-31	0.0	921	100.0%	6
Hgb-7-34	Amos Valley Highlands	Highland area – Groundwater Basin	184.2	7-34	0.0	922	100.0%	6
Hgb-7-38	Palo Verde Valley Highlands	Highland area – Groundwater Basin	50.5	7-38	0.0	923	100.0%	6
Hgb-7-39	Palo Verde Mesa Highlands	Highland area – Groundwater Basin	240.1	7-39	0.0	924	100.0%	6
Hgb-7-4	Rice valley Highlands	Highland area – Groundwater Basin	204.4	7-4	0.0	925	100.0%	6
Hgb-7-40	Quien Sabe Point Valley Highlands	Highland area – Groundwater Basin	98.8	7-40	0.0	926	100.0%	6
Hgb-7-41	Calzona Valley Highlands	Highland area – Groundwater Basin	137.9	7-41	0.0	927	100.0%	6
Hgb-7-42	Vidal Valley Highlands	Highland area – Groundwater Basin	176.2	7-42	0.0	928	100.0%	6
Hgb-7-45	Piute Valley Highlands	Highland area – Groundwater Basin	343.3	7-45	0.0	929	100.0%	6
Hgb-7-50	Iron Ridge Area Highlands	Highland area – Groundwater Basin	18.3	7-50	0.0	930	100.0%	6
Hgb-7-51	Lost Horse Valley Highlands	Highland area – Groundwater Basin	114.4	7-51	0.0	931	100.0%	6
Hgb-7-52	Pleasant Valley Highlands	Highland area – Groundwater Basin	87.7	7-52	0.0	932	100.0%	6
Hgb-7-53	Hexie Mountain Area Highlands	Highland area – Groundwater Basin	30.1	7-53	0.0	933	100.0%	6

Table A2 (*Continued*)

GU_ID	GU_Name	GU_type	Area (km^2)	Related Groundwater basin	Households	Cumulative rank	Cumulative percent	Category
Hgb-7-54	Buck Ridge Fault Valley Highlands	Highland area – Groundwater Basin	52.1	7-54	0.0	934	100.0%	6
Hgb-7-6	Pinto Valley Highlands	Highland area – Groundwater Basin	785.7	7-6	0.0	935	100.0%	6
8								
Hgb-7-61	Davies Valley Highlands	Highland area – Groundwater Basin	31.2	7-61	0.0	936	100.0%	6
Hgb-7-7	Cadiz Valley Highlands	Highland area – Groundwater Basin	386.9	7-7	0.0	937	100.0%	6
Hgb-7-8	Bristol Valley Highlands	Highland area – Groundwater Basin	879.4	7-8	0.0	938	100.0%	6

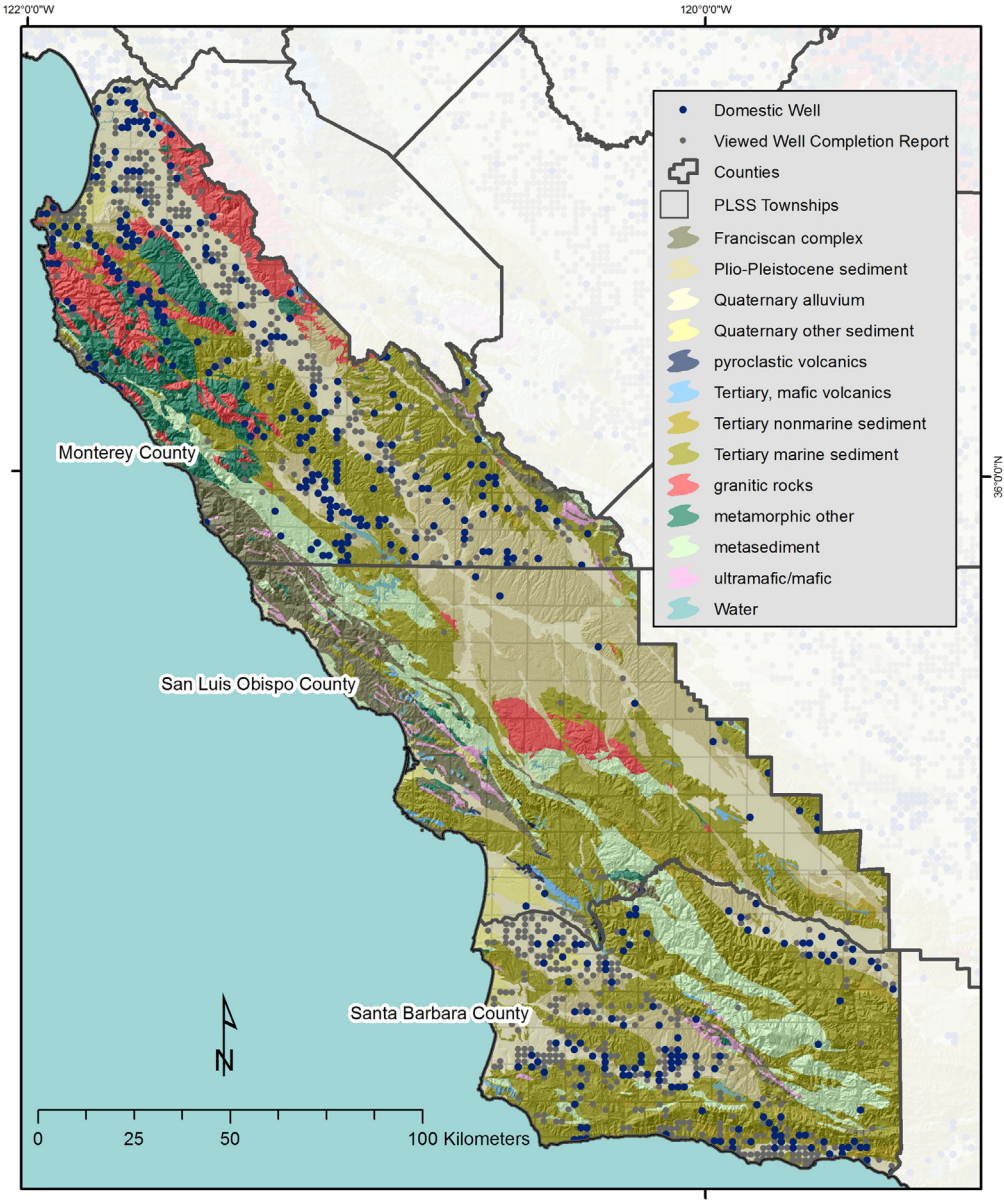

Fig. A1. The geology of Santa Barbara and Monterey Counties was used to estimate well locations in San Luis Obispo County. Geology from Saucedo et al. (2000). Shown are the viewed well completion report locations and the confirmed domestic wells, all other well completion reports not shown.

In order to restrict the location of wells to developed areas, only those PLSS sections that contained at least one named road in the Esri 2010 Streets dataset (Esri and Tele Atlas, 2010) were included in the density calculation. Unnamed roads were not included because domestic wells are generally located near a house, and most houses are within 1 mile (1609 m) of a named street address. Of the 3421 PLSS sections in San Luis Obispo County, 2277 contained a named road and were assigned a number of domestic wells based on the lithology in the section (Table A1).

Fig. A1 shows the geology of Monterey, SLO, and Santa Barbara Counties. Previously, only 16 domestic wells were identified in SLO County. Using the geology based method, SLO County is estimated to contain 2976 domestic wells. Monterey and Santa Barbara Counties are estimated to contain 5353 and 1070 domestic wells, respectively.

A.2. Ranked Groundwater Units

Table A2 lists and ranks the 938 Groundwater Units in the state based upon the number of households using a domestic well (1990 US Census data). The geospatial boundaries of the Groundwater Units (Johnson and Belitz, 2014) can be downloaded from http://dx.doi.org/10.3133/ds796.

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